

5.2 Flora and Fauna

5.2.1 Marine Ecology

5.2.1.1 Introduction

BEC Consultants Ltd was commissioned by Scott Cawley to carry out a marine Ecological Impact Assessment (EcIA) in relation to the construction and operation of a proposed berth for cruise liners in Dún Laoghaire Harbour, Co. Dublin.

The aim of this section is to describe the existing environment in Dún Laoghaire Harbour and surrounds in terms of its marine ecology, as well as describe the potential impacts of the proposed projects along with recommended mitigation measures.

A separate Natura Impact Statement was prepared to inform the Appropriate Assessment process and to fulfil the requirements of Article 6(3) of the Habitats Directive (92/43/EEC).

5.2.1.2 Methodology

5.2.1.2.1 Study area

The study area was Dún Laoghaire Harbour, Co. Dublin and the surrounding waters. The location of the benthic sample stations are illustrated in Figure 5.2.1.1

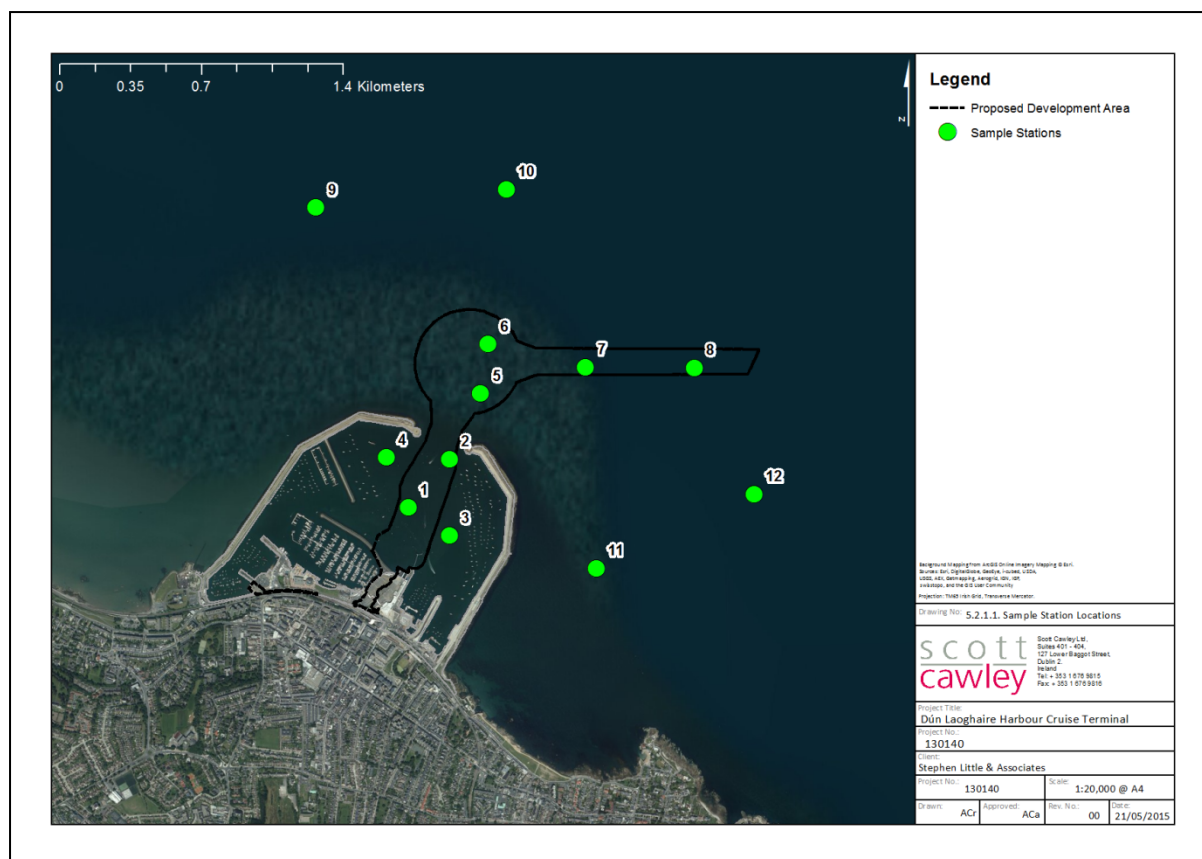


Figure 5.2.1.1 Study Area showing location of Dún Laoghaire Harbour and benthic sample stations.

5.2.1.2.2 Desk study

A desk study was carried out to gather existing information on the marine ecology of the study areas, including benthic ecology, fish and marine mammals. This desk study included a review of the National Parks & Wildlife Service (NPWS) mapping tool, a review of reports and data published by the NPWS, a review of data held on the Irish Whale and Dolphin Group (IWDG) website, and a general literature review of the scientific literature. Details of the materials used are presented in Chapter 9 Bibliography.

5.2.1.2.3 Field survey

A benthic field survey was carried out on 24th April 2014 using a 0.1 m² Van Veen grab deployed from the M.V. Sharpshooter. A total of 12 stations were sampled, with one grab taken for macroinvertebrate analysis and one for sediment analysis (granulometry and Total Organic Carbon) at each station. Sample stations were located using the Sharpshooter's on-board GPS system, onto which preselected sample station locations were loaded.

The 0.1 m² Van Veen grab was deployed from an A-frame on the survey boat. Sediment samples were taken as a core into the retrieved sediment, labelled and placed in a cooler box. These were subsequently frozen on return to shore. Macroinvertebrate samples were washed through a 1 mm mesh sieve. The residue was transferred to labelled sample containers and fixed with 10% Formalin before being transported back to the laboratory for processing.

5.2.1.2.4 Macroinvertebrate sample analysis

Rose Bengal was added to the samples on arrival in the laboratory in order to aid sorting. Samples were transferred to 70% Industrial Methylated Spirits (IMS) as preservative prior to sorting and identification.

Samples were sorted in a white tray, with macroinvertebrates being transferred to labelled containers and preserved with 70% IMS prior to identification.

Identification was carried out using stereoscopic and compound microscopes and appropriate keys.

5.2.1.2.5 Sediment sample analysis

Sediment analysis for granulometry and Total Organic Carbon was carried out by I.B. Aquatic Consultants, Galway.

5.2.1.2.6 Data analysis

On completion of macroinvertebrate and sediment sample analysis, the data were used to describe the benthic environment. PRIMER V6.0 (Clarke & Gorley, 2006) was used to carry out data analysis on the macroinvertebrate and sediment data.

Univariate ecological indices: On completion of sorting and identification, several univariate ecological indices were calculated to characterise the invertebrate community within the study area. These included Species Richness, Shannon-Wiener diversity and Pielou's evenness.

Community structure: Abundance data were fourth-root transformed to down-weight the importance of the highly abundant species and give rarer species more importance (Clarke, 1993) and used to calculate a Bray-Curtis similarity matrix. The similarity matrix was then used in cluster analysis to find sample groupings, i.e. samples within a group that are more similar to each other, than they are similar to samples in different groups. Similarity profile routine (SIMPROF) was used to identify significant ($P < 0.05$) groupings and the results were represented graphically on a dendrogram. Differences in community structure among samples were visualized with non-metric multidimensional scaling plots on the basis of Bray-Curtis similarities of the transformed data.

Sediment: Sediment data were fourth-root transformed and normalised to equalise variance and standardize contributory importance of each variable. Cluster analysis based on Euclidian distances was used to find sample groupings, i.e. samples within a group that are more similar to each other, than they are similar to samples in different groups. Similarity profile routine (SIMPROF) was used to identify significant ($P < 0.05$) groupings and the results were represented graphically on a dendrogram. Principal component analysis (PCA), based on Euclidean distances, was then used to visualise differences in sediment characteristics among samples and to identify the parameters that accounted for the variance among sites. Proportions of sediment particle size classes 0.5-1 mm, 1-2 mm and 2-4 mm were highly correlated (pair wise correlation: > 0.9) and thus were grouped as a single class of 0.5-4 mm for analysis.

5.2.1.2.7 Consultation

Consultation was carried out with David Lyons, Marine Ecologist with the National Parks and Wildlife Service (NPWS) of the Department of Arts, Heritage and the Gaeltacht (DAHG) by telephone on 12/05/2014. The following are the main points raised:

- Development site is not within an SAC, but is close to Rockabill to Dalkey Island SAC (site code: 003000), which is designated for harbour porpoise (*Phocoena phocoena*) and reefs
- Screening for Appropriate Assessment is required as a minimum, which should include potential effect on harbour porpoise and reefs
- Marine mammals in the wider environment need to be considered through carrying out a risk assessment for dredging and piling, as well as spoil disposal
- *Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters* (DAHG, 2014) is required to be implemented for dredging, piling and spoil disposal.

5.2.1.2.8 Impact assessment methodology

This impact assessment was carried out in line with the Environmental Protection Agency's (EPA) *Guidelines on the Information to be contained in Environmental Impact Statements* (CAAS, 2002). The significance of the impact was assessed based on the deemed conservation value of the receptor in relation to legislative protection (Annexes II, IV of the Habitats Directive, Wildlife Acts 1976-2012), as well as the national resource of a particular habitat or species, their specific sensitivities and resilience.

5.2.1.3 Receiving environment

5.2.1.3.1 Designated sites

The following sites, in the vicinity of the proposed development, are designated as Special Areas of Conservation (SACs) under the Habitats Directive (92/43/EEC), which is transposed into Irish law by the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011) and have marine qualifying interests:

- South Dublin Bay (site code: 000210)
 - Mudflats and sandflats not covered by seawater at low tide [1140]
- North Dublin Bay (site code: 000206)
 - 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]
 - *Spartina* swards (*Spartinion maritimae*) [1320]
 - Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]
 - Petalwort (*Petalophyllum ralfsii*) [1395]
 - Mediterranean salt meadows (*Juncetalia maritimi*) [1410]
 - Embryonic shifting dunes [2110]

- Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]
- Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]
- Humid dune slacks [2190]
- Rockabill to Dalkey Island (site code: 003000)
 - Reefs [1170]
 - Harbour porpoise (*Phocoena phocoena*) [1351]

A number of proposed Natural Heritage Areas (pNHAs) occur in the vicinity of the proposed development, most of which are also covered by designation as an SAC and/or Special Protection Area (SPA). These include South Dublin Bay pNHA (000210), North Dublin Bay pNHA (000206) and Dalkey Coastal Zone and Killiney Hill pNHA (001206). While pNHAs have no statutory protection under the Wildlife Act 1976 to 2012 (this is only afforded to fully designated NHAs), they are usually given some protection in the planning process under County Development Plans, as is the case for the Dún Laoghaire-Rathdown County Development Plan (Policy LHB8).

5.2.1.3.2 Benthic ecology

5.2.1.3.2.1 *General*

There is limited published information on the benthic ecology of Dublin Bay as a whole, and the waters in and around Dún Laoghaire Harbour in particular, where the proposed dredging is to occur. Walker & Rees (1980) described the benthic communities of Dublin Bay in relation to sludge dumping, though the data are old (sampling in 1971-72) and the practice of sludge dumping was discontinued in 1999. Walker & Rees (1980) identified three communities (Group I – III). Group I was considered to correspond to the *Acrocnida brachiata/Clymene oerstedii* community of Glémarec (1969; 1973), which is a development of the shallow *Venus* or Boreal offshore sand association (Jones, 1950) inhabiting muddier sediments. Group II resembled the Boreal offshore muddy sand association (*Abra* community) (Jones, 1950, Thorson, 1957), but is probably closer to Casper's (1950) *Nucula nucleus/Sabellaria spinulosa* community. Group III, found on sandbanks of medium sand, had only some similarities with Pearson's (1970) *Polycirrus* in sand and pebble grounds, and the *Ophelia borealis* facies of Glémarec's (1969) deep *Venus fasciata* community, in medium sand. The single sample taken inside Dún Laoghaire Harbour during the 1971/72 survey did not align with any of the groups, one at the harbour mouth was assigned to Group II, while those outside the harbour, but within inner Dublin Bay, were assigned to Group I (Walker & Rees, 1980). Group III was recorded further offshore in an area supporting sand banks (Walker & Rees, 1980).

5.2.1.3.2.2 *DÚN LAOGHAIRE HARBOUR & IMMEDIATE SURROUNDS*

The benthic survey carried out as part of the current study recorded a total of 2,288 individuals represented by 83 species or higher taxa. Major invertebrate groups present included Annelida (45 spp.), Mollusca (18 spp.), Crustacea (11 spp.) and Echinodermata (6 spp.), with Actiniaria, Nemertea and Phoronida also present (details in Appendix 5.2.1). The white furrow shell (*Abra alba*) was the most common species and was present in all but one

sample. Sample Station 4 was the most species-rich of the stations sampled with 37 species, while Station 3 was the least species-rich with 16 species. Both these stations were located within Dún Laoghaire Harbour (Table 5.2.1.1).

Table 5.2.1.1. Univariate ecological indices based on macroinvertebrate community.

Station	Number of species	Abundance (per sampling area)	Pielou's evenness	Shannon-Wiener diversity (natural logarithm base)
1	26	362	0.40	1.31
2	21	256	0.50	1.52
3	16	267	0.40	1.10
4	37	519	0.67	2.42
5	31	134	0.82	2.82
6	17	51	0.89	2.52
7	29	120	0.72	2.41
8	18	214	0.34	0.99
9	19	78	0.90	2.66
10	19	120	0.63	1.85
11	24	53	0.92	2.94
12	24	114	0.62	1.96

In terms of species diversity (Shannon-Wiener) and evenness (Pielou's evenness), Station 11 scored the highest. Stations with lower diversity and evenness scores tended to be those with high numbers of *Abra alba*. These scores are represented graphically in Figure 5.2.1.2.

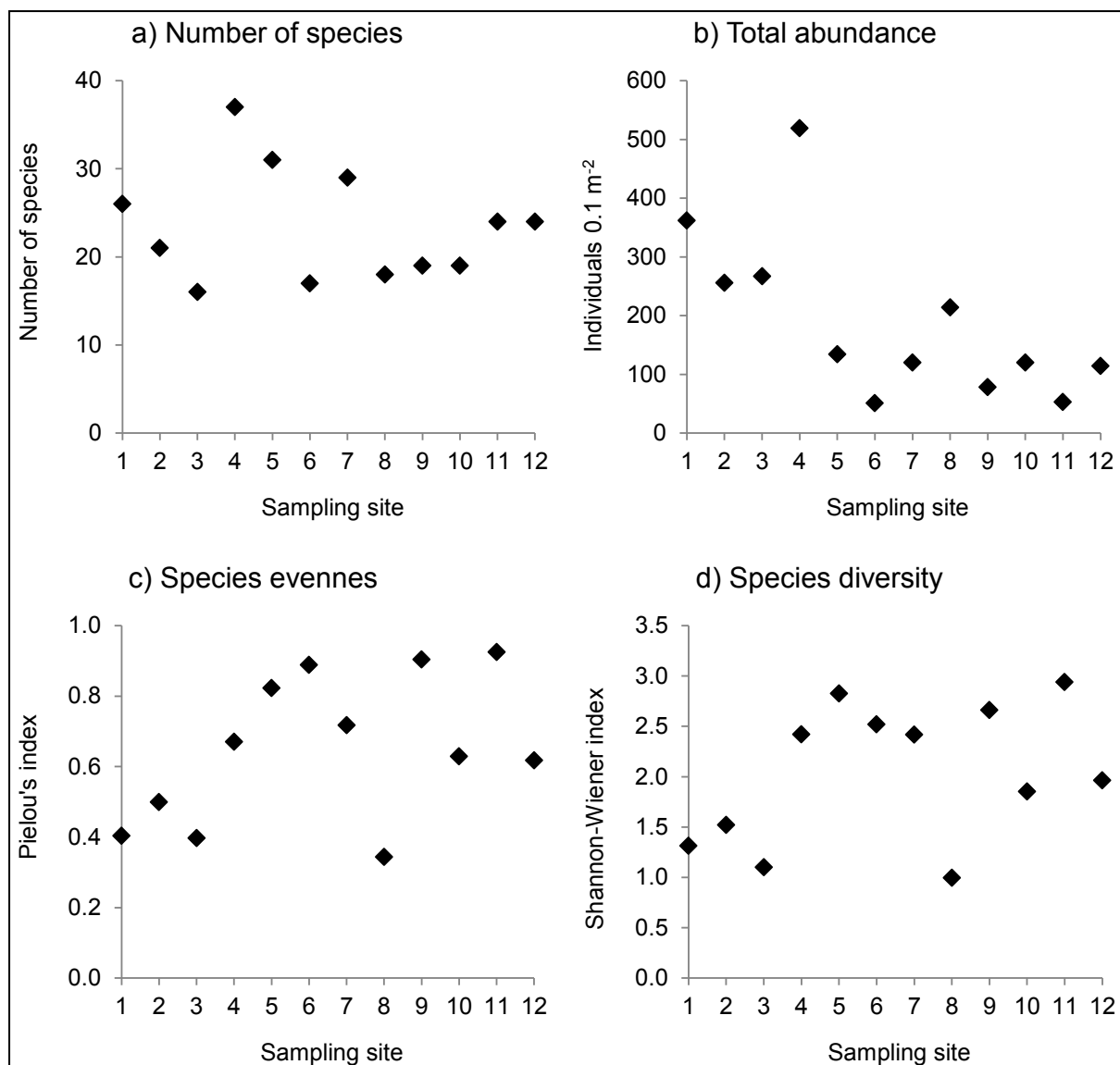


Figure 5.2.1.2. Univariate ecological indices based on macroinvertebrate community.

The two main groups of sample stations based on the macroinvertebrate species present were stations 1 & 2 and stations 6-11 (Figures 5.2.1.3 & 5.2.1.4). Stations 1 & 2 represent the sandy mud community within the harbour, while stations 6-11 represent the sand communities from outside the harbour. Localised effects have resulted in stations 3, 4, 5 and 12 not aligning well with the remaining stations sampled. These effects include currents and potentially human activities within the harbour itself.

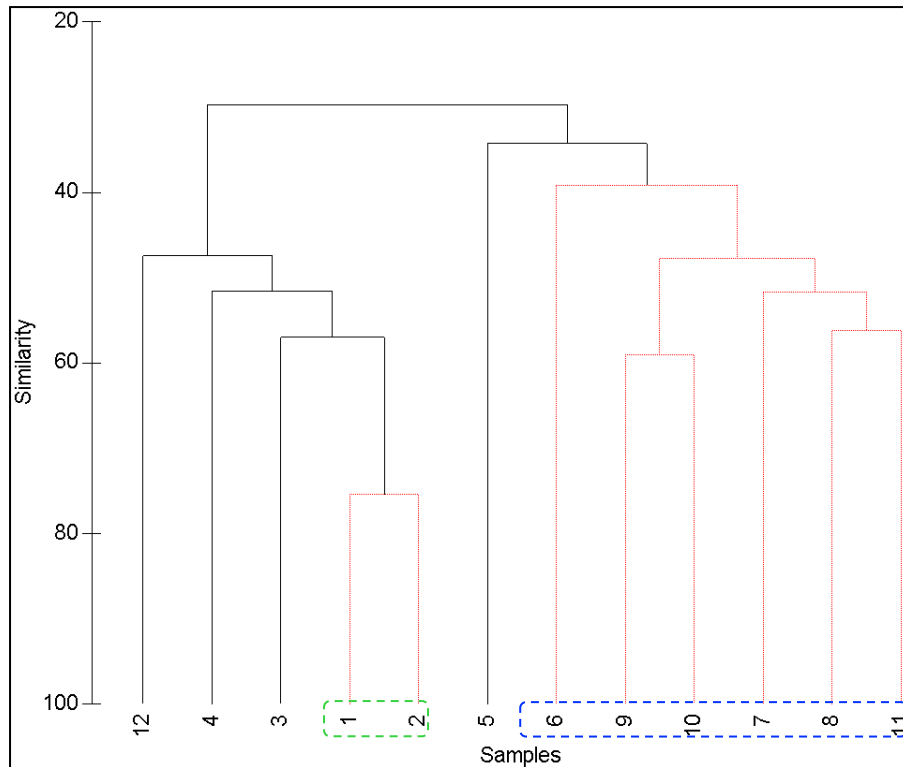


Figure 5.2.1.3. Cluster analysis showing significant (SIMPROF, $P < 0.05$) invertebrate community structure groupings among sampling sites (indicated with broken lines) based on Bray-Curtis similarities.

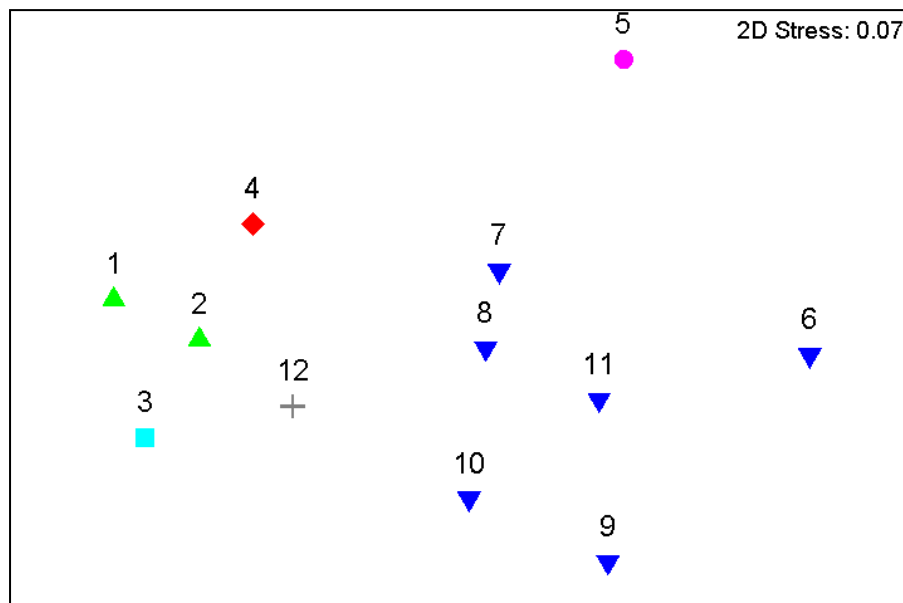


Figure 5.2.1.4. Non-metric multidimensional scaling plot representing the spread of invertebrate community structure among sampling sites based on Bray-Curtis similarities. Symbols indicate significant (SIMPROF, $P < 0.05$) groupings.

The benthic macroinvertebrate community of Dún Laoghaire Harbour and the surrounding waters is strongly dependent on the sediment type. Within the harbour, where the sediment was classed as sandy mud, the community is somewhat different from those outside the harbour where more sandy sediment is recorded. The sediment analysis revealed a pattern broadly similar to the macroinvertebrates, as would be expected, with three grouping:

Stations 1 & 12, stations 2 & 3 and Stations 6-11, with Station 5 very different from the others (Figure 5.2.1.5). Station 5, in the mouth of the harbour, stands out from the rest of the samples on the basis of species and sediment. The sediment was considerably more shelly than any of the other samples, likely to be the result of higher current flows around the mouth of the harbour as compared to other areas. While stations outside the harbour were, on the whole, more sandy than those inside, silt and clays did still occur. This is due to localised variations in current flows due to bottom and/or coastal topographical variation.

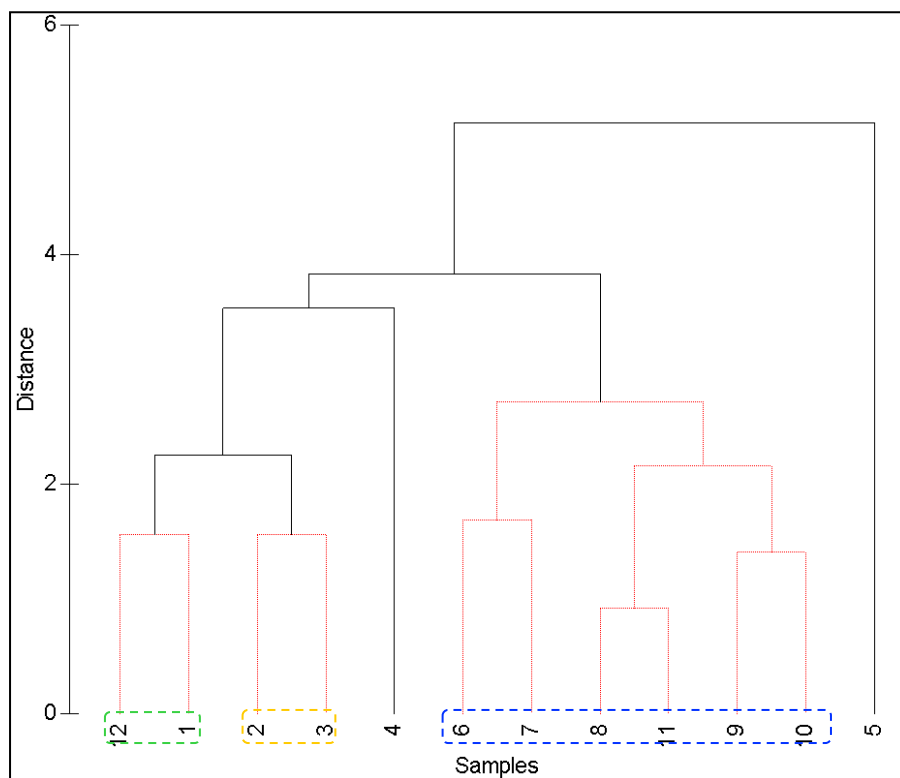


Figure 5.2.1.5. Cluster analysis showing significant (SIMPROF, $P < 0.05$) sediment characteristics groupings among sampling sites (indicated with broken lines) based on Euclidian distances.

The *Abra alba*-dominated community recorded across the sample stations is comparable to that recorded by Walker & Rees (1980) and indicates a stable benthic community in the greater Dublin Bay area. Despite the finer detail elucidated by the statistical analysis, all sample stations within the study area were classified as the biotope SS.SSa.CMuSa.AalbNuc - *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (Connor *et al.*, 2004) (Figure 5.2.1.6). A description of this biotope is presented in Appendix 5.2.2.

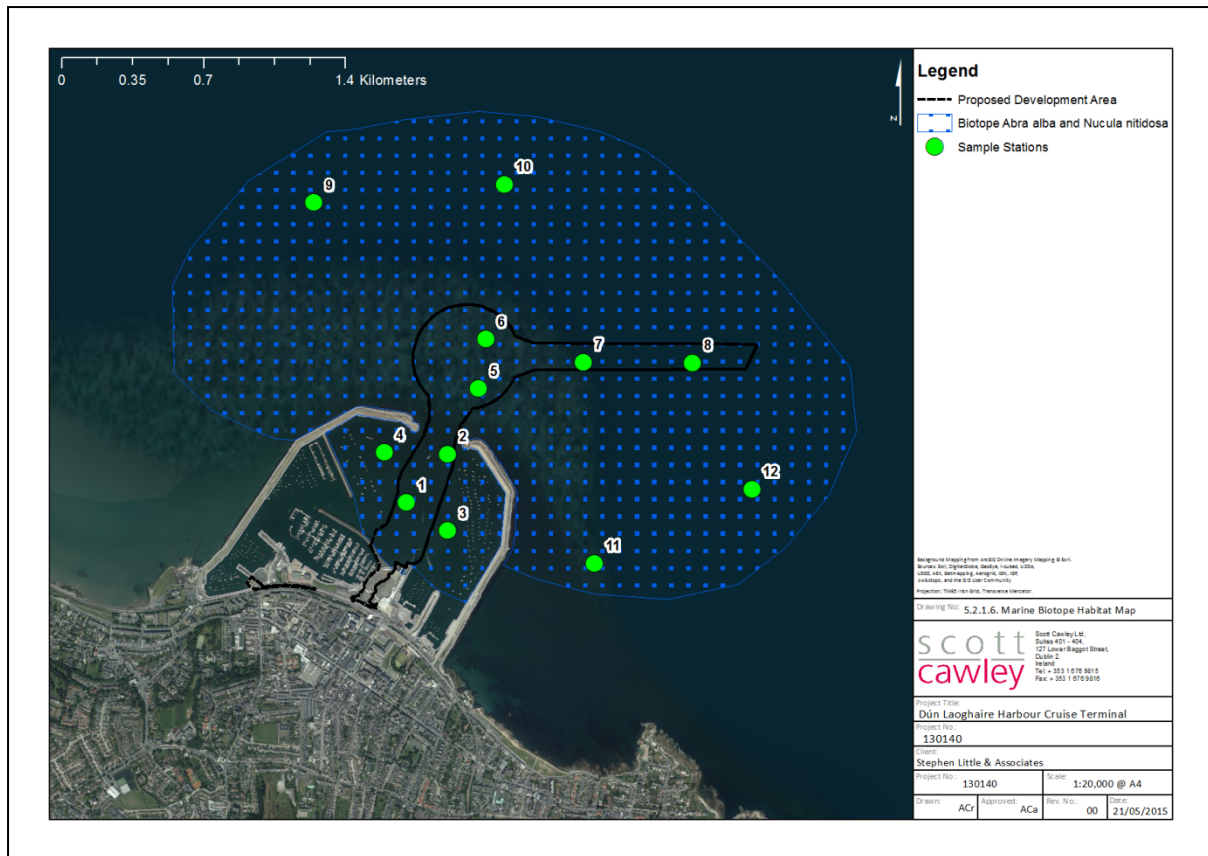


Figure 5.2.1.6. Benthic habitat map of Dún Laoghaire Harbour and surrounds

5.2.1.3.2.3 DREDGE SPOIL DUMP SITE

It is planned that the dredge spoil from the proposed works will be deposited in the dredge spoil dump site just west of the Burford Bank near the outer extent of Dublin Bay (Figure 6.2.1.7). This site has been operational since 1996, receiving dredge spoil from the Dublin Bay area. Its location puts it out in the north-south tidal current in order that spoil material is redistributed outside the bay. It is this current which has resulted in the presence of a number of north-south orientated sand banks along the east coast.

The benthic habitat present within and around the dredge spoil dump site is sedimentary in nature, with sediment type ranging from mud through fine sand to coarse sand and gravel, supporting species including *Nephtys hombergii*, *Ophelia borealis* and *Macoma balthica*, and corresponded to the JNCC habitat SS.SMu.ISaMu.NhomMac (*Nephtys hombergii* and *Macoma balthica* in infralittoral sandy mud) (RPS, 2014). It has been found that the benthic community has recovered well from previous dredge spoil dumping events (Kennedy, 2008 in RPS 2014).

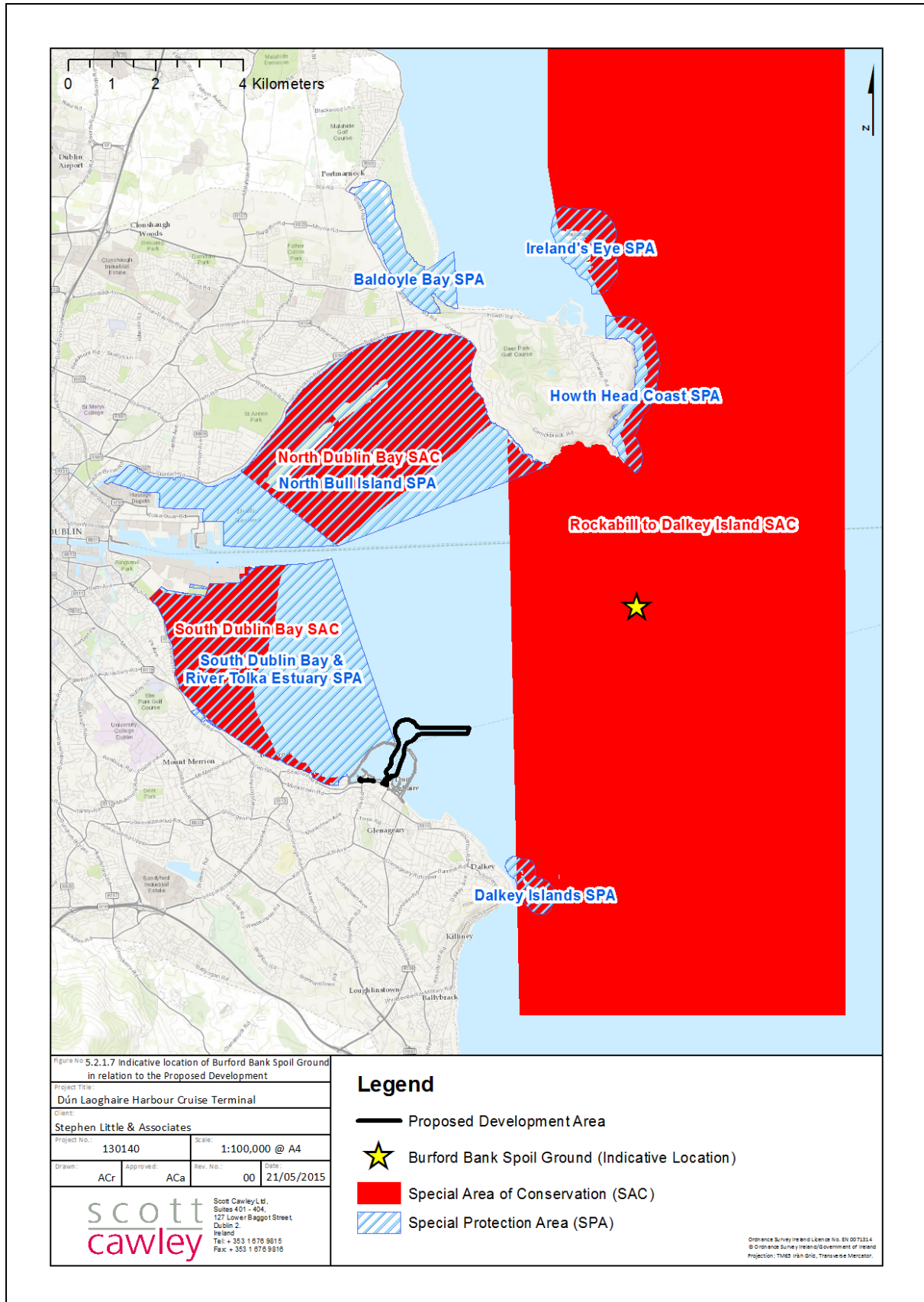


Figure 5.2.1.7. Burford Bank location map.

5.2.1.3.3 Reefs

The reefs for which Rockabill to Dalkey Island SAC are designated are geogenic and include those associated with the littoral and sublittoral zone around Dalkey Island. The intertidal reef complex is dominated by brown (furoid) seaweeds including serrated wrack (*Fucus serratus*), bladder wrack (*Fucus vesiculosus*), spiral wrack (*Fucus spiralis*), knotted wrack (*Ascophyllum nodosum*) and channel wrack (*Pelvetia canaliculata*), with animal species such as mussel (*Mytilus edulis*), barnacle (*Semibalanus balanoides*) and limpet (*Patella vulgata*). The kelp *Laminaria digitata* can be found at the extreme lower end of the zone (NPWS, 2013a).

The subtidal reef supports species such as the kelp *Laminaria hyperborea*, red algae including *Hypoglossum hypoglossoides*, *Brongniartella byssoides*, *Membranoptera alata*, *Phycodrys rubens* and *Delesseria sanguinea*. In water deeper than 10 m, the anemone *Alcyonium digitatum* and *Metridium senile* are recorded. In waters over 20 m deep, bryozoans such as *Flustra foliacea* and *Chartella papyracea* form faunal crusts, with the hydroid *Nemertesia antennaria* and the ascidian *Aplidium punctum* also occurring. Echinoderms that occur in the site include *Asterias rubens*, *Echinus esculentus* and *Antedon bifida* (NPWS, 2013a).

5.2.1.3.4 Fish

Many fish species can be found in the waters off Dún Laoghaire, including a number which are commercially important. Table 5.2.1.2 includes those species which use these waters for spawning and/or as nursery grounds, or at least where juveniles occur.

Table 5.2.1.2. Fish species for which spawning and nursery grounds occur off the coast of Dún Laoghaire (adapted from Ellis *et al.*, 2012).

Common name	Latin name	Spawning	Presence (E&L)	Nursey (LI)	Nursery (HI)	Presence (J)
Spurdog	<i>Squalus acanthias</i>	Ins.	Ins.	-	-	X
Tope shark	<i>Galeorhinus galeus</i>	Ins.	Ins.	X	-	X
Thornback ray	<i>Raja clavata</i>	Ins.	Ins.	X	-	X
Spotted ray	<i>Raja montagui</i>	Ins.	Ins.	X	-	x
Herring	<i>Clupea harengus</i>	-	-	-	-	X
Cod	<i>Gadus morhua</i>	X	X	-	X	X
Whiting	<i>Merlangius merlangus</i>	X	X	-	X	X
Blue whiting	<i>Micromesistius poutassou</i>	-	-	-	-	X
Ling	<i>Molva molva</i>	X	X	-	-	X
European hake	<i>Merluccius merluccius</i>	-	-	-	-	X
Anglerfish	<i>Lophius piscatorius</i>	Ins.	Ins.	X	-	X
Horse mackerel	<i>Trachurus trachurus</i>	-	-	-	-	X
Sandeels	Ammodytidae	X	X	X	-	X
Mackerel	<i>Scomber scombrus</i>	X	X	-	-	X
Plaice	<i>Pleuronectes platessa</i>	X	X	-	X	X
Sole	<i>Solea solea</i>	X	X	X	-	X

E&L = Eggs & Larvae, HI = High Intensity, LI = Low Intensity, J = Juveniles, Ins = Insufficient data

From a national perspective, the commercial fishing activity operating out of Dún Laoghaire Harbour is low, and it is not considered one of Ireland's main fishing ports (Gerritsen & Lordon, 2014). Finfish fisheries off the coast of south Dublin and Wicklow is limited, with crustacean and whelk potting the most common fishing activity, with a number of the boats operating out of Dún Laoghaire engaged in these fisheries.

The following information was provided by Declan McGabhann of the Sea Fisheries Protection Agency (SFPA). The landings into Dún Laoghaire include four species of crustacean (edible crab, velvet crab, lobster and shrimp) and one mollusc (whelk). Approximately 50% of the whelk landings into Dublin area ports are into Dún Laoghaire, 33% of edible crab, 20% of velvet crab and 10% of lobster. During the winter months there is occasionally a shrimp fishery, which is of high value despite the low landings (1-2 tonnes). Table 5.2.1.3 details the approximate weight and values of annual landings into Dún Laoghaire Harbour.

Table 5.2.1.3. Approximate weight and value of annual landings into Dún Laoghaire Harbour (SFPA).

Common name	Latin name	Weight (Tonnes)	Value (€)
Whelk	Buccinum undatum	100-145	210,000
Edible crab	Cancer pagurus	40-50	75,000
Velvet crab	Necora puber	20-35	70,000
Lobster	Hommarus gammarus	5.5	70,000
Shrimp	Palaemon serratus	1-1.2	22,500

In addition to the species in Table 2, sea bass (*Dicentrarchus labrax*), pollock (*Pollachius* spp.), thick-lipped mullet (*Chelon labrosus*) and various flatfish are found around Dún Laoghaire and are targeted by sea anglers (IFI, 2014). The end of the West Pier is a particularly popular spot for shore-based sea angling in Dún Laoghaire Harbour.

5.2.1.3.5 Marine mammals

5.2.1.3.5.1 *HARBOUR PORPOISES*

The harbour porpoise is Ireland's smallest cetacean, and also the most commonly recorded around the Irish coast. The harbour porpoise population in the Irish Sea in 2005 was estimated to be 15,230 (CV = 0.35) (Hammond & MacLeod, 2006), while the Celtic Sea population was calculated as 36,280 (CV = 0.57) in 1994 and 80,616 (CV=0.50) in 2005 (the Celtic Sea survey area boundary varied somewhat between surveys) (Hammond *et al.*, 2002, Hammond & MacLeod, 2006). The harbour porpoise population in Irish coastal waters outside the Irish Sea was calculated to be 10,716 (CV = 0.37; CI 95% = 5,010 - 21,942) in 2005 (Hammond & MacLeod, 2006). The surveys carried out by the Irish Whale and Dolphin Group (IWDG) in 2008 estimated an overall abundance of 211 (CV = 0.22, CI 95% = 137 – 327) in North County Dublin and 138 (CV 0.24, CI 95% = 86 – 221) in Dublin Bay (Berrow *et al.*, 2008). North County Dublin recorded the highest density of harbour porpoise of the sites surveyed and also the highest ratio of young to adults (8%), an important consideration when selecting a site for designation as an SAC (Berrow *et al.*, 2008). There have been 49 recorded sightings of harbour porpoises in the Dún Laoghaire area in the period 2010-2014, with the majority number of sightings (67%) and animals (78%) occurring in the period October-December (IWDG, 2015).

No studies have been carried out to estimate the home range, or movements, of individual harbour porpoises in Irish waters, but data are available from the Bay of Fundy on the east coast of North America and Denmark (Johnston *et al.*, 2005, Sveegaard *et al.*, 2011). These studies have shown that harbour porpoises distribution is spatially and temporally variable. Harbour porpoises have been shown to range across large areas (7,738 – 11,289 km²) over the course of a month, with movements tending to be focused over a smaller area (250 – 300 km²), often around islands, headlands, or restricted channels (Johnston *et al.*, 2005). In Danish waters, harbour porpoises have also been shown to range over large areas, with seasonal shifts in their distribution (Sveegaard *et al.*, 2011).

Calving in harbour porpoise occurs between May and August, with a strong peak in June (IWDG, 2014). It is thought that harbour porpoises move offshore in the period March – June to calving/breeding areas (IWDG, 2014).

Harbour porpoises are listed under Annex II of the EU Habitats Directive as an animal species of community interest whose conservation requires the designation of SACs. Three SACs have harbour porpoises listed as a Qualifying Interest in Ireland; two are in the southwest, while a further SAC has been designated on the east coast extending from Rockabill to Dalkey Island (Table 5.2.1.5). The mouth of Dún Laoghaire Harbour is approximately 2.5 km from the boundary of the SAC, while the Burford Bank dredge spoil dump site is located within the SAC.

Harbour porpoises are also protected under Section 23 of the Wildlife Acts 1976 to 2012 and listed under Annex IV of the Habitats Directive as a species requiring strict protection.

Table 5.2.1.5. List of Special Areas of Conservation for harbour porpoises in Ireland (NPWS, 2015a).

County	Site code	SAC name
Cork	000101	Roaringwater Bay and Islands
Kerry	002172	Blasket Islands
Dublin	003000	Rockabill to Dalkey Island

The Status of EU Protected Habitats and Species in Ireland report (NPWS, 2008) assessed harbour porpoises as being in Favourable Conservation Status. The species has retained its Favourable Conservation Status for the most recent reporting period (NPWS, 2013b).

5.2.1.3.5.2 GREY SEALS

The grey seal (*Halichoerus grypus*) is one of two seal species that breed in Irish waters, the other being the harbour or common seal (*Phoca vitulina*). Recent population estimates for grey seals in Ireland put the population (based on a breeding survey) in the range 5,509 - 7,083 (Ó'Cadhlá *et al.*, 2007), with a minimum population estimate (based on a moult survey) of 5,343 (Ó'Cadhlá & Strong, 2007). The most up-to-date data put the population between 7,284 and 9,365 (NPWS, 2013b). The main colonies are located on the Atlantic seaboard, with Inishkea North (Co. Mayo) and Great Blasket Island (Co. Kerry) supporting 45% of the population (Ó'Cadhlá & Strong, 2007). The Lambay Island population was estimated to be 45 - 60 in 1995 (NPWS, 1995) and 203 - 261 in 2005 (Ó'Cadhlá *et al.*, 2007) and most recently 196-252 (NPWS, 2014), indicating an increasing population.

Thirty-six grey seals were recorded on Dalkey Island during the 2007 moult survey (Ó'Cadhlá & Strong, 2007), while two pups were recorded during the 2005 breeding survey (Ó'Cadhlá *et al.*, 2007). Ten seals were recorded by the NPWS on Dalkey Island, and six on The Muglins, just east of Dalkey Island, during the 2003 harbour seal population assessment (NPWS, 2015b). Grey seals are frequently seen within Dún Laoghaire Harbour, by the fish shop on Coal Quay (pers. obs).

Grey seals are highly mobile predators, with studies showing movement of seals across the Irish Sea between Ireland and Wales and also between Irish sites, though female grey seals may show a degree of inter-annual site fidelity (Kiely *et al.*, 2000). Grey seals spend more time hauled-out during the breeding season (September – December) and the moulting season (November – April) than other times of the year (Kiely *et al.*, 2000). The peak moult period in Ireland appears to be February to March, beginning as early as November for adult females and juveniles and continuing up to April for adult males (Kiely, 1998 in Ó'Cadhlá & Strong, 2007).

Grey seals are listed under Annex II of the EU Habitats Directive as an animal species of community interest whose conservation requires the designation of Special Areas of Conservation and also under Annex V (Animal and plant species of community interest whose taking in the wild and exploitation may be subject to management measures). Ten SACs in Ireland have grey seals listed as a Qualifying Interest, with only Lambay Island SAC located on the east coast (Table 5.2.1.6). They are also protected under Section 23 of the Wildlife Acts 1976 to 2012.

Table 5.2.1.6. List of Special Areas of Conservation for grey seals in Ireland (NPWS, 2015a).

County	Site code	SAC name
Cork	000101	Roaringwater Bay and Islands
Donegal	000147	Horn Head and Rinclevan
Donegal	000190	Slieve Tooley/Tormore Island/Loughros Beg Bay
Dublin	000204	Lambay Island
Galway	000278	Inishbofin and Inishshark
Galway	000328	Slyne Head Islands
Mayo	000495	Duvillaun Islands
Mayo	000507	Inishkea Islands
Wexford	000707	Saltee Islands
Kerry	000509	Blasket Islands

The Status of EU Protected Habitats and Species in Ireland report (NPWS, 2008) assessed grey seals as being in Favourable Conservation Status. The species has retained its Favourable Conservation Status for the most recent reporting period (NPWS, 2013b).

5.2.1.3.5.3 BOTTLENOSE DOLPHIN

Bottlenose dolphins have been recorded all around the Irish coast, predominantly on the west coast, though the only confirmed resident population is found in the Shannon Estuary (O'Brien *et al.*, 2009). Three bottlenose dolphins were regularly occurring in the vicinity of Killiney Bay, Co. Dublin since 2010, and had gained 'semi-resident' status; however, they have not been recorded in the area since July 2012 (IWDG, 2012). Photo-identification has confirmed that two of these individuals were recorded in Ventry Harbour, Co. Kerry in mid-July 2012 (IWDG, 2012).

Bottlenose dolphins are listed under Annex II of the EU Habitats Directive as an animal species of community interest whose conservation requires the designation of SACs and are listed as a Qualifying Interest in two SACs in Ireland (Table 5.2.1.7).

Table 5.2.1.7. List of Special Areas of Conservation for bottlenose dolphin in Ireland (NPWS, 2015a).

County	Site code	SAC name
Clare/Limerick/Kerry	002165	Lower River Shannon
Mayo/Galway	002998	West Connacht Coast

As bottlenose dolphins are no longer regularly recorded in the study area, are considerably less sensitive to noise and human disturbance (often seeking out interaction with boats and humans) than harbour porpoises and are not a Qualifying Interest for any SAC on the east coast, they will not be specifically considered further.

5.2.1.3.5.4 OTHER MARINE MAMMALS

Harbour (common) seals and other cetacean species, including Risso's dolphin (*Grampus griseus*), common dolphin (*Delphinus delphis*), minke whale (*Balaenoptera acutorostrata*), humpback whale (*Megaptera novaeangliae*), fin whale (*Balaenoptera physalus*), pilot whale (*Globicephala melas*), killer whale (*Orca orcinus*) and striped dolphin (*Stenella coeruleoalba*) have all been recorded along the Dublin coast (IWDG, 2014b). All cetaceans are listed under Annex IV of the Habitats Directive and are protected under the Wildlife Acts 1976 to 2012. However, due to the low numbers of records of these species in the area, generally some distance offshore, and therefore the very low likelihood that they will occur during the proposed development period, or that any significant impact would occur on them, they are not considered further.

5.2.1.4 Characteristics of the proposal

5.2.1.4.1 Construction

The construction of the proposed cruise liner berth will include pile-driving and dredging, and these are the aspects of the proposal most relevant to the marine environment.

The majority of piles will be 750 – 1000 mm in diameter, while the mooring will comprise a small number of 3 m diameter piles. The piles will be installed using a drive-drill-drive method, with the piling machinery operating from a barge. The piling will be carried out using a vibrating hammer or hydraulic piling hammer.

The proposed works include dredging a channel within the harbour, and a 500 m diameter turning circle and channel outside the harbour, leading into deeper water to the east. It is proposed that dredging will be carried out by a Trailing Suction Hopper Dredger (TSHD) and that approximately 710,000 m³ of material will be removed for disposal at the Burford Bank spoil site. The operation is expected to take in the region of 14-17 weeks on the basis of 24/7 summertime (March – September) dredging, while daylight only dredging would be estimated to take 32 weeks. The dredging cycle is expected last 1.5 hours, comprising 0.5 hrs dredging, followed by 1 hr transit to the disposal grounds and return (ABP Mer, 2014).

5.2.1.4.2 Operation

Once operational, the facility will accept cruise liners berthing alongside. It is proposed that 100 cruise liner visits per season, which will generally extend from April to September, would be possible. This amounts to an average of one visit every two days during the season, but may also include visits on consecutive days.

Maintenance dredging will be required periodically into the future, and is likely to be infrequent and small in volume due to the lack of a significant sediment source (no riverine input) and the low current speeds in the area (See Chapter 5.4 Coastal Processes). Annual surveys of the depth of the dredged channel will be carried out to build an understanding of the sedimentation process in the channel and to monitor the need for dredging.

5.2.1.5 Potential impact of the proposal

5.2.1.5.1 Construction impacts

The potential impacts of the construction of the proposed development include noise generated by construction activities, as well as water pollution, and loss and disturbance of habitat. A summary table of the impacts is presented in Appendix 5.2.3. A separate Marine Mammal Risk Assessment was carried out in relation to the dredging and piling operations and this is presented in Appendix 5.2.4.

5.2.1.5.1.1 PILING NOISE

The construction works at the site of the proposed cruise berth will involve the operation of piling equipment. The noise generated by construction works can be transmitted through the air and the water column and may potentially impact on marine species.

Marine mammals

The impact of construction noise, particularly activities with high sound levels, such as pile-driving, on marine mammals varies depending on the species, the sound level and frequency, and the duration of the exposure. High noise levels can cause serious injury at close range, including physical injury to organs. As one moves further away from the source, effects diminish to permanent or temporary hearing impairment and behavioural change until the noise level is audible, but causes no measurable effect. Richardson *et al.* (1995) differentiated four zones of noise impact:

- Zone of physical impairment through hearing loss or injury
- Zone of masking (of sound cues)
- Zone of responsiveness
- Zone of audibility.

The sound levels presented in Table 5.2.1.8 have been considered to cause a Temporary Threshold Shift (TTS) in hearing of cetaceans and pinnipeds (seals) underwater (i.e. temporary reduction in hearing ability):

Table 5.2.1.8. Injury criteria proposed by Southall *et al.* (2007) for individual marine mammals

Marine mammal group	Sound type		
	Single pulses	Multiple pulses	Nonpulses
Low-frequency cetaceans	Cell 1	Cell 2	Cell 3
Sound pressure level	230 dB re: 1 µPa (peak) (flat)	230 dB re: 1 µPa (peak) (flat)	230 dB re: 1 µPa (peak) (flat)
Sound exposure level	198 dB re: 1 µPa ² -s (M _{hr})	198 dB re: 1 µPa ² -s (M _{hr})	215 dB re: 1 µPa ² -s (M _{hr})
Mid-frequency cetaceans	Cell 4	Cell 5	Cell 6
Sound pressure level	230 dB re: 1 µPa (peak) (flat)	230 dB re: 1 µPa (peak) (flat)	230 dB re: 1 µPa (peak) (flat)
Sound exposure level	198 dB re: 1 µPa ² -s (M _{mr})	198 dB re: 1 µPa ² -s (M _{mr})	215 dB re: 1 µPa ² -s (M _{mr})
High-frequency cetaceans	Cell 7	Cell 8	Cell 9
Sound pressure level	230 dB re: 1 µPa (peak) (flat)	230 dB re: 1 µPa (peak) (flat)	230 dB re: 1 µPa (peak) (flat)
Sound exposure level	198 dB re: 1 µPa ² -s (M _{hr})	198 dB re: 1 µPa ² -s (M _{hr})	215 dB re: 1 µPa ² -s (M _{hr})
Pinnipeds (in water)	Cell 10	Cell 11	Cell 12
Sound pressure level	218 dB re: 1 µPa (peak) (flat)	218 dB re: 1 µPa (peak) (flat)	218 dB re: 1 µPa (peak) (flat)
Sound exposure level	186 dB re: 1 µPa ² -s (M _{pw})	186 dB re: 1 µPa ² -s (M _{pw})	203 dB re: 1 µPa ² -s (M _{pw})
Pinnipeds (in air)	Cell 13	Cell 14	Cell 15
Sound pressure level	149 dB re: 20 µPa (peak) (flat)	149 dB re: 20 µPa (peak) (flat)	149 dB re: 20 µPa (peak) (flat)
Sound exposure level	144 dB re: (20 µPa) ² -s (M _{pa})	144 dB re: (20 µPa) ² -s (M _{pa})	144.5 dB re: (20 µPa) ² -s (M _{pa})

Note: All criteria in the “Sound pressure level” lines are based on the peak pressure known or assumed to elicit TTS-onset, plus 6 dB. Criteria in the “Sound exposure level” lines are based on the SEL eliciting TTS-onset plus (1) 15 dB for any type of marine mammal exposed to single or multiple pulses, (2) 20 dB for cetaceans or pinnipeds in water exposed to nonpulses, or (3) 13.5 dB for pinnipeds in air exposed to nonpulses. See text for details and derivation.

The zone of responsiveness in marine mammals is more difficult to define as the response of marine mammals to sound depends on so many factors, including the sound properties, physical and behavioural state of the animals and the acoustic and ecological features of the surrounding area (Hildebrand, 2005). Lucke *et al.* (2011) showed consistent aversive behavioural reactions in a captive harbour porpoise at sound levels above 174 dB_{pk-pk} re 1 µPa or an SEL of 145 dB re 1 µPa²s, which is similar to the 140 dB SEL suggested by Nehls *et al.* (2007). No audiogram is available for grey seals, but they appear to show lower responsiveness to noise than harbour porpoises.

All construction activities will be carried out within the confines of Dún Laoghaire Harbour. This will reduce the transmission of noise into the wider water column where it may impact on cetaceans (e.g. harbour porpoises) and diving seals. The likely impact of the piling operations will depend mainly on the type of pile driving method used, with vibration piling having considerably less of an impact on the acoustic environment than impact piling (Nedwell *et al.*, 2003).

Impact piling can generate high sound levels, which depend on various elements including the substratum and the pile diameter (smaller piles generate lower sound levels) (Matuschek & Betke, 2009). Pile-driving operations using a 6.5 m pile have been estimated to generate sound levels of 201 - 204 dB re 1 µPa (Peak) and 175 – 178 dB re 1µPa (SEL) at 500 m in 20 m deep water (Nehls *et al.*, 2007). Impact piling a pile of diameter 1 m would have a sound level approximately 185 dB re 1µPa @ 750 m (peak) and 160 dB re 1µPa @ 750 m (SEL) (Matuschek & Betke, 2009). The German Federal Maritime and Hydrographic Agency (BSH) has set limits for pile-driving noise of 160 dB (SEL) and 190 dB (peak) at a distance of 750 m from the pile for the protection of harbour porpoises. Impact piling would have a temporary, moderate negative impact on marine mammals through displacement from the area surrounding Dún Laoghaire Harbour while piling is on-going.

Vibration piling generates lower sound levels than impact piling. Nedwell *et al.* (2003) found that vibration piling could not be detected above ambient noise at a range of 417 m. Given its non-pulse nature and the low sound levels, vibration piling is expected to have a temporary, imperceptible negative impact on marine mammals.

The drilling associated with piling is a non-pulse sound, with lower levels than the impact piling and so has a low likelihood of having an impact on marine mammals.

In many cases some impact piling is required on completion of vibration piling to ensure stability.

Fish

Similar to marine mammals, fish may be impacted upon by piling works through injury, alteration to behaviour or the masking of sound cues. The literature on the effects of sound on fish includes examples where injury and mortality has occurred in close proximity to the piling operations, though in these studies fish were often restrained in cages, preventing them from moving away from the sound source (Hastings & Popper, 2005). As with other species, impact piling poses more of a threat to fish than vibration piling, with small fish and species with swim bladders most at risk. Nedwell *et al.* (2003) found no reaction of brown trout (*Salmo trutta*) to vibration piling at 50 m, or to impact piling at 400 m (data are not available for impact piling at a closer range).

Given the piling works are to be carried out within the confines of Dún Laoghaire Harbour, the potential to impact on fish at various life stages is limited. While impact piling may result

in minor redistribution of fish, vibration piling is unlikely to have any perceptible impact. Depending on the method of piling employed, the maximum effect of piling on fish is considered temporary, slight negative impact.

There will be some temporary disturbance to recreational fishing from the piers of Dún Laoghaire Harbour from piling and dredging operations, while disturbance to commercial fishing will be minimal due to liaison between the construction company and the fishermen maintaining access into and out of the harbour.

Benthic invertebrates

Very little work has been carried on the effect of noise and vibration on marine benthic invertebrates. Mobile species can move away from a perceived threat, leaving only the sedentary species at risk of impact. The results of the benthic survey shows that the species present within Dún Laoghaire Harbour are common and widespread in the wider marine environment and any impact on individuals in the immediate vicinity of piling works would have no impact on the wider population. The effect of piling on benthic invertebrates is therefore considered a temporary, imperceptible negative impact.

5.2.1.5.1.2 DREDGING NOISE

The operation of a dredger will generate noise that may impact upon the marine ecology of the area, in particular marine mammals. The noise generated by dredging tends to be continuous and broadband in nature, mainly in a frequency range of <1 kHz (Thomsen *et al.*, 2009). The exact sound levels and signature depends of the dredger type, the individual dredger and the operation it is carrying out at the time. A review of the literature suggests that sound levels of 170 – 190 dB re 1µPa @ 1 m can be expected to be generated by TSHD while operational, with a peak frequency of 100 – 350 Hz (Thomsen *et al.*, 2009). As non-pulse sound, this is below the levels that are considered likely to cause TTS in submerged marine mammals (Table 5.2.1.8). Defra (2003) found that the TSHD *Arco Adur* was not detectable above ambient levels at a range of 500 m.

Due to the limited area of operation of the TSHD, the temporary nature of the works and the sound levels expected to be generated, the dredging activities are expected to cause a temporary, slight negative impact on marine species, including marine mammals, through displacement from the immediate vicinity of the operational vessel.

Once the TSHD has a full load, it will transit to the dredge spoil disposal area at the Burford Bank and deposit its load. Harbour porpoises avoid ships at some distance (1-1.5 km) with stronger reaction at 400 m (Richardson, *et al.*, 1995) and therefore will move away from the dredger as it arrives on station at the harbour or the Burford Bank minimising the possibility of any interaction between the two. The noise generated by this activity will be slightly above normal shipping noise and will be short-lived. Therefore the impact on marine species from the noise generated will be temporary, imperceptible, negative.

5.2.1.5.1.3 LOSS AND DISTURBANCE OF HABITAT

The dredging of the channel and turning circle will result in the disturbance to the benthic habitat, while the construction of the quay will result in the permanent loss of an area of benthic habitat. The operation of the dredger will create suspended solids, which may reduce visibility in the immediate vicinity and cause smothering of adjacent benthic habitats.

Given the small footprint of the quay piles in comparison to the availability of the habitat type within the harbour and the greater Dublin Bay area, this loss in habitat is considered a permanent, slight, negative impact.

The removal of material from the channel and the turning circle will result in the loss of benthic invertebrates from the area, with losses also caused in the area immediately surrounding the dredging operations due to smothering (ABP Mer, 2014). Recolonization of the affected areas will begin immediately from surrounding areas, with more mobile species able to move in. Studies carried out in areas where aggregate extraction has occurred have shown recovery of benthic macroinvertebrate species richness within 16 months, with biomass levels taking somewhat longer to recover (Desprez, 2000). While community structure can be altered where aggregates are removed, in this case it is expected that the same community will recolonize as there will be no preferential removal of a certain sediment type. Due to the small area of the biotope affected when compared to the widespread distribution of the biotope in the greater Dublin Bay area, along with the rapid recovery, this is considered a short-term, imperceptible impact.

The reduction in underwater visibility due to raised suspended solids levels in the vicinity of the dredging operations is not considered a significant impact as high suspended solids levels are common in shallow waters close to the coastline. Suspended solid concentrations from dredging operations will disperse to negligible levels (< 5 mg/l) within 2 km (ABP Mer, 2014).

The reef habitats of Dalkey Island will not be impacted by smothering or the generation of suspended solids due to the distance between the work site and the island. Detailed modelling carried out has shown that suspended solid concentrations from dredging operations will disperse to negligible levels (< 5 mg/l) within 2 km (ABP Mer, 2014).

There is likely to be some settling of suspended solids within the South Dublin Bay SAC (Sandymount Strand) on certain stages of the tide, however this will be at levels that will have no effect on the benthic habitat, which is depositional in nature with sediment-dwelling species.

The dumping of dredge spoil in the Burford Bank dredge spoil dump site will result in the smothering of benthic fauna and alteration to the sedimentary profile. The dredge spoil dump site is located out in the North-South tidal current, which is the reason a number of North-South orientated sand banks are present along the east coast. These currents will redistribute the dredged material to a state in-keeping with the natural topography and distribution of sediments. The spoil will be recolonized from the surrounding benthic communities and recover over a number of years. Due to the fact that the effects of the dumping will be short-term in nature, this impact is considered a short-term, slight, negative impact.

The dumping of dredge spoil will result in an increase in the levels of suspended solids around the Burford Bank. This will reduce visibility in this area, which may affect predators operating in the areas including fish and marine mammals. Modelling of the spoil disposal

has shown that levels of suspended solids will be temporarily raised in some areas around the spoil site (ABP Mer, 2014). Due to the limited area affected and the time period, raised suspended solids is considered a temporary, slight, negative impact.

5.2.1.5.1.4 WATER POLLUTION

The construction and demolition works, including the operation of plant and vessels, has the potential to pollute the waters in the vicinity of the construction site.

The operation of plant and machinery has the potential to release pollutants such as diesel and hydraulic fluid into the water column. These substances can have toxic effects on marine organisms including marine mammals and their prey.

The construction of the cruise berth in Dún Laoghaire Harbour will involve the use of marine grade concrete. Concrete can have negative effects when released into water, resulting in an increase in the pH of the water. The fact that concrete will be used to fill the monopiles once they are installed, rather than being exposed to the water column, will mean there is minimal risk to the aquatic environment.

The risk of serious pollution is considered unlikely, but should it occur it would constitute a moderate negative, short-term impact on marine ecology within the confines of Dún Laoghaire Harbour.

5.2.1.5.2 Operational impacts

Potential operational impacts of the cruise berth include vessel noise and maintenance dredging.

5.2.1.5.2.1 CRUISE LINER NOISE

The proposed development is intended to attract more cruise liners to Dún Laoghaire Harbour, by providing docking facilities for all but the very largest cruise liners in the world. In 2013, ten cruise liners visited Dún Laoghaire Harbour, anchoring outside the harbour, with passengers being transferred ashore by tender. The current proposal is intended to allow cruise liners to moor alongside within the harbour and to facilitate, on average, one liner every two days, principally in the period April - September.

The noise generated by the increase in shipping traffic into, and out of, Dún Laoghaire Harbour as a result of the proposed development needs to be considered. A cruise liner generates noise through the operation of its engines, generators and the propeller. The majority of the noise energy is in the low frequency spectrum (that generated by the engines and generators), while mid-high frequency noise is also generated, mainly by cavitation around the propeller (which increases with speed).

Sound levels generated by cruise liners has been found to be in the range 175 to 185 dB re 1 μ Pa @ 1 yard (Kipper, 2002) and the sound peaks in the lower frequency range. While the low frequencies which dominate the sound signature would be expected to be most audible to low-frequency whale species (such as Minke and humpback), high-frequency species (such as harbour porpoise) have also been shown to react. Harbour porpoise is the most commonly recorded cetacean species in the wider study area.

The Dublin Bay area, including Dún Laoghaire Harbour, is home to variable levels of shipping and small boat traffic. The Stena High-speed Sea Service (HSS) has recently ceased operation from Dún Laoghaire Harbour, which removes a regular source of noise from the area. Against this background, the increase in shipping movements caused by the arrival and departure, on average, of one cruise liner every two days will have an intermittent, slight negative impact.

Allowing the vessels to dock within the harbour will remove the need to ferry passengers in and out on tenders operating from the cruise liner, thereby reducing small boat traffic, which generates higher frequency sound, which can be more disturbing to species such as harbour porpoise.

5.2.1.5.2.2 MAINTENANCE DREDGING

Following the completion of capital dredging operations, periodic maintenance dredging will be required to maintain the design specification of the channel and turning circle. Maintenance dredging is likely to be infrequent and small in volume due to the lack of a significant sediment source (no riverine input) and the low current speeds in the area (See Chapter 5.4 Coastal Processes). The effects of maintenance dredging will be similar to those associated with the capital dredging, though will be of a lower magnitude owing to the lower level of work required and the associated reduction in the time taken. This is therefore considered a temporary, slight negative impact.

5.2.1.5.2.3 WATER POLLUTION

The operation of cruise liners has the potential to cause water pollution through accidental spillages. Such vessels operate under the International Convention for the Prevention of Pollution from Ships (MARPOL), which sets out the minimum standards ships must adhere to in order to protect water quality. No impact on water quality is expected from the operation of the cruise liners in the waters around Dún Laoghaire as a result of the proposed development.

5.2.1.6 Avoidance, remedial or reductive measures

The following mitigation measures should be implemented to minimise the potential for a negative impact on the marine ecology of the study area.

5.2.1.6.1 Construction noise

The construction period should be kept to a minimum in order to minimise any potential disturbance to marine mammals. The *Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters* (DAHG, 2014) will be implemented in full for the piling works and with some proposed modification for the dredging works (See section 5.2.1.7.1.2 Dredging noise).

5.2.1.6.1.1 PILING NOISE

The noise generated by the piling works can be minimised by the use of vibration piling. Vibration piling generates significantly less noise than impact piling and therefore has much less of an impact on the acoustic environment of the surrounding area. Where vibration piling is used, no mitigation is required beyond implementing the DAHG (2014) guidance in full.

Where impact piling is necessary, mitigation measures such as bubble curtains or cofferdams will be used to reduce the transmission of piling noise into the water column. Bubble curtains have been shown to reduce sound levels by 14 dB (peak) and 13 dB (SEL) (Lucke *et al.*, 2011), while cofferdam systems can reduce sound levels by 22 dB (SEL) and 18 dB (peak) (Ramboll, 2012). Bubble curtains are only effective in areas of low current velocities, as is the case within Dún Laoghaire Harbour.

5.2.1.6.1.2 DREDGING NOISE

Little can be done to reduce the potential effects of dredging beyond minimising the area disturbed and the time taken to complete the dredging. It is proposed that dredging operations (including transit to the spoil dumping grounds and return) will be carried out 24/7 during summertime (March – September) in order to minimise the length of the dredging operations. This will require a deviation from full adherence to the DAHG (2014) guidance in that some dredge operations will commence at night-time, when a pre-start scan cannot be completed (full adherence to the guidance requires that dredging operations only commence during daylight hours when a pre-start scan can be completed). With 24/7 dredging in the summer, where daylight hours are long, the work programme is expected to be completed in 14-17 weeks. If dredging is only carried out during daylight hours, this would be expected to increase to 32 weeks. The proposed dredging programme balances the very low risk of injury or disturbance to marine mammals of commencing some dredging cycles outside daylight hours with minimising the overall duration of the disturbance. The following was considered in proposing this course of action:

- Sounds generated by dredging are predominantly low frequency and below levels those that would cause temporary or permanent injury to marine mammals (Richardson *et al.*, 1995, Southall *et al.*, 2007). The soft sediment within the footprint of the works would mean the sound levels generated would be at the lower end of the range for dredging.
- Berrow *et al.* (2008) recorded peak harbour porpoise activity at Howth Head & Dalkey Island, with few sightings close to Dún Laoghaire Harbour limit. Numerous harbour porpoise sightings have been made by members of the public outside Dún Laoghaire Harbour (IWDG, 2015); however, the number of records here is reflective of the large number of people using the piers. The majority of sightings occur in the period October-December (IWDG, 2015), thus the proposed dredging programme (March – September) will avoid the peak sightings period.
- It is thought that harbour porpoises move offshore in the period March – June to calving/breeding areas (IWDG, 2014), which would reduce the level of interaction between the proposed works and breeding individuals, as the dredging programme (March – September) would overlap with this period.

- Harbour porpoises avoid ships at some distance (1-1.5 km) with stronger reaction at 400 m (Richardson, *et al.*, 1995) and therefore will move away from the dredger as it arrives on station at the harbour or the Burford Bank.
- Grey seals that frequent Dún Laoghaire Harbour will not show strong disturbance reactions to the dredger, as they will be habituated to boats and shipping in the area and move away accordingly.

5.2.1.6.1.3 LOSS AND DISTURBANCE OF HABITAT

Loss and disturbance to habitats can be minimised by ensuring that dredging only occurs within the required footprint. This will be achieved through a GPS navigation system on the dredger, which will be interfaced with the dredging computer to monitor the position of the vessel in real time.

5.2.1.6.1.4 WATER POLLUTION

Measures should be taken to ensure that there is no release of deleterious substances, such as hydrocarbons and suspended solids. This will include the following:

- All fuels, oils and hydraulic fluids should be kept well away from the water in bunded containers.
- All construction and demolition waste should be stored above the high water mark prior to removal from the site.
- Plant and machinery should be well-maintained to prevent any leaks of fuel, oil or hydraulic fluid.
- Refuelling of machinery should be undertaken well away from water.
- Spill kits and staff trained in their use should be present on-site.

Reference should be made to the Eastern Regional Fisheries Board (now part of Inland Fisheries Ireland) *Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites* (Murphy, 2004) for relevant actions to take to protect water quality, or other best practice guidance for the protection of water quality for the construction industry.

5.2.1.7 Predicted impact of the proposal

With the implementation of recommended mitigation measures no significant negative effects on the marine ecology of Dún Laoghaire Harbour and the surrounding waters will occur. The disturbance caused by the construction will be short-term and be limited in extent. The following is a summary of the predicted effects with the implementation of mitigation measures.

5.2.1.7.1 Construction impacts

5.2.1.7.1.1 PILING NOISE

The effect of vibration piling will be a temporary, imperceptible negative impact on marine species, including marine mammals.

With the implementation of mitigation measures, the effect of impact piling would be reduced to a temporary, slight negative impact on marine species, including marine mammals.

5.2.1.7.1.2 DREDGING NOISE

Little can be done to reduce the potential effects of dredging beyond minimising the area disturbed and the time taken to complete the dredging, while implementing the DAHG (2014) guidance to as great a degree as possible. Therefore the residual impact of dredging noise remains a temporary, slight negative impact.

5.2.1.7.1.3 LOSS AND DISTURBANCE OF HABITAT

The loss and disturbance of habitats remains at most a short-term, slight impact, with the exception of the pile footprint which constitutes a permanent, slight, negative impact.

5.2.1.7.1.4 WATER POLLUTION

Following the implementation of additional mitigation measures, as well as the standard procedures, the occurrence of a serious pollution incident during the construction and operation of the cruise berth is considered unlikely; therefore this impact is considered a temporary, slight negative impact.

5.2.1.7.2 Operation Impacts

The predicted impacts related to the project are unchanged from the potential impact section and are as follows:

5.2.1.7.2.1 CRUISE LINER NOISE

The proposed development is intended to attract more cruise liners to Dún Laoghaire Harbour, by providing docking facilities for all but the very largest cruise liners in the world. In 2013, ten cruise liners visited Dún Laoghaire Harbour, anchoring outside the harbour, with passengers being transferred ashore by tender. The current proposal is intended to allow cruise liners to moor alongside within the harbour and to facilitate, on average, one liner every two days, principally in the period April - September.

The noise generated by the increase in shipping traffic into, and out of, Dún Laoghaire Harbour as a result of the proposed development needs to be considered. A cruise liner generates noise through the operation of its engines, generators and the propeller. The majority of the noise energy is in the low frequency spectrum (that generated by the engines and generators), while mid-high frequency noise is also generated, mainly by cavitation around the propeller (which increases with speed).

Sound levels generated by cruise liners has been found to be in the range 175 to 185 dB re 1 μ Pa @ 1 yard (Kipper, 2002) and the sound peaks in the lower frequency range. While the low frequencies which dominate the sound signature would be expected to be most audible to low-frequency whale species (such as Minke and humpback), high-frequency species (such as harbour porpoise) have also been shown to react. Harbour porpoise is the most commonly recorded cetacean species in the wider study area.

The Dublin Bay area, including Dún Laoghaire Harbour, is home to variable levels of shipping and small boat traffic. The Stena High-speed Sea Service (HSS) has recently ceased operation from Dún Laoghaire Harbour, which removes a regular source of noise from the area. Against this background, the increase in shipping movements caused by the arrival and departure, on average, of one cruise liner every two days will have an intermittent, slight negative impact.

Allowing the vessels to dock within the harbour will remove the need to ferry passengers in and out on tenders operating from the cruise liner, thereby reducing small boat traffic, which generates higher frequency sound, which can be more disturbing to species such as harbour porpoise.

5.2.1.7.2.2 MAINTENANCE DREDGING

Following the completion of capital dredging operations, periodic maintenance dredging will be required to maintain the design specification of the channel and turning circle. Maintenance dredging is likely to be infrequent and small in volume due to the lack of a significant sediment source (no riverine input) and the low current speeds in the area (See Chapter 5.4 Coastal Processes). The effects of maintenance dredging will be similar to those associated with the capital dredging, though will be of a lower magnitude owing to the lower level of work required and the associated reduction in the time taken. This is therefore considered a temporary, slight negative impact.

5.2.1.7.2.3 WATER POLLUTION

The operation of cruise liners has the potential to cause water pollution through accidental spillages. Such vessels operate under the International Convention for the Prevention of Pollution from Ships (MARPOL), which sets out the minimum standards ships must adhere to in order to protect water quality. No impact on water quality is expected from the operation of the cruise liners in the waters around Dún Laoghaire as a result of the proposed development.

5.2.1.7.3 'Do nothing' scenario

Should the proposed development works not go ahead, and in the absence of any other anthropogenic impact, there will be no change to the ecology of the study area other than natural change.

5.2.1.7.4 Worst case scenario

The worst case scenario related to the proposed works would be permanent injury to marine mammals, in particular harbour porpoise, due to the effects of impact piling at close range. This impact is extremely unlikely given the implementation of the DAHG (2014) guidance in full for this activity.

5.2.1.8 **Cumulative impacts**

5.2.1.8.1 Intra-project impacts

Separate impacts related to a project may interact cumulatively, resulting in an overall impact that is of greater significance than either impact alone. In the course of the proposed construction works, it is expected that dredging will be carried out for 14-17 weeks, while piling works will be carried out over 12 weeks, with a 4 week overlap. The potential for the noise generated by these works to impact cumulatively needs to be considered.

In assessing the dredging and the piling separately, neither is expected to result in a significant impact. Due to the temporary duration of these works, combined with the localised effect of the dredging operation, the significance of the cumulative impact of these two operations will not exceed those related to piling alone.

5.2.1.8.2 Inter-project impacts

Other plans and projects in the wider area that may act in combination with the proposed Dún Laoghaire Harbour cruise berth include Alexandra Basin Redevelopment (Dublin Port) and Dublin Array wind farm (Kish Bank). It is difficult to assess the potential for cumulative effects owing to a lack of certainty around the timeframe for any of these projects. The current timeline for the Dublin Array is for construction to commence in 2018 (Dublin Array, 2015); however, this development has not yet received consent. Similarly, the Alexandra Basin Redevelopment is proposed to commence piling works in October 2015 and continue

to March 2018, with dredging to extend for a minimum of six years and up to ten years (RPS, 2015).

Sound generated by impact piling on all three projects will result in some level of disturbance to harbour porpoises within, and inshore of, the Rockabill to Dalkey Island SAC. The Alexandra Basin Redevelopment will involve a 38 month piling programme and it was concluded that it would not have any significant effect on marine mammals (RPS, 2015). The principally small diameter piles used in the works proposed for Dún Laoghaire Harbour and the very short piling period (12 weeks) means that this project would have the lowest impact on the sound environment of the area of the three considered, and a negligible in-combination effect. Based on the current timelines, it is not expected that the Dublin Array will have commenced construction works before the piling works are completed for the Dún Laoghaire Harbour cruise berth, meaning there will be no cumulative effect through overlapping works. The distance between the three projects also means that the likelihood of a measureable negative effect is low, with the sound levels attenuating with distance. All three projects will involve the use of Marine Mammal Observers to minimise the risk of injury or hearing loss for marine mammals.

The Alexandra Basin Redevelopment will also involve dredging, with some of the dredge spoil disposed of on land due to the levels of contamination, but with the remainder dumped at the Burford Bank spoil dump site. The Alexandra Basin Redevelopment is expected to dispose of 5,900,000 m³ of spoil in the course of the development works (RPS, 2014), as compared to approximately 710,000 m³ for the proposed project at Dún Laoghaire. The volume of dredge spoil disposed by the Dún Laoghaire Harbour cruise berth project will comprise 11% of the two projects combined. It is proposed that dredging will be carried out for the Alexandra Basin Redevelopment in the period October – March over a six year period (up to a maximum of 10), due to the presence of out-migrating salmon smolts and so there may be slight overlap with the Dún Laoghaire Harbour dredging, which is proposed to take place over one summer period from March to September, with a planned duration of 14-17 weeks. The Alexandra Basin Redevelopment EIS concluded that the spoil disposal would have a temporary negative effect *“principally affecting the direct footprint of the disposal site, and that substantial recovery can be expected to occur within 12 months of the cessation of disposal”*. Given the relatively small contribution the Dún Laoghaire cruise berth project will make to the disposal of dredge spoil over the Burford Bank spoil dump site in comparison to the Alexandra Basin Redevelopment in terms of time and spoil volume, the combined effects of the two projects on the marine environment will not be significant. The currents in the vicinity of the Burford Bank will redistribute the dredge spoil as it is laid down and lead to the restoration of similar biotope following the completion of the works resulting in a negligible effect in the short-term. Once operational, the maintenance dredging of Dublin Port will be of similar magnitude to the existing situation, and so will not lead to a deviation from the existing environment in Dublin Bay.

The Dún Laoghaire Urban Beach, which is located at Berth 1 on the east pier of Dún Laoghaire Harbour, has been granted planning permission. The project is expected to be completed by summer 2016 and the works involved will not lead to any cumulative impacts, as they will be completed before Dún Laoghaire Harbour cruise berth commences and are limited to the landside, with no significant source of impact on the marine environment.

5.2.1.9 Monitoring

The deployment of Marine Mammal Observers (MMOs) is required for the duration of the piling and dredging works. These are required in order to comply with the *Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters* (DAHG, 2014). Reporting to the NPWS is an element of this monitoring.

A repeat of the benthic survey should be carried out 1, 2 and 4 years following the completion of the dredging works to monitor recovery times of the benthic macroinvertebrate community.

5.2.2 Terrestrial Ecology and Ornithology

5.2.2.1 Introduction

Scott Cawley Ltd. was commissioned by Stephen Little and Associates on behalf of Dún Laoghaire Cruise Stakeholder Group to undertake an Ecological (Terrestrial Ecology and Ornithology) Impact Assessment of a proposed development in Dún Laoghaire Harbour, Co. Dublin. The aims of this Ecological Impact Assessment are to:

- establish the ecological baseline for the proposed development site;
- determine the ecological value of the identified ecological features;
- assess the impact of the proposed development on ecological features of value;
- recommend mitigation measures to avoid, reduce and remedy any identified ecological impacts;
- identify any residual impacts of the development post-mitigation.

5.2.2.2 Methodology

5.2.2.2.1 Relevant Legislation, Policy and Guidelines

The assessment of the likely impacts of the proposed development on ecological resources has taken account of the following policy documents and legislation, where relevant.

National and International Policy and Legislation

- *Wildlife Acts 1976 - 2012* (as amended); hereafter collectively referred to as the Wildlife Acts;
- *European Communities (EC) (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011)* (as amended); hereafter referred to as the Birds and Habitats Regulations;
- *EU Birds Directive 2009/147/EEC*;
- *EU Habitats Directive 92/43/EEC* (as amended);
- *Flora (Protection) Order, 1999*;
- *Actions for Biodiversity 2011 – 2016: Ireland’s National Biodiversity Plan*.

Relevant Local Policies and Plans

- *Dún Laoghaire Harbour Master Plan (Dún Laoghaire Harbour Company, 2011)*;
- *Dún Laoghaire-Rathdown County Development Plan 2010-2016*;
- *Core Strategy of the Dún Laoghaire-Rathdown County Development Plan 2010-2016*;
- *Eastern River Basin District, River Basin Management Plan 2009-2015*;
- *Destination Dublin: A Collective Strategy for Tourism Growth to 2020*.

The baseline ecological surveys, evaluation and impact assessment have taken account of the following legislation and guidelines, where relevant.

General Guidance

- *Guidelines for Ecological Impact Assessment in the United Kingdom* (CIEEM, 2006);
- *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009a);
- *Guidelines on the Information to be contained in Environmental Impact Statements* (EPA, 2002);
- *Advice Notes on Current Practice (in preparation of Environmental Impact Statements)* (EPA, 2003);
- *Environmental Planning and Construction Guidelines Series* (National Roads Authority, 2005 – 2011).

Habitats

- *Best Practice Guidance for Habitat Survey and Mapping* (Heritage Council, 2011);
- *A Guide to Habitats in Ireland* (Fossitt, 2000);

Fauna

- *Bird Monitoring Methods: a manual of techniques for key UK species* (Gilbert *et. al.*, 2011);
- *Bat Mitigation Guidelines for Ireland* (Kelleher & Marnell, 2006. NPWS);
- *Bat Surveys: Good Practice Guidelines* (Hundt, 2012. Bat Conservation Trust);
- *Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes* (National Roads Authority, 2006);
- *Design Manual for Roads and Bridges* (Highways Agency, 2001a and 2001b and amendments);
- *Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes* (National Roads Authority, 2009b);

5.2.2.2.2 DESKTOP STUDY

A desktop study was undertaken in order to collate available information on the existing local ecological environment. The following resources and databases were consulted in the production of this report:

- Data on rare/protected/threatened species held by the National Parks and Wildlife Service (NPWS) for Irish National Grid 10km squares O22, O23, O32 and O33 obtained 16th May 2014 and updated 14th May 2015, and accessed online <http://www.npws.ie/mapsanddata> 22nd May 2014 and updated 13th May 2015;
- Data on designated sites was obtained from the online National Parks and Wildlife Service (NPWS) database <http://www.npws.ie/mapsanddata> accessed April 2015;
- Data on rare/protected/threatened species held by the online National Biodiversity Data Centre database, available online at <http://www.biodiversityireland.ie> accessed 23rd May 2014 and updated 13th May 2015;

- Data on known bat roosts and bat records held by Bat Conservation Ireland (BCI), data obtained 23rd May 2014 and updated 20th May 2015;
- Data from previous fauna surveys carried out for Carlisle Pier (Scott Cawley Ltd, 2009);
- Watercourse maps were obtained from the online Environmental Protection Agency (EPA) database ENVision <http://www.epa.ie>;
- Ordnance Survey Mapping. Available online at www.osi.ie;
- Aerial photography available online at Google Maps <http://maps.google.com/> and Bing Maps <http://www.bing.com/maps/>; and
- A review of various reports and data held by the NPWS.

Desktop records of protected, rare and other notable flora and fauna species in the area are included in Appendix 5.2.5.

Likelihood of Occurrence of Protected Species within Proposed Development

Flora¹

It is unlikely that any notable flora species recorded in the desktop study occur within the proposed development site due to lack of suitable habitat. The majority of the development footprint is built ground and coastal waters. However, ports and harbours can often play host to rare plant species and therefore presence of rare or unusual plant species cannot be ruled out in the absence of a site survey. It is possible that some invasive species occur within the proposed development area.

Fauna

Of the mammal fauna recorded in the desktop study, there is potential for the following to occur on the site due to suitable habitat within the proposed development, within close proximity to the site or coastal waters around the site; terrestrial and marine mammals e.g. seals, Harbour Porpoise, Otter, bats, Badger, Hedgehog and Pygmy Shrew.

Due to the coastal location of the proposed development site, and proximity to South Dublin Bay and River Tolka Estuary Special Protection Area (SPA) it is highly likely that bird species associated with coastal and wetland habitats occur within the proposed development site. There is potential for a range of passerine bird species to occur within the proposed development site and there may be nesting opportunities in buildings and structures within the site. However there is limited vegetation within the proposed development site and more suitable vegetated habitat adjacent to the proposed development site.

There is some potential for both terrestrial and marine reptiles to occur e.g. Viviparous lizard and sea turtle species. Viviparous lizards can be found in grassland, hedgerows, sea walls, rail and road embankments. Highest densities of the lizard tend to be found in damp or wet areas where abundant grass tussocks are present to provide food, shelter, basking and hibernation site (Edgar *et al.*, 2010). Therefore potential for occurrence within the proposed development site is unlikely due to lack of suitable habitat. Marine reptile occurrence in the study area is unlikely and any records are likely to be for strandings and/or unusual sightings.

¹ Habitat Preferences and distribution data from Parnell & Curtis (2012), Curtis & McGough (2005), Doogue *et al.* (1998), and the online atlas of the British and Irish Flora <https://www.brc.ac.uk/plantatlas/> Accessed 5th March 2015.

Designated Sites

There are ten Special Areas of Conservation (SACs) and seven SPAs, collectively referred to as European sites², located within 15km of the proposed development, as illustrated in Figure 5.2.2.1 and listed in the Appropriate Assessment (AA) Screening Report see Appendix 5.2.10. Of these, only three SACs and six SPAs are considered to be within the Zone of Influence of the proposed development. These are Rockabill to Dalkey Island SAC, South Dublin Bay SAC, North Dublin Bay SAC, Dalkey Islands SPA, South Dublin Bay and River Tolka Estuary SPA, North Bull Island SPA, Howth Head Coast SPA, Baldoyle Bay SPA and Ireland's Eye SPA. See the Natura Impact Statement (NIS) that is included with this application for full discussion of potential impacts on these nine European sites.

The proposed development proposes to dispose of dredge spoil at the Burford Bank, which is located within the Rockabill to Dalkey Island SAC and is located approximately 1km offshore to the east of the proposed development.

Special Areas of Conservation (cSAC) are designated under the EC Habitats Directive (92/43/EEC) as amended, which is transposed into Irish law through a variety of legislation including the Birds and Habitats Regulations and the Planning Acts, for the protection of habitats listed on Annex I and/or species listed on Annex II of the Directive.

Special Protection Areas (SPAs) are designated under the Birds Directive (2009/147/EC) for the protection of protected bird species listed on Annex I of the Directive, regularly occurring populations of migratory species (such as ducks, geese or waders), and areas of international importance for migratory birds.

There are 25 proposed Natural Heritage Areas (pNHAs) but no Natural Heritage Areas (NHAs) located within 15km of the proposed development, as illustrated in Figure 5.2.2.2 and listed in Table 5.2.2.1 below. Only eight of these are considered to be within the Zone of Influence of the proposed development. All of these overlap at least partially with European site boundaries.

National Heritage Areas (NHAs) are designations under the Wildlife Acts to protect habitats, species or geology of national importance. Many of the NHAs in Ireland overlap with the boundaries of European sites. Although many NHA designations are not yet fully designated (referred to as proposed NHAs or pNHAs), they are offered protection in the interim period under existing planning legislation which requires that planning authorities give due regard to their protection in planning policies and decisions. pNHAs are usually given some protection under County Development Plans, as is the case for the Dún Laoghaire-Rathdown County Development Plan (Policy LHB8).

² Natura 2000 sites are defined under the Habitats Directive (Article 3) as a European ecological network of special areas of conservation composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II of the Habitats Directive and Annex I of the Birds Directive. The aim of the network is to aid the long-term survival of Europe's most valuable and threatened species and habitats. In Ireland these sites are designed as *European sites* - defined under the Planning Acts and/or Birds and Habitats Regulations as (a) a candidate site of Community importance, (b) a site of Community importance, (c) a candidate special area of conservation, (d) a special area of conservation, (e) a candidate special protection area, or (f) a special protection area. They are commonly referred to in Ireland as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs).

Table 5.2.2.1 Proposed Natural Heritage Areas (pNHA) within 15km of the Proposed Development (information downloaded from www.npws.ie in April 2015)

Site name and code	Reasons for designation (taken from Site Synopsis where available)	Do any potential source-pathway-receptor links exist between the proposed development and the pNHA?
Dalkey Coastal Zone and Killiney Hill pNHA [001206] ca. 0.5km	Coastal habitats and breeding waterbirds and Terns.	Yes
South Dublin Bay pNHA [000210] ca. 0.2km	Estuarine habitats and wintering waterbirds (see South Dublin Bay SAC and South Dublin Bay and River Tolka Estuary SPA above).	Yes
Boosterstown Marsh pNHA [001205] ca. 3.7km	Saltmarsh habitat and associated bird species.	Yes
Dolphins, Dublin Docks pNHA [000201] ca. 5.8km	Breeding Tern colonies.	Yes
North Dublin Bay pNHA [000206] ca. 4.2km	Coastal and estuarine habitats, and wintering waterbirds (see North Dublin Bay SAC and South Dublin Bay and River Tolka Estuary SPA above).	Yes
Loughlinstown Woods pNHA [001211] c. 5.5km	Woodland habitat.	No
Howth Head pNHA [000202] ca. 6.5km	Sea cliff and heath habitats and breeding Kittiwake (see Howth Head SAC and Howth Head Coast SPA above).	Yes
Dingle Glen pNHA [001207] ca. 6.7km	Woodland habitat and heath vegetation.	No
Fitzsimon's Wood pNHA [001753] ca. 6.6km	Birch <i>Betula</i> spp. Woodland.	No
Grand Canal pNHA [002104] ca. 7.8km	Freshwater habitat, hedgerow, calcareous grassland, reed fringe, scrub and woodland.	No
Royal Canal pNHA [002103] ca. 8.9km	Freshwater habitat, hedgerow, calcareous grassland, reed fringe, scrub and woodland.	No
Santry Demesne pNHA [000178] ca. 13km	Woodland habitat and protected plant species (Hairy St. John's wort <i>Hypericum hirsutum</i>).	No
Baldoyle Bay pNHA [000199] ca. 9.5km	Coastal and estuarine habitats, and wintering waterbirds (see Baldoyle Bay SAC and SPA above).	Yes
Sluice River Marsh pNHA [001763] ca. 12.7km	Freshwater marsh habitats.	No
Ireland's Eye pNHA [000203] ca. 11km	Sea cliff and coastal habitats and breeding sea birds (see Ireland Eye SAC/SPA above).	Yes

Table 5.2.2.1 Proposed Natural Heritage Areas (pNHA) within 15km of the Proposed Development (information downloaded from www.npws.ie in April 2015)

Site name and code	Reasons for designation (taken from Site Synopsis where available)	Do any potential source-pathway-receptor links exist between the proposed development and the pNHA?
Dodder Valley pNHA [000991] ca. 12.6km	River habitat and associated bank side vegetation.	No
Ballybetagh Bog pNHA [001202] ca. 9km	Fen and marsh habitats.	No
Knocksink Wood pNHA [000725] ca. 10.4km	Woodland and springs (see Knocksink Wood SAC above).	No
Powerscourt Woodland pNHA [001768] ca. 11.8km	Mixed woodland habitat.	No
Ballyman Glen pNHA [000713] ca. 9.9km	Alkaline fen and petrifying spring habitats.	No
Dargle River Valley pNHA [001754] ca. 11.8km	Woodland valley habitat and geological interest.	No
Bray Head pNHA [000714] ca. 11.3km	Sea cliff and heath habitat.	No
Glencree Valley pNHA [001755] ca. 14.5km	Woodland, boggy flushes and river habitat.	No
Great Sugar Loaf pNHA [001769] ca. 13km	Heath, upland grassland, woodland habitats and geological interest.	No
Kilmacanogue Marsh pNHA [000724] ca. 14km	Wet woodland, fen and grassland habitats.	No

5.2.2.2.3 CONSULTATION

The following organisations with relevance to ecology were consulted regarding any impacts, records or ecological sensitivities in relation to the proposed development. Any written correspondence received has been included in Appendix 5.2.6:

- Irish Whale and Dolphin Group, consulted on 14th May 2014, no response received;
- BirdWatch Ireland, consulted on 14th May 2014, response received;
- Botanical Society of Britain and Ireland (BSBI), consulted on 14th May 2014, no response received;
- Department of Arts, Heritage and the Gaeltacht (Development Applications Unit), consulted on 20th May 2014, response received;
- NPWS:
 - Dr. David Lyons, Marine Ecologist, consulted on 12th May 2014 and 10th April 2015 by phone;

- Kieran Buckley, Local Ranger, consulted on 24th October 2014 by phone;
- Terry Doherty, consulted on 2nd and 18th February 2015 by phone, and 24th of February 2015 via site visit;
- Heritage Officers of Dún Laoghaire-Rathdown County Council, Dublin City Council and Fingal County Council, consulted on 15th to 19th May 2014, no response received; and
- Biodiversity Officer of Fingal County Council, consulted on 19th May 2014, no response received.

Bat Roost Records were obtained from Bat Conservation Ireland (BCI) for the site and environs to a distance of ca. 10km on the 23rd May 2014 and updated on 20th May 2015. The BCI have no records of bat roosts within 1km of the proposed development. The nearest known roost was of an unidentified bat located ca. 3.7km from subject lands.

5.2.2.2.4 FIELD SURVEY METHODOLOGY

The terrestrial areas of proposed development and surrounding areas including marine waters for the purposes of ornithological surveys (referred to throughout this assessment as the study area) were surveyed between February and June 2014. Terrestrial ecology and ornithology surveys were undertaken by a team of surveyors from Scott Cawley Ltd. Additional wintering bird surveys were undertaken between September 2014 and February 2015. See Table 5.2.2.2 below for details.

Survey	Survey Date(s)
Habitats	12 th May 2014 and 23 rd December 2014
Bats (Dusk Survey)	23 rd April 2014
Bats (Static Detector)	23 rd – 28 th April 2014
Otters	6 th & 12 th May 2014, 24 th February 2015
Birds (Wintering)	6 th , 13 th , 20 th , 22 nd , 28 th February, 23 rd March, 29 th September, 29 th October 27 th /28 th November, 18 th /19 th December 2014 25 th /26 th January and 26 th February 2015
Birds (Breeding)	12 th May and 24 th June 2014

The Zone of Influence (ZoI) for Sensitive Ecological Receptors

The Zone of Influence (ZoI)³ over which significant impacts may occur will differ for Sensitive Ecological Receptors (SER's)⁴, depending on the sensitivity of the receptor and the pathways for any potential impacts.

The ZoI for terrestrial habitats is generally limited to the footprint of the proposed development, and immediate environs.

Hydrological linkages (e.g. surface waters and groundwater flows) between impact sources and aquatic habitats and species often result in potential for impacts to occur at significant distance. The distances over which water-borne pollutants are likely to remain in sufficient concentrations to have a significant impact on receiving waters is difficult to quantify and

³ In accordance with NRA (2009) Guidelines, the "zone of influence" is an important term to define the receiving environment for the activities associated with the project and the biophysical changes that are likely to occur. The zone of influence is the "effect area" over which change is likely to occur. This differs for different species and habitats due to varying sensitivities to potential impacts. For instance some birds of prey will flush from an active nest at several hundred metres from human disturbance, while some woodland passerines will tolerate disturbance at a few metres.

⁴ Termed 'Key Ecological Receptors in NRA Guidelines (2009). 'Significant' impacts are deemed to be those with impacts resulting in a likely change in conservation status of a Sensitive Ecological Receptor (SER). According to NRA Guidelines (2009), SER's will be features of sufficient value to be material in the decision-making process for which potential impacts are likely. According to NRA Guidelines, SER's are therefore defined as features of Local Value Importance (Higher Value), County, National, or International.

highly site-specific. Evidently, it will depend on volumes of discharged waters, concentrations and types of pollutants, volumes of receiving waters, and sensitivity of receiving waters. As a precautionary measure, the distance over which surface water discharges could have a significant impact on the marine receiving waters is considered to cover the extent of the wider Dublin Bay area in this instance.

The ZoI for significant impacts to breeding birds is considered to be within the confines of the harbour walls. The closest known tern breeding colony is on Dalkey Island, located approximately 3km at its closest point to the proposed works. At this distance impacts on the breeding site from noise and disturbance are not anticipated to occur. For breeding terns potentially utilizing the harbour, for feeding or other purposes while remote from their breeding sites, the ZoI for significant impacts extends to SPAs within 15km of the proposed development designated for breeding terns. This is to take account of the highly mobile nature of bird species and the potential for disturbance from loud and unpredictable noise during construction and operation to these species while remote from their SPAs. There are no highly sensitive breeding bird species (e.g. raptors) for which disturbance over greater distance might be expected.

The ZoI for significant impacts to wintering birds is considered to extend up to 500m from the harbour walls, including the proposed turning circle 500 m in diameter and proposed navigation channel (in part) outside the harbour walls leading into deeper water to the east, but also includes SPAs within 15km of the proposed development that are designated for wintering bird species, if those species occur within the proposed development area while feeding or ranging remote from their SPAs. This is to take account of the highly mobile nature of bird species and the potential for disturbance from loud and unpredictable noise during construction and operation to these species while remote from their SPAs.

The ZoI for Otters may extend over greater distances than small mammal and bird species due to their ability to disperse many kilometres from their natal site. Impacts to bats may potentially occur at distances up to 13km due to known long-distance foraging of Irish Leisler bats *Nyctalus leisleri* from their nursery roost sites (Shiels *et al.*, 2006).

Habitats

Terrestrial flora and habitats within the proposed development site were surveyed on the 12th May 2014 using methodology outlined in *Best Practice Guidance for Habitat Survey and Mapping* (Heritage Council, 2011) and rechecked on 23rd December 2014. All habitat types were classified using the *Guide to Habitats in Ireland* (Fossitt, 2000). Plant nomenclature followed that of the *Checklist of the Flora of Britain & Ireland* (BSBI, 2007). Within each habitat, the following species were recorded if present;

- Dominant and indicator plant species;
- Protected species under the Flora (Protection) Order, 1999;
- Threatened species on the *Irish Red Data Book 1: Vascular Plants* (Curtis & McGough, 2005), and rare species in the *Flora of County Dublin* (Doogue *et al.*, 1998);
- 'Local biodiversity plan species' listed in the *Dún Laoghaoire-Rathdown Biodiversity Plan 2009-2013*⁵(DLRBP) (Dún Laoghaoire-Rathdown County Council, 2009);
- Invasive species on Schedule 3 of the Bird and Habitat Regulations, and those listed as "Problematic Plants" in the National Invasive species database⁶.

⁵ The 2009-2013 DLRBP has not been updated. The DLRBP lists "Local biodiversity plan habitats /species" for protection within Dún Laoghaoire-Rathdown.

⁶ Available online at: <http://www.biodiversityireland.ie/>. Accessed in May 2014.

Bats

Specialist bat surveys were undertaken to assess potential use of the site by bats. One dusk survey of the StenaLine Ferry Terminal, Eastern Breakwater and environs was conducted on the 23rd of April 2014. The dusk survey was conducted from 30 minutes before sunset, 20.40hrs, until 2 hours thereafter (i.e. peak emergence time for bats leaving roosts). Direct observations were combined with use of heterodyne/time expansion (Pettersson D240x) ultrasound detectors.

A static frequency-division detector was also placed in close proximity to the StenaLine ferry terminal and set to record from sunset on the 23rd April 2014 until sunrise on the 28th April 2014. Recordings were analysed using sound analysis software (Analook).

Otter

The Harbour was surveyed for any signs of Otter *Lutra lutra* activity. Usage by Otter was substantiated through the detection of field signs such as evidence of breeding or resting places, tracks, feeding signs, and spraints (droppings), as well as by direct observation. A land based walkover survey of the Harbour was carried out on the 6th of May 2014 to note any field signs of Otters. This included inspection of rock armour on foot where accessible, and inspection with binoculars where not directly accessible. A boat based survey was conducted on the 12th of May 2014 to inspect Harbour structures and areas not accessible by foot.

A further inspection of the rock armour of the Eastern Breakwater took place on 24th February 2015 during a site meeting with Terry Doherty, NPWS Ranger, and confirmed previous findings.

Infrared cameras could not be used within the study area to investigate Otter activity due to access difficulties and lack of secure locations to place the devices.

Wintering Birds

Surveys were conducted over two winter seasons:

- Winter 2014 - weekly surveys were carried out throughout February 2014, and one in March 2014 (6 in total);
- Winter 2014/2015 – monthly surveys were carried out from September 2014 to February 2015 (6 in total).

All areas of the Harbour, the area associated with the proposed turning circle and proposed navigation channel (in part) outside the Harbour walls were surveyed at both low and high tide, recording the bird species and numbers in the area. Survey methodology was adapted from Gilbert *et. al.*, (2011) using generic survey methods for monitoring waterfowl on non-estuarine coastlines, and included a 30 minute count at the end of the Harbour wall to survey the proposed turning circle area. Surveys also incorporated one dawn and one dusk period to record any birds roosting in the Harbour overnight. Birds were counted using an Opticron ES 80 GA ED V3 spotting scope, KOWA TSN3 spotting scope, Opticron imagic 10x50 binoculars and ZEISS 7x42 binoculars. Table 5.2.2.3 presents the survey times and weather conditions.

Table 5.2.2.3 Wintering Bird Survey – Times and Weather Conditions at Dún Laoghaire Harbour

Date	Tide	Tide Height	Tide Time	Cloud (Oktas)	Wind (Beaufort Scale)	General
06/02/2014	Low	0.72m	09h55	4	F2	Dry and bright, good visibility
	High	3.38m	16h11	4	F1	Dry and bright, sea mist outside harbour from 15h00
13/02/2014	High	3.54m	10h30	2	F6	Gusty, water very choppy but dry and bright
	Low	0.50m	16h47	2	F4-5	Gusty, water choppy but dry and bright
20/02/2014	Low	0.61m	08h22	5	F5	Dry, good visibility
	High	3.52m	14h34	5	F5	Bright with occasional showers, good visibility
22/02/2014	Low	1.10m	09h43	7	F4 (Gusts 5-6)	Dry, excellent visibility
	High	3.60m	16h36	7-8	F4 (Gusts 5-6)	Dry, excellent visibility
28/02/2014	High	4.02m	10h34	6	F5	Dry, excellent visibility
	Low	0.30m	16h27	6	F5	Dry, excellent visibility
23/03/2014	Low	0.90m	09h27	5	F5	Dry, excellent visibility
	High	3.60m	16h19	5	F5	Dry, excellent visibility
29/09/2014	Low	0.57m	09h05	4	F2	Dry, sunny spells, excellent visibility
	High	3.40m	15h15	4	F2	Dry, sunny spells, excellent visibility
29/10/2014	Low	1.10m	08h15	5	F4	Dry, excellent visibility
	High	3.90m	14h58	5	F4	Dry, excellent visibility
27/11/2014	High	4.10m	14h41	5	F2 (Increasing to F4)	Dry, excellent visibility
28/11/2014	Low	1.20m	09h00	6	F2	Dry, excellent visibility
18/12/2014	Low	0.97m	14h26	5	F4	Bright with occasional light showers, water choppy, good visibility
19/12/2014	High	3.31m	09h06	6	F5	Bright with some showers, water very choppy, visibility good
25/01/2015	Low	0.70m	08h34	7	F3	Dry and overcast, water choppy, excellent visibility
26/01/2015	High	4.10m	15h42	5	F4	Dry with sunny spells, water choppy, good visibility
26/02/15	Low	1.20m	11h07	6	F4	Light showers, water choppy, visibility good
	High	3.50m	17h27	6	F4	Light showers, water choppy, visibility good

Breeding Birds

The breeding bird survey concentrated on confirming the nesting locations of the population of Black Guillemot *Cephus grille* known to breed within the harbour. Two breeding bird surveys were conducted, one on the 12th May 2014 and one on 24th June 2014.

The first survey comprised of an early morning observation (07.30am) for Black Guillemots sitting on the water outside nest holes to get an indication of whether any nest holes were present in Carlisle Pier. This was followed by a boat based inspection of harbour structures for nest holes, focusing on structures in the immediate vicinity of Carlisle Pier and the StenaLine ferry terminal, and recording locations of possible nest holes and/or numbers of breeding pairs.

The second survey involved early morning observation (07.20am) for the numbers of Black Guillemot breeding pairs attending nest holes in Carlisle Pier and in the Irish Lights compound, the structures identified by the first survey as containing nest holes. Table 5.2.2.4 presents the survey times and weather conditions.

Table 5.2.2.4 Breeding Bird Survey – Times and Weather Conditions at Dún Laoghaire Harbour

Date	Start time	End time	Wind (Beaufort Scale)	General
12/05/2014	07h30	13h30	F2 (SW)	Dry and bright, good visibility
24/06/2014	07h20	16h47	F2 (W)	Dry and bright, good visibility

5.2.2.2.5 LIMITATIONS

Field surveys for wintering birds were conducted between 6th February and 23rd March 2014, and September 2014 to February 2015, in combination spanning two winter seasons and providing data for one full winter season. Given the nature of the potential impacts of the proposed development on winter birds and the numbers and species of birds recorded present a single winter season survey period is deemed to be sufficient for the purposes of this assessment.

A field survey for bats was undertaken on 23rd April 2014, with additional static detectors on site set to record bat activity on site until 28th April. Due to the low number of bat detections during both surveys, lack of suitable roosting structures in the immediate vicinity of the proposed development and lack of desktop records for the area no further surveys were deemed necessary.

Otter surveys were conducted on 6th and 12th May 2014. All accessible and suitable habitats for Otter were surveyed. However, difficulties were encountered when surveying rock armour due to the nature of the rock armour with many inaccessible crevices. Infrared cameras could not be used due to access difficulties and lack of secure locations to place the devices. Therefore it was not entirely possible to rule out usage of rock armour by Otters in all areas.

All other surveys were undertaken within suitable survey periods and to an appropriate level of survey effort given the nature of the site and the proposed development.

5.2.2.2.6 ECOLOGICAL EVALUATION AND IMPACT ASSESSMENT METHODOLOGY

SITE EVALUATION AND IMPACT ASSESSMENT CRITERIA

The criteria used to assess the ecological value and significance of the development site follows the *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (NRA, 2009) and the *Guidelines for Ecological Impact Assessment in the United Kingdom* (CIEEM, 2006).

In accordance with NRA guidelines (2009), impact assessment was only undertaken of “sensitive ecological receptors”⁷. These were features within the zone of influence of the development which were “both of sufficient value to be material in decision making and likely to be affected significantly” (NRA, 2009). Features qualifying as sensitive ecological receptors must as a minimum meet the ecological valuation criteria of “Local Importance (Higher Value)” or higher as per the NRA value criteria. Features of lower ecological value are excluded from impact assessment. The highest levels of impact significance for each Sensitive Ecological Receptor ‘value’ rating are shown in Table 5.2.2.5.

⁷ Termed “key ecological receptors” in NRA guidelines (2009)

Table 5.2.2.5 Maximum level of impact significance for Sensitive Ecological Receptors	
Sensitive Ecological Receptor 'value' rating	Highest possible significance level
International Importance	Significant Positive/ Negative impact at International level
National Importance	Significant Positive/ Negative impact at National level
County Importance	Significant Positive/ Negative impact at County level
Local Importance (higher value)	Significant Positive/ Negative impact at Local level

The following impact significance criteria (EPA, 2002) are used where applicable:

- Imperceptible Impact – an impact capable of measurement but without noticeable consequences;
- Slight Impact – an impact which causes noticeable changes in the character of the environment without affecting its sensitivities;
- Moderate Impact – an impact that alters the character of the environment in a manner that is consistent with existing and emerging trends;
- Significant Impact – an impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment;
- Profound Impact – an impact which obliterates sensitive characteristics.

In addition to the above definitions of duration (EPA, 2002) have been employed as follows:

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

5.2.2.3 Receiving Environment

Site Overview

The subject site is located at Dún Laoghaire Harbour, Dún Laoghaire, Co. Dublin. Dún Laoghaire is a working harbour with the Stena Line Ferry having operated out of the harbour seasonally up until Autumn 2014, commercial fishing boats operating out of the harbour and various recreational boats utilising the harbour. The area proposed for development is *ca.* 55 hectares and consists mainly of built land, coastal structures and coastal water habitat of the harbour and associated littoral and sublittoral habitats. Harbour related structures within the site boundary include; the Eastern Breakwater (in part), the HSS Stena Line Ferry Terminal (in part), security building, canopy and associated facilities and existing car parks.

Habitat Survey

The following habitat types of the Heritage Council classification system (Fossitt 2000) were identified within the landside terrestrial elements of the proposed development and surrounding area as mapped in Figures 5.2.2.3a and 5.2.2.3b. Vegetation within the proposed development boundary was primarily limited to landscaped areas of ornamental vegetation. There were ruderal and pioneer vegetation communities on bareground. The habitats recorded within the subject lands were:

- Woodland and Scrub

WS3 Ornamental/Non-native Shrub

There were small areas of ornamental planting at the entrance to the Eastern Breakwater and StenaLine Ferry Terminal. Species present included White clover *Trifolium repens*, fescue grass *Festuca* spp., and non-native ornamental species including some immature Sycamores *Acer pseudoplatanus*. This habitat was considered to be of local (lower) ecological value.

- Exposed Rock and Disturbed Ground

ED3 Recolonising Bare Ground

A narrow linear strip of land ran between Harbour Road and the railway line. The area was comprised largely of bareground being recolonized with ruderal species such as Butterfly Bush *Buddleja davidii*, Colt's Foot *Tussilago farfara*, Dandelion *Taraxacum* spp., willow-herbs *Epilobium* spp. and various moss species. Grass species included fescues *Festuca* spp. and meadow-grasses *Poa* spp. This habitat was considered to be of local (lower) ecological value.

- Cultivated and Built Land

BL1 Stonewalls and Other Stonework

Stonewalls on the site mainly comprised of boundary walls along Harbour Road and the railway line. This habitat was considered to be of negligible ecological value.

BL3 Buildings and Artificial Surfaces

Buildings on site included the Motorists Building within the HSS StenaLine Ferry Terminal, security hut and canopy over the entrance to the terminal. A concrete wall ran along the boundary of the HSS StenalLine Ferry Terminal and the walkway to the Eastern Breakwater. Artificial surfaces in the area were a mix of tarmacadam, concrete and paving mainly associated with car parking areas, access roads and the Ferry Terminal holding area. This habitat was considered to be of negligible ecological value.

- Coastland

CC1 Sea walls, Piers and Jetties

The Eastern Breakwater was constructed of precast concrete, with much of the surface paved. There was metal fencing sitting on a precast concrete base installed along the edges of the breakwater. Rock armour on the seaward edge of the structure comprised of large boulders. There was also a causeway associated with the HSS Stenaline Ferry Terminal which appeared to be mainly constructed of metal. This habitat was considered to be of negligible ecological value.

Bats

All bats and their roosting sites are legally protected under the Habitats Directive as transposed by the Habitats Regulations, as well as under the Wildlife Act. Eight bat species are listed as local biodiversity plan species on the DLRBP, including Leisler's bat *Nyctalus leisleri*.

Three Leisler's bats were observed feeding in front of the StenaLine Ferry berth from 21.00hrs to 21.20hrs during a dusk survey on the 23rd of April 2014. Sunset on the 23rd April 2014 was 20.40hrs. It is possible the bats were feeding here as there was some shelter afforded due to the structure and insects may have been carried on the wind into the area.

Leisler's bats were recorded in the vicinity of the StenaLine Ferry berth again on the nights of 24th, 27th and 28th of April 2014 from approximately 21.00hrs to 21.30hrs and on the morning of 28th of April 2014 from 05.04hrs to 05.34hrs, during a total of 5 days recording by a static detector. Sunset on these dates was between 20.40hrs – 20.50hrs, and sunrise was between 06.05hrs – 05.55hrs.

No roosts were confirmed in the study area. Buildings and structures in the immediate vicinity of the StenaLine Ferry berth presented very low bat roost potential due to lack of cracks and crevices, lack of attic/roof voids and high levels of human disturbance. Leisler's bats emerge from their roosts earlier in the evening than other bat species, may stay away from their roosts until just before dawn and feeding activity peaks at dusk and just before dawn. The timing of the recordings, ca. 20 minutes after sunset and ca. 30 minutes before sunrise, indicated that the bats are roosting somewhere in proximity, although given the nature of the structures within the study area it is likely they are roosting outside of the proposed development area, and were foraging in the proposed development area while commuting from and back to a roost at dawn.

Otters

Otters are protected under the Wildlife Act 1976 - 2012 (as amended) and are listed on Annex II and Annex IV of the Habitats Directive. They are also listed as local biodiversity plan species on the DLRBP.

Otter activity was confirmed at a number of locations within the harbour and environs by detection of spraints. See Figure 5.2.2.X for locations of Otter activity. A possible resting area was noted on a disused ferry pontoon located to the south east of the Stena Line Ferry berth, although the pontoon is not located within the footprint of the proposed development. No holts were confirmed within the study area, however, rock armour along the breakwaters within the harbour and outside the harbour walls may provide suitable conditions for a holt.

Wintering Birds

A full species list of species recorded from surveys undertaken in February 2014, March 2014 and September 2015 – February 2015 are provided in Appendix 5.2.7. Count data for each survey day can be found in Appendix 5.2.8.

Table 5.2.2.6 summarizes the bird species recorded during the surveys and their conservation importance. Criteria indicating conservation importance include:

- European Protected Species under Annex I of the Birds Directive;

- Special Conservation Interests (SCIs) of SPAs within 15km of the proposed development;
- Amber and Red-listed Birds of Conservation Concern in Ireland⁸; and
- Local Biodiversity Plan Species (LBPS)⁹.

Peak counts for each bird species recorded during the surveys are included in Table 5.2.2.6 alongside the IWeBS peak counts for Dublin Bay and the 1% National Threshold¹⁰ where available.

⁸ Colhoun & Cummins, 2014.

⁹ DLRCC, 2009.

¹⁰ The threshold for nationally important numbers is represented as 1% of the National population. These figures are generated from the Irish Wetland Bird Survey (iWeBS) count data.

Table 5.2.2.6 Conservation Importance of Wintering Birds recorded within the study area (February 2014 – February 2015)							
Common Name	Conservation Importance				Peak Count within Survey Area	Peak Count within Dublin Bay ¹¹	1% National threshold ¹²
	Annex I	SCI	Red-list ⁷	LBPS ⁸			
Bar-tailed Godwit	√	√	Amber	-	38	2141	150
Black Guillemot	-	-	Amber	√	17	-	-
Black Redstart	-	-	Green	-	2	-	-
Black-headed Gull	-	√	Red	-	94	3738	-
Brent Goose	-	√	Amber	√	23	6134	360
Collared Dove	-	-	Green	-	1	-	-
Common Gull	-	-	Amber	-	30	685	-
Common Tern	√	√	Amber	-	125	38	-
Cormorant	-	√	Amber	-	58	211	120
Curlew	-	√	Red	-	2	1240	350
Dunlin	√	√	Red	-	1100	6490	570
Duncock	-	-	Green	-	1	-	-
Gannet	-	-	Amber	-	1	-	-
Goldfinch	-	-	Green	-	11	-	-
Goldcrest	-	-	Amber	-	2	-	-
Great Black-backed Gull	-	-	Amber	-	60	358	-

¹¹ I-WeBS Site Summary Data for Dublin Bay 2008/09-2012/13. Downloaded from BirdWatch Ireland 7th May 2015.

¹² Crowe & Holt, 2013.

Great Crested Grebe	-	-	Amber	-	5	930	40
Great Northern Diver	√	-	Amber	-	10	8	20
Greenshank	-	-	Green	-	2	68	20
Grey Heron	-	-	Green	√	5	54	25
Grey Wagtail	-	-	Red	-	1	-	-
Guillemot	-	√	Amber	-	62	-	-
Herring Gull	-	√	Red	√	48	422	-
Hooded Crow	-	-	Green	-	8	-	-
House Sparrow	-	-	Amber	-	3	-	-
Kittiwake	-	√	Amber	-	2	-	-
Lesser Black-backed Gull	-	-	Amber	-	4	195	-
Lesser Redpoll	-	-	Green	-	1	-	-
Linnet	-	-	Amber	√	22	-	-
Little Grebe	-	-	Amber	-	1	9	20
Magpie	-	-	Green	-	2	-	-
Mallard	-	-	Green	-	2	151	290
Meadow Pipit	-	-	Red	√	4	-	-
Mediterranean Gull	√	-	Amber	√	13	113	-

Mistle Thrush	-	-	Amber	-	1	-	-
Mute Swan	-	-	Amber	-	1	7	90
Oystercatcher	-	√	Amber	-	14	4324	690
Peregrine	√	√	Green	√	1	-	-
Pied Wagtail	-	-	Green	-	8	-	-
Purple Sandpiper	-	-	Green	-	9	16	20
Razorbill	-	√	Amber	-	94	-	-
Red-Breasted Merganser	-	-	Green	-	1	114	20
Red-necked Grebe	-	-	Green	-	1	-	-
Redshank	-	√	Red	√	14	3621	300
Red-throated Diver	√	-	Amber	-	3	16	20
Ringed Plover	-	√	Green	-	89	314	100
Robin	-	-	Amber	-	1	-	-
Rock Pipit	-	-	Green	-	4	-	-
Rook	-	-	Green	-	2	-	-
Sanderling	-	√	Green	-	240	674	60
Sandwich Tern	√	-	Amber	-	4	43	-
Shag	-	-	Amber	-	217	35	-
Shelduck	-	√	Amber	-	1	1142	120
Starling	-	-	Amber	-	17	-	-
Swallow	-	-	Amber	-	1	-	-

Turnstone	-	√	Green	-	33	392	95
Wheatear	-	-	Amber	-	2	-	-
Wren	-	-	Green	-	1	-	-

In total, 58 species were recorded within the study area during the survey period. This included 8 Annex I species, 18 SCI species for nearby SPAs, 7 Red listed and 30 Amber listed species.

Figure 5.2.2.5a and Figure 5.2.2.5b map the distribution and numbers of bird species at both high and low tide. For illustration purposes, only those birds recorded on the water or on land are represented in the figures. Birds recorded in flight over the area have not been included in the figures, but have been included in the data analysis and impact assessment.

As can be seen in these figures, the majority of the bird species were recorded on or in close proximity to the East and West Pier and in relatively small numbers. There were some larger flocks of birds recorded high tide roosting on the outsides of the harbour walls, at high tide. Relatively few birds were recorded outside the mouth of the harbour in the proposed turning circle area, proposed navigation channel or in the areas of the proposed navigation channel inside the harbour.

SPA SCI species

18 SCIs for SPAs within 15km of the proposed development were recorded in the study area. Regularly occurring species included Black-headed Gull, Dunlin, Cormorant, Guillemot, Herring Gull, Oystercatcher, Redshank, Ringed Plover and Turnstone. Figure 5.2.2.5c and Figure 5.2.2.5d illustrate the distribution of SCI bird species recorded at both high and low tide during the surveys. Only those birds recorded on the water or on land are represented in the figures. Birds recorded in flight over the area have not been included in the figures, but have been included in the data analysis and impact assessment. Each point is labelled with the bird species corresponding BTO species code and numbers of the species recorded.

All were generally recorded in small numbers not exceeding the 1% National Threshold, with the exception of Dunlin and Sanderling. Dunlin were recorded on nine occasions in the study area high tide roosting and on two of these occasions in numbers exceeding the 1% National Threshold. The peak count for Dunlin within the study area equates to approximately 17% of the peak count for the whole of Dublin Bay. Dunlin are a SCI of the nearby South Dublin Bay and River Tolka Estuary SPA. Sanderling were recorded on three occasions in the study, twice high tide roosting and once at low tide. During the two high tide occasions the numbers exceeded the 1% National Threshold and equated to approximately 35% of the peak count for Dublin Bay. Sanderling are a SCI of the nearby South Dublin Bay and River Tolka Estuary SPA. Ringed Plover did occur in larger flocks on occasion, most often high tide roosting with Dunlin, but did not exceed the 1% National Threshold, and equating to approximately 28% of the Dublin Bay peak count.

Bar-tailed Godwit were recorded on three occasions in numbers equating to approximately 2% of the peak count for Dublin Bay. Common Tern were recorded on a single occasion in numbers exceeding the peak count for Dublin Bay. A single Shelduck was recorded throughout the survey period.

There was a single raptor of conservation importance, Peregrine, recorded in flight once over the study area on the 22nd of February 2014 during the surveys.

All other non-SPA SCI species

Eight Annex I bird species were recorded in the study area, with four of these not listed as SCIs for nearby SPAs; Great Northern Diver, Mediterranean Gull, Red-throated Diver and Sandwich Tern. Great Northern Diver, Mediterranean Gull and Red-throated Diver were regularly recorded in small numbers in the study area. Sandwich Tern were recorded on three occasions in the study area in numbers equating to approximately 9% of the peak count for Dublin Bay.

A number of passerine bird species were recorded in small numbers in the study area, with a number of these listed as red or amber birds of conservation concern in Ireland.

There were large numbers of Shag, and to a lesser extent Cormorant, recorded in the harbour at the beginning of February 2014. This is believed to be an unusual occurrence and to be due to the fact that large shoals of sprat were sheltering from storms in the harbour, and consequently the birds sheltered from the storms with a large food supply (S. Coate and H. Delaney, pers. comm.). By mid to late February 2014 the numbers had dropped off again, as can be seen in the survey data, see Appendix 5.2.8.

Breeding Birds

All birds and their nests are legally protected under the Wildlife Act.

Tern species

Terns do not breed within in the harbour although Common Tern *Sterna hirundo* are known to have opportunistically attempted to nest on boat structures in recent years (H. Delaney, pers. comm.). Small numbers of terns, ca. eight individuals and almost always Common Terns, have been observed feeding within the harbour along the East Pier during breeding season, however, it is possible that these are non-breeders (H. Delaney, pers. comm.). 125 Common Terns were recorded on a single occasion (29th September 2014) feeding off the end of the East Pier during winter bird surveys carried out for the proposed development. This exceeds the peak count for Common Tern in Dublin Bay. It cannot be confirmed if these terns are from nearby breeding colonies on Dalkey Islands SPA, South Dublin Bay & River Tolka Estuary SPA or other SPAs designated for terns, or if they are non-breeders.

Black Guillemot and all other breeding bird species

Black Guillemots are amber listed; birds of Medium Conservation Concern in Ireland (Colhoun & Cummins, 2014). They are also listed as local biodiversity plan species on the DLRBP, with a proposed action for the species included in the plan as follows "The county contains small but important numbers of this species. Ensure that the species and the habitat that it relies on are adequately protected". Black Guillemots are predominantly cliff-nesting species, but many have adapted to man-made environments and regularly nest around the harbour in Carlisle Pier and other structures.

A total of nine breeding pairs of Black Guillemot were confirmed within the study area in May and June 2014 as illustrated in Figure 5.2.2.6.

- Five breeding pairs were observed attending nest holes underneath Carlisle Pier, with nest holes in crevices and ledges underneath the pier structure (three pairs on the east side and two pairs underneath the west side of the pier);
- Four breeding pairs were observed in front of the Commissioners of Irish Lights building, with nest holes in narrow outfall pipes.

In addition, one pair of Grey Wagtail *Motacilla cinerea*, a red listed species, was noted as breeding in a wall in the dry dock area of the National Yacht Club at the base of the east pier; one pair of Swallow *Hirundo rustica*, an amber listed species, was observed nesting on the underside of the docking structure in the Commissioners of Irish Lights compound; and Hooded Crow *Corvus cornix* were observed nesting on a mast of a small boat anchored off the western side of the Western Breakwater. The indicative locations of the nesting sites can be seen in Figure 5.2.2.6.

Ecological Evaluation

Table 5.2.2.7 provides an ecological evaluation of all identified Sensitive Ecological Receptors. Sensitive Ecological Receptors have been identified as at risk of potentially significant impacts via a source-pathway-receptor link. Impact significance here is defined as producing a change in conservation status at a specified geographic level in line with NRA guidance. SER's are valued as Local (high) or above as per the criteria set out in Appendix 5.2.5, which takes into consideration legal protection, conservation status and local abundance of ecological features.

Table 5.2.2.7 Ecological Evaluation of Sensitive Ecological Receptors		
Habitat / Species	Highest Ecological Valuation Level	Sensitive Ecological Receptor?
Designated Sites		
SACs and SPAs	International	Yes (See NIS)
pNHAs	National	Yes (See NIS) as site boundaries overlap with SACs & SPAs boundaries)
Protected Species		
Bat species	Local (High)	Yes
Otters	County	Yes
Wintering Bird Species – SPA SCI species	International	Yes
Wintering Bird Species – All other non-SPA SCI species	County	Yes
Breeding Bird Species – Tern species	International	Yes
Breeding Bird Species – Black Guillemot and all other species	County	Yes
Habitats & Flora		
BL1 Stonewalls and Other Stonework	Negligible	No

Table 5.2.2.7 Ecological Evaluation of Sensitive Ecological Receptors

Habitat / Species	Highest Ecological Valuation Level	Sensitive Ecological Receptor?
BL3 Buildings and Artificial Surfaces	Negligible	No
CC1 Sea walls, Piers and Jetties	Negligible	No
ED3 Recolonising bare ground	Local (Lower)	No
WS3 Ornamental/Non-native shrub	Local (Lower)	No

5.2.2.4 Characteristics of the Proposal

Construction

A detailed description of the proposed development is provided in Chapter 3 of the EIS. In summary, the proposed development will consist of the construction of a new quay and dredging of a navigation channel to accommodate the berthing of Freedom Class cruise ships within Dún Laoghaire Harbour.

The new quay is to be located in the centre of the harbour, directly south of the existing harbour mouth. The new quay structure will extend approximately 435m north-north west from a point just west of the Hobbler Memorial on the Eastern Marina Breakwater and will consist of three sections; the quay itself, an access causeway and mooring dolphins. The quay will consist of a 120m long by 20m wide concrete deck supported on concrete filled tubular steel piles. The quay will be connected to the Eastern Marina Breakwater by an access causeway, also supported on tubular steel piles. Eight mooring dolphins are proposed which will consist of concrete filled steel mono-piles. Ships will berth along the eastern side of the quay.

The new quay will include lighting columns on the centreline, public water mains, to provide fresh water supply to the berthed cruise ships where necessary, firefighting hydrants, power connection for maintenance works, rescue buoys, ladders, CCTV cameras and a navigation light on the outermost monopole.

Dredging works will be required as part of the proposed development to ensure access and egress of cruise ships at different states of the tide; a dredged sea access navigation channel into the harbour and a dredged turning circle outside of the harbour walls totalling approximately 2.5km long. The creation of the navigation channel will require dredging of approximately 710,000m³ of sand and silt from the seabed. Dredged material will be disposed of at the existing spoil grounds at Burford Bank and cut and fill within the harbour itself. Any disposal of dredged materials offshore will be subject to the granting of a Dumping at Sea Permit by the EPA. The dredging programme is envisaged to take in the region of 14-17 weeks based on working 7 days a week, 24 hours a day during summer time (March – September).

To cater for visiting cruise passengers, an access corridor linking Harbour Road to the proposed cruise berth will be created along the western edge of the existing HSS StenaLine marshalling area, with a proposed new boardwalk to be added facing the marina. This will require some limited demolition, including the boundary wall between the existing Eastern Breakwater and HSS StenaLine marshalling area, security hut and canopy (in part) at the entrance to the existing ferry terminal. New surfacing, replacement public lighting and surface water drainage will be provided for the new corridor. Some limited landscaping is proposed for

these areas. Coach pick up points will be located in the existing HSS StenaLine marshalling area. A new pedestrian footpath is proposed running east-west parallel to Harbour Road and an overflow coach parking area proposed along Accommodation Walk running parallel to the existing train line.

Operation

The cruise terminal will operate seasonally, generally between April to September, amounting to a cruise liner visit every two days on average. Cruise liners will berth along the eastern side of the new quay. Landside toilet facilities will be provided in the Motorists building. Foul/waste water from the cruise ships will be treated entirely on board the cruise liner, with any residue discharged outside territorial waters. Maintenance dredging will be required periodically into the future to maintain the navigation channel.

5.2.2.5 Potential Impact of the Proposal

All impacts are described in the absence of mitigation.

5.2.2.5.1 CONSTRUCTION PHASE

Designated Areas for Nature Conservation

Nine European sites were identified as having a potential source-pathway-receptor link with the proposed development; Rockabill to Dalkey Island SAC, South Dublin Bay SAC, North Dublin Bay SAC, Dalkey Islands SPA, South Dublin Bay and River Tolka Estuary SPA, North Bull Island SPA, Howth Head Coast SPA, Baldoyle Bay SPA and Ireland's Eye SPA. Eight pNHAs were identified as having potential source-pathway-receptor links with the proposed development (see Table 5.2.2.1), with all of these pNHAs overlapping at least partially with European site boundaries.

Potential impacts of the proposed development on designated sites are addressed in detail in the Appropriate Assessment Screening Report (see Appendix 5.2.10) and Natura Impact Statement. In summary, key sources of ecological impact include:

- Noise and disturbance effects to Qualifying Interest species and Special Conservation Interest Species arising from dredging and piling activities during construction works;
- Accidental pollution events during construction or in operation could carry pollutants into the local coastal waters of Dublin Bay.

Habitats

Given that the landward side of the existing site is almost entirely comprised of built land and coastal structures (habitat types of a low ecological value) with limited vegetated areas, the proposed development will not result in any significant impacts due to habitat loss. The impact of the proposed development on habitats on the landward side of the proposed development is considered to be neutral.

Bats

In the event that night-time construction takes places, increased night-time activity, human disturbance and temporary security lighting of the construction site has the potential to impact

on bats feeding in the area. Given the existing use of the proposed development site as a working harbour and ferry terminal, any bats using the area would be habituated to some level of night-time activity, human disturbance and some lighting of the area.

Bat activity recorded in the vicinity of the proposed development was low and existing buildings and structures within and in the immediate vicinity of the proposed development were deemed to be of low bat roost potential. This was due to lack of cracks and crevices and high levels of human disturbance. The potential impact of the proposed development is considered to be a temporary imperceptible negative impact on bats at a local level.

Otters

Evidence of Otter activity was recorded within the study area, however no holts (breeding places) or couches (resting places) were confirmed by the survey. There is however potential for impacts on breeding and/or resting place, foraging activity, loss of foraging habitat and pollution impacts.

High levels of Otter activity were recorded along the seaward facing rock armour of the Eastern Breakwater, a habitat potentially providing suitable conditions for aholt. Construction works will involve temporary lifting of the rock armour of the Eastern Breakwater within the development footprint and has the potential to directly impact on an unconfirmedholt present. Any disturbance and/or destruction to same could constitute an offence under the Wildlife Acts and the Birds and Natural Habitats Regulations and would have to be permitted via a derogation licence from the NPWS. The impact is considered a probable temporary negative impact at a county level.

A possible resting area was noted on a disused ferry pontoon to the south east of the Stena Line Ferry berth. Although not directly within the development footprint it should be noted in the event that the pontoon needs to be moved for any reason during construction works, disturbance and/or destruction to an Otter resting area could constitute an offence under the Wildlife Acts and the Birds and Natural Habitats Regulations and would have to be permitted via a derogation licence from the NPWS. The impact is considered a probable temporary negative impact at a county level.

Otters are largely, but not exclusively, nocturnal and can habituate to human disturbance (Chanin, 2003). Construction works, particularly night time works, could result in displacement of Otters from foraging habitat in the immediate construction area. However, Otter activity was recorded across a wide area both inside and outside the Harbour walls and therefore Otters would have alternative foraging habitat available. This would result in an imperceptible temporary negative impact at a county level.

Water pollution incidents during construction could result in deterioration of foraging habitat, alter prey abundance and/or result in Otter fatalities. The risk of serious pollution is considered unlikely, but should it occur, would result in a moderate to significant negative short term impact at a county level.

Wintering Birds

SPA SCI species

There will be no direct loss of winter bird habitat as a result of the proposed development. During the winter season noise and vibration from dredging and piling during construction works have the potential to result in temporary disturbance to and displacement of winter birds from the harbour and environs into the wider Dublin Bay area. As piling will be carried out within the confines of Dún Laoghaire Harbour, the transmission of noise into the wider water column will be reduced; however the piling programme may overlap with the winter bird season in part. The dredging programme will be limited to summer months (March –

September), therefore there may be some overlap with the early winter and late winter bird season, often referred to as the 'shoulder period', when winter birds begin to arrive in Ireland, or passing migrants stop off on their way from summering grounds to wintering grounds further south or vice versa. In general, winter bird numbers would not be at their peak during this period. Noise emitted by dredgers is similar to that emitted by regular shipping activity. Birds in the area are likely to have become habituated to a high degree of disturbance and background noise given the location within a working harbour and proximity to the Dublin Port shipping lane.

18 SCI species were recorded within the survey area, with only 9 regularly occurring. Generally numbers recorded were low, not exceeding the 1% National Threshold, and equating to $\leq 35\%$ of the Dublin Bay peak counts. Larger flocks of Dunlin, Sanderling and Ringed Plover that were recorded high tide roosting were located on the outside of the harbour walls, with the harbour walls forming a buffer to disturbance from within the confines of the harbour. Given that the construction works will only overlap with the winter bird season in part, during the shoulder season when winter bird numbers are generally not at their peak, and that wintering birds can feed outside the harbour in the larger Dublin Bay area, the impact of noise and vibration from dredging and piling during construction works is not considered significant. As generally the numbers of birds occurring were low, this can be classified as a temporary slight negative impact at an international level.

All other non-SPA SCI species

Impacts described above for SPA SCI species will similarly apply to non-SPA SCI species.

There were eight Annex I bird species recorded in the area with four of these not listed as SCIs of nearby SPAs. These were Great Northern Diver, Mediterranean Gull, Red-throated Diver and Sandwich Tern. Great Northern Diver numbers recorded in the study did not exceed the 1% National Threshold, although they exceed the peak count for Dublin Bay. The remaining three Annex I species numbers recorded equated to approximately $\leq 19\%$ of the Dublin Bay peak count.

Shag numbers exceeded the Dublin Bay peak count on one occasion, however, as detailed in Section 5.2.4.1 *Wintering Birds* this is believed to be an unusual occurrence. Purple Sandpiper numbers recorded equated to approximately 56% of the Dublin Bay Peak counts, however, the numbers were small, with a peak count of nine birds, did not exceed the 1% National Threshold and occurred outside the harbour walls. All other species recorded in the area that have 1% National Threshold values assigned to them did not exceed the threshold. A number of passerine bird species, including red and amber listed species, were recorded in the study area. These were generally recorded in small numbers.

Given that wintering birds can feed outside the harbour, that numbers recorded regularly were low and that the impact of noise and vibration from dredging and piling during construction works is not considered significant, this can be classified as a temporary slight negative impact at a county level.

There is a potential indirect effect of piling noise on fish prey of fish eating wintering birds such as Black Guillemot and Razorbill. Section 5.2.1.6.1.1 under Marine Ecology concludes that as the piling works are to be carried out within the confines of the harbour, impacts on fish are limited. Adopting a precautionary approach, the maximum effect piling works would have on fish is considered temporary, slight negative impact at a county level for wintering species. However, as wintering birds can feed outside the harbour, the impact of a temporary decrease in fish prey is not considered significant.

There is a potential indirect effect of dredging on fish eating wintering birds as they use their eyes to catch prey e.g. Cormorants. The operation of the dredger will create suspended solids,

which may reduce underwater visibility. However, as is concluded in Section 5.2.1.6.1.3 under Marine Ecology, reduction in underwater visibility in the vicinity of the dredging operations is not considered significant as high suspended solids levels are common in shallow waters close to the coastline. Also, suspended solid concentrations from dredging operations will disperse to negligible levels within 2km (ABP MER Ltd., 2014).

Breeding Birds

Tern species

Small numbers of terns, *ca.* 8 individuals, have historically been observed feeding within the harbour during summer months (May to September) (H. Delaney pers. comm.). 125 Common Terns were recorded on one occasion (29th September 2014) during winter bird surveys carried out for the proposed development feeding off the end of the East Pier. This exceeds the peak count for Common Tern in Dublin Bay. It cannot be confirmed if these terns are from nearby breeding colonies on Dalkey Islands SPA, South Dublin Bay & River Tolka Estuary SPA or other SPAs designated for terns, or if they are non-breeders. However, adopting a precautionary approach it will be assumed that they are the SCIs of these SPAs. These terns may be temporarily displaced from feeding within the harbour due to noise and vibration from construction works and/or due to reduced prey availability.

There is a potential indirect effect of piling noise on fish prey of terns. Section 5.2.1.6.1.1 under Marine Ecology concludes that as the piling works are to be carried out within the confines of the harbour, impacts on fish are limited. Adopting a precautionary approach, the maximum effect piling works would have on fish is considered temporary, slight negative impact at an international level. However as terns can feed in other areas both within and outside the harbour, the impact is not considered significant.

There is a potential indirect effect of dredging on fish eating terns as they use their eyes to catch prey. The operation of the dredger will create suspended solids, which may reduce underwater visibility. However, as is concluded in Section 5.2.1.6.1.3 under Marine Ecology, reduction in underwater visibility in the vicinity of the dredging operations is not considered significant as high suspended solids levels are common in shallow waters close to the coastline. Also, suspended solid concentrations from dredging operations will disperse to negligible levels within 2km (ABP MER Ltd., 2014).

Therefore, due to the infrequency of their occurrence, the small number of terns historically known to feed in the harbour, for reasons discussed above and the fact that there is a large availability of alternative feeding grounds in the wider Dublin Bay area the impact of the proposed development is not considered significant, but could result in a temporary imperceptible negative impact at an international level.

Black Guillemot and all other breeding bird species

There will be no direct loss of breeding bird habitat as a result of the proposed development. During the breeding season noise and vibration from piling and dredging works have the potential to result in reduced breeding success of birds breeding in the vicinity of the works. In this case, there were a small number of breeding birds identified within the harbour; nine breeding pairs of Black Guillemot, one pair of Grey Wagtail, one pair of Hooded Crow and one pair of Swallow. Birds in the area are likely to have become habituated to a high degree of disturbance given the location within a working harbour. The breeding birds identified within the harbour during the 2014 breeding season were located, at the closest point, at a distance of *ca.* 300m from the proposed development. There were other harbour structures located between the proposed development and breeding sites, forming a buffer to some degree between the two sites, such as the Eastern Breakwater and Stena Line Ferry Terminal. Given these factors and the small number of breeding birds within the harbour, the impact of

construction works is not considered significant, but could result in a temporary imperceptible negative impact at a county level.

There is a potential indirect effect of piling noise on fish prey of fish eating breeding birds. Section 5.2.1.6.1.1 under Marine Ecology concludes that as the piling works are to be carried out within the confines of the harbour, impacts on fish are limited. However, adopting a precautionary approach, the maximum effect piling works would have on fish is considered temporary, slight negative impact at a county level. As breeding birds can feed in other areas both within and outside the harbour, the impact is not considered significant.

There is a potential indirect effect of dredging on fish eating breeding birds as they use their eyes to chase and catch prey e.g. Black Guillemots. The operation of the dredger will create suspended solids, which may reduce underwater visibility. However, as is concluded in Section 5.2.1.6.1.3 under Marine Ecology, reduction in underwater visibility in the vicinity of the dredging operations is not considered significant as high suspended solids levels are common in shallow waters close to the coastline. Also, suspended solid concentrations from dredging operations will disperse to negligible levels within 2km (ABP MER Ltd., 2014).

5.2.2.5.2 OPERATIONAL PHASE

Designated Areas for Nature Conservation

Nine European sites were identified as having a potential source-pathway-receptor link with the proposed development; Rockabill to Dalkey Island SAC, South Dublin Bay SAC, North Dublin Bay SAC, Dalkey Islands SPA, South Dublin Bay and River Tolka Estuary SPA, North Bull Island SPA, Howth Head Coast SPA, Baldoyle Bay SPA and Ireland's Eye SPA. Nine pNHAs were identified as having potential source-pathway-receptor links with the proposed development (see Table 5.2.2.1), with all of these pNHAs overlapping at least partially with European site boundaries.

Potential impacts of the proposed development on designated sites are addressed in detail in the Appropriate Assessment Screening Report (see Appendix 5.2.10) and Natura Impact Statement. In summary, key sources of ecological impact include:

- Accidental pollution events during operation could carry pollutants into the local coastal waters of Dublin Bay;
- There is the potential for escape of plant materials, seeds/seedlings from new planting to be introduced to the receiving water environment via surface water drainage. If any non-native invasive species were to be used in the landscaping proposals this could present a risk of introduction/spread of non-native invasive species to habitats within Dublin Bay.

Habitats

The operational phase of the proposed development will not significantly alter the habitats present on site, but will result in an increase in the areas of built land and coastland, and a very slight increase in areas of ornamental/non-native shrub.

There is the potential for escape of plant materials, seeds/seedlings from new planting to be introduced on site to the receiving water environment via surface water drainage. If any non-native invasive species were to be used in the landscaping proposals this could present a risk of introduction/spread of non-native invasive species to habitats within Dublin Bay. In the absence of mitigation, the proposed development could have a significant negative impact on designated habitats at an international scale.

Surface water discharge from the proposed development will be via petrol interceptor into Dún Laoghaire Harbour. Foul water discharge associated with the landside facilities will be discharged to Ringsend WWTP. Therefore the proposed development will not result in any significant impact on waterbodies in this regard.

Bats

The proposed development will not involve a substantial change in habitat type on the proposed development site. Increased lighting of public areas and security lighting in the area could impact on bat feeding habitat, however, due to the location of the proposed development there is already a considerable amount of public/security lighting in place. Leisler's bat was the only species of bat recorded in the vicinity of the proposed development and is generally accepted to be less vulnerable to light avoidance than other species e.g. *Myotis* species of bat¹³. The impact of the operation of the proposed development on bats is not considered significant, but may result in a long-term imperceptible negative impact a county scale.

Otters

Cruise ship movement into and out of the harbour will be increased with the proposed development. The proposed development is designed to function as a "port of call" and cruise liners will generally arrive early in the morning, to be on berth by 8am or earlier, and will depart the harbour by ca. 6pm the same day. Otter are largely, but not exclusively, nocturnal and can habituate to human disturbance (Chanin, 2003). The impact of cruise ship traffic is thus considered neutral.

Water pollution incidents during operation e.g. oil or fuel spill, could result in deterioration of foraging habitat, alter prey abundance and/or result in Otter fatalities. Such vessels operate under the International Convention for the Prevention of Pollution from Ships (MARPOL), which sets out the minimum standards ships must adhere to in order to protect water quality. Foul and waste water from the cruise liners will be treated entirely on board the cruise liner, with any residue discharged outside territorial waters. Therefore the risk of serious pollution is very unlikely, but should it occur, would result in a moderate to significant medium term impact at a county scale.

Wintering Birds

SPA SCI species

The cruise liners will only operate between April – September, thus largely avoiding the winter bird season (September – March). There will be an overlap with cruise ship activity and the winter bird season in the month of September. This is often referred to as the 'shoulder period' or early winter period when winter birds begin to arrive in Ireland, or passing migrants stop off on their way from summering grounds to wintering grounds further south. In general, winter bird numbers would not be at their peak during this period. The Stena Line Ferry operated seasonally out of Dún Laoghaire Harbour up until Autumn 2014, and in the 2014 season operated between 9th of April to 9th of September, forming some overlap with the winter bird season. Winter bird surveys in Dún Laoghaire Harbour have shown that the proposed turning circle area and navigation channel are not heavily used by winter birds, with the areas in the vicinity of the harbour walls more commonly used. Surveyors also noted that

¹³ Fure, 2006 cited in Bat Conservation Ireland, 2010.

when winter birds were disturbed by boat traffic they were temporarily displaced within the harbour to other roosting and/or feeding areas. Therefore, winter birds are habituated to some level of boat traffic and disturbance and can utilise other areas of the harbour or coastal waters for roosting and/or feeding. The impact of the operation of the proposed development on winter birds during September is not considered significant, but may result in a slight temporary negative impact at an international level.

All other non-SPA SCI species

Impacts described above for SPA SCI species will similarly apply to non-SPA SCI species.

Breeding Birds

Tern species

The cruise liners will operate between April – September, thus largely overlapping with the breeding bird season, March – August. The Stena Line Ferry operated seasonally out of Dún Laoghaire Harbour up until Autumn 2014, and in 2014 operated between 9th of April to 9th of September, forming an overlap with the breeding bird season. Commercial fishing vessels and recreational boats are also active within the harbour. Large ships, for example Commissioner of Irish Lights commercial vessels, dock alongside Carlisle Pier. Therefore, breeding birds utilising the harbour are habituated to a degree of boat traffic.

Small numbers of terns, *ca.* 8 individuals, have been observed feeding within the harbour during breeding season, but it cannot be confirmed if these terns are from nearby breeding colonies on Dalkey Islands SPA, South Dublin Bay & River Tolka Estuary SPA, other SPA designated for terns or if they are non-breeders (H. Delaney pers. comm). However, adopting a precautionary approach it will be assumed that they are the SCIs of these SPAs. As discussed above, cruise liner movements will be limited to morning and evening on any given day and would only temporarily displace feeding terns either within or outside the harbour area, where there is a large area of alternative foraging habitat available within the wider Dublin Bay area. Due to the small number of terns concerned, the impact is not considered significant, but could result in a temporary imperceptible negative impact at an international level.

Black Guillemot and all other breeding bird species

The cruise liners will operate between April – September, thus largely overlapping with the breeding bird season, March – August. The Stena Line Ferry operated seasonally out of Dún Laoghaire Harbour up until Autumn 2014, and in 2014 operated between 9th of April to 9th of September, forming an overlap with the breeding bird season. Commercial fishing vessels and recreational boats are also active within the harbour. Large ships, for example Commissioner of Irish Lights commercial vessels, dock alongside Carlisle Pier, one location of Black Guillemot nest holes. Therefore, breeding Black Guillemots and other breeding birds within the Harbour are habituated to a degree of boat traffic.

Nest holes of Black Guillemots breeding within the harbour during the 2014 season were located, at the closest point, at a distance of *ca.* 300m from the proposed development. There were other harbour structures located between the proposed development and the nest site, forming a buffer to between the two sites, such as the Eastern Breakwater and Stena Line Ferry Terminal. Other breeding bird nest sites were in structures around the harbour. Cruise liners will arrive early in the morning, to be on berth by 8am or earlier, will stay in situ at the berth for most of the day and will depart the Harbour by 6pm the same day. Therefore, any

disturbance to Black Guillemots and other breeding birds will be mainly limited to the cruise liner movements on arrival and departure to the harbour in the morning and evening. Birds may be temporarily displaced within or outside the harbour to other foraging areas for short periods of time. The impact of the operation of the proposed development on breeding birds is not considered significant, but may result in a slight temporary negative impact at a county level.

5.2.2.6 Avoidance, Remedial or Reductive Measures

All of the mitigation measures described in this section are in accordance with current best practice guidance, as detailed in Section 5.2.2.1. Mitigation measures are only proposed in relation to those receptors where significant, or potentially significant, impacts were predicted as a result of the proposed development.

5.2.2.6.1 CONSTRUCTION PHASE

Mitigation Measure 1: Measures to Mitigate Against Impacts on Designated Sites

The NIS, sets out detailed mitigation measures in relation to designated sites. As boundaries of pNHAs within the ZoI of the proposed development overlap with European sites, the mitigation measures included in the NIS also mitigate any potential impact on pNHAs.

Mitigation Measure 2: Measures to Reduce the Potential Risk of Impacts to Water Quality in Receiving Waters

Construction methods proposed are normal construction practice involving no new or novel features, including those in relation to pouring of concrete. Although the risk of any significant impact on water quality on coastal waters is considered to be low, best practice will be implemented at all times in relation to all construction activities to maintain water quality standards in Dublin Bay.

Prior to commencement of construction, a project-specific Construction and Environmental Management Plan (CEMP) will be established by the contractor and maintained by the contractors during the construction phase of the proposed development to prevent release of hydrocarbons, polluting chemicals and sediments. The CEMP will cover all potentially polluting activities and include an emergency response procedure. All personnel working on the site will be trained in the implementation of the procedures. As a minimum, the manual will be formulated in consideration of the standard best international practice including but not limited to:

- *CIRIA, (2001), Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors,*
- *Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site (C650), 2005,*
- *BPGCS005, Oil Storage Guidelines,*
- *CIRIA 697, The SUDS Manual, 2007,*
- *UK Pollution Prevention Guidelines (PPG) UK Environment Agency, 2004.*
- *Construction Industry Research and Information Association CIRIA C648: Control of water pollution from linear construction projects: Technical guidance (Murnane et al. 2006)*
- *CIRIA C648: Control of water pollution from linear construction projects: Site guide (Murnane et al. 2006)*

- *ERFB (2005). Inland Fisheries Ireland's Requirements for the protection of fisheries and habitats during construction and development works at river sites*

The contractor will implement the following mitigation measures, via the CEMP, for release of hydrocarbons, polluting chemicals and sediment control:

- Provision of measures to prevent the release of sediment over baseline conditions to Dublin Bay during the construction work. These measures may include but not be limited to the use of silt traps, silt fences, silt curtains, settlement lagoons, filter materials. This is particularly important when undertaking any constructing/upgrading to the surface water drainage network on the development site;
- Provision of exclusion zones and barriers (sediment fences) between earthworks, stockpiles and temporary surfaces to prevent sediment washing into the receiving water environment;
- Temporary construction surface drainage and sediment control measures will be in place before earthworks commence;
- Weather conditions will be taken into account when planning construction activities to minimise risk of run off from the site,
- Pouring of cementitious materials for the works adjacent to surface water drainage features, or drainage features connected to same, will be carried out in the dry. Pumped concrete will be monitored to ensure no accidental discharge. Mixer washings and excess concrete will not be discharged to surface water. Concrete washout areas will be located remote from any surface water drainage features to avoid accidental discharge to watercourses;
- No storage of hydrocarbons or any polluting chemicals will occur within 50 m of the surface water network or receiving coastal water. Fuel storage tanks will be bunded to a capacity at least 110% of the volume of the storage tank (plus an allowance of 30 mm for rainwater ingress). Re-fuelling of plant or the addition of hydraulic oil or lubricant will not occur within 50 m of the receiving water network and only in bunded refuelling areas;
- All construction and demolition waste should be stored above the high water mark prior to removal from the site.
- Emergency procedures and spillage kits will be available and construction staff will be familiar with emergency procedures;
- Implementation of measures to minimise waste and ensure correct handling, storage and disposal of waste (most notably wet concrete, pile arisings and asphalt);
- Response measures to potential pollution incidents;
- Foul drainage from site offices and compounds, where not directed to the existing waste water network, will be contained and disposed of off-site in an appropriate manner and in accordance with the relevant statutory regulations, to prevent the pollution of watercourses.

Mitigation Measure 3: Measures to Reduce the Impact on Bats

In the unlikely event that bats are found on the site during demolition or construction works, works will immediately cease in that area and the local NPWS Conservation Ranger will be contacted. The bats will be removed by hand by a suitably qualified and licenced bat surveyor, under licence from the NPWS.

Any external lighting to be installed to facilitate night time working or security lighting on the site should be sensitive to the presence of bats in the area. Lighting of the site during construction and operation will be designed in accordance with the following guidance:

- Guidance Notes for the Reduction of Obtrusive Light GN01 (Institute of Lighting Professionals, 2011)

- Bats & Lighting - Guidance Notes for Planners, Engineers, Architects and Developers (Bat Conservation Ireland, December 2010)
- Bats and Lighting in the UK – Bats and the Built Environment Series (Bat Conservation Trust UK, January 2008).

Goals to be achieved in the lighting design are:

- Lighting levels should be the minimum required for health and safety requirements.
- Vertical light spill at light sources should be below 3m to avoid potential bat flight paths.

Mitigation Measure 4: Measures to Reduce the Impact on Otters

Otter activity was recorded along the rock armour of the Eastern Breakwater, making it possible that there was a holt located here. Immediately prior to temporary lifting of the rock armour, a qualified ecologist will be required to check the rock armour scheduled for removal for signs of Otter activity and/or a holt. If no holt is confirmed then lifting of the rock armour should proceed under the supervision of a qualified ecologist.

If a holt is encountered prior to or during construction works, works will immediately cease in that area and the NPWS will be contacted to obtain a derogation licence.

In the event that the disused ferry pontoon acting as a possible Otter resting place (located to the south east of the Stena Line Ferry berth) requires movement prior to or during construction works, a qualified ecologist should be consulted in advance of works and the requirement for re-survey discussed.

If a resting place is confirmed prior to or during construction works, works will immediately cease in that area and the NPWS will be contacted to obtain a derogation licence.

Mitigation measures in relation to lighting design and water pollution are set out above.

5.2.2.6.2 OPERATIONAL PHASE

Mitigation Measure 5: Measures to Prevent Impacts on Water Quality in Receiving Waterbodies

Cruise vessels will operate under the International Convention for the Prevention of Pollution from Ships (MARPOL), which sets out the minimum standards ships must adhere to in order to protect water quality.

The operation of the cruise ships, specifically with regard to diesel storage and usage, should be subject to an Environmental Management Plan (EMP) and relevant operational guidelines for cruise ships at port, including entering and exiting of the port. Specific adherence should be given to the following:

- Usage of diesel when in port including potential refuelling processes
- Foul/waste water will be disposed of outside of territorial water;
- Hazardous chemicals onboard should be stored in sealed drums with relevant labels in locked chemical storage cabinets;
- Spillages on deck should be controlled with absorbent materials or 'Spill Kits'.

Surface water run-off from the landside element of the proposed development will be treated via petrol interceptor to remove contaminants prior to discharging into the harbour.

Non-native invasive species will not be planted on the site in accordance with the *Bird & Natural Habitats Regulations 2011*, under which it is an offence to “cause to disperse, spread or otherwise cause to grow ...” the range of invasive species listed in Schedule 3 of the regulations. Planting will also have regard to the ‘Most Wanted’ list on the Invasive Species Ireland (ISI) National Invasive Species Database <http://invasivespeciesireland.com/> and will ensure no such species are planted on the site.

Mitigation Measure 6: Measures to Reduce Impact on Bats and Otter

The lighting plan for the proposed development will be reviewed by a competent bat ecologist who shall if necessary recommend adjustments to directional lighting (e.g. through retrofit of cowls, shields or louvres) to ensure the lighting plan is sensitive to the presence of bats and Otter in the area. Lighting of the site during operation will be designed in accordance with the following guidance:

- Guidance Notes for the Reduction of Obtrusive Light GN01 (Institute of Lighting Professionals, 2011)
- Bats & Lighting - Guidance Notes for Planners, Engineers, Architects and Developers (Bat Conservation Ireland, December 2010)
- Bats and Lighting in the UK – Bats and the Built Environment Series (Bat Conservation Trust UK, January 2008).

Goals to be achieved in the lighting design are:

- Lighting levels should be the minimum required for health and safety requirements.
- Vertical light spill at light sources should be below 3m to avoid potential bat flight paths.

Mitigation Measure 7: Measures to Enhance the Breeding Bird Habitat of the Site

To enhance breeding bird habitat on the site for Black Guillemot, 10 concrete nest boxes will be incorporated into the new quay at appropriate locations to encourage increased numbers of breeding pairs in the harbour. A qualified ecologist will be engaged to choose appropriate locations for nest boxes and supervise installation.

5.2.2.7 Predicted Impact of the Proposal

With the implementation of recommended mitigation measures for any significant impacts predicted, it is considered that the proposed development will not result in any significant negative residual impacts. Disturbance caused by the construction will be short term and limited in extent, and disturbance caused by operation will be seasonal and limited to shipping movements in early morning and late evening.

It is also concluded that there will be no significant impacts on the Conservation Objectives, Qualifying Interests or Special Conservation Interest species of the SACs and SPAs in the zone of influence of the proposed development.

Do-Nothing Scenario

The likely Do-Nothing scenario for the proposed development is the continued commercial and recreational operation of the Harbour. There would be continued use of the harbour by large commercial ships, commercial fishing boats, recreation boating with associated deterioration of existing harbour structures. There would be no change to the terrestrial ecology or ornithology in the area other than natural change.

Worst Case Impact

The worst case scenario related to the proposed development, although highly unlikely, would be an accidental pollution incident during construction and/or operation of a magnitude that would result in loss of QI habitats within Dublin Bay and/or result in mortality of species within the zone of influence of the proposed development e.g. wintering and breeding birds, Otters and their associated prey items on which they depend. Mitigation measures proposed to prevent impacts to water quality ensure that this scenario remains unlikely.

Another worst case scenario would be permanent displacement of wintering and breeding bird species from the harbour and navigation channel due to disturbance during construction from dredging and piling activities and/or during operation due to shipping movements. Considering the proposed phasing of construction and that birds in the area are already habituated to a certain level of disturbance due to proximity to Dublin Port shipping land and shipping within Dún Laoghaire Harbour itself this scenario is highly unlikely. However, if it did occur there are substantial alternative roosting, foraging and breeding habitats available within the wider Dublin Bay area.

Cumulative Impacts

Other plans and projects in the wider area that may act in combination with the proposed Dún Laoghaire Harbour cruise berth include Alexandra Basin Redevelopment (Dublin Port), maintenance dredging carried out by Dublin Port on a regular basis and Dún Laoghaire Urban Beach.

Sound generated by impact piling on the Alexandra Basin Redevelopment and the proposed development could result in noise disturbance to wintering and breeding bird species, though the principally small diameter piles used in the works proposed for Dún Laoghaire harbour and the much shorter construction period means that this project would have the lowest impact on the sound environment of the area.

The Alexandra Basin Redevelopment will involve capital dredging works. Maintenance dredging is carried out on a regular basis in Dublin Port to maintain the navigation channel length. Noise generated by the operation of dredging plant could cause disturbance to wintering and breeding bird species. However, noise emitted from dredge plant is similar to that emitted by regular shipping activity and birds in the Dublin Bay area are likely to have become habituated to a high degree of disturbance and background noise given the location with working ports, harbours and operation of the Dublin port shipping lane in through the Bay.

The Dún Laoghaire Urban Beach will be moored off the East Pier in Dún Laoghaire Harbour and is proposed to be operational by the spring/summer season of 2016. Construction works

will be mainly landside, with some pile driving expected to last in the region of 4 to 10 days. It is difficult to assess the potential impact due to lack of uncertainty around the timing of the construction works. Although noise generated from construction and piling works could cause disturbance to wintering or breeding bird species, construction works will be relatively limited and piling works of very short duration. The facility will operate seasonally, in spring and summer months, overlapping with the operation of the proposed cruise terminal development in the harbour, thus potentially causing disturbance to breeding birds or wintering birds if operation overlaps with the wintering bird season in part. However, the Urban Beach will be permanently moored in the harbour, the East Pier is already heavily used as a recreation area, there is frequent shipping activity in the harbour and birds in the area are likely to have become habituated to a high degree of disturbance and background noise.

Given the mitigation proposed for the significant impacts predicted in Section 5.2.2.6, it is considered that any existing or proposed projects in the local area, which involve similar scale impacts, will not have the potential to cumulatively impact with the proposed development to result in impacts that may be greater than the sum of the individual impacts.