Appendix 8: Species Accounts

1 INTRODUCTION

This Appendix provides an account of all species recorded during the Open Coast Bird Survey 2011/12 and discusses the potential impact of brine emissions at Castle Robin Bay on these species. The species recorded are listed under their associations with designated sites. A number of species are associated with more than one designated site and are therefore only discussed under one designation. This Appendix should be read with reference to Table 10 within the main report, Table 1 within this Appendix, Appendix 4 Appendix 5 and Appendix 7.

1.1 Larne Lough SPA

The following species are outlined as designation features of Larne Lough SPA:

- **Overwintering Pale-bellied Brent Goose.**

Although breeding Roseate *Sterna dougallii* and Common Tern are also listed as designation features they are discussed under Swan Island SPA below.

1.1.1 Pale-bellied Brent Goose

Pale-bellied Brent Geese are a primary designation feature of Larne Lough SPA. Pale-bellied Brent Geese were not recorded within the vicinity of Castle Robin Bay but were recorded within Portmuck Bay and Browns Bay, numbers peaking in Browns Bay. A single juvenile was recorded in Portmuck Bay roosting and foraging over two days in early/mid-November 2011, it is thought it was the same bird. The species was also recorded in Browns Bay with a peak of four birds recorded foraging along the southern sandy shoreline in mid-October 2011.

No significant impact on Pale-bellied Brent Geese due to proposed construction activities and brine emissions at the Castle Robin locale is likely. It was also concluded that no significant impact on Pale-bellied Brent Geese due to proposed construction and operation activities located within Larne Lough is likely.

1.2 Swan Island SPA

The following species are outlined as designation features of Swan Island SPA:

- **Roseate Tern;**
- **Common Tern.**

Although Sandwich and Arctic Tern are not listed as a designation features for the purpose of this report all tern spp. recorded during Open Coast Bird Surveys in 2011/12 are detailed here. Sandwich Tern is a designation feature of Larne Lough ASSI. Arctic Tern although not a recent breeding species within Larne Lough is a designation feature of the Copeland Island SPA), is listed on Annex I of the EU Birds Directive Annex, protected under Schedule 1 of the Wildlife (NI) Order 1985 (as amended) and an Amber-listed BOCCI.

1.2.1 Roseate Tern

Roseate Terns have been largely absent from the Larne Lough tern colony in recent years and were not recorded during RPS Coastal Seabird Surveys in 2011-12. In 2010 one pair of territorial Roseate Terns was recorded in Larne Lough and the foraging track of a single individual during the incubation stage was subsequently recorded during JNCC Tracking Studies (Appendix 4).

Roseate Terns have been shown to have a more restricted and less diverse diet than other terns feeding almost exclusively on small schooling fish species. In Europe Roseate Terns have primarily been noted to take sandeels *Ammodytes marinus*, *A. tobianus*, herring *Clupea harengus* and sprat *C. sprattus* . Studies from the Rockabill colony off the Skerries in north Dublin between 1997and 1999 show sandeels (e.g. *A. marinus, and A. tobianus*) were the most common prey species presented by roseate terns during the courtship and incubation stage (Newton & Crowe, 2000). Clupeids (e.g. sprat *Sprattus sprattus* and herring *Clupea harengus*), gadoids (e.g. pollack *Pollachius pollachius*, saithe *P. virens* and rockling spp) and 'other prey' (squid and crustaceans) were also presented to a much lesser extent, with clupeids more frequently presented in years when the number of sandeels presented decreased (Newton & Crowe, 2000). During the chick provisioning stage at Rockabill clupeids became the predominant prey species presented to Roseate Tern chicks between 1997 and 1999 with lesser amounts of clupeids and significantly lesser amounts of gadoids (Newton & Crowe, 2000).

Roseate Terns typically forage within 12km of their colony however, will forage beyond this range in association with the presence of shallow sandbanks. At Rockabill Roseate Terns were found to forage within 10km of the colony with some birds foraging up to 30km away (Newton & Crowe, 2000). Similar studies from Lady's Island Lake found Roseate Terns most frequently foraged within 5km of the colony (Newton & Crowe, 2000). In 2009 birds tracked from Coquet Island, Northumberland typically foraged within 8m of the colony, with their foraging locations largely restricted to 30m water depth (Wilson *et al*., 2009).

1.2.2 Common Tern

Foraging Common terns were mostly recorded in Browns Bay, in the waters immediately adjacent to Skernaghans Point and Portmuck Bay during survey. Foraging individuals were largely more sporadic and further offshore throughout the rest of the survey area. Where visibility conditions permitted notable flocks of "commic" terns (most likely common) together with black-headed gulls, kittiwakes, auks and small numbers of Manx shearwaters could be seen foraging north of the Hunter Rock Buoys towards the Maidens. A peak number of 32 was recorded in Browns Bay, during HT in late July with foraging with Sandwich terns. In late July/early August adult birds were noted provisioning juvenile birds roosting on rocky outcrops within the Bay. A peak number of 12 foraging birds occurred in Section 1, 500m-1km offshore, during early June 2011. A peak number of four foraging birds occurred in Section 2, 500m-1km offshore, in mid-May and a peak number of 8 birds recorded foraging in Section 3, 500-750m offshore. Foraging common terns in Section 3 often foraged in the shallower waters of Portmuck Bay, remaining in the area for several minutes and making numerous fishing attempts, before flying north or south. Foraging behaviour elsewhere between Skernaghans Point and Portmuck Bay (<1km offshore) appeared opportunistic.

Common Terns are generalist or opportunistic feeders, having been found to switch rapidly between prey types as circumstances change e.g. tidal and weather conditions or time of day (Chivers, 2007; Wheatland Palmer, 2011). Diets can vary considerably between colonies and depends largely on available feeding habitats and local prey abundances. Typical marine fish in the diet consistently include Herring *Clupea harengus*, Sprat *C. sprattus* (clupeids), sandeels (*Ammodytes marinus* and *A. tobianus*). Clupeids are the main prey type delivered to common tern chicks at the Belfast Harbour RSPB Reserve, along with shore crabs *Carcinus maenas* and Common Shrimps *Crangon vulgaris* frequently presented during low tide conditions and Sandeels *Ammodytes spp*., gadoids (including Cod *Gadus morbua*, Saithe *Plooachius virens*, Pollack *Pollachius pollachius*, and whiting *Trisopterus luscus*) and Sticklebacks *Gasterosteus aculeatus* (Chivers, 2007; Wheatland Palmer, 2011). Flatfish have also been noted being presented to Belfast Harbour and Larne Lough chicks but are most often rejected due to the inability of chicks to swallow such species (Chivers, 2007; M. Tickner RSPB *Pers Comms*). The size of clupeids delivered to chicks has been

found to vary during the breeding season, but generally fish of 4-7cm are presented, with smaller specimens typically presented to younger chicks.

Common Terns typically forage 3-10km from breeding colonies however, often up to 22km or 37km Common Terns from the Belfast Harbour RSPB Reserve generally forage within 8km of the colony. Due to the appararent lack of preference for foraging within the nearshore coastal waters between Skernaghans Point and Portmuck Bay, and over the proposed brine outfall location the potential for Common Terns to be impacted by the avoidance of prey items here is unlikely to be significant.

1.2.3 Sandwich Tern

Between March and September 2011 sandwich terns were regularly recorded foraging within the survey area, with peak numbers recorded in Section 3 (in Portmuck Bay) and Browns Bay. A peak number of 40 foraging sandwich terns were recorded in Browns Bay during low tide conditions in July (corresponding to the chick provisioning/fledging period), with foraging birds often spending several minutes foraging before departing (often over land) for Larne Lough. Peak numbers of foraging sandwich terns were lowest in Section 2. A peak of 16 foraging birds were recorded in Section 2 in mid-May, with birds foraging predominantly >750m offshore together with small numbers of common tern. Peak numbers of sandwich terns in Section 3 were recorded in July with 28 birds observed foraging within the shallow waters of Portmuck Bay (<250m from shore) during low tide conditions. A peak of four foraging birds were also recorded in July during low tide conditions in Section 1, foraging within nearshore waters adjacent to Skernaghans Point.

Similar to Roseate terns (although to a lesser extent) sandwich terns are specialised foragers, feeding almost exclusively on clupeids (e.g. sprat and herring) and sandeels (Wilson *et al*., 2009) with smaller amounts of gadoids (e.g. pollack,whiting *Gadus merlangus* and cod *G. morhua*) taken depending on the locality of the colony. Average foraging distances for Sandwich terns are generally between 13-16km although they are known to travel huge distances from their colonies (Allcorn *et* al., 2003; Wilson *et al*., 2009). Recent survey work has shown that common and sandwich terns forage beyond 15km from their colonies however, foraging is generally concentrated within 5km of their colonies and within nearshore waters (Allcorn *et al*., 2003).

Although aggregations of foraging birds were recorded frequently during the 2011 breeding season within the survey area, regular significant concentrations were note recorded within the near vicinity of the brine outfall pipe locations, relative to the concentrations recorded in Portmuck Bay (c. 1.6km from the initial mixing zone) and Browns Bay, where no impact of brine emissions is expected.

1.2.4 Arctic Tern

Arctic terns were recorded in October 2011 (post-breeding season) in Section 1 and Browns Bay. In Section 1 Arctic terns were noted on two occasions, with a peak count of two birds. Birds observed were recorded exclusively roosting at Skernaghans Point and foraging in the adjacent waters. Two birds were also recorded in Browns Bay roosting on a rocky outcrop on the eastern shoreline. It is possible these birds were on passage south from more northerly breeding grounds. Foraging Arctic terns were not recorded during April to September 2011 within the survey area.

JNCC tracking studies of Arctic Terns from Cockle Island and Big Copeland between 2009 and 2011 did not show the species to fish with c.8km of the limit of significant brine influence (Appendix 4).

Similarly to common, sandwich and roseate terns sandeels make up a significant proportion of the Arctic tern diet, along with clupeid fry (spratt and herring). Adults typically forage within

5km of the colony but greater foraging distances are associated with the presence of sandbank. Although Arctic terns have previously been noted as breeding within Larne Lough they have no done so in recent years (Figure 6 of Main Report). The nearest Arctic tern colony is located on Big Copeland Island. Arctic terns may forage up to 20km from their colonies, however typically forage within 12km.

Due to the low numbers of Arctic terns recorded within the survey area during the 2011/12 survey season, and the absence of the species during the critical breeding period. No potential significant impact as a result of brine emissions.

1.2.5 Summary of Potential Impacts of Brine Emissions on Foraging Larne Lough SPA Tern Species

This section should be read with reference to Appendix 5.

For the purposes of this assessment the impact on foraging terns associated with the Larne Lough and Swan Island SPAs and to a lesser degree the Copeland Island or Outer Ards SPAs (Arctic Terns), is based on the potential impacts on typical key prey species (namely sandeels, clupeids and gadoids) and loss of foraging potential within key foraging areas identified by JNCC Tern Tracking Study data (2009-2011) and 2011 RPS Coastal Seabird Surveys.

The brine outfall location is located approximately 450m off the eastern coast of Islandmagee, at a depth of 27m. The modelling outputs of the salinity as detailed in Section 9.3.4.1 of the EIS predict increases in excess of the range normally experienced salinities at this locale (which are) to be restricted to the initial mixing zone, less than 100m from the outfall. This corresponds to a distance of c. 350-550m from the eastern Islandmagee coastline. At this location no significant foraging by tern species was recorded during 2011 coastal seabird surveys or by JNCC Tern Tracking Study data. Regular foraging areas for terns from the Larne Lough colony as identified by JNCC Tern Tracking Study data are within or at the mouth of Larne Lough, Browns Bay and an area >3km north of Skernaghan's Point towards the Hunter Rock Buoys and Maidens, where no increased salinity as a result of the brine discharge is expected. Foraging terns were observed to a significantly lesser extent by both JNCC Tern Tracking studies and RPS 2011 Costal Seabird Surveys within the nearshore (upto 1km) coastal waters between Skernaghan's Point and Portmuck Bay. Foraging terns were subsequently rarely observed foraging within the limit of significant brine influence and localised foraging within these coastal waters was concentrated within a few meters of Skernaghans Point and Portmuck Bay, where no significant increase in salinity as a result of the brine discharge is expected.

Sandeels are a consistent dietary component of all Northern Ireland terns to a varying degree. In a study on the lesser sandeel *A. marinus* in Shetland the species like other sandeel species was shown to have a preference for sandy sediments, in particular coarse sand areas (<2mm particle size) with strong currents, typical of a rippled bottom and with a silt content of less than 2%. The species was also found to be largely absent from sediment with a silt content >10%. The areas around the brine outfall location are dominated by coarse sediments, much coarser than those preferred by sandeels. The closest concentration of sandy sediments is within the shallow waters of Portmuck Bay, c. Xkm from the limit of significant brine influence and subject to only marginal increases in salinity, which are well within demonstrated salinity tolerances of sandeel species (e.g. *A. marinus* 34.76-35.18psu). Although pockets of sandeels can't be ruled out from the initial mixing zone (<100m from the outfall) and near field (100-200m from the outfall), important concentrations of sandeels are unlikely to occur in the near vicinity (c.20m diameter) of the brine outfall location likely to experience salinities in excess of 36.6psu, due to the presence of coarse sediments. Sandeels may forage over the wider coastal area but typically tend to forage over the sediments they inhabit. There is likely to be a degree of avoidance by sandeels of the

immediate area of the brine outfall location (c. 20m diameter) however, this would only constitute a minor negative impact on the species considering that a relatively small population are likely to be involved.

The fry of clupeid species (e.g. herring) are also a consistent dietary component of all Northern Ireland terns to a varying degree. The increased salinities associated with the Islandmagee brine discharge within 100-200m around the outfall (36-38psu) are relatively minor compared to the upper salinity ranges for clupeid larvae (e.g. herring). In addition fish eggs and larvae are controlled by the movement of the general waterbody and can be carried extensive distances from their spawning grounds. It is therefore unlikely that any given group of fish eggs and larvae are going to be present in waters of significantly elevated salinity (i.e within 10m) for any extended period of time. The risk of adverse impacts on these sensitive life stages of local fish populations is unlikely to be significant. The risk of decreases in subsequent life stages of such populations in the wider Irish Sea and thus limiting the availability of small clupeid and gadoid species to Larne Lough terns within their typical foraging ranges species, is therefore unlikely to be significant.

In light of additional information regarding the potential impacts on tern prey species based along with additional ornithological survey data, RPS withhold the original assessment made in the Islandmagee Storage EIS in that no significant impact as a result of brine emissions are predicted on tern species associated with Larne Lough and Swan Island SPA, as a result of the brine discharge leading to loss of foraging potential. The reduction in fish prey species by avoidance of areas of increased salinity is likely to be localised to within the limit of significant brine influence (<100m from the outfall), not recorded as a key foraging location of terns and breeding seabirds associated with adjacent ASSIs. Following the granting of permission to drill the deposits and obtain salt cores for detailed chemical analysis this assessment can be re-visited.

1.3 Larne Lough ASSI

The following species are outlined as designation features of Larne Lough ASSI:

- **Goldeneye**
- **Great Crested Grebe**
- **Red-breasted Merganser**
- **Shelduck**
- **Greenshank**
- **Redshank**

Greenshank were not recorded during the Open Coast Bird Survey 2011-12.

1.3.1 Goldeneye

A flock of seven birds were recorded in Section 1 (250-500m offshore) during an afternoon count in October 2011. The flock was noted as loafing in the direction of Larne Lough and no evidence of foraging was recorded.

Goldeneye feed largely on molluscs, crustaceans and insect larvae, often small fish and plant material caught by surface diving, generally in shallow waters (typical diving depths of c.4m). Although often opportunistic on passage, goldeneye tend to show preference for sheltered estuaries, marine bays and shallow coastlines. The inshore waters between Skernaghans Point and Portmuck are therefore unlikely to be of significant foraging value to overwintering goldeneye due to their depth and relatively unsheltered nature. This combined with the apparent rarity of the species during survey and, would not likely result in any significant impact on this Larne Lough ASSI feature species as a result of brine emissions and construction activities at Castle Robin Bay.

1.3.2 Great Crested Grebe

A single great crested grebe was recorded foraging within Browns Bay in December 2011. Great crested grebe are present in Larne Lough in nationally important numbers during the overwintering period. No significant impact as a result of brine emissions or construction activity at Castle Robin Bay is likely.

1.3.3 Red-Breasted Merganser

Red-breasted Mergansers were recorded on several occasions during 2011/12 Open Coast Bird Surveys. No evidence of foraging was recorded between Skernaghans Point and Portmuck Bay however, a small number of foraging birds were noted within Browns Bay. A peak count of 4 was noted within Section 3 in an early morning survey in November 2011. All birds recorded were typically loafing in nearshore waters, moving in a northerly direction towards Larne Lough.

Overwintering red-breasted merganser in Northern Ireland show a preference for sheltered, enclosed waters, generally avoiding open expanses of exposed coastal waters. Prey species taken typically include small fish including sandeels, butterfish, clupeids, flounder and sprat in estuarine environments. Marine crustaceans, worms, molluscs and insects are also taken. The impact of the brine emissions and construction at Castle Robin Bay is not likely to impact significantly on this ASSI feature species, due to the low number of birds recorded during survey, lack of foraging activity within Sections 1-3 and the species preference for foraging in more sheltered and shallow habitats such as Larne Lough.

1.3.4 Shelduck

A peak count of 4 adult birds was recorded roosting during high tide conditions in Section 2, south of the proposed brine outfall pipe location, in June 2011. Small numbers of birds (1-2 individuals)were also noted loafing on occasion in nearshore waters (<250m) in Sections 2 and 3, with some evidence of foraging recorded during April/May 2011 in Section 3 (Portmuck Bay).

Shelduck were exclusively recorded within the breeding season and not the overwintering season, for which they are a feature species of the Larne Lough ASSI and are therefore considered to be associated with the Isle of Muck where the species is locally known to breed. Shelduck feed mainly on plant material, molluscs, insects and crustaceans obtained from exposed intertidal muds, or by dabbling, head-dipping and upending in shallow waters. The open coast environment between Skernaghans Point and Portmuck are typically unsuitable for foraging shelduck due to the lack of an intertidal foraging zone however, Portmuck Bay provides some limited foraging opportunities as evident. Due to the low numbers of Shelduck recorded and the limited foraging potential for the species within the survey area, no significant impact on Shelduck as a result of brine emissions resulting in food resource depletion is expected.

1.3.5 Redshank

Small numbers of Redshank were noted within the Open Coast Survey area during 2011/12. Individuals were predominantly roosting along the craggy cliffs between Skernaghans point and Castle Robin Bay and also at Portmuck Bay. No significant roosting sites were however identified within the vicinity of the proposed Brine Outfall Pipe and Seawater Intake Pumping Station. Foraging activity was exclusively recorded within Portmuck Bay. No significant impact on redshank as a result of the brine emissions or construction works at Castle Robin Bay is therefore likely.

1.4 Larne Lough Ramsar

The following species are outlined as designation features of Larne Lough Ramsar Site:

- **Common Eider**
- **Common Gull**
- **Black-headed Gull**

1.4.1 Common Gull

Common gulls breeding locally on the Isle of Muck (c. 15 AON in 2010) and overwinter in Larne Lough in nationally important numbers. Peak numbers of common gull were recorded in Browns Bay in February 2012 (914 birds) loafing together with black-headed and herring gull. A peak of 34 birds were recorded in Section 1 also in February with birds predominantly noted as roosting and loafing in nearshore waters (<500m). Peak numbers of birds in Section 2 and 3 were 17 and 33 respectively, also noted during the wintering season. Birds within Section 2 were generally noted as loafing with some erratic foraging, associated with short-lived multi-species foraging associations (MSFAs). Portmuck Bay in Section 3 provides limited inter-tidal foraging habitat to common gulls. Peak numbers in Section 3 were recorded in September/October with birds associated with an MSFA together with black-headed gull, herring gull, kittiwake, razorbill and guillemot.

Similar to most gulls common gulls are largely opportunistic and few studies have attempted to quantify seasonal diets. Broadly their diets consist of earthworms, aquatic and terrestrial invertebrates, small fish. Regurgitates from chicks on the Copeland Island have included terrestrial worms and marine arthropods (S. Wolsey, QUB *Pers Comms*). Common gulls will also frequent agricultural lands, re-fuse tips, parks and harbours to scavenge a variety of items.

Although foraging was recorded within the vicinity of the proposed brine outfall location any impact on common gulls associated with the Isle of Muck colony and Larne Lough overwintering colony as a result potential prey avoidance is unlikely to be significant. This is due to the low incidence of regular foraging of large numbers of birds recorded foraging and the gulls ability to compensate decreases in preferred food resources due to its broad ranging diet.

1.4.2 Common Eider

Common Eider breed locally on the Isle of Muck and also within Larne Lough, with adult birds with flightless young were noted in Section 2 during May and June 2011. Eider also overwinter at levels of national importance within Larne Lough. Peak numbers of Eider were recorded in Section 3, with 27 birds noted loafing just off the Isle of Muck (500-750m offshore) in late November 2011. Small numbers of birds were recorded foraging within the survey area however birds were generally recorded as loafing >500m offshore.

Eider feed largely on benthic molluscs and crustaceans (mussels, urchins, cockles) obtained by surface diving, typically in shallow water (mead diving depth c.11m). During the wintering season Common Eiders show a strong preference for sheltered coastal waters and estuaries. The low incidence of foraging birds within the survey area in comparison to numbers noted foraging within Larne Lough (N. Robinson *Pers Obvs*) during the 2011/12 wintering period, would suggest the waters between Skernaghans Point and Portmuck Bay and indeed over the proposed brine outfall location are of limited significant to breeding/overwintering Eider. The avoidance of the initial mixing zone by benthic molluscs and crustaceans is expected to be restricted to within 100m of the outfall location, which was not identified as significant for the foraging eiders observed during Open Coast Bird Surveys. No significant impact on Eider associated with the Larne Lough Ramsar Site as a result of brine emissions is therefore envisaged.

1.4.3 Black-headed Gull

Black-headed gulls were frequent throughout the survey. The species breeds and overwinters locally within Larne Lough. Peak numbers of black-headed gulls were recorded within the survey area during the wintering months, with peak numbers of birds recorded loafing in Browns Bay during high tide in late February 2012. A peak of 14 birds was recorded in Section 1 in early November within a small short-lived MSFA, together with herring gull, common gull, common guillemot and razorbill, 250-500m offshore. A peak count of 33 birds was recorded foraging and loafing within Section 2 and associated with a larger MSFA in Section 3. A peak number of 54 foraging black-headed gulls was noted in Section 3, associated with a south moving foraging flock of common gull.

Gull species are rarely specialist foragers and are largely opportunistic in their feeding habits. Black-headed gulls forage on a range of items throughout the year and over a range of habitats. Their diet can largely consist of aquatic and terrestrial insects, marine invertebrates obtained from intertidal sand/mud flats, earthworms and offal. They also frequently forage over agricultural land feeding on crop waste and grain and also over refuse tips, parks and gardens. Sewage outfalls also provide important foraging habitats.

Foraging ranges have been poorly researched but can range between 5-15km during the breeding season. Despite foraging birds being relatively frequent within the survey area and within the limit of significant brine influence, the species opportunistic nature is highly likely to offset any potential impacts as a result of the loss of foraging potential in the near vicinity of the brine outfall location.

1.5 Gobbins/Portmuck ASSI

The following species are outlined as designation features of Larne Lough Ramsar Site:

- **Kittiwake**
- **Razorbill**
- **Puffin**
- **Fulmar**
- **Cormorant**
- **Shag**
- **Common Guillemot**

1.5.1 (Black-legged) Kittiwake

Kittiwakes nest locally on the Isle of Muck and Gobbins Cliffs. A peak number of 85 birds were recorded in Section 3 in October within a mixed foraging flock of razorbill, herring gull, black-headed gull, common gull and common guillemot, moving south through the survey area. A peak number of 20 birds were recorded in Section 3 in late August, although birds were exclusively noted as loafing >500m offshore. Foraging throughout the survey area where noted, was typically >750m from shore with key concentrations noted on several occasions between May and August outside the survey area, north of the Hunter Rock Buoys.

Around the British Isles Kittiwakes feed predominantly on small surface shoaling fish such as sandeels, sprats and young herring (cluepeids and gadoids), marine invertebrates (squid and shrimp), but are largely opportunistic and will exploit offal discarded from fishing vessels and sewage outfalls. During the breeding season kittiwakes will also feed on intertidal molluscs and crustaceans, earthworms and earthworms where available. Typical foraging ranges for birds from UK colonies can be upwards of 20km away but are generally associated with areas regularly supporting an abundance of surface shoaling prey such as tidal fronts, tidal upwellings and offshore sandbanks.

Although occasional foraging within the survey area, most likely associated with short-lived MSFAs cannot be ruled out there were no consistent concentrations of foraging kittiwakes recorded within the survey area, and in particular over the proposed outfall location. The potential impact on kittiwakes as a result of brine emissions and construction activities at Castle Robin Bay will not be significant.

1.5.2 Razorbill

During the breeding season Razorbills are generally known to feed well away from their colonies in shallow waters over sandy sea beds (Wanless *et* al., 1990). Foraging ranges usually fall between15-20km with most prey caught within 15km of a colony however, regular concentrations of feeding Razorbills have been recorded at distances of between 9-13km and 26-28 away from their colonies. Foraging razorbills are also associated with areas of upwellings and tidal fronts, where fish are brought to the surface by flow gradients.

Sandeels and to a lesser extent clupeids (sprat and herring) caught by surface-diving represent the key component of the Razorbills diet. In European colonies during the breeding season, adult and chick diet is almost exclusively sandeels. Between 2007 and 2009 chicks from the Isle of May colonies were fed almost exclusively on 0-group sandeels, however in 2010 chicks were fed predominantly on clupeids (67% of adult food loads). A study into the diets of auks from the Rathlin Island colony over three years show Razorbills took predominantly sandeels and then clupeids up to about a maximum of 9 cm long (L. Chivers QUB *Pers Comms*).

1.5.3 (Atlantic) Puffin

A single puffin was recorded loafing off the Isle of Muck (500-750m) in Section 3 in April 2011. Puffins have historically bred on the Isle of Muck but not in recent years. Puffins also nest on the Gobbins Cliffs.

Atlantic Puffins feed largely on small to mid-sized fish (5-15cm) obtained by pursuit surface diving. Sandeels comprise a large proportion of the diets of Scottish populations with other prey items taken by UK birds including sprat, whiting, saithe, haddock, herring and rockling. At the Isle of May colony between 2007 and 2010 63-91% of prey items brought to chicks by adults consisted of 0-group sandeels. Puffins are known to switch readily between prey species when preferred prey species are limited. Puffins typically feed close (3-5km) to their breeding colonies in shallow waters however are often recorded at greater distances of 10km and as far as 40-100km. Greater foraging distances appear to be associated with the occurrence of shallow sandbanks and tidal fronts.

No evidence of foraging was recorded within the survey area and the impact on Puffins associated with the Portmuck and Gobbins ASSI is likely to be negligible.

1.5.4 (Northern) Fulmar

Fulmars nest locally on the Isle of Muck and and Gobbins Cliffs (Portmuck and Gobbins ASSIs). Fulmars were not observed foraging within the survey area and birds were not recorded within Browns Bay. Fulmars were also largely absent from the survey area between August and December 2011, corresponding with the desertion of inshore waters during the moulting period, with birds returning to prospect nesting cliffs in late December. Peak numbers of birds (8) were generally noted loafing just off the Isle of Muck, >500m offshore in Section 3, with smaller numbers of birds noted loafing >250m offshore in Section 1 and 2 and also beneath potential nesting cliffs in Portmuck Bay.

Despite between 20 and 70 pairs nesting recently on the Isle of Muck, numbers of Fulmars recorded within the survey area were low. This is likely due to the preference for long distance foraging trips undertaken by provisioning adults during the breeding season, and birds tending to loaf close to the Isle of Muck nesting cliffs on the eastern side of the Island

(not visible from land-based survey vantage points). Fulmars commute regularly over large foraging distances often to regular foraging habitats along continental shelf edges during the breeding season. Adult foraging trip lengths during the breeding season can often be a number of days, with birds from UK colonies frequenting the North Sea and Irish Seas. Individuals satellite tagged from a Greenland colony showed adults to forage 40-200km during incubation and chick-rearing stages however, most foraging during the chick-rearing stage is thought to be within 100km of the colony.

Fulmars are primarily surface feeders obtaining most of their prey through surface seizing whilst floating. Fulmars feed on a wide range of foods being largely opportunistic and known for scavenging offal discarded from trawlers, particularly in the North Sea (Camphuysen & Garthe, 1997). They feed on a variety of fish (including sandeels, sprat and small gadoids), zooplankton (amphipods and copepods), jellyfish and squid. Although surface feeding mesopelagic species of fish, squid and crustaceans are also frequent in the diet, suggesting night time feeding when such species are available in the surface waters.

Fulmars were not recorded nesting within the vicinity of the proposed outfall pipe and pumping station at Castle Robin Bay, but do take up nesting ledges in Portmuck Bay. No impact on nesting fulmars is likely as a result of proposed construction works at Castle Robin Bay. No significant impact on foraging fulmars associated with the Gobbins and Portmuck ASSIs as a result of brine emissions and the avoidance of prey items within c. 100m of the outfall location is expected.

1.5.5 Cormorant

Cormorants were recorded throughout the survey area with peak numbers recorded foraging in Section 1 on the afternoon of December 14th 2011. Small numbers of cormorants were regularly noted roosting at Skernaghans Point and along the eastern rocky shoreline of Browns Bay. Numbers of foraging (and loafing) cormorants within the survey area were generally low with, a peak number of two in Section 2 occurring twice during the 2011/12 wintering period, with foraging birds present in all seawards distance bands. The peak number of foraging birds in Section 3 was five in January 2012, 500m-1km offshore.

In marine environments cormorants feed predominantly on bottom-dwelling fish and crustaceans including flatfish, blennies, sea scorpions, sculpins and gadoids, obtained by surface diving. Cormorants will also take schooling fish such as sandeels demonstrating their ability to switch readily between benthic and pelagic species. Dab, plaice and flounder are frequent species. Eels and salmonids also feature in the diet to some extent in Northern Ireland during summer months.

Comorants are typically solitary feeders and can forage up to 20-25km from their breeding colonies or wintering roost sites. Feeding-flocks do occur and are generally associated with schooling prey. Cormorants can dive to depths of c.30m but generally forage up to depths of 12m to obtain benthic prey species. Schooling prey are often taken in deeper waters.

The survey waters between Skernaghans Point and Portmuck Bay do not appear to be significant for foraging cormorants, particularly during the breeding season by birds likely associated with the Gobbins ASSI. With large foraging ranges any minimal impacts on cormorants due to the avoidance of prey items within the near vicinity of the proposed brine outfall location would be offset and the overall impact on cormorants insignificant.

1.5.6 Common Guillemot

A peak of 48 foraging and loafing birds were recorded within Section 3 in October 2011 associated with a mixed foraging flock of gulls, kittiwake and razorbill just off Portmuck Bay. Common guillemots nest locally on the Isle of Muck (1774 Ind in 2011) and Gobbins cliffs (1484 Ind, Seabird 2000). Despite nesting in large numbers in the vicinity of the proposed

outfall location significant numbers of birds were not noted foraging regularly within the survey area during the breeding season. During the breeding season birds departing from colonies on foraging trips often flock together in waters adjacent to their colonies before departing to foraging areas. Although such flocks from the Isle of Muck could not be seen from the land-based vantage points low flying flocks of varying size were typically noted flying just north of the island. Flying flocks of low flying auks of varying size were regularly noted passing north and south, >750m offshore, throughout the day between April and July 2011 (also in late December 2011 and March 2012) often totalling several hundred. Guillemots typically forage within c. 30km of their breeding colonies with regular aggregations of foraging guillemots are often associated at ocean fronts, offshore sandbanks and areas of tidal upwelling, where ocean processes concentrate prey, typically sandeels, into predictable locations.

Numbers of guillemots recorded as foraging within the survey increased during the wintering months. During the winter guillemots are generally found close to shore close to their breeding colonies. A peak of 48 recorded within Section 3 within a short-lived nearshore MSFA observed in October 2011. Peak numbers (28) of guillemots were recorded in Section 1 in November 2011 again in a short-lived MSFA (razorbill, common, black-headed and herring gull). Peak numbers in Section 2 (11-14) were noted in December through to March with birds largely noted as foraging and loafing in pairs or small groups with razorbill >500m offshore.

Common guillemots main prey items include schooling fish, mostly sandeel, herring and sprat. Preliminary results from dietry studies on Rathlin Island show guillemots take mostly clupeids (sprat and herring) along with sandeels and small gadoids (L. Chivers *Pers Comms*). Guillemots typically obtain one prey item before returning to their nesting colonies explaining the continual movements of adults birds over the survey area during the breeding season.

Relative to the adjacent colony sizes the incidence of foraging guillemots within the survey area was considered to be low. During the breeding season adults birds are likely to aggregate at specific foraging locations not identified within the survey area. Although foraging occurred within the vicinity of the proposed brine outfall location, most notably within the wintering months, avoidance of prey items is predicited to be restricted to within the initial mixing zone c.100m. Based on the preference of foraging areas outwith the survey area and the guillemots ability to forage at distance upwards of 20km away from their colonies, only a negligible to slight potential impact on foraging guillemots associated with the Isle of Muck and Gobbins ASSIs as a result of brine emissions is likely.

1.5.7 Shag

The European Shag is largely an opportunistic feeder taking a range of benthic, dermersal and pelagic fish species, with sandeels (lesser sandeel *Ammodytes marinus)* being a dominant prey species taken by British populations. Breeding success has been shown to be low in years of poor sandeel abundance. Benthic fish species are taken to a lesser extent than Cormorants. Sandeels are consistently reported as a key component of the diets of Isle of Muck birds comprising 28.3-91.5% (by mass) of the diet between 2007 and 2010. The remainder of the shag diet mainly comprises of gadoids, clupeids, sea scorpions *Taurulus bubalis* and butterfish *Pholis gunnellus*.

Mean foraging ranges of the Isle of Muck colonies during the chick rearing period were found to be 7km from the colony, with birds utilising waters close to the colony (<2km) and more distance waters (5-13km). Their distribution was strongly related to water depth and sea-bottom sediment type, with shags feeding most often in waters 20-40m deep with a gravel, sandy or rocky bottom.

Shags were frequent foragers within the survey area usually within 250m of the coastline in shallower waters. Browns Bay (unreported survey data) and Portmuck Bay consistently held foraging shags, likely due to the shallow sandy waters supporting preferred prey items.

1.6 Additional Species

The following species were also recorded during Open Coast Bird Surveys 2011/12.

1.6.1 Arctic Skua

Arctic Skua were recorded during survey on two occasions. Once in Section 1 in the afternoon of the 2nd June and once in Section 3 on the morning of the 29th September. On both occasions a single bird was noted flying between 750m-1km offshore and on both occasions were associated with foraging and flying black-legged kittiwakes. Kleptoparasitism ('food piracy') was noted. Arctic skuas are typically wintering migrants to Northern Ireland waters, leaving their Arctic/Sub-Arctic breeding grounds in August and moving south along coastal passages. Returning north again in April-May. Skuas are largely opportunistic in their feeding habits, regularly obtaining food through food piracy from other seabirds (including kittiwakes, gulls, terns and auks), but generally taking a range of prey species including chicks, eggs, insects, fish, offal and carrion. Food piracy is often the species primary way of obtaining food during the overwintering period.

Due to the species apparent rarity to the survey area and preference for offshore waters no potential impact as a result of proposed construction works and brine emissions at Castle Robin Bay will not be significant.

1.6.2 Black-tailed Godwit

A single black-tailed godwit was recorded roosting within Browns Bay along the southern sandy shoreline. The survey area between Skernaghans Point and Portmuck bay provide little foraging habitat for Black-tailed Godwits and other inter-tidal foragers.

1.6.3 Black Guillemot

Black guillemots feed on and provision their chicks primarily with benthic fish species, most notably Butterfish *Pholis gunnellus.* They forage largely in shallow inshore waters with rocky seabeds often vegetated with kelp (*Laminaria* spp.) during the breeding season, which reflects the typical habitat of butterfish. Breeding pairs from the Copeland Island and Bangor, Northern Ireland are reported to feed almost exclusively on Butterfish (K. Leonard *Pers Comms*). Individuals observed foraging within the Islandmagee survey area between close to the shore between April and July 2011 brought exclusively butterfish to the surface. Additional prey species taken by Scottish populations include sandeels and gadoids along with flat fish and sea scorpions. During the breeding season Black Guillemots tend to forage within 5km of their colonies and often up to 10km. Exceptional foraging distances have been noted up to 55km.

During the winter Black Guillemots usually remain close to their nesting colonies, although fledged young tend to disperse over large distances. Many adults also disperse to moult before returning to their colonies gradually over the course of the winter months. Black Few studies have examined the wintering diet of Black Guillemots but it is likely that butterfish remain a key component throughout the year.

Black Guillemots are known to nest locally within Larne Lough, Portmuck Bay, on the Isle of Muck and along the Gobbins Cliffs. Nesting pairs are also present at the Maidens. A peak number of 42 black guillemots were recorded in Section 3 during the morning of the 15th July 2011. Further peaks of 38 and 39 birds were noted in mid-May and early July. Peak counts typically corresponded with high tide conditions occurring early in the morning, when birds are displaying and loafing in the waters adjacent to their colonies. Birds were regularly recorded foraging throughout the survey area, foraging typically less than 500m from the

shore, corresponding with the presence of kelp vegetated bedrock “Sediment-affected or disturbed kelp and seaweed communities”, recorded during intertidal and benthic surveys stretching c.1.5km either side of the proposed brine outfall pipe location (EIS Section 6.3.4.3 and 6.4.15.1).

1.6.3.1 Nesting Black Guillemots at Castle Robin Bay

In 2009 an Open Coast Breeding Seabird Survey was undertaken by RPS. The aim of this survey was to locate breeding seabirds within c. 400m of the proposed brine outfall location and pumping station at Castle Robin Bay, which may be impacted by this aspect of the development. The results of this survey are presented in the EIS. At the time of this survey no breeding seabirds were located within 400m of the outfall location in 2009. In 2011 it was not the intention to repeat the Open Coast Breeding Seabird Survey, instead the purpose of the surveys was to identify the use of the nearshore coastal waters by foraging seabirds. Subsequently a minimum of two black guillemot nests were recorded just north of the proposed outfall location. A maximum of 6 birds were noted to regularly associate with this small colony during surveys undertaken between April and July 2011. Closer inspection of the site confirmed a minimum of two nests. The construction of the outfall location and pumping station at Castle Robin Bay will not directly result in the loss of these nest sites however, construction works may cause significant disturbance to nesting pairs if carried out during the breeding season. The nesting sites are located c.100m from the proposed pumping station and c.200m from the outfall pipe. Mitigation regarding timing of works at this locale is therefore proposed due to potential of disturbance to nesting birds.

1.6.4 Curlew

Curlew were often recorded roosting in small numbers along the craggy coastline between Skernaghans Point and Portmuck Bay. Birds were also noted foraging within Browns Bay and within improved grasslands immediately to the south of Skernaghans Point during the 2011/12 wintering period. The relatively low numbers recorded are unlikely to be impacted by any proposed construction works at Castle Robin Bay and no impacts as a result of brine emissions in this part are envisaged.

1.6.5 Dunlin

A peak count of 34 dunlin was recorded in Section 3 in late December 2011. The birds were predominantly foraging together with small numbers of redshank, turnstone, oystercatcher and ringed plover. Dunlin overwinter in Larne Lough in moderate numbers and the coastline between Skernaghans Point and Portmuck Bay are not considered to provide a significant foraging or roosting habitat. The peak count recorded in December was an apparent rarity over the wintering month.

No potential impact on Dunlin as a result of any proposed construction works at Castle Robin Bay or brine emissions are likely.

1.6.6 Great Black-backed Gull

Great black-backed gulls nest in small numbers (1-2 pairs) locally on the Isle of Muck (N. Robinson *Pers Obvs*), they also overwinter in small numbers in Larne Lough. A peak count of six birds was recorded within Section 3 and Browns Bay in October 2011 and February respectively. Great black-backed gulls are formidable predators, scavengers and food pirates. They are opportunistic and their diet can change significantly with locality and season and during the breeding season and can often reflect seabird colonies adjacent to their nesting locations. Small mammals (rabbits, mice, rats), birds (adults, eggs and nestlings), fish, crustaceans and carrion are key prey items.

Similar to other gull species recorded within the survey area the great black-backed gulls broad diet and opportunistic nature typically offsets any local changes in food abundances.

Their low frequency within the survey area and within the vicinity of the outfall location is unlikely to result in any impacts on the species as a result of construction activities and localised potential prey avoidance at Castle Robin Bay.

1.6.7 (Northern) Gannet

Gannets are not known to breed in Northern Ireland. The closest colonies to the proposed brine outfall location are located in Scotland: Ailsa Craig (Firth of Clyde) and Scar Rocks (Mull of Galloway) and Ireland: Irelands Eye (Dublin). Gannets were recorded foraging within all survey sections but were largely absent from the survey area between October and January, corresponding to their migration to more southerly and offshore waters. Individuals from the Bass Rock colony in the Firth of Forth are known to overwinter in the North Sea, the Bay of Biscay and the Mediterranean Sea.

Gannets generally forage in communal flocks over shoals of schooling fish but will forage singly. Foraging birds are often associated with sandbanks and areas of tidal mixing and over spawning grounds of favoured prey species such as herring. Birds from Great Saltee Island in South East Ireland associate with the main spawning ground of the Celtic Sea Herring (*Clupea harengus*). Foraging distributions are also influenced by traditional commercial fishing grounds, particularly in the North Sea, with major gannet feeding areas concentrated around commercial herring, mackerel and sandeel fisheries.

The Northern Gannet is largely opportunistic feeding on a wide range of surface schooling fish and squid. Gannets readily switch between abundant prey items and their overall diet is subject to significant geographic, annual and seasonal variation, moving between inshore and offshore waters as prey becomes available. They are also a dominant scavenger at discarding trawlers. Gannets generally choose larger more energy rich species with mackerel a consistent prey species taken by the UK breeding population along with herring, sandeels, haddock, sprat, whiting, other gadoid and clupeid species. Their broad diet and ability to switch between prey items would suggest they have a significant ability to buffer against localised reductions in food supplies.

A peak number of ten birds was recorded foraging in Section 3 in late August, with the majority of birds fishing between 750m-1km offshore. Throughout the survey area gannets showed a preference for fishing in slightly deeper water offshore, >250m. The peak number of foraging birds within Section 2 was nine in late September, foraging over the proposed outfall location (250-500m).

Although gannets were frequent foragers to the survey area there were no regular significant concentrations noted however upwards of 30 foraging birds could be seen >12km from shore when conditions permitted in June and July 2012. No significant impact on foraging gannets as a result of brine emissions and construction activities at Castle Robin Bay is likely.

1.6.8 Grey Heron

Herons were often noted roosting along the craggy coastline between Skernaghans Point and Portmuck Bay and on rocky outcrops within Browns Bay. No significant impacts as a result of the proposed construction and brine emissions at Castle Robin Bay are likely.

1.6.9 Herring Gull

Herring Gull are known to nest locally on the Isle of Muck. The species takes a wide range of prey items including fish, small birds and mammals, eggs, crustaceans and intertidal invertebrates. Starfish were commonly recorded as prey items for gulls foraging in Browns Bay and Portmuck Bay. Scavenge over farmland, harbours, urban areas and refuse tips. Herring gulls are opportunistic foragers but to a lesser degree than other gulls with more open-sea feeding than other gulls. The species is generally piscivorous but will take a range

of vertebrates, invertebrates and waste materials. Typical fish species taken include gadoids, cluepeids (herring) and sandeels, when present in surface shoaling schools. Crabs, shrimps, worms, molluscs and starfish also taken along with plant material, seaweed agricultural grains and berries where available. Small mammals and birds (usually nestlings) taken, often from immediate nesting colonies.

With a broad ranging diet and low numbers of birds recorded within the survey area any potential change in the availability of prey species within the initial mixing zone of the brine outfall point is unlikely to produce a significant impact on herring gulls associated with the Isle of Muck colony.

1.6.10 Iceland Gull

Typically a scarce winter visitor to Northern Ireland, however, the 2011/12 overwintering period saw an influx of Iceland Gulls to parts of the UK. Birds were frequently recorded within and around Larne Lough through January and March 2012, associating with overwintering loafing/roosting flocks of common, herring and black-headed gulls. A single bird was recorded in Browns Bay loafing within a large flock of predominantly common gulls in late February.

1.6.11 Lapwing

Three lapwing were recorded roosting on a rocky outcrop in Section 3 in mid-December 2011. There is limited foraging for lapwing within the survey area. No significant impact as a result of proposed construction works or brine emissions at the Castle Robin locale is likely.

1.6.12 Lesser Black-backed Gull

Lesser black-backed gulls nest locally in small numbers on the Isle of Muck (2011 – c.13 AON. Larger nesting colonies nearby are present on Rathlin Island and on Old Lighthouse Island and Mew Island of the Copelands (Seabird 2000). Despite nesting adjacent to the survey area only negligible numbers of birds were recorded within the survey area, with birds predominantly recorded loafing off the Isle of Muck between May and June. Similarly to other gulls lesser black-backed gulls are predominantly opportunistic scavengers. No significant impact on the species is likely as a result of brine emissions and construction activities at Castle Robin Bay.

1.6.13 Long-tailed Duck

A single long-tailed duck was recorded in Section 1 in late November 2011. Britain and Northern Ireland lie effectively at the south-western limit of the long-tailed ducks overwintering range with only small numbers reaching Irish coastal waters. The bird was only observed briefly within Section 1 before departing south.

No significant impact as a result of proposed construction works or brine emissions at Castle Robin is likely due this species apparent rarity within the survey area.

1.6.14 Mallard

Small flocks of mallard were noted on occasion within the survey area. Birds typically foraged and roosted within Portmuck Bay and Browns Bay and were noted loafing in the direction of Larne Lough elsewhere with the survey area. Peak numbers of four (Section 2) and five (Section 3 and Browns Bay) were recorded during the wintering period. Moderate numbers overwinter in Larne Lough.

Mallard are typically omnivorous but largely opportunistic in their feeding habits. The species shows a preference for shallow sheltered inland waters, waterways, marine bays and estuaries.

No significant impact as a result of proposed construction works or brine emissions at Castle Robin Bay is likely.

1.6.15 Mute Swan

A single mute swan was recorded loafing northwards within Section 2 in early September. Mute swans overwinter and breed within Larne Lough. Mute swans feed predominantly on aquatic vegetation obtained by grazing, dabbling and upending. There is little foraging potential for mute swan between Skernaghans Point and Portmuck Bay.

1.6.16 Mediterranean Gull

The first record of Irish nesting Mediterranean gull was recorded in Larne Lough in 1995, with more recent nesting in 2008/09 (two apparently occupied nests, RSPB). Mediterranean gulls however in 2008 and 2009 two apparently occupied nests were noted on Swan Island. Although evidence of breeding has historically occurred locally the Mediterranean gull is predominantly a winter visitor to Britain and Ireland. The rarity of the species locally and within the survey area would result in no significant impact as a result of brine emissions and construction activities at Castle Robin Bay.

1.6.17 Manx Shearwater

The nearest Manx shearwater colony to the brine outfall location is located on the Copeland Islands, c. 25km south of the outfall. The Copeland Islands Manx Shearwaters are a feature of the Copeland Island SPA whereby the Copeland Islands SPA qualifies for designation under Article 4.1 of the EC Birds Directive (79/409/EEC) by supporting nationally important breeding populations of arctic tern and under Article 4.2 by supporting internationally important breeding populations of Manx shearwater.

Manx shearwaters feed largely on small schooling 'bait' fish such as herring and spratt. Small crustaceans, squid and offal are also reported.

GPS tracking studies have shown Manx shearwaters have extensive foraging distances and it is possible that a proportion of birds frequenting Irish waters may also be associated with the Stockholm and Skomer (south-west Wales), Rum (south-west Skye) Glannau Aberdaron and Ynys Enlli/Aberdaron Coast and Bardsey Island SPA populations (north-west Wales).

Seawards extensions are currently being proposed for a number of UK SPAs to include marine areas on which existing qualifying features are ecologically dependent. Currently such areas identified for Manx shearwaters include those where aggregations of evening rafting adult birds are regularly formed prior to them coming ashore to feed their chicks after night-fall. Investigative studies using GPS tracking have been used to identify such rafting areas used by the populations of the Skomer, Rhum and Bardsey SPAs. Seawards boundary extensions for these SPAs have been recommended as 4km for Skomer and Stokholm SPA, 6km for Rum SPA and 9km for Bardsey Island part of the Glannau Aberdaron and Yns Enlli/Aberdaron Coast and Bardsey Island SPA. An extension of at least 4km (or more) for other SPAs for which Manx shearwater is a designated feature has been recommended.

The Copeland Island SPA has been highlighted by JNCC as one that may be extended. RPS are aware that investigative studies into the identification of important rafting areas of the Copeland Island SPA Manx shearwater population are currently being completed. Interim data is however not available and remains sensitive until finalised. In correspondence with NIEA RPS have however been assured that no significant usage of the sea area off Portmuck by rafting Manx Shearwater associated with the Copeland Islands SPA has been identified (I. Enlander NIEA *Pers Comms*).

Although loafing individuals were noted during the survey area no significant rafting behaviour was recorded during afternoon/early evening surveys undertaken by RPS in 2011. Manx shearwaters were recorded almost exclusively flying over the survey area at distances >750m offshore. Foraging behaviour was noted on only a few occasions within the survey area and on occasion passed the Hunter Rock Buoys c.2km from the shore. Although occasional foraging within the survey area cannot be ruled out particularly in deeper waters >500m offshore, no significant impact on Manx shearwaters as a result of brine emissions and construction activities at Castle Robin Bay.

1.6.18 Great Northern Diver

Great northern divers are wintering visitors to Northern Irish waters. Peak numbers of great northern divers were two, three and three were recorded in Sections 1, 2 and 3 respectively with foraging birds regularly noted. The diet of the great northern diver largely depends on season and locality but primarily feeds on fish, crustaceans and molluscs. Aquatic worms, insects and amphibians also taken. Key fish species taken include haddock, herring, sprat, sandeel and also benthic flat fish. Crustaceans largely include crabs and shrimps.

Although regular foraging of overwintering birds cannot be ruled out the low incidence of birds within the survey area and localised avoidance by prey species over the outfall location would not result in a significant loss of foraging habitat. No significant impact as a result of brine emissions and construction activities at Castle Robin Bay are therefore likely.

1.6.19 Purple Sandpiper

Purple sandpipers were uncommon throughout the survey area with single individuals recorded in February/March 2012 foraging within Portmuck Bay, Section 3 amongst turnstone over exposed bladderwrack and just to the south-east of Skernaghans Point, similarly amongst turnstone and over exposed bladderwrack.

No significant impacts on purple sandpiper as a result of proposed construction activities or brine emissions in the vicinity of Castle Robin Bay are likely.

1.6.20 Red-throated Diver

Overwintering red-throated divers typically start to arrive in Irish waters from their arctic breeding areas in September, with numbers tending to peak in January and February. Red-throated divers are generally associated with shallow sandy bays and inshore waters when wintering in Britain and Ireland (Okill, 1994), but can occur at much greater distances offshore where shallow sandbanks occur. Belfast Lough is a notable overwintering site for the species in Northern Ireland.

The species was noted throughout the survey area with regular foraging noted within shallower inshore waters. Peak numbers, often paired individuals, were however noted loafing and foraging just of the Isle of Muck. In the UK red-throated divers commonly take herring, sprat and sandeel and although few studies have described the species wintering diet, cod is a consistent item taken by birds wintering in the North Sea.

Although foraging birds were frequently noted within the survey area the species was not noted in significant numbers. Flocks of >20 birds were regularly seen commuting from the north, heading south in the direction of Belfast Lough during December and January. The avoidance of preferred prey items will be localised to within 100m of the outfall location and no significant long term impact on potential red-throated diver foraging habitat as a result of construction activities and brine emissions at Castle Robin Bay is likely.

1.6.21 Turnstone

Foraging and roosting turnstone were recorded in Section 1, 3 and Browns Bay between October 2011 and March 2012, with peak numbers occurring in Section 3 in November.

Birds were generally restricted to foraging over exposed intertidal bladderwrack and roosting on rocky outcrops in Portmuck Bay. Turnstone were not recorded within Section 2 and no impact as a result of disturbance by proposed construction works or brine emissions are likely.

1.6.22 Whooper Swan

A single whooper swan was noted loafing within Browns Bay on a morning in November 2011, with varying flocks (4-15) of passage birds noted flying south and inland from September to November 2011. Whooper swans overwinter in low/moderate numbers in Larne Lough however, have a strong preference for arable grazing fields and intertidal mudflats within and adjacent to the Lough. The coastal survey area between Skernaghans Point and Portmuck Bay is unsuitable for foraging whooper swans.

No impact as a result of proposed construction works or brine emissions at the Castle Robin Bay locale are likely.

Table 1 Typical foraging ranges of key species.

BTO Species Code	BLI Max (km)	BLI Mean Max (km)	BLI Mean (km)	Wilson *et al.* (2009) Mean Max (km)	Ratcliffe et *al.* (2000) Max (km)
CN	37	33	9	8km	
RS	30	18	12	4km	
TE	70	42	15	8km	
AE	21	12	12	16km	
KI	200	65km	25		
RA	51	31	10		
PU	200	62km	30		
F.	664	311	69		
CA	50	32	8		
SA	20	16	7		
GU	200	61	24		
MX*	400	196	172		
TY	55	12	5		
CM					<15
GB					<50
LB	44-84km				<40
HG					<40
EI	100km	38.33	9.25		
GX	640km	308km	140km		

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