



REFINING NZ CRUDE SHIPPING PROJECT

AEE REPORT COASTAL BIRDS

FINAL

FOR: REFINING NZ

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1. EXECUTIVE SUMMARY

A description of the coastal and pelagic birds observed utilising or recorded previously within the broad Project area is presented; that is the result of literature searches, information from a local bird watcher and specific field investigations completed in 2015 and 2016. High value bird habitats in a national context were identified at Mair Bank and Bream Bay. Northport to One Tree Point and Urquharts Bay areas were identified as being of high value in the context of the Outer Harbour.

Breeding within the Harbour was recorded or strongly inferred for variable oystercatcher, reef heron and little penguin; specific breeding sites used by threatened and at risk species are of national importance during the breeding season.

The potential risk of Project-generated effects on shorebird habitats was considered high at Mair Bank and low-moderate at Reotahi Bay as a result of their proximity to the works. The risk at the other habitats was judged to be low.

Potential issues regarding coastal and pelagic birds were identified as climate change, turbidity increases, deposition of resuspended sediment, vessel movements, vessel lighting, underwater noise and cumulative effects. There is no concern regarding permanent decrease in feeding habitat, a loss of roosting or breeding habitat, sediment contaminants, maintenance dredging, or the erection and maintenance of navigational aids. An analysis of potential effects was completed. The species most susceptible to a turbidity increase in the dredging area is considered to be little penguin; the concern is disruption of its passage between shoreline nesting areas, specifically those within the Harbour and the nearby open water. However the confined sediment plume, limited dredging area within Busby Head, temporary nature of the works, Project turbidity thresholds and ranges in ambient turbidity, indicate that adverse effects will likely be avoided and will not be contrary to NZCPS Policy 11 (a) (i) and Policy 11 (b) (ii). The probability of an adverse turbidity effect at the disposal site is considered remote and not likely to be contrary to NZCPS Policy 11 (a) (i) or 11 (b) (ii). Similarly there would be no effect on coastal or pelagic birds from the deposition of any resuspended sediments. The issue of increased vessel movements is assessed

relative to the current baseline; because the Project area is frequently used by a wide variety of vessels the effect has been judged less than minor.

Vessel lighting is a known attraction to pelagic species especially shearwaters and petrels that nest on the Hen and Chickens Islands, but especially grey-faced petrel that nests locally and is being actively encouraged within the immediately adjacent Bream Scenic Reserve. Although the objective of NZCPS Policy 11 (a) (i) would be maintained, mitigation is proposed via the provision of nesting boxes in the Reserve. The issue of noise regarding diving and swimming birds is considered negligible and to be consistent with NZCPS Policies.

Recommendations are the provision of nesting boxes for little penguin (possible turbidity effect) and grey-faced petrel (possible lighting effect), and a lighting audit of the Project's vessels to minimise the light attraction of seabirds. Monitoring of the post-dredging state-of-the-environment is proposed to cover little penguin specifically and coastal birds.

In summary the overall impact on coastal and pelagic birds is considered to be low. The Project would be consistent with NZCPS Policy 11 (a) (i) and Policy 11 (b) (ii).

2. INTRODUCTION

Assessments of the coastal bird populations in the area from a line between One Tree Point and Darch Point through to Home Point and the northern end of Bream Bay Beach were completed in February-March 2015, November 2015 and February-March 2016. The February-March 2015 and 2016 surveys aimed at documenting coastal bird abundance, diversity and habitat use while the November 2015 surveys recorded breeding activities in the context of the planned application by Refining NZ for the Crude Shipping Project.

The aim of the surveys was to gain an understanding of the characteristics and significance of bird populations in areas in the vicinity of the Project and to update information that had been reviewed in a literature review completed by Bioresearches in 2015. That literature review identified that a total of ten nationally threatened and sixteen nationally at risk coastal and pelagic species had been recorded in the outer Harbour (east of One Tree Point) and Bream Bay habitats. With non-resident native and non-threatened birds the total diversity was 34 species. Breeding in Harbour and Bream Bay edge habitat was reported for both threatened and at risk species comprising a wide range of bird groups – waders, gulls, terns, penguin, shags and shearwaters.

The two broad groups of birds present are coastal birds that utilise intertidal and nearshore habitats, and pelagic birds that generally utilise open water offshore habitats (eg shearwaters, petrels) but can occur close to shore on occasions. In this investigation the coastal birds were assessed via field surveys while information on pelagic species relied on the literature, together with observations and reports provided by Margaret Hicks, a local resident and experienced bird watcher.

While the surveys completed for this Project were completed in a two year period, a longer term benchmark is provided by the data collected at Marsden Bay by the Ornithological Society of NZ (now Birds NZ) and reported by Dickie 1984, from 1975 to 1984 inclusive; and from 2009 to 2015 inclusive by Bioresearches for the Marsden Cove Development. Those data indicate a relative stability in at least the wading bird population in this part of the Harbour over that period.

The coastal and pelagic species referred to in this report and their current (May 2017) national conservation ratings are shown in Tables 1 and 2.

The assessment of effects recognises the New Zealand Coastal Policy Statement (NZCPS) (2010), particularly Policy 11 Indigenous Biological Diversity (biodiversity) (a) which states “avoid adverse effects of activities on: (i) indigenous taxa that are listed or threatened or at risk in the New Zealand Threat Classification System lists.” A total of 27 such species have been recorded in the outer Harbour survey area and Bream Bay.

Policy 11(a)(ii) is also relevant but birds listed by the International Union for Conservation of Nature and Natural Resources (IUCN) are understood to have been captured by Policy 11(a)(i). Policy 11(a)(v) is relevant to this assessment i.e. “areas containing nationally significant examples of indigenous community types” insofar as it relates to communities of coastal birds. That has been summarised in Figure 11 of this report.

Finally this evaluation recognises Policy 11(b): “avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on: (ii) habitats in the coastal environment that are important during the vulnerable life stages of indigenous species”. Areas of known (literature review, field investigations) habitat used for bird nesting and juvenile rearing have been identified in this assessment.

TABLE 1 - List of Coastal birds, recorded during the surveys and their current conservation status (Robertson et al, 2017*)

COMMON NAMES	CONSERVATION STATUS *
black-backed gull; karoro	not threatened
caspian tern; taranui	threatened – nationally vulnerable
eastern bar-tailed godwit; kuaka	at risk - declining
eastern curlew	non-resident native
kingfisher; kotare	not threatened
lesser knot, huahou	threatened – nationally vulnerable
little shag; kawaupaka	not threatened
mallard	not threatened
NZ dotterel; tuturiwhatu	at risk - recovering
paradise shelduck; pūtangitangi	not threatened
pied shag; karuhiruhi	at risk - recovering
pied stilt; poaka	not threatened
red-billed gull; tarapunga	at risk - declining
reef heron; matuku-moana	threatened – nationally endangered
South Island pied oystercatcher; torea	at risk - declining
spur-winged plover	not threatened
variable oystercatcher; toreapango	at risk - recovering
white-faced heron	not threatened
white-fronted tern; tara	at risk - declining

* Robertson, HA; Baird K; Dowding JE; Elliott, GP; Hitchmough, RA; Miskelly CM; McArthur N; O'Donnell CFJ; Sagar, PM; Scofield RP; Taylor GA May 2017. Conservation Status of New Zealand birds, 2016. NZ Threat Classification Series 19. Dept of Conservation. 23 pp.

TABLE 2 - List of pelagic birds, recorded in the literature as utilising the wider Bream Bay area and their current conservation status (Robertson et al, 2017*)

COMMON NAMES	CONSERVATION STATUS *
australasian gannet; takapu	not threatened
arctic skua	non-resident native
black-winged petrel	not threatened
Buller's shearwater	at risk; naturally uncommon
fairy prion, titi wainui	at risk – relict
flesh-footed shearwater; toanui	threatened – nationally vulnerable
fluttering shearwater, pakaha	at risk – relict
giant petrel (northern); pangurunguru	at risk - recovering
grey-faced petrel; oi; titi	not threatened
Indian Ocean yellow-nosed mollymawk	non-resident coloniser
little penguin; korora	at risk – declining
little shearwater	at risk - recovering
northern diving petrel; kuaka	at risk - relict
Pycroft's petrel	at risk - recovering
shy mollymawk	at risk - declining
sooty shearwater; titi; muttonbird	at risk - declining
white-faced (NZ) storm petrel; takahikare-moana	at risk – relict

3. FIELD INVESTIGATIONS

3.1 INTRODUCTION

Over the 2015-16 period there were three groups of surveys as follows:-

- (i) February – March 2015: coastal bird surveys at five locations
 - Bream Bay Beach (at Mair Road)
 - Taurikura Bay
 - McKenzie Bay
 - Urquharts Bay
- (ii) November 2015 – breeding activity surveys:
 - Mair Road to Northport inspection
 - Marsden Point to Northport habitat use
 - Darch Point to Home Point habitat use
- (iii) February – March 2016:- coastal bird surveys at eight locations
 - Mair Bank (as 2015)
 - Refinery Jetty to Northport
 - Marsden Bay west to One Tree Point
 - Part of Snake Bank
 - Reotahi Bay
 - Taurikura Bay
 - McKenzie Bay
 - Urquharts Bay

The above areas are shown on Figures 1 to 8.

The only 2015 survey area that was not surveyed in 2016 was Bream Bay Beach on the basis that it supported a low diversity and relatively low numbers of coastal birds and no significant high tide roosting.

For clarity a summary of the coastal bird count surveys is as follows:

Area of coast	Date	No. hourly counts
Bream Bay Beach	23.3.15	9
Mair Bank	25.2.15	9
	3.3.15	9
	9.2.16	9
Refinery Jetty to Northport	8.3.16	9
Marsden Bay West to One Tree Point	16.2.16	8
Part Snake Bank	16.2.16	8
Reotahi Bay	9.3.16	9
Taurikura Bay	18.3.15	9
	9.3.16	9
McKenzie Bay	18.3.15	9
	9.3.16	9
Urquharts Bay	18.3.15	9
	9.3.16	9

Bird use of nine sections of coastline was recorded via a total of 124 hourly counts. Mair Bank received additional emphasis regarding both the coastal bird surveys and breeding season surveys because of its proximity to the proposed works, its significance as a coastal bird habitat in a national context [NZCPS 11(a)(v)] and its current condition that includes a decrease in the pipi population (Williams JR & Hume TM 2014; Pawley, 2016) and an apparent increase in green-lipped mussels (Pawley 2016) that may change the attractiveness of Mair Bank as a feeding area for coastal birds, especially variable oystercatcher.

3.2 METHODOLOGY

The methodology for the bird surveys of the nine sections of coastline was reviewed by NIWA on behalf of Northland Regional Council. It is the same methodology that has

been used to monitor the bird populations using Marsden Bay, to the west of Northport, over the 2003 to 2015 period with approval of Northland Regional Council and the Department of Conservation.

At each site hourly counts were completed to cover a range of tidal conditions and habitat use activities recorded using Leupold BX-2 Cascades 10 x 42 binoculars and a Kowa TSN-883 Prominar spotting scope (25-60 times wide zoom eye piece). Before each count the air temperature was measured (quartz digi-thermo -10 to +110°C thermometer) with wind speed, barometric pressure (Silva Alba Windwatch) and general weather conditions recorded. Field data were entered on pre-prepared, waterproof record sheets.

As well as recording bird abundance and diversity, bird habitat use was recorded using an activity code as follows:

FI	:	feeding in the intertidal area
FW	:	feeding in or over the water
REI	:	resting in the intertidal area
REW	:	resting on the water
ROI	:	roosting (waders only) in the intertidal area *
ROP	:	resting/roosting on stakes, poles, rock walls, trees

* Roosting (ROI) over the high tide period is a category applied only to wading birds in this assessment, because the presence of a high tide wading bird roost is generally considered a notable coastal feature. The ROI category applies to the period of high tide itself and one hour either side of it to provide a comparative standard. Roosting by waders can be related to “staging” i.e. birds form groups at mid to upper shore levels prior to moving up to above the high tide level to roost over the high tide period or alternatively, flying elsewhere to roost. Whether birds are resting or roosting at the time of staging can be variable and debatable, and “roosting” has therefore been standardised. In contrast, resting/roosting by non-wading birds tends to be more random in terms of both the location used and tidal stage.

For the breeding season surveys the Mair Road to Northport area was inspected on foot and using a spotting scope and binoculars. The Marsden Point to Refinery Jetty

area was monitored for a total of six hours to record breeding season activities. The coastline from Darch Point to Home Point was inspected mostly on foot (Darch Point to Little Munro Bay; Urquharts Bay to Home Point) or via a combination of specific point inspections and spotting scope observations (Little Munro Bay to Urquharts Bay).

3.3 SPECIFIC AREA SURVEYS

3.3.1 Bream Bay Beach

The section of Bream Bay Beach surveyed (Figure 1) extended from near the end of Rama Road to just south of Marsden Point proper, a distance of c.2350m.



Figure 1. Bream Bay Beach Survey Area.

Species diversity was low and comprised australasian gannet, black-backed gull, caspian tern, red-billed gull, variable oystercatcher and white-fronted tern i.e. six species (note that “pelagic species” are discussed further in Section 2.4).

The highest maximum number was only 18 red-billed gull with the other species recording less than 8 individuals.

Similar maxima per kilometre were recorded in the same habitat north of Waipu River mouth but higher numbers were recorded at the Waipu River mouth and estuary in previous surveys.

The average number of birds (rounded) was 15 with red-billed gull the dominant species (53.3%) followed by black-backed gull (20.7%) and variable oystercatcher (13.3%). In total 74% of the population was gulls and the main habitat use was resting in the intertidal area (79.3% of records).

3.3.2 Mair Bank

The Mair Bank survey area (Figure 2) included the beach between Marsden Point proper and the Refinery Jetty, the inner bank adjacent to the Refinery mooring dolphins and the outer banks.



Figure 2. Mair Bank Survey Area.

The diversity of species was moderate with ten species over the three surveys – black-backed gull, caspian tern, little shag, NZ dotterel, pied shag, pied stilt, red-billed gull, South Island pied oystercatcher, variable oystercatcher and white-faced heron; one threatened and five at risk species.

The highest maximum was of black-backed gull (196) followed by 70 red-billed gull and 66 variable oystercatcher over the three surveys. The maximum number of individuals was 288 at low tide on 25.2.15 but 67.4% were black-backed gulls. Average numbers of birds (rounded) were 119, 76 and 120 over the three surveys with the highest numbers on the two lowest tides (0.5m).

Mair Bank was utilised for feeding mainly during a four hour period from about four hours after high tide, over the low tide period and to about two hours after low tide i.e. for about one third of a 12 hour tidal cycle.

There was no significant high tide wading bird roost but the beach was used for resting by up to about 100 black-backed gulls and the occasional caspian tern, red-billed gull and variable oystercatcher.

The dominant species was clearly black-backed gull followed about equally overall by red-billed gull and variable oystercatcher.

The predominant habitat use was resting in the intertidal (80.4% 2015; 70.7% 2016) with feeding in the intertidal habitats 14.9% in 2015 and 20.9% in 2016.

The two outer banks were the more important feeding habitats; the average percentages of feeding records over the surveys were: beach – 5.7%; inner bank – 19.9% and outer banks 74.4%. That probably reflects the presence of shellfish beds in the outer banks area that remain attractive to coastal birds.

3.3.3 Refinery Jetty to Northport

This area of habitat consists of a sandy intertidal area flanked by the Refinery Jetty and Northport (Figure 3).

A total of ten species were recorded comprising black-backed gull, caspian tern, NZ dotterel, pied shag, pied stilt, red-billed gull, South Island pied oystercatcher, spur-winged plover, variable oystercatcher and white-fronted tern; one threatened species and six at risk species.

South Island pied oystercatcher had the highest number of individuals (437) followed by red-billed gull (154) and variable oystercatcher (60) noting that a maximum of 66

variable oystercatcher was also recorded using Mair Bank in February 2016. The maxima of all the remaining species were less than 5. The average number of birds (rounded) was 298 which is high but reflects specific habitat use (refer below).

The key habitat feature of this piece of coastline was its use by the three dominant species and NZ dotterel for roosting at high water; numbers of wading birds were high from high tide to half tide falling but red-billed gull, that nests within the Refinery grounds, remained throughout the survey period and was most common with white-fronted tern over the low tide period following the departure of the oystercatchers.

South Island pied oystercatcher comprised 56.6% of the records, red-billed gull 30.4% and variable oystercatcher 8.0%; white-fronted tern occurred at 3.2% while the remaining species were less than 1%.

The clearly dominant habitat use was resting rather than feeding: resting in the intertidal – 61.1%; high tide roosting – 37.2%. The value of the habitat for feeding was low.

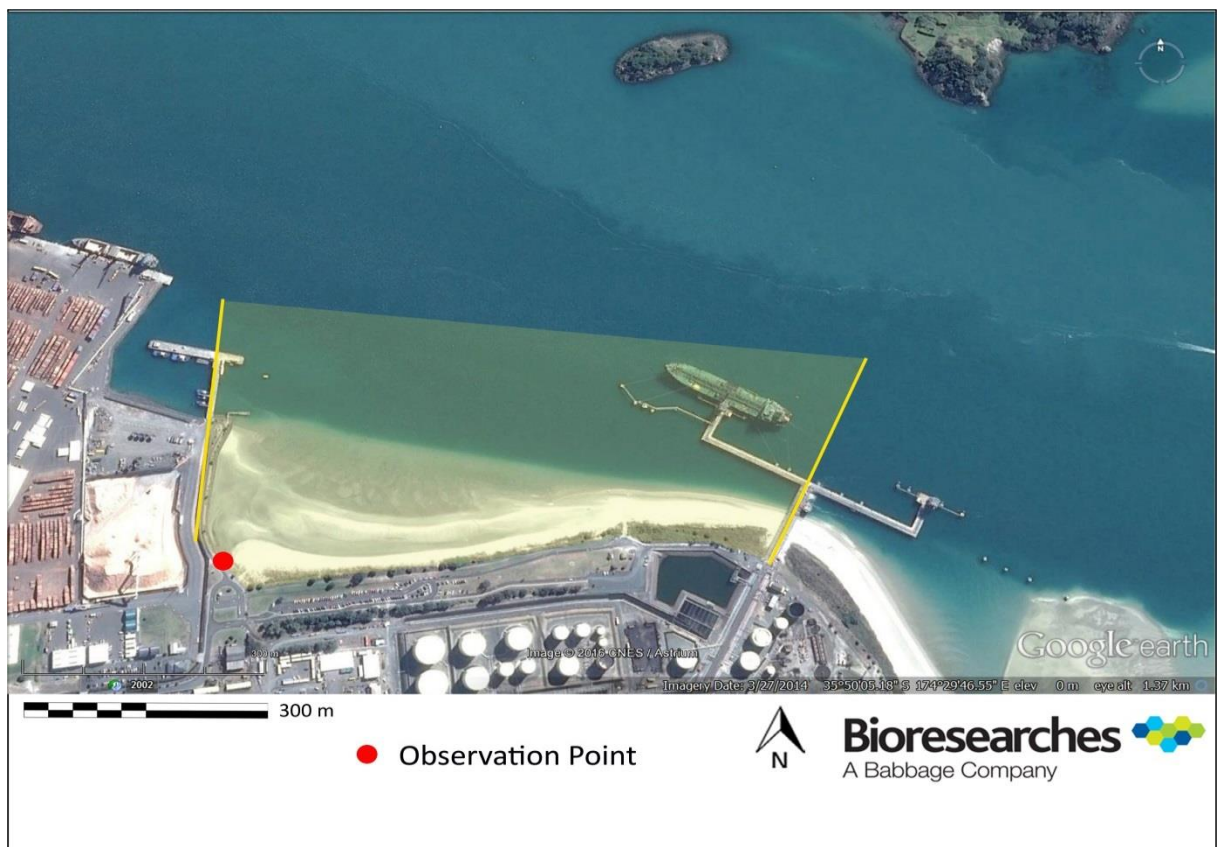


Figure 3. Refinery Jetty to Northport Survey Area.

3.3.4 One Tree Point

This area of habitat is contiguous with and similar to Marsden Bay, albeit with a narrower intertidal area and a lack of high tide roosting opportunity for wading birds (Figure 4).

Note: where there are multiple observation points, those locations were used on each hourly count to provide better coverage of the survey area (traversed by vehicle).



Figure 4. One Tree Point Survey Area.

A moderate – high total of 15 species was recorded – black-backed gull, caspian tern, eastern bar-tailed godwit, eastern curlew, lesser knot, little shag, mallard, NZ dotterel, paradise shelduck, pied stilt, red-billed gull, South Island pied oystercatcher, variable oystercatcher, white-faced heron and white-fronted tern.

The notable species were bar-tailed godwit, eastern curlew and lesser knot, all overseas migrants. A total of two threatened species and six at risk species was

recorded; bar-tailed godwit is at risk nationally but threatened overseas while lesser knot is threatened both nationally and overseas.

The highest maxima were black-backed gull (114), white-fronted tern (71), bar-tailed godwit (60), red-billed gull (58), variable oystercatcher (54) and lesser knot (37). In contrast to the maxima at Marsden Bay, (i.e. between Northpoint and the One Tree Point survey area) the maxima at One Tree Point that were lower were for bar-tailed godwit, lesser knot, NZ dotterel, South Island pied oystercatcher and variable oystercatcher noting that Marsden Bay is also utilised for high tide roosting. The only higher maxima at One Tree Point were for black-backed gull and white-fronted tern.

The average number of individuals was 168 (rounded) with the highest number over the low tide period to half tide rising after which only white-fronted tern was common, resting on an intertidal fence.

Over the entire survey period the dominant species were black-backed gull (25.2%), white-fronted tern (20.5%), red-billed gull (17.5%), bar-tailed godwit (13.9%) and variable oystercatcher (9.2%) while the remaining species occurred at less than 5%.

In contrast to the Refinery Jetty to Northport area and Marsden Bay (c.24% feeding, c.76% resting/roosting), the split at One Tree Point was 47.6% feeding and 52.4% resting with no high tide wading bird roost but a high proportion of resting by gulls and tern.

The predominant features were a lower diversity than Marsden Bay and a population containing relatively large numbers of black-backed gull and white-fronted tern.

3.3.5 Snake Bank

The southern end of Snake Bank was surveyed i.e. south of a line from about One Tree Point to Darch Point. The wider area of Snake Bank, and McDonald Bank to the east, where considered beyond the survey area for the purposes of this assessment

The diversity of species recorded (8) was relatively low but included one threatened and four at risk species. Birds recorded were black-backed gull, eastern bar-tailed

godwit, little shag, red-billed gull, South Island pied oystercatcher, variable oystercatcher, white-faced heron and white-fronted tern.

The highest maximum was for South Island pied oystercatcher (63) but maxima for the remaining species were all less than 12.



Figure 5. Snake Bank Survey Area. Observation points as shown in Figure 4.

The average number of individuals (rounded) was relatively low at c.39 but birds were only common over the low tide period, as recorded at Mair Bank, and no high tide roost is present.

Clearly dominant was South Island pied oystercatcher (75.8%) followed by black-backed gull (9.7%) and variable oystercatcher (6.5%) with the remainder incidental only. Feeding, mainly by South Island pied oystercatcher, was the predominant activity (63.5%). The Snake Bank population differed from that at Mair Bank in that black-backed and red-billed gull were not as prominent and South Island pied, rather than variable, was the more common oystercatcher species. Snake Bank is a relatively short commute for birds roosting at Marsden Bay over the high tide period and contains a notable population of cockles as a food source.

3.3.6 Reotahi Bay

Reotahi Bay (Figure 6) presents a small area of soft intertidal habitat amongst a rocky shoreline.

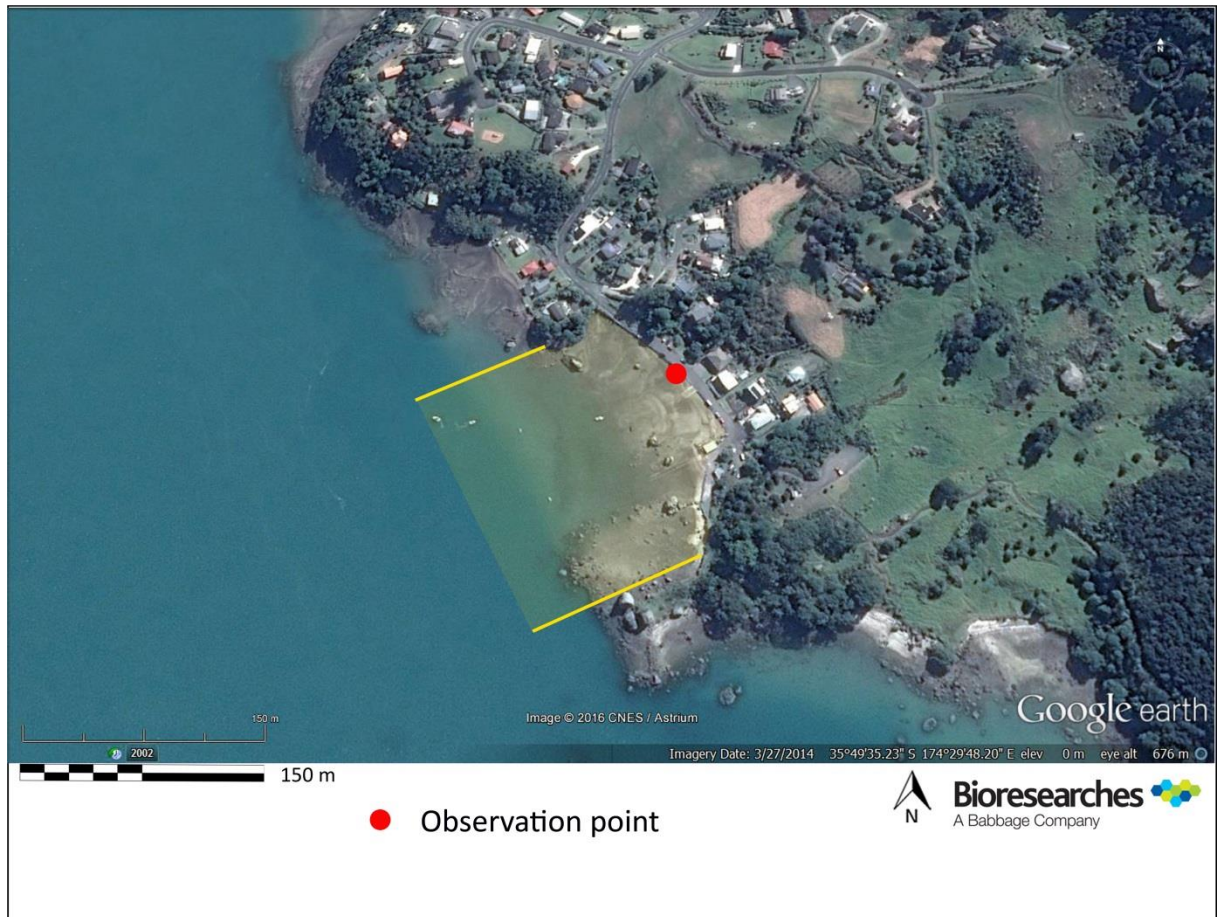


Figure 6. Survey Area at Reotahi Bay.

A total of six species were recorded – black-backed gull, caspian tern, red-billed gull, variable oystercatcher, white-faced heron and white-fronted tern. Of those species, one is threatened and three at risk.

Overall the maxima were low with the highest being of red-billed gull (26) followed by white-fronted tern (10) and the rest less than six. The overall average (rounded) was 24 individuals dominated by red-billed gull (77.6%) and white-fronted tern (10.0%) with the remaining species less than 7%.

The Bay was used almost exclusively for resting (in the intertidal area) or roosting on poles, boulders and trees, a combined total of 98.2%.

3.3.7 Taurikura Bay

The Bay (Figure 7) contains a combination of rocky and soft intertidal habitat.



Figure 7. Taurikura Bay and McKenzie Bay Survey Areas.

Over the two (2015 and 2016) surveys a total of 11 species was recorded that included two threatened species and three at risk species. The species recorded were australasian gannet, black-backed gull, caspian tern, kingfisher, little shag, pied shag, red-billed gull, reef heron, spur-winged plover, variable oystercatcher and white-faced heron.

The maxima were low with the highest being for red-billed gull - 24 in 2015 and 29 in 2016; other species were less than 10 and 6 respectively.

The average numbers were 23 (2015) and 30 (2016) and dominated by red-billed gull at 71.9% and 80.3% of records respectively. The second most dominant species was variable oystercatcher with 8.1 and 7.7 respectively i.e. 8 individuals in each survey.

Habitat use was biased toward resting in both 2015 and 2016 with 75.9% and 82.4% resting respectively.

Overall the 2015 and 2016 results were similar inferring a consistency to bird use of Taurikura Bay in the March period.

3.3.8 McKenzie Bay

McKenzie Bay is a small, enclosed area of habitat that was utilised by low numbers and a low diversity of species.

Birds recorded were black-backed gull, caspian tern, red-billed gull, variable oystercatcher and white-faced heron that included one threatened and two at risk species.

The rounded average number of birds was 2 in 2015 and 3 in 2016; the dominant (consistent) species overall was variable oystercatcher and resting and roosting were the dominant habitat use activities at 96.9%.

3.3.9 Urquharts Bay

The Bay is relatively large and comprises both rocky and soft intertidal substrate dominated by the latter.

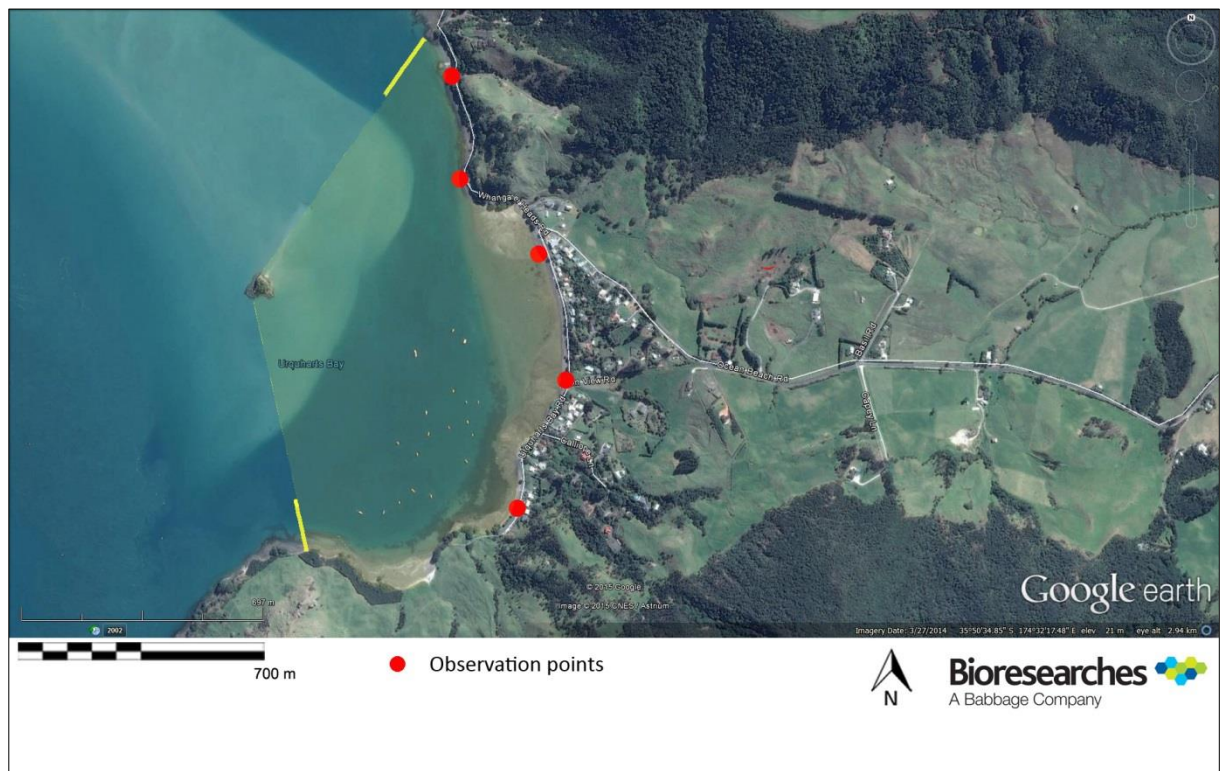


Figure 8. Urquharts Bay Survey Area.

A relatively high total of 12 species was recorded, considering the limited habitat, over the 2015 and 2016 surveys including two threatened and five at risk species.

The population recorded consisted of australasian gannet, black-backed gull, caspian tern, little shag, pied shag, red-billed gull, reef heron, South Island pied oystercatcher, spur-winged plover, variable oystercatcher, white-faced heron and white-fronted tern.

As at both Reotahi and Taurikura Bays, the highest maxima at Urquharts Bay were for red-billed gull (51 : 2015; 37 : 2016) with about equal maxima for black-backed gull and variable oystercatcher. Little shag was notably common overall.

The average number of individuals was 77 in 2015 and 50 in 2016. The dominant species were consistent in terms of percentage occurrence. Notably, 8.9% of records in 2016 were for little shag but only 2.4% in 2015; little shag commonly roosts on vessels in Urquharts Bay.

The total percentage occurrence of gulls illustrates the typical population in the Bay with 66.6% in 2015 and 69.7% in 2016 (red-billed plus black-backed gull). That is largely reflected in the habitat use data with resting and roosting the main activity – 70.1% : 2015; 74.4% : 2016. However the proportion of feeding (29.9% : 2015 and 25.6% : 2016) was relatively high. Marsden Bay, which contains both feeding and high tide roosting habitat, has c.24% feeding and c.76% resting and roosting activity.

3.3.10 Comparative Population Composition and Habitat Use

The following summarises the percentages of wading birds versus gulls in the survey area and the percentages of feeding versus resting/roosting. McKenzie Bay is excluded because of low numbers.

TABLE 1 – COMPARATIVE POPULATION COMPOSITION AND HABITAT USE

	Bream Bay Beach	Mair Bank	Refinery Jetty to Northport	One Tree Point	Snake Bank	Reotahi Bay	Taurikura Bay	Urquharts Bay
% feeding	11.8	18.0	1.5	47.6	63.5	1.8	20.9	23.3
% resting/roosting	88.2	83.5	98.5	52.4	36.5	98.2	79.1	76.7
% wading birds	13.3	16.1	65.1	34.4	84.2	4.2	12.1	23.9
% gulls	74.0	82.9	31.0	42.3	12.9	84.4	81.1	68.2

Where several surveys have been completed, an overall percentage is presented. Table 1 presents an overall reference that is useful in the effects analysis below by identifying the areas where feeding was predominant with that activity likely to be the more susceptible to any habitat changes. The activity can be matched with the overall population composition. For example One Tree Point and Snake Bank stand out as key feeding habitats for reasonably high proportions of wading birds whereas the Refinery Jetty to Northport and Reotahi Bay are not notable feeding areas. Areas clearly dominated by gulls are Bream Bay Beach, Mair Bank, Reotahi Bay, Taurikura Bay and Urquharts Bay.

3.4 PELAGIC BIRDS

Pelagic species recorded in the outer Harbour and Bream Bay are also addressed in the Bioresearches literature review (2015). A total of 17 species had been recorded in the literature; of those species one is considered threatened (flesh-footed shearwater) and eleven at risk – little penguin, sooty shearwater, little shearwater, Pycroft's petrel, fairy prion, fluttering shearwater, northern diving petrel, white-faced storm petrel, Buller's shearwater, giant petrel and shy mollymawk.

Other, non-threatened species recorded are – australasian gannet, arctic skua, black-winged petrel, grey-faced petrel and eastern yellow-nosed mollymawk.

The literature indicates that Bream Bay is utilised for feeding by the above species either regularly or on a seasonal basis.

Observations of three pelagic species have been provided by Margaret Hicks as follows:

- (i) From September onwards, large numbers of Australasian gannets feed in the vicinity of the Ruakaka Estuary mouth and an extensive area to the north of the mouth. Ms Hicks reports that advice from the Department of Conservation is that the gannets are from the Poor Knights Islands colony.
- (ii) Little penguins, possibly mainly juveniles, are common in the northern part of Bream Bay especially in spring and summer; dead individuals are commonly found washed up on Bream Bay Beach. On 9 November 2015, between Mair Road and Northport, four dead little penguins and one dead fluttering shearwater were recorded. The observations are also endorsed by the results of regular surveys of beach wrecked birds undertaken by the Northland Region of the Ornithological Society of New Zealand and published in their newsletter Amokura. For example in February 2007 a notable beach wreck of 258 little penguin was recorded between Mair Road and Mangawhai (Amokura, 2007). Other commonly beach wrecked birds are flesh-footed shearwater, Buller's shearwater, sooty shearwater, fluttering shearwater, common diving petrel and australasian gannet, however numbers and species are both highly variable.
- (iii) In April hundreds of fluttering shearwaters are typically observed in Bream Bay in the area off Bream Bay Beach between Sime Rd and Mair Rd and they also enter the Mair Bank and outer Harbour open water areas.

There is a high diversity of species that utilises Bream Bay's open water habitat; several of those species have been observed to occur in high numbers close to shore at various times.

3.5 BREEDING SEASON SURVEYS

The “breeding season” for shorebirds was considered to be from August/September to December/January acknowledging that some species exhibit breeding outside that period. The surveys described below were undertaken in November 2015 and results are shown on Figures 9 & 10.

3.5.1 Mair Road to Northport

The section of foreshore was inspected on foot on 9 November 2015. No nesting birds were present along the foreshore.

3.5.2 Marsden Point to Refinery Jetty

The use of this area by breeding birds was documented on 9 and 24 November 2015. The decision to survey this area was based on known breeding of NZ dotterel in particular within the RNZ grounds and the possibility that early nesting in the area may have occurred prior to 9 November.

This section of coastline was used by a pair of NZ dotterel for juvenile rearing with three juveniles present on 9 and 24 November. Secondly a maximum of four adults were recorded feeding along the intertidal habitat and returning to within the Refinery grounds.

The area was also utilised by variable oystercatcher for juvenile rearing and adult feeding with a total of four adults and two juveniles recorded.

3.5.3 Refinery Jetty to Northport

No juveniles of either NZ dotterel or variable oystercatcher were recorded and the feeding frequency of adults of both species was low. In comparison the adjacent Marsden Point to Refinery Jetty area had the greater “intensity of use” during the breeding season period surveyed.

3.5.4 Darch Point to Home Point

This area contained a high diversity of potential breeding habits – rocky outcrops, overhanging trees (especially pohutukawas), caves, rock platforms, Harbour edge scrub and sandy beach.

The following nesting was recorded:

Western end Reotahi Bay	<ul style="list-style-type: none"> • variable oystercatcher on rocky outcrop (1 pair)
Motukaroro Island	<ul style="list-style-type: none"> • little shag (dominant) and pied shag in pohutukawas (10-15 pairs) • variable oystercatcher on rock platform (1 pair) • reef heron probable outside a small cave
McKenzie Bay east	<ul style="list-style-type: none"> • variable oystercatcher in high tidal boulders (1 pair)
Calliope Island	<ul style="list-style-type: none"> • black-backed gull and variable oystercatcher on rock platform (1 pair of each)
Urquharts Bay South	<ul style="list-style-type: none"> • pair variable oystercatcher + 2 juveniles
Home Point	<ul style="list-style-type: none"> • little shag and pied shag in pohutukawas (10-15 pairs)

3.6 HARBOUR PENGUIN SURVEYS

Preliminary surveys in the November-December 2016 nesting period concluded that a population of little penguin is utilising the area between Busby Head and McLeods Bay. Nesting is considered highly probable on the mainland between McLeods Bay and Reotahi Bay, and on High, Calliope and Motukaroro Islands. A minimum population of 12 nesting pairs is estimated from the initial surveys (Bioresearches, December 2016).

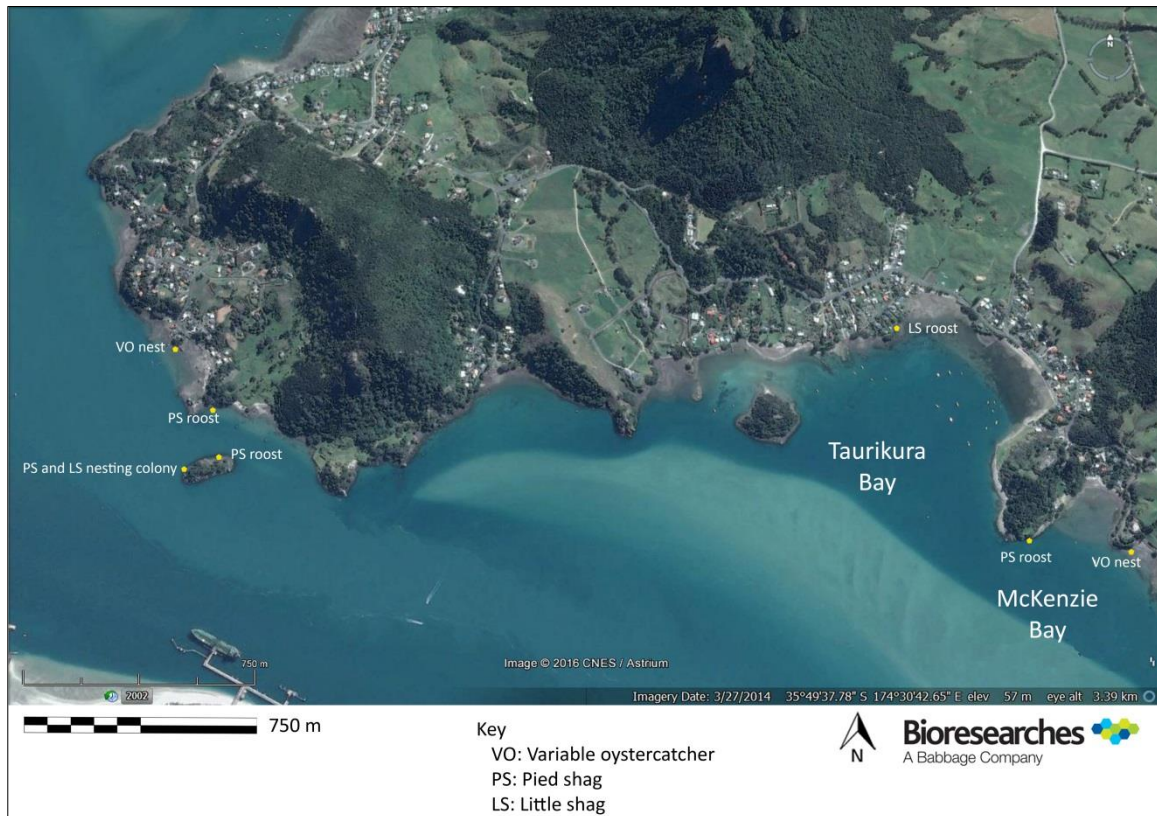


Figure 9. Breeding activity recorded from Reotahi Bay to McKenzie Bay

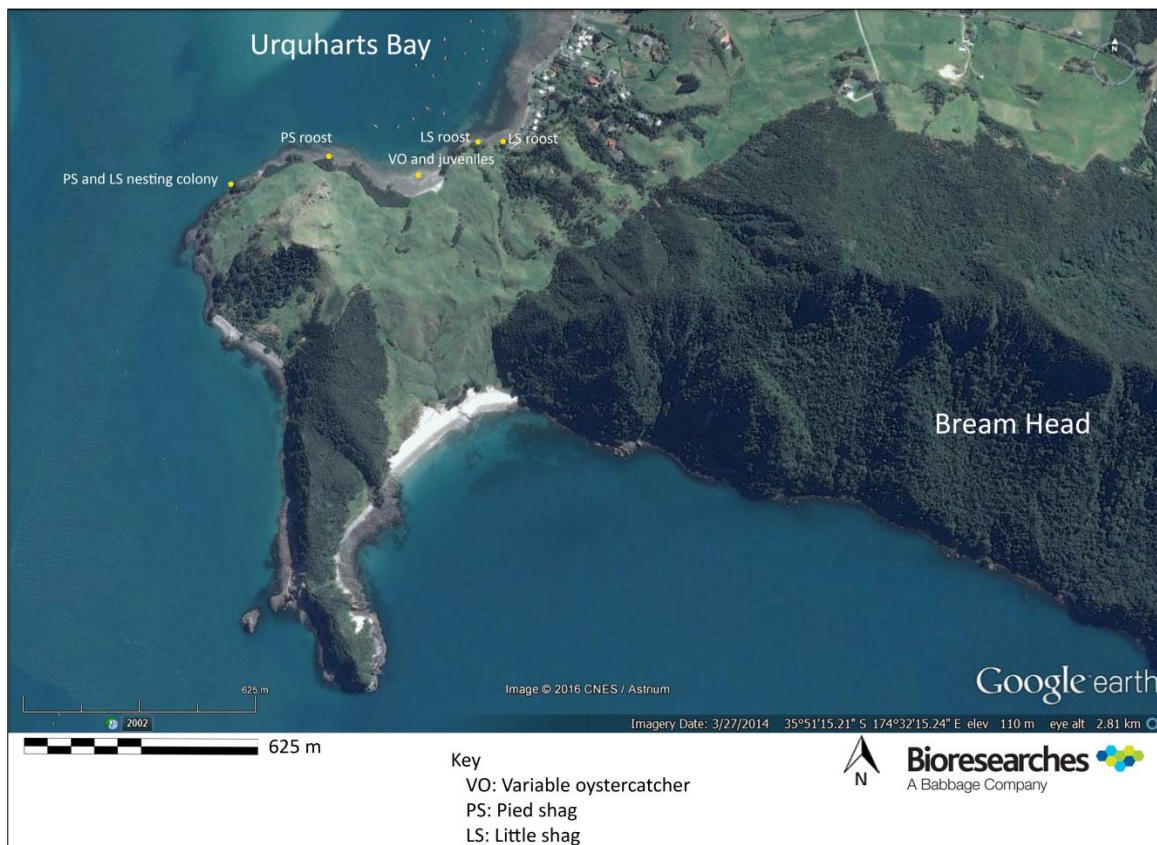


Figure 10. Breeding activity recorded from Urquharts Bay to Home Point.

4. AVIFAUNAL VALUES AND HABITAT SIGNIFICANCE

4.1 INTRODUCTION

The operative Regional Coastal Plan (RCP) for Northland refers at Section 9.2 to Habitats of Indigenous Fauna i.e. “all fauna associated with estuarine or marine habitats other than those known to be introduced by man. This includes resident and migratory birds, fish and marine mammals”.

Relevant to coastal birds, intertidal habitats include:

- sand flats and banks
- beaches
- rocky shores

Subtidal habitats also involve the full range of types (i.e. soft bottom open coasts to shallow and deep rocky reefs and flats) that are relevant to open water pelagic species.

A significant threat to habitats of indigenous fauna noted in the RCP is “dredging and dredge spoil disposal.”

A Policy (9.2.4.1) relevant to this assessment is “to identify habitats or habitat areas of indigenous fauna that have moderate, moderate high, high or outstanding value within Northland’s coastal marine area and protect these from adverse effects of subdivision, use and development.”

Method 9.25.2 of the RCP states that “assessments of significance should include the criteria listed within the appendices.” Appendix 9 – Criteria used to determine areas of important conservation value – lists 9 criteria including (3) Protected areas (4) Wetlands, Estuaries and Coastal Lagoons, (5) Marine Mammals and Birds and (6) Ecosystems, flora and fauna habitats. Specifically, Criterion 5(b) concerns “habitats of endangered, vulnerable, rare or threatened bird species” and Criterion 5(c) refers to “important roost sites, or feeding areas of wading birds”. The assessment of avifaunal values and habitat significance has considered the criteria and policies of both the RCP and NZCPS; in combination, both documents capture the features that need to be considered.

The draft Northland Regional Plan identifies significant bird areas in the Whangarei Harbour. Those within the survey area for this project are Snake Bank, Marsden Bay to One Tree Point; the Northern Coastline – Darch Point to Busby Head, Mair Bank – Marsden Point and the nearshore area of Bream Bay Beach and Mair Bank across to Busby Head and thence to Bream Head. (Note: the Plan's provisions are currently draft and have no legal effect).

Two habitats within the area of interest for this project that are not annotated as significant bird areas are (i) the wider Bream Bay pelagic habitat and (ii) the intertidal area between the Refinery Jetty and Northport.

The most recent Harbour – wide assessment of its avifauna is that of Pierce, 2005 for Northland Regional Council in the context of a proposed reclassification of a substantial part of the harbour as a Marine 1 (MM1) Area.

Key locations identified in Pierce 2015 were as follows:

- (i) Tidal flats of Marsden Bay (including mangroves) and One Tree Point.
- (ii) Mair Bank and Snake Bank
- (iii) Northeastern Harbour beaches and headlands i.e. Darch Point to Home Point in this assessment.
- (iv) Islands used for breeding: Motukaroro, High and Calliope.

In addition the area from Home Point to Busby Head, including Frenchman Island, was identified as a key location. Pierce, 2005 concluded that regarding the key areas, “habitat and avifaunal values are particularly high at these sites and they require ongoing protection via the RMA and other statutory means.”

On the basis of the recent literature reviews, surveys specific to this project and surveys completed in Marsden Bay almost annually in the 2002-2015 period, the following values are assigned to the key locations identified in Pierce 2005.

- (a) Tidal flats – Marsden Bay to One Tree Point: of regional significance and of high value in an outer Harbour context.

- (b) Mair Bank : national significance and part of Snake Bank: regional significance and of high value in an outer Harbour context.
- (c) Northeastern Harbour beaches and headlands: national significance in parts in the breeding season because of nesting by threatened and at risk species. Of local significance outside the breeding seasons and vary between low and high value in the context of the outer Harbour.
- (d) Islands – Motukaroro; High and Calliope: significance as for (c) above. Frenchman Island, adjacent to Busby Head, would also be of national significance in the breeding season (as indicated on Figure 11).

The additional areas of significance identified in this survey are Bream Bay pelagic habitat and the upper intertidal habitat adjacent to Northport. The Bream Bay area is of national significance for seabirds being in close proximity to breeding habitats at the Bream Head Scenic Reserve and the Hen and Chicken Islands. The area of the Refinery Jetty to Northport shoreline that is used for high tide roosting is considered to be of regional significance during high tide periods only, but is otherwise of low coastal bird value based on the field investigations completed for this project.

The following assessment of values addresses each survey area and integrates the information from the Regional Coastal Plan, draft Northland Regional Plan, Pierce 2005 and the specific surveys undertaken for this project.

Sections 3.2 to 3.10 inclusive address the avifaunal values of the various surveyed areas that apply during most of the year i.e. their general values based on feeding, resting and roosting. Section 3.11 considers pelagic species including the close proximity of nationally important seabird breeding colonies. Section 3.12 addresses breeding activities as a separate consideration because, rather than any area supporting exceptionally large colonies, the breeding recorded occurred in discrete, relatively small areas and at isolated nesting sites. Those activities increase the values for the duration of the breeding season only eg scattered individual variable oystercatcher nests. A summary of avifaunal habitat values is shown as Figure 11.

4.2 BREAM BAY BEACH

The c.2450m section of Beach in the vicinity of Mair Road is open coastline habitat that was utilised by a low diversity and relatively low numbers of coastal birds. It did not contain a high tide roost for wading birds and was not used by significant numbers of birds for feeding either in its intertidal habitat or nearshore open water habitat. It is accepted however that pelagic species use the nearshore areas for feeding at times (refer 4.11 below).

The intertidal habitat is similar to that along about 30km of Bream Bay from Marsden Point to Bream Tail, has relatively low coastal bird values and is considered of local significance only. However, that assessment excludes both Ruakaka and Waipu River mouths and estuaries that have very high coastal bird values in a national context. The River mouth habitats were not surveyed because they were considered too remote from potential works areas. Based on the project description and proposed disposal areas (i.e. disposal areas 1, 2 and 3.2) the probability of the river mouths and estuaries being adversely affected is remote.

4.3 MAIR BANK

The three surveys indicated that Mair Bank complex was a notable high tide resting area for black-backed gull and a key low tide feeding habitat for variable oystercatcher as a result of its pipi beds. The surveys showed that the two outer banks (Figure 2) are the most utilised feeding habitats and are therefore the highest value areas within the context of the entire Bank. Mair Bank presents a habitat that is different from habitats of both Bream Bay Beach and inside the Harbour entrance. Mair Bank is a sand and shell ebb-tidal delta swept by strong currents and contains shellfish beds whereas Bream Bay Beach is an open, sandy surf beach. The Taurikura to Home Point area is relatively sheltered and contains a diversity of soft sediment and rocky habitats. Overall Mair Bank is considered a nationally significant coastal bird habitat. A key feature of Whangarei Harbour is that it is the third ranked wintering site in New Zealand for variable oystercatcher (Dowding and Moore 2006). The present surveys showed that Mair Bank is a key feeding area for variable oystercatcher and that raises the significance of the Bank. The potential risk of an adverse effect on Mair Bank is high because of its proximity to the works and its use for feeding.

4.4 REFINERY JETTY TO NORTHPORT

This area of coastline presents poor quality feeding habitat but is a notable high tidal roosting area and supports a significant portion of the outer Harbour's variable oystercatcher population at high tide. Other roosting and resting birds were South Island pied oystercatcher, red billed gull and white-fronted tern. The area is of significance in the context of the outer Harbour and functions as an alternative to the Marsden Bay high tide roosting areas. It is of regional significance during high tide periods as a roosting site for threatened and at risk species but is otherwise of local significance only. The potential risk is considered low-moderate because the area is used mainly for roosting and resting.

4.5 ONE TREE POINT

The coastline from the western side of Marsden Bay to One Tree Point contrasts with the above (4.4) area in that it is a significant outer Harbour feeding and resting habitat in the context of the Harbour, but does not contain a high tide roosting area, the closest of which is in the contiguous Marsden Bay. Notable numbers of black-backed gull and white-fronted tern were recorded but the maxima of five typical wading species were lower than recorded in Marsden Bay. Both the Bay and the One Tree Point area are "stepping stone" habitats to Snake Bank in particular. The Marsden Bay – One Tree Point – Snake Bay complex is considered a regionally significant coastal bird habitat. The overall risk is considered low because it is removed from the works area.

4.6 SNAKE BANK

The southern part of Snake Bank supported a low species diversity but a high number of feeding South Island pied oystercatcher. The southern part of the Bank is a significant outer Harbour feeding area in the context of Whangarei Harbour especially in tandem with the Marsden Bay to One Tree Point habitats and in this survey, particularly for South Island pied oystercatcher. The Marsden Bay – One Tree Point – Snake Bank complex is considered a regionally significant coastal bird habitat – separating out individual areas is arbitrary and not appropriate in the context of a functioning habitat. The overall risk is considered low because it is removed from the works area.

4.7 REOTAHİ BAY

Reotahi Bay supported a low number and low diversity of birds dominated by red-billed gull and is used mainly for resting and roosting. It is not a notable local feeding habitat and is not a significant coastal bird habitat in general relative to the NZCPS (i.e. for feeding, resting and roosting) outside of the breeding season the details of which are provided in Section 4.12 below. The risk is considered low-moderate because it is close to the works but is mainly used for resting.

4.8 TAURIKURA BAY

The results of Taurikura Bay (also dominated by red-billed gull) recorded in 2015 and 2016 were consistent and indicated that the Bay does not contain significant intertidal feeding habitats or a notable high tide roost. In the context of the northern shoreline and the NZCPS it is a low value coastal bird habitat. All the remaining northern Bays (McKenzie, Taurikura and Urquharts) are considered low risk areas because they are removed from the works area.

4.9 MCKENZIE BAY

The McKenzie Bay results were consistent in 2015 and 2016; it provides limited habitat that supports a low diversity and very small number of coastal birds. It is not a significant coastal bird habitat in the context of the northern shoreline and the NZCPS in general outside the breeding season, the details of which are provided in Section 4.12 below.

4.10 URQUHARTS BAY

The results for Urquharts Bay were also consistent in 2015 and 2016 and indicate that the Bay supports a relatively diverse avifauna although dominated by red-billed gull. It provides feeding habitat for variable oystercatcher and resting habitat for red-billed gull and is a favoured local area by little shag. It is in close proximity to Mair Bank feeding habitats and overall is a notable habitat for coastal birds but only in the context of the outer Harbour and the NZCPS outside the breeding season, the details of which are provided in Section 4.12 below.

4.11 PELAGIC BIRDS

Bream Bay supports a relatively high diversity of pelagic birds including threatened and at risk species, some of which can be present in high numbers eg little penguin, australasian gannet, fluttering shearwater. It is in close proximity to known seabird breeding colonies within Bream Bay Scenic Reserve and the Hen and Chickens Islands in particular, together with slightly more distant habitats at the Poor Knights and Mokohinau Islands. Whangarei Harbour and Bream Bay are within a wider area proposed as a New Zealand Pelagic Important Bird Area (IBA) (Gaskin, 2014). Overall Bream Bay is considered a significant habitat for pelagic birds in a national context i.e. it is of national significance relative to the NZCPS (Figure 11).

4.12 BREEDING

“Breeding” is broadly considered to include the period from nest construction and establishment to the fledging of juveniles. The notable breeding activities identified in the survey area (One Tree Point to Darch Point and thence to Home Point) were as follows:

- juvenile NZ dotterel (at risk species) rearing and variable oystercatcher (at risk species) rearing: Marsden Point to Refinery Jetty.
- variable oystercatcher nesting along the northern shoreline – Reotahi Bay, McKenzie Bay East, Urquharts Bay South, Motukaroro and Calliope Islands
- significant shag (little and pied shag – the latter an at risk species) colonies at Motukaroro Island and Home Point.
- inferred nesting by reef heron (threatened species) – Motukaroro Island.

In addition there is a very high probability of the survey areas being used for nesting by little penguin (at risk species) based on the literature review completed by Bioresearches in 2015 and the November–December 2016 surveys. Potential breeding habitat for little penguin is not shown on Figure 11 but would potentially involve all areas of shoreline.

On the basis of known and probable nesting and juvenile rearing in the survey area of one threatened and four at risk species, together with reported additional breeding

from Home Point to Bream Head, the area as a whole is considered to contain significant breeding habitats in a national context i.e. relative to the NZCPS. [(Policy 11(a) (i) and Policy 11 (b) (ii)]. That value differs from the general value of the areas as coastal bird habitat because it refers to the duration of the breeding season for each species only, but could not be necessarily applied to the habitat outside the breeding season. As a result of recorded breeding by species that are “at risk” or “threatened” on a national basis in the 2016 surveys, the following areas are of national importance, at least in part, during the breeding season of the species concerned – Marsden Point to Refinery Jetty, Reotahi Bay, Motukaroro Island, McKenzie Bay East, Calliope Island, Urquharts Bay South and Home Point.

Tree nesting pied shags (Motukaroro Island; Home Point) can lay clutches all through the year. New Zealand dotterel (Marsden Point to Refinery Jetty) that is “ground-nesting” has a breeding season extending from about August to December. The similarly ground-nesting variable oystercatcher (Reotahi Bay, Motukaroro Island, McKenzie Bay East, Calliope Island, Urquharts Bay South and Marsden Point to Refinery Jetty) has an approximate September to March inclusive breeding season.

Little penguin can be present at nesting burrows in all months except April and May.

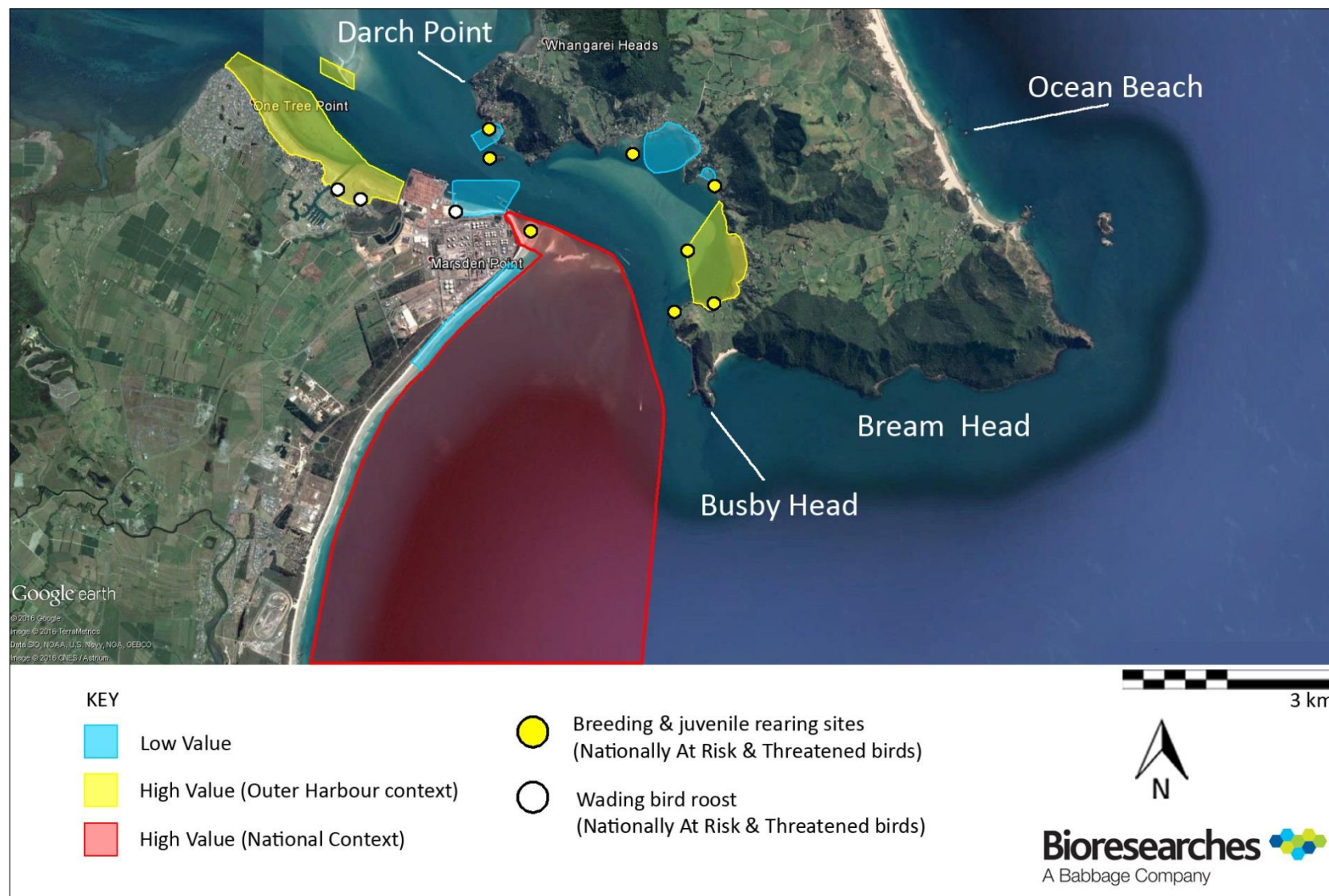


Figure 11. Overview of coastal bird values.

5. AVIFAUNAL EFFECTS

There may be effects during the consent period (limited to a maximum of 35 years by section 123 RMA) as a result of climate change. For shorebirds that could include direct effects (changes to rainfall, temperature, wind conditions, solar radiation) and indirect effects – habitat changes eg loss of intertidal flats, saltmarsh and rocky shorelines; alteration to invertebrate prey distribution and abundance; changes to predator populations; changes to both South Island breeding and feeding areas and North Island feeding areas (eg South Island pied oystercatcher). For eastern bar-tailed godwit that breeds in Western Alaska, climate change is likely to affect birds at all stages of their annual cycle ie in New Zealand, along the East Asian-Australasian Flyway and in Alaska – tundra vegetation encroachment on nesting habitat, asynchronous food production at breeding sites, loss of intertidal foraging areas and changes to synoptic weather patterns adversely affecting migratory flights.

Pelagic species will also be subject to changing climatic conditions, air temperature, sea temperature and freshwater inputs for example, all of which could affect marine productivity and food availability. Overall, the aspects listed as (i) to (iii) inclusive below could be affected by climatic change (East Asian-Australasian Flyway Partnership e-Newsletter, No.42, May 2017, Barbraud et al, 2012; Mustin et al 2007; Piersma & Lindstrom, 2004; Rehfish & Crick, 2003; www.nzbirdsonline.org.nz).

Although effects as a result of climate change are probable, those effects are unlikely to be exacerbated by this Project.

5.1 DISCOUNTED EFFECTS

The Project will not result in the following issues that are relevant to coastal and pelagic birds

- (i) there will be no permanent loss of feeding habitat
- (ii) no intertidal roosting site for shorebirds will be removed or adversely affected to the degree that it is no longer used.
- (iii) no nesting habitat will be adversely affected
- (iv) there is no concern regarding sediment contamination or any contaminant release that could affect marine habitats and organisms relied on for food. This

includes the potential for avifauna to be impacted by bioaccumulation of contaminants.

- (v) there is no concern regarding the avifaunal effects of intermittent maintenance dredging
- (vi) there will be no adverse effect as a result of the erection and maintenance of navigational aids.

5.2 POTENTIAL ISSUES

The potential issues regarding the avifauna arising from the Project are as follows:

- (i) turbidity increases in the dredging and disposal areas
- (ii) deposition of resuspended sediment on soft substrate and hard substrate intertidal habitats
- (iii) increase in vessel movements
- (iv) vessel lighting
- (v) underwater noise
- (vi) cumulative effects

These potential issues are discussed below.

5.2.1 Turbidity Increase

5.2.1.1 Capital dredging

The dredging area totals 1.95 km² of seabed that will be excavated on a continuous (24 hours, 7 days per week) basis for about six months. The uncontaminated sediments contain less than 6% silt (Coffey 2016). Modelling has indicated that the Trailing Suction Hopper Dredger (TSHD) sediment plumes will not disperse to adjacent beaches, sand banks or marine management areas (MetOcean, 2016).

The risk of intertidal deposition of sediment will increase in the smaller berth pocket area that would be excavated with backhoe and barge equipment (BHD). That risk may result in the operation being restricted to slack water or ebb tide periods (Tonkin and Taylor, 2016).

It is clear, however, that there will be a continual increase in the turbidity in the immediate vicinity of the dredger for the duration of the dredging which is unavoidable, in contrast to the short term, temporary increase in turbidity at the disposal sites during each spoil release.

The 2000 – 2010 average range of turbidity from One Tree Point, Marsden Point, Mair Bank and Snake Bank is 0.5 to 7.5 NTU with a grand median for those sites of 1.3 NTU (Coffey, 2016; Table 2).

The comparable secchi disk values are 1.5 to 7.5m with a grand median of 3.9m i.e. water clarity is generally excellent in these areas.

In contrast, turbidity may decrease significantly in inner Bream Bay following heavy rainfall where a level of 23.7 NTU has been recorded (Coffey 2016).

For this Project the trigger level threshold for the turbidity entering the Marine 1 Management Areas is 15-20 NTU and 15-20 g/m³ suspended solids [i.e. Motukaroro Island, Mair Bank, Calliope Bank (northern bays) and the Home Point to Busby Head coastline].

At the Port of Melbourne a similar water quality threshold was set for a channel dredging project at 25 g/m³ suspended solids and 17 NTU. Those thresholds were aimed at protection of feeding areas of crested tern (*Sterna cristata*) and australasian gannet (*Morus serrator*) (Sagar, 2011).

The birds that will be affected by an increase in turbidity are visual fish feeders (eg little penguin, australasian gannet, white-fronted tern, caspian tern, red-billed gull and the shag species).

Firstly an increase in turbidity may impair their ability to see and capture fish and fish may avoid areas of higher turbidity reducing the available area of feeding habitat. In general the effects of increased turbidity and suspended solids on foraging seabirds are not well known (Michel et al 2013).

The use of vision by birds to locate food aggregations and capture prey is well known however (eg Wells et al, 2016; Thiebault et al, 2014; Stempniewicz et al, 2013) and the occurrence of a continual plume of elevated turbidity is considered to present a

potential adverse effect, but only to a limited number of species and only while the dredge is operating.

A vulnerability assessment was undertaken by Cook & Burton, 2010 in the context of marine aggregate extraction. Some of the affected species are analogous with birds that occur in the Project's dredging area. The conclusions were as follows:

Northern gannet (*Morus bassanus*; compared with australasian gannet *Morus serrator*) were considered relatively insensitive to the dredging operation and associated shipping. "Their wide foraging means that despite being moderately sensitive to increased sedimentation and impacts to the benthos or associated fish communities, the vulnerability of Gannets to these issues has been assessed as being very low. Despite using vision whilst foraging their vulnerability to increased turbidity has also been assessed as being low." This conclusion is considered to have a high level of application to australasian gannet.

Similarly the effects on overseas shag species have application to shags in the Project area. European or common shag [(*Phalacrocorax aristotelis*) cf pied shag and little shag in particular; *Phalacrocorax varius* and *Phalacrocorax melanoleucos* – nesting colonies present] "Despite being highly sensitive to some aspects of marine aggregate dredging, notably disturbance and the issues related to shipping, the exposure of the European Shag to dredging operations is low. Consequently European shags have been assessed as being of low vulnerability to all of the issues associated with marine aggregate extraction."

This conclusion is considered to have a low to moderate level of application because of the recorded degree of use of the Darch Point to Busby Head area by shags and the presence of nesting colonies of pied and little shag at Motukaroro Island and Home Point. There is the potential for an adverse effect on an at risk species (pied shag) through a decreased level of feeding efficiency. The reduced efficiency to capture prey (small fish) could result from a combination of impaired underwater vision and avoidance of feeding areas close to the nesting sites by small fish. Those factors in isolation or combination would lead to a decrease in feeding efficiency and therefore the ability to sustain juvenile shags.

The potential effect would apply to the nesting periods that can be variable and extended but generally peak in the spring-summer. “Some little shags begin nesting in July or August, while others join the colony later and breeding can extend to April or May. Peak activity occurs in October-December.” Regarding pied shag – “Clutches are laid in all months, with peaks during February-April and August-October” (nzbirdsonline.org.nz).

In general, gulls are likely to be of low sensitivity to the effects of dredging activities as they have a broad diet and are able to use a wide variety of habitats (Cook & Burton 2010). Although this conclusion has a high level of application to red-billed gull, an effect is most likely during the breeding period (“They have an extremely long egg-laying period that can extend from mid-September to January” – nzbirdsonline.org.nz). A nationally significant nesting colony is present within the RNZ grounds.

There are two species of terns that are common in the dredging area, white-fronted and caspian, both of which dive for small fish. Cook and Burton 2010 comment on terns as follows “As they are constrained by a short foraging range, they are highly vulnerable to reduced food availability”. “Thus any changes in food availability at a local level could have a dramatic impact on populations. As they require clear water for foraging (Essink, 1999) terns may thus be particularly sensitive to the turbidity caused by dredging operations and the re-suspension of sediment.” An increase in turbidity has been suggested as resulting in the reduced breeding success of sandwich tern (*Sterna sandvicensis*) in the Dutch Wadden sea as a result of adults having to fly a greater distance from the breeding colony to obtain food for their young (Essink, 1999).

In the case of the dredging area effects of this Project, the level of application is considered relatively low because both white-fronted and caspian terns will range both up the Harbour and out into Bream Bay to feed. Both species use the intertidal area, especially Refinery Jetty to Northport, for resting, while white-fronted tern commonly uses the Refinery Jetty for roosting.

In general, however, terns can be considered as being moderately to highly vulnerable to the effects of impacts on the benthos and associated fish communities, and highly vulnerable to increases in turbidity (Cook and Burton, 2010).

The species and groups of birds discussed above are all able to fly and therefore move rapidly away from visually unsuitable feeding conditions. There will be sufficient areas of habitat containing typically high clarity water close to the dredging area to prevent a significant adverse effect in general, however, a caveat applies to nesting shags, gulls and terns during the main breeding period when feeding efficiency and energy conservation obtaining food can be critical to breeding success and juvenile survival.

Specific instances may arise where greater effort may be required to secure food (eg longer feeding flights; additional feeding time in Bream Bay and beyond). These instances, if any, cannot be defined precisely but are unlikely to be any greater than the effects caused by natural, seasonal prey variation or poor weather conditions and are unlikely to reduce either breeding success or juvenile survival during the six month period of dredging.

The flightless species using the dredging area footprint is little penguin that hunts prey visually in daylight (squid, small fish) and is likely to nest around the coastline of the islands and northern shoreline. Their behaviour that informs consideration of potential effects in the dredging area is as follows from nzbirdsonline.org.nz.

Eggs are laid from July to mid-November, with additional clutches beginning as late as December. Incubation takes up to 36 days. Chicks are brooded for 18 – 38 days, and fledge after 7-8 weeks.

Little penguins are nocturnal on land. They return to nesting areas at dusk, congregating in small groups, or “rafts” offshore. Rafts usually come ashore together and are comprised of the same individuals each night. They feed at sea as solitary individuals or small groups, rarely more than 6 individuals. They must stay ashore continuously for about 2 weeks during the annual moult (mainly between January and March), when all feathers are replaced simultaneously.

During the breeding season little penguins forage within 20 km of the colony, pursuit diving for prey generally in waters less than 50m deep. Their diet is composed of varying proportions of small shoaling fish, squid and crustacean species. Important prey items include arrow squid (*Nototodarus sloanii*), slender sprat (*Sprattus antipodum*), Graham's gudgeon (*Grahamichthys radiata*), red cod (*Pseudophycis bachus*), ahuru (*Auchenoceros punctatus*) and stomatopod larvae. (nzbirdsonline.org.nz).

The concern with the dredging footprint is primarily the disruption to breeding penguins commuting between inner Harbour nesting habitats and feeding areas (i.e. probably, Bream Bay).

Although little penguins are typically seen on the water surface, the deepest dive recorded in New Zealand waters is 35m with an average dive of 5.2 – 6.4m (Doc 2015). The deepest dive recorded was at Phillip Island, Australia at 66.7m (Ropert-Coudert et al 2006), however most dives did not exceed 50m. NZ little penguins spend about 60% of their time below 1m depth while at sea.

There are two main phases of little penguin breeding of concern and during those phases behaviour can be quite different. The two phases are egg incubation and the chick-guard stage both of which are shared. In the incubation phase the foraging trips away from the nest averaged 8 days, however, the majority are about 2 – 3 days (Cannell, 2016). During the guard phase the penguins foraged closer to the nesting location and that is driven by the need for penguins to return each evening to feed their chicks (Cannell, 2016). In the guard phase satellite tracking has shown that most penguins undertake one day trips up to 22km from the colony but of a mean maximum distance of 14.2km (Preston, 2007).

The overarching behaviour that could be affected is mid-water to demersal foraging for food (Preston 2007, Preston et al 2007) – they require light penetration through the total water column to forage efficiently since they hunt by sight. Therefore areas affected by a turbidity plume could be rendered unsuitable for foraging by little penguin resulting in temporary displacement from that feeding area and a lower foraging efficiency. That would have potentially adverse effects at a local population

level but not at a national level where the national population is estimated at 50,000 – 100,000 with a world breeding population of c.350,000 – 600,000 individuals (www.penguins.cl/little-penguins.htm). In context any area of disruption is almost certainly likely to be minor relative to the wide feeding area available in Bream Bay out to the Hen and Chickens Islands.

In summary the main concern regarding little penguin is disruption of their passage between shoreline nesting areas and the nearby open water and specifically between the inner Harbour and its entrance.

The recent information on little penguin use of the Harbour is sparse. Pierce 2005 refers to past breeding (i.e. pre 1985) on Calliope Island, High Island, some northern headlands and One Tree Point and notes observations of little penguin at potential nesting areas including Little Munro Bay and McGregors Bay. Pierce, 2005 concludes that the current relative scarcity of little penguin in Whangarei Harbour probably reflects their vulnerability to predators over a long period. No little penguins were observed either singly or rafting in groups during any of the 2015 – 2016 coastal bird surveys. In addition the modification and renovation of residential dwellings on the northern shoreline may have reduced the availability of suitable nesting sites under houses.

However targeted surveys in November-December 2016 at dusk identified a population that could represent at least twelve pairs using the Harbour habitat for nesting and chick rearing. That is a notable result in the context of the Harbour but numbers recorded suggest a relatively low breeding density.

Therefore although a continual but confined plume has the potential to disrupt foraging trips during the breeding season, the risk on a population level is considered low-moderate inside Busby Head on the basis of current information and relative to the adverse effects of storm events as evidenced by beach wreck data.

Recent advice on nesting little penguin beyond the Harbour has been provided by the Ranger, Bream Head Conservation Trust (Riaan Elliot pers comm; email of 3.10.16). Little penguin is known to be currently using the shoreline from Busby Head to Bream Head and around to Ocean Beach (Bream Islands) for breeding although there are no

data on the numbers. The probability of an adverse effect in this area on a local population basis is also considered low because much of the nesting habitat is remote from the works area, it is an open water situation with high dilution and dispersion rates and the probability of a “turbidity barrier” to foraging trips being created is remote; the effects on little penguin nesting beyond the Harbour (ie along the Bream Head coastline) would be less than minor.

Nevertheless there remains a possibility of a short term change to the local little penguin population with respect to effects both inside and outside Busby Head in combination, especially the former.

The characteristics of the sediment plumes associated with the dredging would be as follows (Metocean Solutions 2016): the plumes associated with the drag head are “constrained within the lower water column, with negligible expression in the mid-water and surface levels. In contrast the sediment plumes associated with the overflow phase are spread across the entire water column”. Of note was that the maximum excursion of any plume did not exceed 1200m and was constrained to the channel.

There would be a discrete inner Harbour dredging area to the southeast of Motukaroro Island and more minor works towards Home Point, with the major dredging area being predominantly outside Busby Head.

Therefore the main area of dredging disturbance, albeit temporary, will be beyond the Heads and would not affect the passage of little penguin to and from the Harbour. The turbidity effect of dredging within the Harbour will be temporary and confined to the existing channel i.e. a turbidity “barrier” across the channel at right angles would not be created allowing little penguin to traverse the channel’s edges, especially along the northern side where nesting habitat is more likely. That would avoid a disruptive barrier being created between inner Harbour nesting habitats and open water (Bream Bay) feeding areas. In addition, as noted above, there will be Project-specific turbidity threshold levels that are similar to those aimed at protecting the foraging of terns and gannets at the Port of Melbourne. Finally, although the specific turbidity levels are not known, little penguins have adapted to intermittent, temporary turbidity increases

that would be accommodated during storm events, rainfall events and river discharges.

On balance the Project would be consistent with NZCPS Policy 11 (a) (i) and Policy 11 (b) (ii) and Objective 3.4 and Policy 4.4.1 of the partially Operative Northland Regional Policy Statement ('NRPS') as applied to little penguin and, indeed, to the other bird species that nest within or frequent the outer Harbour and Bream Bay.

It is acknowledged, however, that the behaviour of birds is difficult to predict and it is equally difficult to discount all effects. For that reason, recommendations are presented below for predator control and the installation of little penguin nesting boxes inside the Harbour to mitigate any short term changes that might adversely affect the local breeding population. In the longer term the maintenance of nesting boxes, especially in a predator – controlled area, would be a positive benefit to the Harbour's population, and also to any nesting variable oystercatcher, reef heron and shags.

In summary, without any mitigation the effects on the local little penguin population are concluded to be less than minor; with the initiatives outlined in Section 7.1 the nett result is viewed as ecological enhancement.

5.2.1.2 Disposal Areas

Disposal area 3.2 is 5.75 km² and 45m deep and would be the repository for most of the dredged material. Area 1.2 is 2.5 km² and 7-15m deep.

At Area 3.2 the average mound height would be a maximum of c.4m whereas that at Area 1.2 would average 0.6m and no shoreward migration of sediment that could adversely affect the intertidal habitat would occur.

There is no concern regarding potential contaminant release at the disposal sites and the proportion of silt is low.

The main disposal area is utilised as part of the wider Bream Bay by a relatively high diversity of pelagic birds at times as identified and described in the Bioresearches literature review (2015) and Section 3.4 of this report.

The dredge vessel's slow passage into the release site will disperse any surface resting birds as would the passage of tankers, freighters and other vessels at present. The released sediment will rapidly fall to the seafloor at 45m depth and, because of the low silt content, any adverse effect on water quality is likely to be very localised. At least in daylight there would be nothing to attract birds to the vessel in contrast, for example, with a fishing vessel and the behaviour and presence of birds can be highly variable.

Species such as grey-faced petrel are nocturnally active at breeding sites (April/May and August) but rapidly fly out to the continental shelf to feed. Birds have been recorded flying to the east coast of Australia while their partner is sitting on an egg (nzbirdsonline.org.nz). In contrast, fluttering shearwaters can form large feeding flocks in inshore and harbour waters during the summer (Gaskin & Rayner, 2013) and are typically present off Bream Bay Beach (Sime Road to Mair Road) in April (M. Hicks pers comm).

Similarly large numbers of gannets can be present from Ruakaka Estuary mouth north from September onwards and would extend into Area 1.2.

Therefore while there would be disruption to any feeding pelagic birds by the dredge vessel's passage, the effect would be less than minor on a population level. Similarly the probability of pelagic birds being attracted to the stationary vessel and diving to depths with localised elevated turbidity resulting in an adverse effect, is remote, and any effect would be very low and would not trigger NZCPS Policy 11 (a) (i) or 11 (b) (ii) and cut across Objective 3.4 and Policy 4.4.1 of the NRPS.

5.2.2 Resuspended Sediment Deposition

Based on the modelling results for the dredging area and the disposal areas there is no concern regarding an adverse ecological effect of sediment deposition on adjacent intertidal and subtidal areas that could impact on the feeding areas of coastal birds. There would be no adverse effect.

5.2.3 Vessel Movements

The vessels involved with the Project will not be very different from the range using inner Bream Bay and the Home Point to Busby Point area at present in terms of sizes

and speeds. Large ships utilise the Busby Head to Northport area on a regular basis at present. Similarly, freighters and cement carriers pass through the area en route to the Port of Whangarei and Portland, together with numerous smaller commercial and private vessels. On balance the risk of additional vessel movements resulting in an adverse effect on the avifauna is very low.

Arguably the species most at risk is little penguin but injuries and mortality from fast moving craft are more likely than from the vessels used for this Project. (Canwell 2016). Little penguins can reach speeds of up to 6 kph (3.2 knots) underwater (www.doc.govt.nz/native-animals/birds/birds-a-z/penguins/little-penguin-korora/) and have the ability to deep dive.

On balance any effect would be less than minor, and would, therefore, be in accordance with the direction set by the NZCPS and the NRPS.

5.2.4 Vessel Lighting

Light is well known to attract a variety of marine birds (Montevecchi, 2016). The adverse attraction to vessel lights by seabirds is considered to be more likely in Bream Bay beyond Busby Head. That is because the degree of ambient night lighting within Busby Head is relatively high and contributed by the Refinery, Northport, Marsden Cove, berthed vessels, residential areas and navigational aids.

Beyond Busby Head, however, the potential attraction of seabirds to a vessel dredging, in transit to and from disposal area 3.2 in particular, and stationary over that area, is considered high. Considering the operation is continuous, the potential for an adverse effect is also considered moderate-high but tempered by the fact that large vessels are moored in Bream Bay on a continual basis, 12 months a year in all weather conditions. It is not known whether these vessels are impacted by seabirds however it would be surprising if that were not the case. Nevertheless the dredger will be a large, “resident” vessel and a constant light source. Fishing vessels can also be an attractant to seabirds that impact with their decks at night. The most sensitive seabirds to light attractions are gadfly petrels (*Pterodroma* genus), storm petrels, diving petrels, prions and some smaller shearwater species (Taylor, 2014).

Petrels and shearwaters in particular are described as being very sensitive to artificial light (Le Corre et al, 2002) especially fledglings on their first flight to sea. It is thought that occurs because these species feed on bioluminescent squid and mistake the lights for potential prey. (Le Corre et al 2002). One of the species known to exhibit this behaviour is grey-faced petrel (*Pterodroma macroptera gouldi*) that nests within the adjacent Bream Head Scenic Reserve (Montevecchi, 2006).

The susceptibility of light-attracted seabirds to collision and injury or death is higher on moonless nights or during the hours of darkness when the moon is below the horizon. A critical period is a week either side of the new moon each month, whereas clear starlit nights are less risky because the birds are able to navigate and orientate normally. Similarly heavy fog and rain at night can increase the collision risk (Black, 2005; Thompson, 2013; Taylor, 2014).

Therefore it is concluded that collisions between seabirds and the dredging vessel especially in the areas between Busby Head and disposal Area 3.2 are likely.

From the advice of Taylor 2014 above the more susceptible seabirds are the gadfly petrels, grey-faced petrel (*Pterodroma macroptera gouldi*) that nests within Bream Scenic Reserve, and Pycrofts petrel (*Pterodroma pycrofti*) that nests on the Hen and Chicken Islands.

Shearwaters and diving petrels nesting on the Hens and Chickens Islands and therefore susceptible to collision are as follows -

- flesh-footed shearwater (*Puffinus carneipes*)
- sooty shearwater (*Puffinus griseus*)
- fluttering shearwater (*Puffinus gavia*)
- little shearwater (*Puffinus assimilis haurakiensis*)
- northern diving petrel (*Pelecanoides urinatrix urinatrix*)

Additional susceptible species that nest on the Poor Knights Islands are –

- fairy prion (*Pachyptila turtur*)

- Buller's shearwater (*Puffinus bulleri*)
- white-faced storm petrel (*Pelagodroma marina maoriana*)

The literature review undertaken by Bioresearches (2015) identified one nationally threatened pelagic species (flesh-footed shearwater) and twelve nationally at risk species that are potentially susceptible.

Clearly, but with the caveats on the existing use of the area by large vessels, the risk of an effect on species that are considered nationally threatened or at risk is notable and heightened by the proximity of breeding colonies at Bream Bay Scenic Reserve, the Hen and Chickens Islands and the Poor Knights Islands, and the use of Bream Bay by young, inexperienced birds.

It is understood that there has been no breeding activity by grey-faced petrel on Matakohē-Limestone Island in the inner Harbour in 2016 so that potential risk would not appear to be an issue. Any birds utilising the Island would anyway have acclimated to the ambient light levels of the Harbour environment.

On balance the general risk of light attraction and collision would be similar to that of any other large vessel and would not be significant on a population level but would increase during the post-fledging period. While NZCPS Policy 11 (a) (i) would not be triggered, some management may be appropriate, particularly to achieve the direction set in Objective 3.4 and Policy 4.4.1 of the NRPS.

There are management measures to reduce the attraction of seabirds to a vessel as summarised by Taylor, 2014 in the case of mining on the Chatham Rise and quoted in full. Such measures should be considered as part of a lighting audit (refer section 7.2 below) to address concerns, including for locally breeding grey-faced petrel in the Bream Head Reserve.

- “(a) reduce all unnecessary deck and cabin lighting, cover accommodation windows at night with blinds and curtains;
- (b) where possible, orientate all deck lights so they shine only downwards and shield them to prevent upwards or horizontal light projection.

- (c) use light dimmers and timers to minimise lighting in areas where people are not constantly active;
- (d) trial different light colour options such as green coloured lights in operational areas to reduce overall light intensity levels on the vessel;
- (e) investigate the use of LED floodlights with computer controlled light levels, colours and timers;”

5.2.5 Noise

The noise generation of potential concern would be underwater noise. This is of relevance mainly to species that hunt prey underwater for longer periods than the short dives of birds such as white-fronted tern and australasian gannet. In the project area that will apply to shags and little penguin.

Roger HaskoningDHV advise that the noise generated by a TSHD will be similar to that of a large vessel. Clearly large vessels are common in the Project area at present, the difference being that the noise will be continuous rather than intermittent.

Woehler, 2002 investigated the literature during a study on the underwater hearing abilities of six species of penguin in Antarctica. Only one study was located; Cooper 1982 found that underwater acoustics (killer whale vocalisations or electronic noise) had no effect on cape cormorants (*Phalacrocorax capensis*) or jackass penguins (*Spheniscus demersus*), and concluded that underwater acoustics does not seem to be an efficient scaring technique.

However the present position appears to be that there are no published studies on the effects of underwater noise on birds (McCauley & Kent, 2008) that provide an assurance; however Bream Bay and the Harbour support a diverse and abundant avifauna despite the passage of large ships and numerous smaller vessels. The probability of a noise-induced adverse effect on swimming and diving birds is considered negligible. Noise effects would not cut across the requirements set by either NZCPS Policy or by the NRPS.

5.2.6 Cumulative Effects

On balance it is concluded that the cumulative effects (ie general combined overall disruption) on coastal and pelagic birds and their habitats will be less than minor, especially in the context of existing conditions and activities, and the proposed mitigation.

None of the effects arising from dredging and disposal is particularly novel; large vessels traverse the Whangarei Heads and Harbour area at present on a 24 hour basis and in a wide range of sea states, weather conditions, tidal stages and turbidity levels. There is some information that little penguin nationally is subject to external pressures, including development in the coastal strip. This is evidenced by its 'at-risk' ranking. However, there is no information that the current proposal will have effects – including cumulative effects - on little penguin beyond intermittent, temporary turbidity increases confined to the existing channel. When considered together with the provision of nesting boxes and predator eradication and control proposed by way of environmental enhancement, the effect on little penguin is considered negligible.

6. CONSULTATION AND REVIEW

This assessment has benefitted from discussion (and subsequent provision of information) with Margaret Hicks at an Open Day at NZ Refining on 9 March 2015, and a review by Dr David Thompson, NIWA on behalf of Northland Regional Council.

Comment was also received from tangata whenua regarding coastal birds. While views expressed by tangata whenua regarding the nature and scale of potential effects on birds, and in particular variable oystercatcher, have been carefully considered, they are not consistent with the findings of this assessment. As described above, and following careful assessment and field investigations, the effects on birds is overall held to be less than minor, especially in the context of existing conditions and activities, and the proposed mitigation (refer Section 5.2.6).

With respect to variable oystercatcher, feeding on Mair Bank only occurs when the Bank is exposed. While there may be additional noise from the dredger, acclimation will be rapid and feeding will not be disrupted. The current environment includes movements of ships and other vessels, and a variety of noises. The key variable oystercatcher roost is within 50-100m of the Northport facility (refer Figure 3) and is subject to regular industrial noise, discharges and movement of vehicles, cranes and heavy industry. Indeed there are some variable oystercatcher nests within the RNZ property, which is a heavy industrial site. On balance the likely effects of the Crude Shipping Project on variable oystercatcher will be no more than minor and do not warrant further mitigation.

7. RECOMMENDATIONS AND MITIGATION

7.1 LITTLE PENGUIN

There is sufficient information to indicate that little penguin would be susceptible to a sustained increase in turbidity. The effect is a potential decrease in the foraging efficiency of the penguins which in turn has the potential to impact on juvenile survival and the viability of the local population. Secondly there is a concern, but only at a precautionary level, over the effect of continuous underwater noise during the breeding season. Countering that, the available information indicates that the key breeding area is possibly the shoreline from Busby Head to Ocean Beach rather than inside the Harbour and that on balance, the effect at a population level would be low. However there is clearly a local nesting population within the Harbour and beyond Busby Head, and there remains a possibility that an adverse effect on the breeding success of those populations could occur.

It is further recommended that in consultation with the Department of Conservation the breeding opportunity and potential success of little penguin should be enhanced via predator control and the provision of nesting boxes on Motukaroro Island

Focus should be on Motukaroro Island because it is in a Marine Reserve and is habitat that is readily pest controlled. Motukaroro Island is part of the DoC estate and is not currently pest controlled. Pest eradication is recommended on the Island and along its facing mainland foreshore to minimise pest incursions, commencing 6 months prior to the start of any capital dredging. That should provide a sufficient period in which to eradicate pests and assemble and deploy nesting boxes. The eradication should be paralleled by the establishment of tracking tunnels on the Island to monitor pest presence. The most efficient means for both eradication and subsequent control, especially on the Island, would be via self-setting traps for stoats/rats and possums, with about 5 stations on the Island and 10 on the mainland edge.

Pest eradication should ideally be completed prior to June when little penguins start to utilise their burrows (April – May is the only period when little penguins are unlikely to be present on land.) The pest control should be continued for a minimum of 5 years

to accommodate acclimation to the boxes and allow a positive impact on the local population in pest controlled conditions.

The Island has a total area of about 11321m² (ie 1.13ha). From the literature accessed, a typical maximum density of a mixture of natural burrows and nest boxes is about 0.5 per 100m² or 1.0 per 200 m² (eg Braidwood et al 2011). On that basis there is potential area available on the Island for c.57 nests/breeding pairs. On the assumptions that (a) the twelve pairs observed in the November-December 2016 surveys are typical and (b) for management purposes, all pairs nest on Motukaroro Island, then a theoretical surplus of nesting area for a further 45 pairs would be available.

Motukaroro Island is likely to consist of a relatively rough, rocky surface and the aim of 45 nest boxes may not be practicable. It is recommended that the target is 24 boxes based on an assumed current nesting population of 12 pairs that were observed during the surveys. An increase of 24 pairs would be a significant conservation gain and, in combination with pest eradication and control, would ensure any adverse effect on the local population was negligible.

7.2 VESSEL LIGHTING

In recognition of the high diversity of pelagic species, a relatively high proportion of which have national conservation ratings, the nearby presence of significant seabird breeding colonies and the reported aggregations of pelagic species, a lighting audit of the Project's vessels should be undertaken relative to the potential measures in mitigation listed in Section 5.2.4 above. Where there are deficiencies, those should be rectified where practicable in consultation with the vessel operators.

7.3 GREY-FACED PETREL

The concern with grey-faced petrel is mortality of fledged young as a result of attraction to lights and subsequent collision with the dredger in particular, especially when it is operating beyond Busby Heads at night.

As with little penguin, any potential adverse effect could be offset by the provision of nesting boxes. It is understood that the Bream Head Conservation Trust already operates a comprehensive predator control program at present and that Refining NZ is a supporter of the Trust. The grey-faced petrel nest box initiative would be specific

and targeted, with the nest boxes enhancing existing earth burrows. In consultation with the Trust and Department of Conservation, the final details could be outlined in a specific management plan or agreement. It is understood, however, that there are at least ten active burrows. It is recommended, as with little penguin, that the aim should be a significant increase of available nest sites and therefore 20 boxes should be provided contingent upon confirmation from the Trust.

8. MONITORING

The recommendations below assume that the Recommendations and Mitigation outlined in Section 7 above can be achieved.

There is no regular monitoring recommended for coastal birds because the major elements of the Project are essentially fixed and there are unlikely to be any opportunities to modify those elements in the event of an adverse effect being recorded, which based on the modelling results and analysis, is considered to be in the low risk category.

It would be more effective to focus on potential offset measures and monitoring following completion of the Project.

8.1 MONITORING

The proposal is to document the state of the coastal bird populations in specific areas following the completion of the Project so that both before and after data were on the record.

The following exercises are proposed, with the coastal bird surveys being repeats of the November 2015 – March 2016 surveys in terms of methodology and timing.

8.1.1 Coastal Birds

The following once-off state-of-environment surveys are proposed.

- (a) Marsden Point to Northport breeding season (November) habitat use.
 - (b) Darch Point to Home Point breeding season (November) habitat use.
 - (c) Mair Bank coastal bird surveys (2) in the February – March period.
 - (d) Refinery Jetty to Northport coastal bird survey (1) in the February – March period.
 - (e) Urquharts Bay coastal bird survey (1) in the February - March period.
- (a) and (b) would document the degree of post-dredging nesting activity by coastal birds as previously, especially variable oystercatcher, reef heron, pied shag and little shag.

Mair Bank is considered to be of national importance, is immediately adjacent to the TSHD and berth pocket dredging and is the key feeding habitat for variable oystercatcher in the outer Harbour.

The Refinery Jetty to Northport habitat is also adjacent to the TSHD and berth pocket dredging and is a key high tide wading bird roost and general resting area.

Urquharts Bay is a locally significant habitat for coastal birds, is the most notable habitat on the northern shoreline and the data would reflect the general state of the northern shoreline.

Overall, the above surveys would substantiate the state-of-environment and baseline condition of the avifauna post-dredging that is likely to be of interest to stakeholders and provide useful assurance for Refining NZ.

8.1.2 Little Penguin

Daylight counts and dusk arrival counts should be completed in the November to January period as a once-off exercise when both parents are likely to be feeding at sea and therefore more visible. In the chick-guard period (about September to October) only one adult would be feeding at sea and encounters would be lower. The survey area should cover the northern bays area from Reotahi Bay to Urquharts Bay inclusive.

In addition a regular, ongoing monitoring program to record nesting box success will be developed in consultation with the Department of Conservation. To parallel the pest control that should continue for a minimum of 5 years.

9. CONCLUSION

Overall the impact of the Project including cumulative effects on coastal and pelagic birds is considered to be low especially at a national population level; the NZCPS Policy 11 (a) (i), regarding adverse effects on threatened or at risk taxa, and Policy 11 (b) (ii), regarding adverse effects on vulnerable life stages would not be triggered at a population or regional level and, if triggered at a local level, can be mitigated. Furthermore, the other applicable (avifauna) policy from the NRPS will also be achieved if the Proposal is advanced in the manner that we have recommended.

The key initiative recommended is the provision of little penguin nesting boxes within the Harbour to offset any local effect on breeding success as a result of dredging and a turbidity increase.

In addition the provision of nest boxes for grey-faced petrel in Bream Head Scenic Reserve is recommended to offset any local effect of the dredger's lighting on fledged juveniles.

Post-capital dredging monitoring is recommended to provide before and after state-of-the-environment information on coastal birds and little penguin.

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