

Annex V

Distribution of waterbird species in Castlemaine Harbour

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Waterbirds in the mussel nursery area

- 1.1 Three of the NPWS Baseline Waterbird Survey count sectors overlap the mussel nursery area (Figure 1). These sectors contain 384 ha of intertidal habitat, which amount to 7% of the total extent of intertidal habitat in Castlemaine Harbour, as mapped by the NPWS habitat survey. During the NPWS Baseline Waterbird Survey counts these sectors held well over 7% of the Castlemaine Harbour populations of all the waterbird species that use intertidal habitat, except Black-tailed Godwit (Table 1). The sectors were particularly important for Light-bellied Brent, Shelduck, Pintail, Grey Plover, Common Gull, Herring Gull and Great Black-backed Gull, holding 50% or more of the Castlemaine Harbour populations of these species.
- 1.2 The dabbling ducks showed consistently higher numbers in sector OK447 during the low tide counts compared to the other two sectors that overlap the mussel nursery area.

Table 1 – Percentage of the total Castlemaine Harbour population of various waterbird species recorded in count sectors OK444, OK445 and OK447 which overlap with the intertidal mussel nursery area during the NPWS Baseline Waterbird Survey counts.

Species	Low tide counts (n = 4)		High tide count
	Mean	s.d.	
Special Conservation Interests			
Light-bellied Brent Goose	55%	34%	61%
Wigeon	40%	22%	65%
Mallard	51%	18%	52%
Pintail	74%	19%	94%
Common Scoter	0%	0%	0%
Red-throated Diver	0%	0%	0%
Great Northern Diver	2%	3%	0%
Cormorant	23%	12%	0%
Oystercatcher	34%	15%	33%
Ringed Plover	47%	27%	37%
Sanderling	28%	26%	7%
Bar-tailed Godwit	26%	26%	0%
Redshank	19%	18%	37%
Greenshank	18%	15%	18%
Turnstone	16%	19%	40%
Other species			
Shelduck	56%	41%	76%
Teal	26%	16%	35%
Red-breasted Merganser	23%	13%	0%
Little Egret	43%	12%	43%

Species	Low tide counts (n = 4)		High tide count
	Mean	s.d.	
Grey Heron	20%	12%	50%
Grey Plover	60%	43%	67%
Knot	25%	50%	0%
Dunlin	36%	20%	60%
Black-tailed Godwit	0%	0%	0%
Curlew	41%	7%	30%
Black-headed Gull	22%	12%	5%
Common Gull	50%	20%	25%
Lesser Black-backed Gull	11%	16%	0%
Herring Gull	52%	17%	0%
Great Black-backed Gull	50%	31%	0%

- 1.3 The three count sectors that overlap the mussel nursery area hold large areas of intertidal habitat outside the mussel nursery area. Therefore, the percentages in Table 1 probably overestimate the usage of the mussel nursery area. The transect counts carried out in the mussel nursery area in February and March 2010 provide a more precise estimate of the usage of the mussel nursery area. Comparison of the mean daily maxima of these counts with the mean Castlemaine count (Table 2) indicates that the mussel nursery area is used by significant components of the Castlemaine populations of Light-bellied Brent, Little Egret, Sanderling, Dunlin, Bar-tailed Godwit, Curlew, Redshank, Turnstone and Herring Gull.

Table 2 – Transect counts of waterbirds in the mussel nursery area compared to 2009/10 counts for the whole of Castlemaine Harbour.

Species	Daily maxima of transect counts ¹		Mean Castlemaine count ²	Nursery area count as % of Castlemaine count ³
	Mean	s.d.		
Special Conservation Interests				
Light-bellied Brent Goose	73	71	937	10%
Cormorant	1	0.4	70	2%
Oystercatcher	126	36	1623	10%
Sanderling	16	18	320	6%
Bar-tailed Godwit	20	10	200	13%
Redshank	96	16	1059	12%
Greenshank	2	0.9	61	3%
Turnstone	18	10	110	22%
Other species				
Little Egret	4	2.4	30	19%
Knot	1	1.3	193	1%

Species	Daily maxima of transect counts ¹		Mean Castlemaine count ²	Nursery area count as % of Castlemaine count ³
	Mean	s.d.		
Dunlin	133	107	1873	9%
Curlew	129	21	1028	16%
Black-headed Gull	3	1.9	635	1%
Common Gull	7	3.5	349	3%
Herring Gull	22	14	195	15%
Great Black-backed Gull	1	1.1	47	2%

¹ The transect counts for all 20 transects on each complete series of counts (n = 4 per day) were summed to provide a total count for all the transects. The maximum of the four summed transect counts on each day was used to calculate the mean daily maxima across the five count days.

² Mean of all five counts, except for Little Egret, Sanderling, Dunlin, Black-headed Gull, Herring Gull and Great Black-backed Gull. For these species, the October count was not used to calculate the mean because it was much higher (Little Egret and the gull species) or lower (Sanderling and Dunlin) than the other counts.

³ The raw values of the transect counts as percentages of the Castlemaine count were corrected by a factor of 1.31, which is the ratio of the total extent of the mussel nursery area to the area covered by the transect counts.

Additional species recorded on the transect counts with mean daily maxima of < 0.5 were Wigeon, Mallard, Pintail, Red-breasted Merganser, Great Northern Diver, Ringed Plover, Grey Plover, Black-tailed Godwit and Lesser Black-backed Gull.

- 1.4 We have also examined the flock distribution maps from the NPWS Baseline Waterbird Survey counts to check if the spatial distribution of waterbirds was different earlier in the winter. On the first count (October 5 2009), 46 foraging Wigeon were recorded on intertidal habitat in sector OK445 and 580 roosting Wigeon were recorded on intertidal habitat in sector OK447. According to the flock distribution maps, most of the Wigeon in sector OK447 were within the mussel nursery area, while a small part of the Wigeon flock in sector OK445 were also within the mussel nursery area (Figure 2). On the other counts, the species with mapped flock locations within the mussel nursery area did not include significant numbers of any species that were not recorded in significant numbers in the transect counts.
- 1.5 While the October count shows an indication that Wigeon may make more use of the mussel nursery area than suggested by the transect counts, it is notable that the main flock recorded in the nursery area was roosting, not feeding. It is also difficult to precisely record the position relative to the tideline of birds feeding on intertidal habitat from vantage points over 1 km away. Therefore, it is quite possible that the Wigeon flock in sector OK445 was actually feeding on *Zostera* habitat, as the recorded flock location is only just outside the mapped area of *Zostera* habitat (Figure 2).
- 1.6 Taking account of the above considerations, overall the flock distribution maps do not provide strong evidence that waterbird usage of the mussel nursery area differed significantly between the transect counts and earlier in the winter.

Distribution of waterbirds that feed in subtidal habitat

- 1.7 The 2009 seed mussel extraction area overlaps two of the NPWS Baseline Waterbird Survey count sectors (OK917 and 918) but part of the area falls outside any of the count sectors (Figure 1). It only forms very small component of the two sectors that it overlaps so the overall numbers of waterbirds counted within these sectors are of little value in assessing its usage. Flock locations were mapped in sector OK918 on 25 January, 1 February and 8 March 2010 (the latter being the dedicated seaduck/diver survey). These were all in the northern two-thirds of the sector, with none of the mapped concentrations within 1 km of the 2009 seed mussel extraction area (Figures 3-6).

- 1.8 The main flock locations in sector OK918 across the duration of the survey are shown in Figure 3-6. Between 224 and 1248 Common Scoters were recorded in these sectors during the counts. The scoter were largely recorded either in one larger group in location A in Sector OK917 and/or in two main groups, one in location A in Sector OK917 and one in location B in sector OK916. These locations are over 4 km from the 2009 seed mussel extraction area. A flock of 300+ scoter was also seen in the area marked C on a reconnaissance visit on 24 September 2009. This flock location is close to the 2009 seed mussel extraction area. The largest count of Red-throated Divers (total of 23) in these sectors, on 1 February 2010, was located in the area marked D on Figure 5.
- 1.9 Seven of the NPWS Baseline Waterbird Survey count sectors overlap areas that may be affected by boat activity during mussel on-growing and harvesting operations (excluding seed mussel extraction) (Figure 1). These sectors contain 1904 ha of subtidal habitat, which amount to 26% of the total extent of subtidal habitat within the area covered by the NPWS Baseline Waterbird Survey at Castlemaine Harbour. Common Scoter was not recorded within these sectors during the NPWS Baseline Waterbird Survey counts (Figure 3). The percentage occurrence of other subtidal-feeding waterbird species was broadly in line with the percentage expected if the birds were randomly distributed across the subtidal habitat covered by the survey.
- 1.10 The percentage occurrence of the two diver species in these sectors is probably overestimated in Table 3. The dedicated seaduck/diver survey on 8 March 2010 recorded 262 Red-throated Divers and 36 Great Northern Divers in the outer part of Castlemaine Harbour (west of Inch), compared to mean counts in these areas during the standard counts of 8 Red-throated Divers and 11 Great Northern Divers.
- 1.11 Locations of roost sites were distant from the intertidal mussel nursery area and mainly located at strandline areas at Inch and along the shores of the Harbour (Figure 7).

Table 3 – Percentage of the total Castlemaine Harbour population of subtidal feeding waterbirds recorded in sectors OK444, OK445, OK447, OK448, OK469, OK473 and OK474 during the NPWS Baseline Waterbird Survey counts.

Species	Mean	s.d.
Common Scoter	0%	0%
Cormorant	23%	15%
Great Northern Diver	25%	20%
Red-breasted Merganser	39%	25%
Red-throated Diver	12%	27%

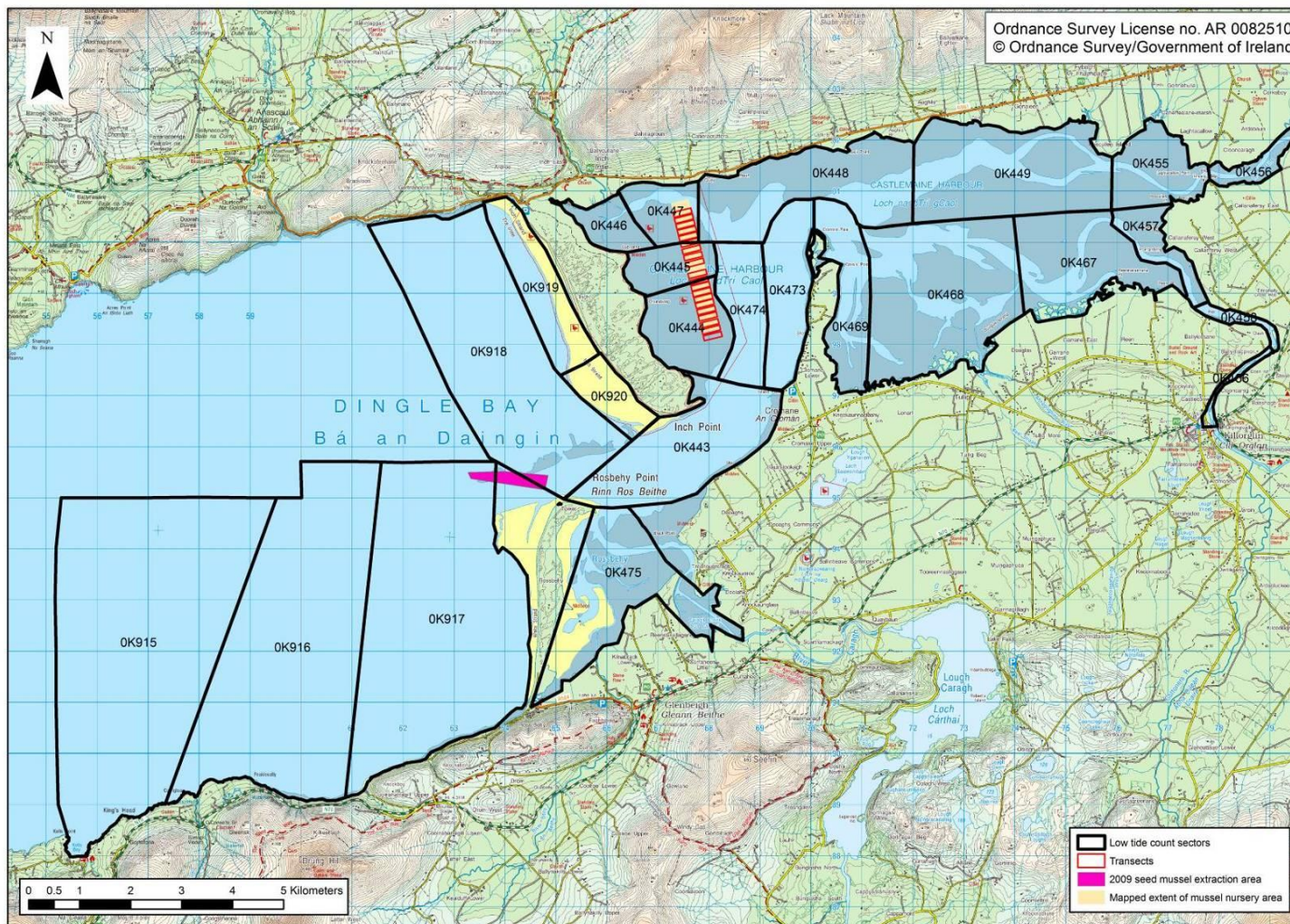


Figure 1 – Count sectors used in the NPWS Baseline Waterbird Survey Programme 2009/10 at Castlemaine Harbour and transects counted in the intertidal nursery area by ATKINS

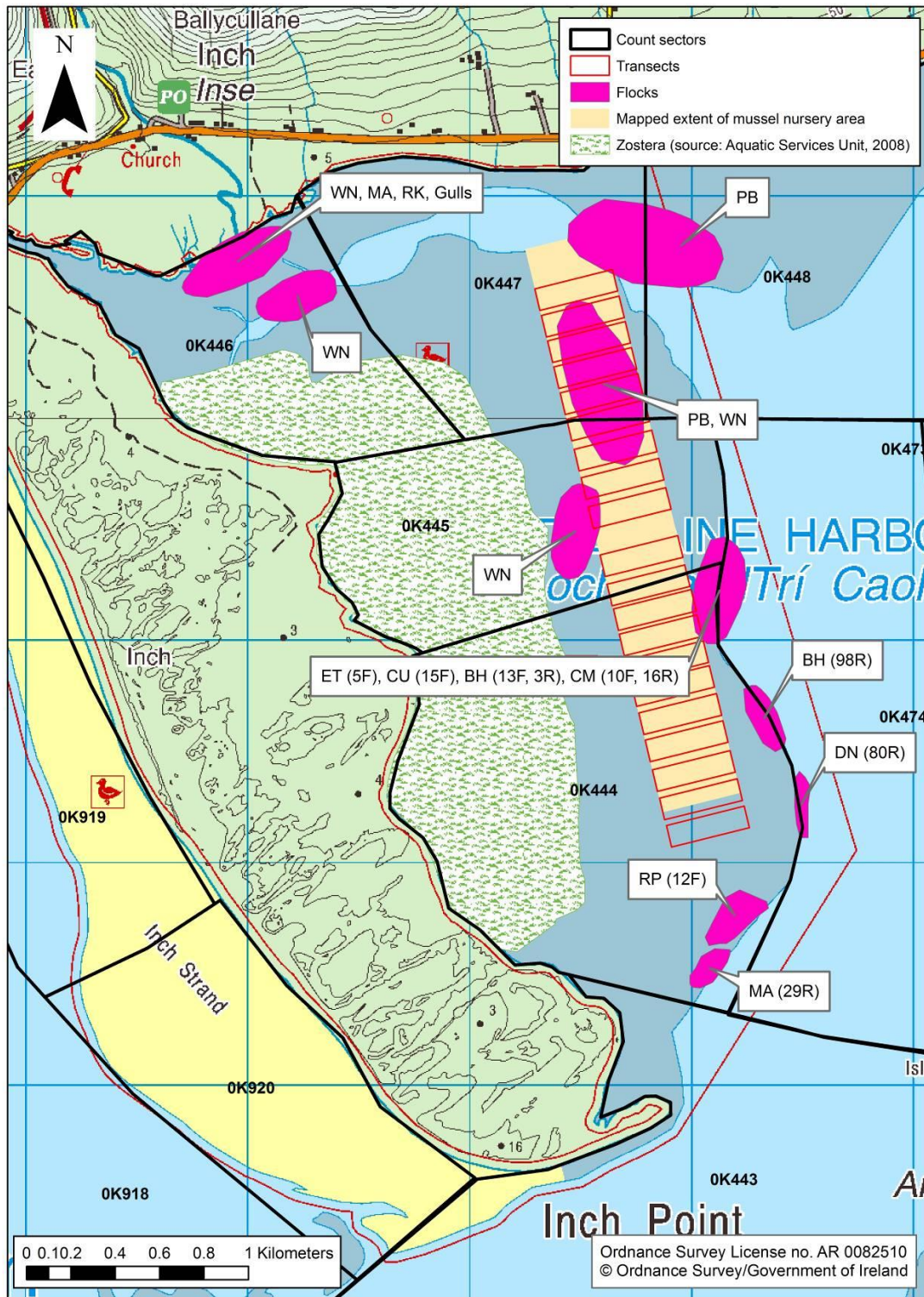


Figure 2 – Distribution of waterbird flocks recorded in sectors OK444-447 on the NPWS Baseline Waterbird count on October 5 2009. WN = wigeon, RP = ringed plover, RK = redshank, MA = mallard, PB = light bellied brent geese, ET = little egret, CU = curlew, BH = black headed gull, CM = common gull, DN = dunlin,

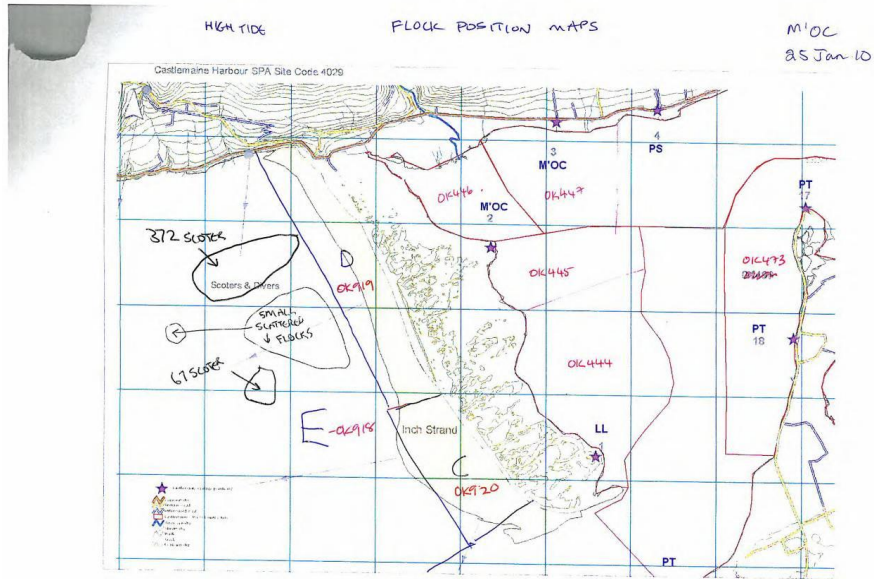


Figure 3. Locations of scoter flocks during high tide on Jan 25th 2010 (NPWS)

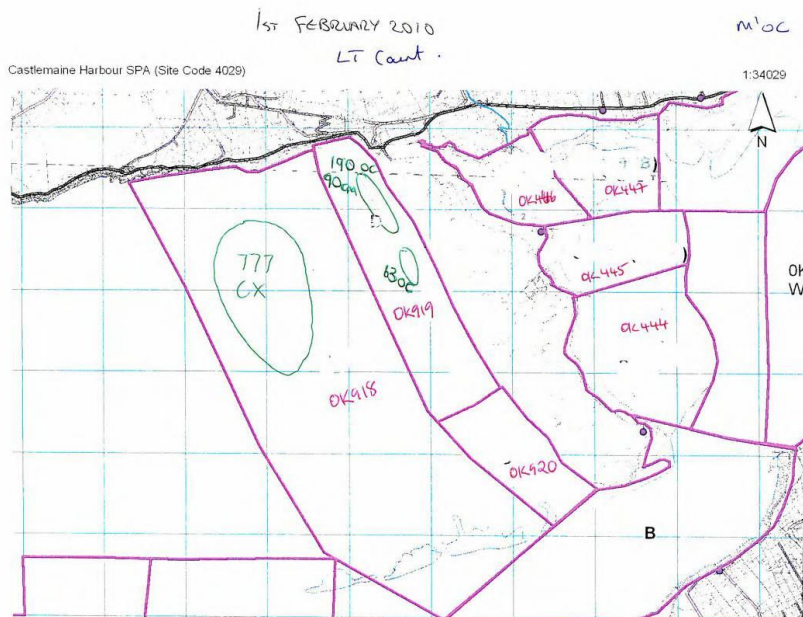


Figure 4. . Locations of scoter flocks during low tide on February 4th 2010 (NPWS)

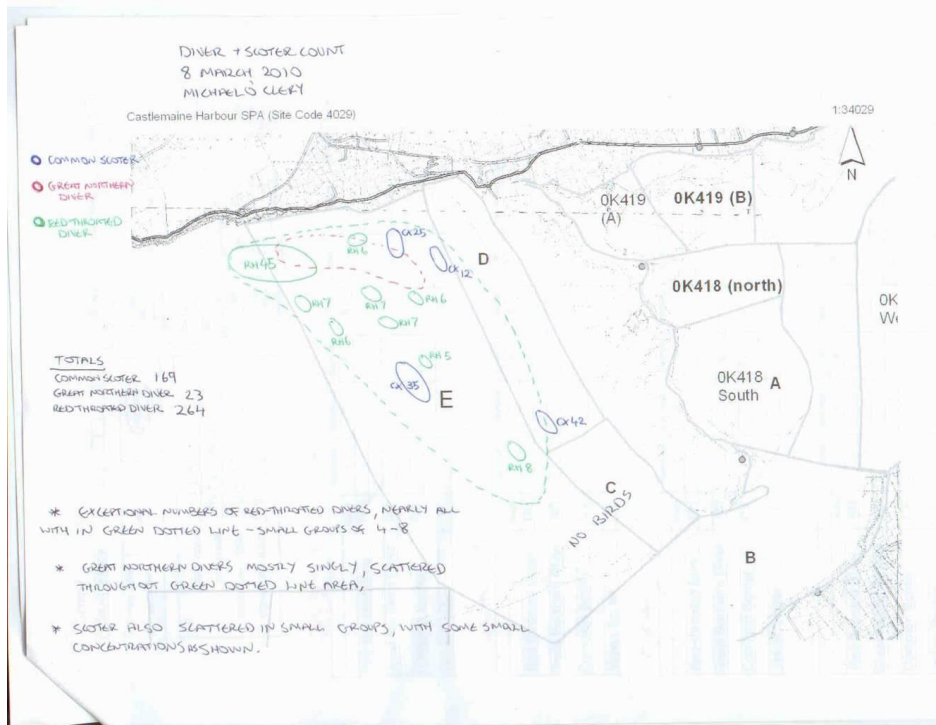


Figure 5. . Locations of scoter counts during the dedicated seaduck/diver survey on March 8th 2010 by NPWS.



Figure 6. Main locations of scoter and diver concentrations recorded in sectors OK915-917 across the duration of the NPWS Baseline Waterbird Survey Programme 2009/10 at Castlemaine Harbour. Flock C is located close to the seed mussel extraction area.

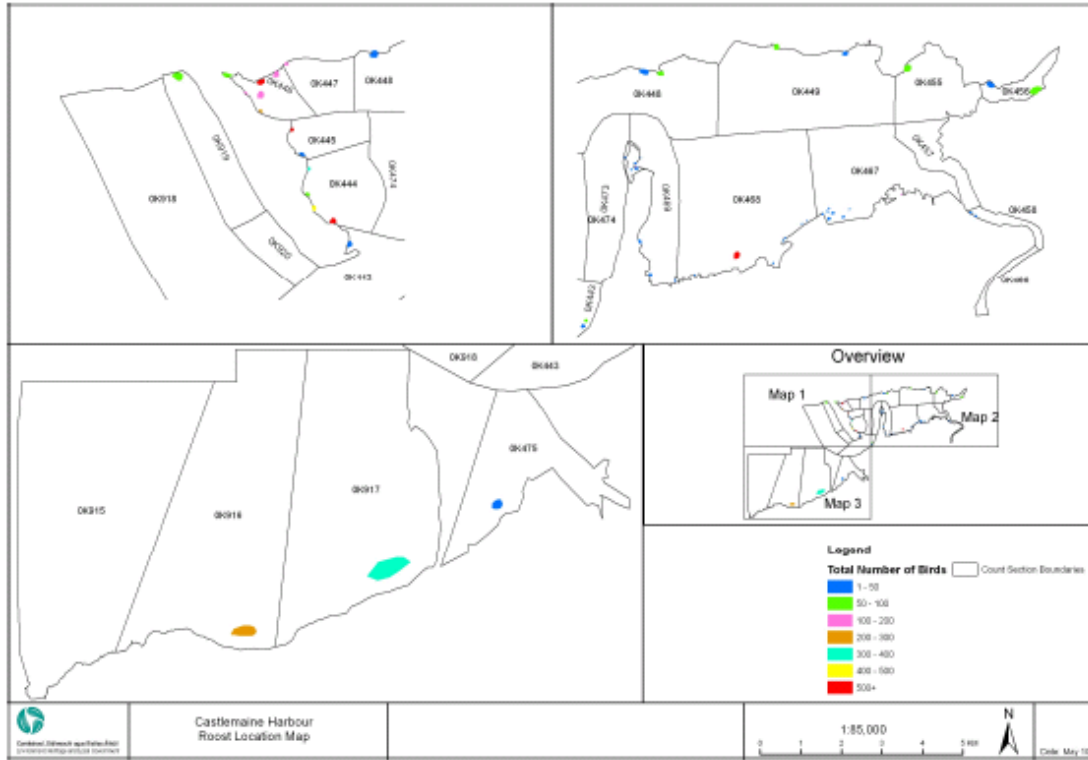


Figure 7. Roost locations identified by NPWS surveys (NPWS 2010b)