



**BTO Research Report No. 399**

**The Effects on Waterbirds  
of Dredging at the  
Cardiff Bay Barrage  
Report for 2004/05**

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## EXECUTIVE SUMMARY

1. This study reports the impact of maintenance dredging on the birds utilising mudflats within and adjoining the outer harbour of the Cardiff Bay barrage using data collected in January and March 2005. Results are compared to those reported between 2002 and 2004. Dredging is required to maintain a channel from the outer harbour to the sea and to prevent sediment build up within this harbour. Initial dredging took place during the construction of the barrage and since August 2000 has usually taken place twice annually (in February and August). During the period of study, mudflats were dredged between 4 February and 2 March 2005. Within the outer harbour, mudflats reform naturally after dredging.
2. Cardiff Bay was formed by the combined estuaries of the Rivers Taff and Ely and is situated at the mouth of the larger Severn Estuary. The bay was impounded by a barrage constructed at its mouth in November 1999. The mudflats that now adjoin the Cardiff Bay barrage historically formed part of the intertidal mudflats of the bay.
3. Data are presented for the months of January 2005, before dredging commenced, and March 2005, after dredging operations had been completed.
4. Ten waterbird species were recorded using the mudflats affected by dredging in January and March 2005. These included four of the 10 species of wildfowl and wader that had been recorded on the equivalent mudflats prior to barrage construction – Shelduck, Mallard, Curlew and Redshank – together with Cormorant, Mute Swan and four species of gull – Black-headed Gull, Lesser Black-backed Gull, Herring Gull and Great Black-backed. These species, and also Oystercatcher and Common Gull had been recorded on these mudflats during previous periods of post-barrage fieldwork.
5. By far the most numerous species on the mudflats affected by dredging were Black-headed Gull and Lesser Black-backed Gull. Aside from these, only Mallard were recorded in numbers of greater than 10 on any one of these mudflats. Black-headed and Lesser Black-backed Gulls utilised all three mudflat areas, whilst Mallard particularly favoured the area within the outer harbour. These results are very similar to those reported previously.
6. Although the overall numbers of wildfowl and waders using the mudflats affected by dredging are very low, two species found on these mudflats – Mute Swan and Redshank – were not recorded on comparative areas of mudflat nearby. Densities of Shelduck and Black-headed Gull, Lesser Black-backed and Herring Gulls were greater on the comparative mudflats, however.
7. There is no evidence that the dredging in February / March 2005 had an effect in the short term on the numbers of birds using the mudflats by the barrage. Indeed, numbers of Black-headed, Lesser Black-backed and Herring Gulls on these mudflats were higher in March than in January, whilst Mute Swans and Shelduck were only recorded on these mudflats in March.
8. Numbers of Black-headed Gulls in January and March 2005 were less than in the previous three winters, though as gull numbers can be highly variable this drop may be within the bounds of normal fluctuations. Numbers of other species appeared more stable. The Redshank seen on the mudflats by the barrage were the first recorded there for two years. At present, therefore, there is little evidence that waterbirds have been affected by the dredging in the longer term. It should be noted, though, that due to the regular dredging that has occurred since the barrage was completed invertebrate food supplies in the areas of mudflats being dredged may have been prevented from developing. This is an inevitable consequence of complying with the statutory requirements of the Cardiff Bay Barrage Act 1993. Overall, however, the numbers of birds that might be affected by dredging are very small in relation to the substantial populations found locally.

9. Further monitoring is recommended in order to allow future assessment of the impacts of dredging over both the short and long term.



## 1. INTRODUCTION

This study reports the impact of maintenance dredging on the birds utilising mudflats within and adjoining the outer harbour of the Cardiff Bay barrage using data collected in January and March 2005. Dredging is required to maintain a channel from the outer harbour to the sea and to prevent sediment build up within the harbour. Within the outer harbour, mudflats reform naturally after dredging. Initial dredging took place during the construction of the barrage and since August 2000 has usually taken place twice annually (in February and August). During the period of study, mudflats were dredged between 4 February and 2 March 2005.

Data are presented separately for periods immediately before and after dredging, in January and March 2005, so as to assess whether there were any short-term impacts of the operations. Longer-term impacts are assessed through comparison with the data contained in previous reports (Burton & Clark 2002a, 2002b, Burton *et al.* 2003a, 2003b, Holloway *et al.* 2004).

The ornithological significance of the mudflats by the barrage was assessed in previous reports (Burton & Clark 2002a, 2002b) by comparing counts made between August 2001 and March 2002 with historic data collected prior to the construction of the barrage and with concurrent count data from two adjacent areas of mudflat.

Cardiff Bay was formed by the combined estuaries of the Rivers Taff and Ely and is situated at the mouth of the larger Severn Estuary. The bay was impounded by a barrage constructed at its mouth in November 1999. The Severn Estuary is ornithologically important because of the populations of waterbirds (i.e. grebes, cormorants, herons, rails, wildfowl, waders, gulls and terns) that it supports in winter and as a result is designated as a Special Protection Area (SPA). Some of the mudflats beside the Cardiff Bay barrage are included in this area.

The Severn Estuary currently holds internationally important numbers of European White-fronted Goose *Anser albifrons albifrons*, Shelduck *Tadorna tadorna*, Gadwall *Anas strepera*, Dunlin *Calidris alpina* and Redshank *Tringa totanus* (Pollitt *et al.* 2003) and Cardiff Bay itself formerly held nationally important numbers of Dunlin (Burton *et al.* 2003c). Sites are considered internationally important for a species if they regularly hold at least 1% of the individuals in a population of that species. Sites within Britain are considered nationally important for a species if they regularly hold 1% or more of the estimated British population of that species. Current national importance thresholds for the waterbird species referred to in this report are shown in Appendix 1.



## 2. METHODS

Figure 2.1 shows the areas subject to maintenance dredging and Figure 2.2, the numbered mudflat count areas that have been surveyed between August 2001 and March 2005. Areas B2 and B3 include remnants of the mudflats of the bay that were dissected by the building of the barrage. Accretion of sediments has enlarged these mudflats and also occurs naturally within the barrage's outer harbour – 'mudflat' B5. This area would also previously have formed part of the bay's intertidal area. Dredging of these three mudflats is required to allow continued passage of boats from the barrage gates to the sea. Two further areas of mudflat – areas B1 and B4 – were also surveyed to provide comparative counts. Mudflat B1 was similar to B2, both being entirely muddy, whilst mudflats B3 and B4 contained a mix of mud and rocky substrate. The five mudflats are, respectively, 4.8, 11.9, 7.0, 19.8 and 3.3 ha in size at mean low tide.

The waterbirds using mudflats B1-B5 were counted at hourly intervals (relative to low tide) over the time that the mudflats were exposed, twice in both January and March 2005. Counts were undertaken on 22-24 January and 8-10 March. The mudflats became exposed around 3 hours before low tide and became inundated around 3 hours afterwards. The counts made in January were before dredging took place, whilst those in March were made immediately after dredging operations had finished.

Counts of area B5 within the barrage's outer harbour included birds on the water and on the small area of mudflat that formed at low tide.

The mean numbers and densities of waterbirds recorded on mudflats B1-B5 at low tide are tabulated for both January and March. Further tables provide information on the mean bird hours recorded per tidal cycle (i.e. the sum of the average number of birds each hour) on mudflats B1-B5 and the peak numbers of each species recorded on each mudflat. By tabulating the data in this way, it is possible to assess whether the numbers of birds occurring on the mudflats after dredging differed from those that occurred prior to operations.



### 3. RESULTS

Table 3.1 reports the mean numbers and densities of waterbirds recorded on mudflats B1-B5 at low tide in January and March 2005. Table 3.2 indicates the overall usage of mudflats B1-B5 through the tidal cycle and Table 3.3, the peak numbers of birds recorded on each mudflat.

A total of 10 waterbird species were recorded using the mudflats affected by dredging, i.e. B2, B3 and B5, in January and March 2005. These included four species of wildfowl and wader that had been recorded on the equivalent mudflats prior to barrage construction (Burton & Clark 2002a, 2002b) – Shelduck, Mallard *Anas platyrhynchos*, Curlew *Numenius arquata* and Redshank. In addition, Cormorant *Phalacrocorax carbo*, Mute Swan *Cygnus olor* and four species of gull – Black-headed Gull *Larus ridibundus*, Lesser Black-backed Gull *L. fuscus*, Herring Gull *L. argentatus* and Great Black-backed Gull *L. marinus* were also recorded on these mudflats. These species, and also Oystercatcher *Haematopus ostralegus* and Common Gull *L. canus* had been recorded on these mudflats during the previous fieldwork (Burton *et al.* 2004).

By far the most numerous species on the mudflats affected by dredging were Black-headed Gull and Lesser Black-backed Gull. Aside from these, only Mallard were recorded in numbers of greater than 10 on any one of these mudflats (Table 3.3). Tables 3.1 and 3.3 show that Black-headed and Lesser Black-backed Gulls utilised all three mudflats, whilst Mallard particularly favoured mudflat B5, within the outer harbour. The latter mudflat was also used by Mute Swans, Shelduck, Curlew and Black-headed, Lesser Black-backed and Herring Gulls.

Gulls were particularly associated with the channel and seaward edge of mudflats, whilst other species were found higher up the mudflats. Typically, the overwhelming majority of the birds that were recorded on these mudflats were feeding.

Table 3.1 also allows comparison to be made between the low tide densities found on the mudflats affected by the dredging (B2, B3 & B5) and those found on mudflats B1 and B4, which have not been affected by dredging. In comparison to mudflats B2, B3 and B5, mudflats B1 and B4 held higher low tide densities of Shelduck and Black-headed, Lesser Black-backed and Herring Gulls. In contrast, no Mallard or Redshank were recorded on mudflats B1 or B4.

The possible short term effects of dredging can be examined by comparing the numbers of birds recorded in January 2005 (prior to dredging) with those in March 2005 (post-dredging). On the mudflats affected by operations, no species were recorded to have declined following the dredging in February / March 2005. Indeed, numbers of Black-headed, Lesser Black-backed and Herring Gulls were all higher following the operations than beforehand. Mute Swans and Shelduck were only recorded on these mudflats in March.

The longer term effects of dredging can be evaluated by comparing the counts on the mudflats affected by dredging from this winter with those from the previous three. Numbers of Black-headed Gulls in January and March 2005 were less than in the previous three winters; peak numbers occurred in February 2003 when a large number of birds were recorded roosting on mudflat B2 (Tables 3.2; Burton *et al.* 2003b). In contrast, late-winter numbers of most other species – notably Lesser Black-backed Gull and Mallard – appear more stable. The Redshank seen on the mudflats by the barrage were the first recorded there for two years. Numbers of Curlew, although small, were also higher in 2005 than in 2004.



#### **4. ASSESSMENT OF THE ORNITHOLOGICAL IMPORTANCE OF THE STUDY AREA AND THE POTENTIAL IMPACT OF DREDGING**

A total of 10 waterbird species were recorded using the mudflats affected by dredging, i.e. B2, B3 and B5, in January and March 2005. These included four species of wildfowl and wader that had been recorded on the equivalent mudflats prior to barrage construction (Burton & Clark 2002a, 2002b) – Shelduck, Mallard, Curlew and Redshank. In addition, Cormorant, Mute Swan and four species of gull – Black-headed Gull, Lesser Black-backed Gull, Herring Gull and Great Black-backed Gull were also recorded on these mudflats. These species, and also Oystercatcher and Common Gull had been recorded on these mudflats during previous fieldwork (Holloway *et al.* 2004).

The report for 2001/02 found that the densities of Shelduck, Mallard, Oystercatcher, Curlew and Redshank were less than those found in the four years immediately prior to construction of the barrage and that five species of wildfowl and wader recorded in those years were absent (Burton & Clark 2002b). However, though the overall numbers of wildfowl and waders using the mudflats affected by dredging are now very low, two species found on these mudflats in January / March 2005 – Mallard and Redshank – were not recorded on comparative areas of mudflat nearby. Densities of Shelduck and Black-headed, Lesser Black-backed and Herring Gulls were greater on the comparative mudflats, however. These findings are similar to those of August 2001 to March 2005 (Burton & Clark 2002a, 2002b, Burton *et al.* 2003a, 2003b, Holloway *et al.* 2004).

The reports for previous winters found only slight evidence that densities of waterbirds might have been affected by dredging operations in the short term. For example, although numbers of Mallard, Black-headed Gull and Lesser Black-backed Gull decreased on adjacent mudflats after the dredging operations in February 2004, Herring Gulls increased in number, whilst Shelduck were only recorded following dredging. The decrease in the numbers of Black-headed and Lesser Black-backed Gulls after dredging both in February 2004 and February 2003 may have been a result of some of the birds beginning to move back to their breeding areas. It is also possible, though, that declines in gull and Mallard numbers in those years were linked to a short-term decline in food resources, possibly as a result of dredging disturbance. However, as the levels of the food resources in the water and sediments were not measured, it is not possible to say for sure.

This winter, however, there was no evidence that the dredging had any effects in the short-term. Numbers of Black-headed, Lesser Black-backed and Herring Gulls were all higher following the operations than beforehand. Mute Swans and Shelduck were only recorded on the mudflats by the barrage in March.

Numbers of Black-headed Gulls using the mudflats affected by dredging were less than in the previous three winters (even allowing for the presence of a large flock of roosting Black-headed Gulls in February 2003). However, as gull numbers can be highly variable, this drop may be within the bounds of normal fluctuations. In contrast, numbers of other species appeared more stable. The Redshank seen on the mudflats by the barrage were the first recorded there for two years and there was also a small increase in numbers of Curlew. At present, therefore, there is little evidence that waterbirds have been affected by dredging in the longer term. It should be noted, though, that due to the regular dredging that has occurred since the barrage was completed invertebrate food supplies in the areas of mudflats being dredged may have been prevented from developing. This is an inevitable consequence of complying with the statutory requirements of the Cardiff Bay Barrage Act 1993. As reported previously, densities of wader and wildfowl species on the mudflats affected by dredging are lower than those found prior to construction of the barrage (Burton & Clark 2002b). Overall, however, the numbers of birds that might be affected by dredging are very small in relation to the substantial populations found locally (see Burton *et al.* 2003c).

Further monitoring is recommended in order to allow future assessment of the impacts of dredging over both the short and long term.





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	Jan 2005		Mar 2005	
	n	d	n	d
<b>Cormorant</b>				
<i>Mudflat B2</i>	0.5	0.04	0.5	0.04
<i>Mudflat B3</i>	0	0	0	0
<i>Mudflat B5</i>	0	0	0	0
Mudflat B1	0.5	0.10	0	0
Mudflat B4	3.0	0.15	2.0	0.10
<b>Mudflats B2,B3,B5</b>	<b>0.5</b>	<b>0.02</b>	<b>0.5</b>	<b>0.02</b>
<b>Mudflats B1, B4</b>	<b>3.5</b>	<b>0.14</b>	<b>2.0</b>	<b>0.08</b>
<b>Mute Swan</b>				
<i>Mudflat B2</i>	0	0	0	0
<i>Mudflat B3</i>	0	0	0	0
<i>Mudflat B5</i>	0	0	0	0
Mudflat B1	0	0	0	0
Mudflat B4	0	0	0	0
<b>Mudflats B2,B3,B5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Mudflats B1, B4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Shelduck</b>				
<i>Mudflat B2</i>	0	0	0	0
<i>Mudflat B3</i>	0	0	2.0	0.29
<i>Mudflat B5</i>	0	0	0	0
Mudflat B1	10.0	2.08	13.5	2.81
Mudflat B4	0	0	21.0	1.06
<b>Mudflats B2,B3,B5</b>	<b>0</b>	<b>0</b>	<b>2.0</b>	<b>0.09</b>
<b>Mudflats B1, B4</b>	<b>10.0</b>	<b>0.41</b>	<b>34.5</b>	<b>1.40</b>
<b>Mallard</b>				
<i>Mudflat B2</i>	0	0	2.0	0.17
<i>Mudflat B3</i>	0	0	0	0
<i>Mudflat B5</i>	0.5	0.15	1.0	0.30
Mudflat B1	0	0	0	0
Mudflat B4	0	0	0	0
<b>Mudflats B2,B3,B5</b>	<b>0.5</b>	<b>0.02</b>	<b>3.0</b>	<b>0.14</b>
<b>Mudflats B1, B4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Oystercatcher</b>				
<i>Mudflat B2</i>	0	0	0	0
<i>Mudflat B3</i>	0	0	0	0
<i>Mudflat B5</i>	0	0	0	0
Mudflat B1	0	0	0	0
Mudflat B4	0	0	2.0	0.10
<b>Mudflats B2,B3,B5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Mudflats B1, B4</b>	<b>0</b>	<b>0</b>	<b>2.0</b>	<b>0.08</b>
<b>Curlew</b>				
<i>Mudflat B2</i>	0	0	0	0
<i>Mudflat B3</i>	0.5	0.07	1.5	0.21
<i>Mudflat B5</i>	0	0	0	0
Mudflat B1	0	0	0	0
Mudflat B4	2.0	0.10	6.0	0.30
<b>Mudflats B2,B3,B5</b>	<b>0.5</b>	<b>0.02</b>	<b>1.5</b>	<b>0.07</b>
<b>Mudflats B1, B4</b>	<b>2.0</b>	<b>0.08</b>	<b>6.0</b>	<b>0.24</b>

**Table 3.1** Mean low tide numbers (n) and densities (d) (birds/ha) of waterbirds using mudflats near the Cardiff Bay barrage at low tide in January and March 2005.

Only species recorded since August 2001 at low tide on mudflats affected by dredging (shown italicised) are included. Figures in bold are total numbers and densities for mudflats B2, B3 and B5 combined and for mudflats B1 and B4 combined.

	Jan 2005		Mar 2005	
	n	d	n	d
<b>Redshank</b>				
<i>Mudflat B2</i>	0.5	0.04	4.0	0.34
<i>Mudflat B3</i>	0	0	0	0
<i>Mudflat B5</i>	0	0	0	0
Mudflat B1	0	0	0	0
Mudflat B4	0	0	0	0
<b>Mudflats B2,B3,B5</b>	<b>0.5</b>	<b>0.02</b>	<b>4.0</b>	<b>0.18</b>
<b>Mudflats B1, B4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Black-headed Gull</b>				
<i>Mudflat B2</i>	14.0	1.18	0	0
<i>Mudflat B3</i>	2.5	0.36	8.0	1.14
<i>Mudflat B5</i>	0	0	1.5	0.45
Mudflat B1	0	0	0	0
Mudflat B4	43.5	2.20	18.5	0.93
<b>Mudflats B2,B3,B5</b>	<b>16.5</b>	<b>0.74</b>	<b>9.5</b>	<b>0.43</b>
<b>Mudflats B1, B4</b>	<b>43.5</b>	<b>1.77</b>	<b>18.5</b>	<b>0.75</b>
<b>Common Gull</b>				
<i>Mudflat B2</i>	0	0	0	0
<i>Mudflat B3</i>	0	0	0	0
<i>Mudflat B5</i>	0	0	0	0
Mudflat B1	0	0	0	0
Mudflat B4	0	0	0	0
<b>Mudflats B2,B3,B5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Mudflats B1, B4</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>Lesser Black-backed Gull</b>				
<i>Mudflat B2</i>	2.5	0.21	2.5	0.21
<i>Mudflat B3</i>	0.5	0.07	0	0
<i>Mudflat B5</i>	0	0	0.5	0.15
Mudflat B1	0	0	0.5	0.10
Mudflat B4	53.5	2.70	17.0	0.86
<b>Mudflats B2,B3,B5</b>	<b>3.0</b>	<b>0.14</b>	<b>3.0</b>	<b>0.14</b>
<b>Mudflats B1, B4</b>	<b>53.5</b>	<b>2.17</b>	<b>17.5</b>	<b>0.71</b>
<b>Herring Gull</b>				
<i>Mudflat B2</i>	1.5	0.13	0.5	0.04
<i>Mudflat B3</i>	0	0	2.0	0.29
<i>Mudflat B5</i>	0	0	0	0
Mudflat B1	0	0	0	0
Mudflat B4	1.0	0.05	31.0	1.57
<b>Mudflats B2,B3,B5</b>	<b>1.5</b>	<b>0.07</b>	<b>2.5</b>	<b>0.11</b>
<b>Mudflats B1, B4</b>	<b>1.0</b>	<b>0.04</b>	<b>31.0</b>	<b>1.26</b>
<b>Great Black-backed Gull</b>				
<i>Mudflat B2</i>	1.5	0.13	0	0
<i>Mudflat B3</i>	0	0	0	0
<i>Mudflat B5</i>	0	0	0	0
Mudflat B1	0	0	1.0	0.21
Mudflat B4	1.0	0.05	0	0
<b>Mudflats B2,B3,B5</b>	<b>1.5</b>	<b>0.07</b>	<b>0</b>	<b>0</b>
<b>Mudflats B1, B4</b>	<b>1.0</b>	<b>0.04</b>	<b>1.0</b>	<b>0.04</b>

Table 3.1 Continued.

	Jan 2005	Mar 2005
<b>Cormorant</b>		
<i>Mudflat B2</i>	1.0	4.0
<i>Mudflat B3</i>	0	0
<i>Mudflat B5</i>	0	0
Mudflat B1	2.0	3.5
Mudflat B4	11.0	4.0
<b>Mute Swan</b>		
<i>Mudflat B2</i>	0	0
<i>Mudflat B3</i>	0	0
<i>Mudflat B5</i>	0	2.5
Mudflat B1	0	0
Mudflat B4	0	0
<b>Shelduck</b>		
<i>Mudflat B2</i>	0	2.0
<i>Mudflat B3</i>	0	9.0
<i>Mudflat B5</i>	0	1.0
Mudflat B1	23.5	103.5
Mudflat B4	0.5	83.5
<b>Mallard</b>		
<i>Mudflat B2</i>	1.0	3.5
<i>Mudflat B3</i>	0.5	11.0
<i>Mudflat B5</i>	19.0	1.0
Mudflat B1	0	1.0
Mudflat B4	0	0
<b>Oystercatcher</b>		
<i>Mudflat B2</i>	0	0
<i>Mudflat B3</i>	0	0
<i>Mudflat B5</i>	0	0
Mudflat B1	0	0
Mudflat B4	5.0	14.5
<b>Curlew</b>		
<i>Mudflat B2</i>	0	0
<i>Mudflat B3</i>	2.0	3.5
<i>Mudflat B5</i>	0	0
Mudflat B1	0	0
Mudflat B4	9.5	14.0
<b>Redshank</b>		
<i>Mudflat B2</i>	13.0	17.0
<i>Mudflat B3</i>	0	0.5
<i>Mudflat B5</i>	0	0
Mudflat B1	0	0
Mudflat B4	0	0

**Table 3.2** Mean numbers of bird hours per tidal cycle recorded on mudflats near the Cardiff Bay barrage in January and March 2005.

Only species recorded since August 2001 on mudflats affected by dredging (shown italicised) are included.

	Jan 2005	Mar 2005
<b>Black-headed Gull</b>		
<i>Mudflat B2</i>	29.5	30.0
<i>Mudflat B3</i>	7.0	52.0
<i>Mudflat B5</i>	23.5	64.0
Mudflat B1	5.0	72.5
Mudflat B4	218.0	364.5
<b>Common Gull</b>		
<i>Mudflat B2</i>	0	0
<i>Mudflat B3</i>	0	0
<i>Mudflat B5</i>	0	0
Mudflat B1	0	0
Mudflat B4	3.0	0
<b>Lesser Black-backed Gull</b>		
<i>Mudflat B2</i>	8.5	20.0
<i>Mudflat B3</i>	4.0	31.0
<i>Mudflat B5</i>	4.0	27.0
Mudflat B1	2.5	7.5
Mudflat B4	218.0	100.0
<b>Herring Gull</b>		
<i>Mudflat B2</i>	2.0	4.0
<i>Mudflat B3</i>	8.0	28.5
<i>Mudflat B5</i>	1.5	15.0
Mudflat B1	0	1.0
Mudflat B4	105.5	104.5
<b>Great Black-backed Gull</b>		
<i>Mudflat B2</i>	2.0	2.5
<i>Mudflat B3</i>	0	2.5
<i>Mudflat B5</i>	0	0
Mudflat B1	1.0	1.0
Mudflat B4	9.5	0

**Table 3.2** Continued.



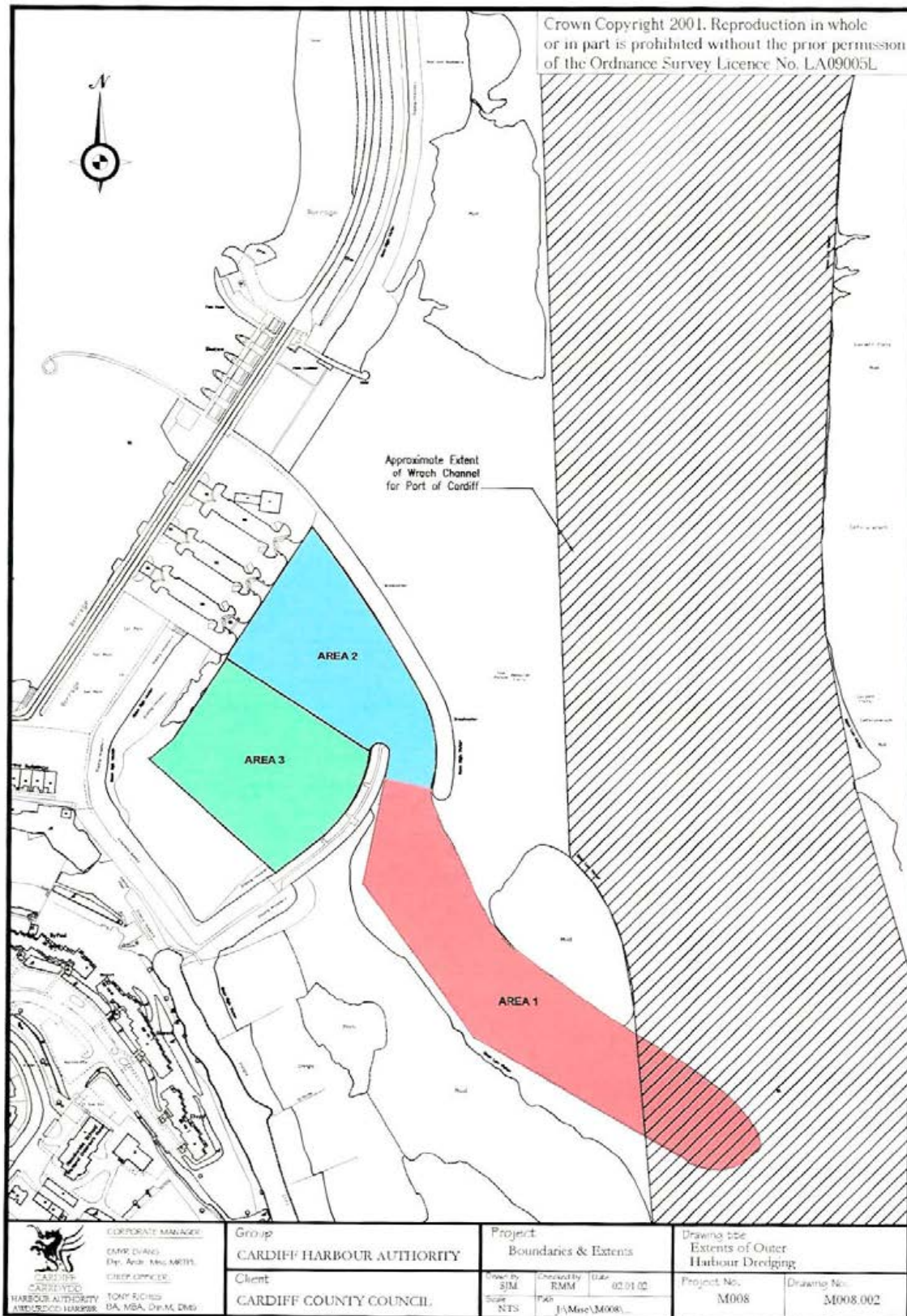
	Jan 2005	Mar 2005
<b>Cormorant</b>		
<i>Mudflat B2</i>	1	3
<i>Mudflat B3</i>	0	0
<i>Mudflat B5</i>	0	0
Mudflat B1	2	4
Mudflat B4	6	4
<b>Mute Swan</b>		
<i>Mudflat B2</i>	0	0
<i>Mudflat B3</i>	0	0
<i>Mudflat B5</i>	0	2
Mudflat B1	0	0
Mudflat B4	0	0
<b>Shelduck</b>		
<i>Mudflat B2</i>	0	2
<i>Mudflat B3</i>	0	3
<i>Mudflat B5</i>	0	2
Mudflat B1	16	29
Mudflat B4	1	28
<b>Mallard</b>		
<i>Mudflat B2</i>	2	2
<i>Mudflat B3</i>	1	9
<i>Mudflat B5</i>	11	4
Mudflat B1	0	2
Mudflat B4	0	0
<b>Oystercatcher</b>		
<i>Mudflat B2</i>	0	0
<i>Mudflat B3</i>	0	0
<i>Mudflat B5</i>	0	0
Mudflat B1	0	0
Mudflat B4	3	17
<b>Curlew</b>		
<i>Mudflat B2</i>	0	0
<i>Mudflat B3</i>	2	2
<i>Mudflat B5</i>	1	0
Mudflat B1	0	0
Mudflat B4	5	7
<b>Redshank</b>		
<i>Mudflat B2</i>	6	5
<i>Mudflat B3</i>	0	1
<i>Mudflat B5</i>	0	0
Mudflat B1	0	0
Mudflat B4	0	0

**Table 3.3** Peak numbers of waterbirds recorded on mudflats near the Cardiff Bay barrage in January and March 2005.

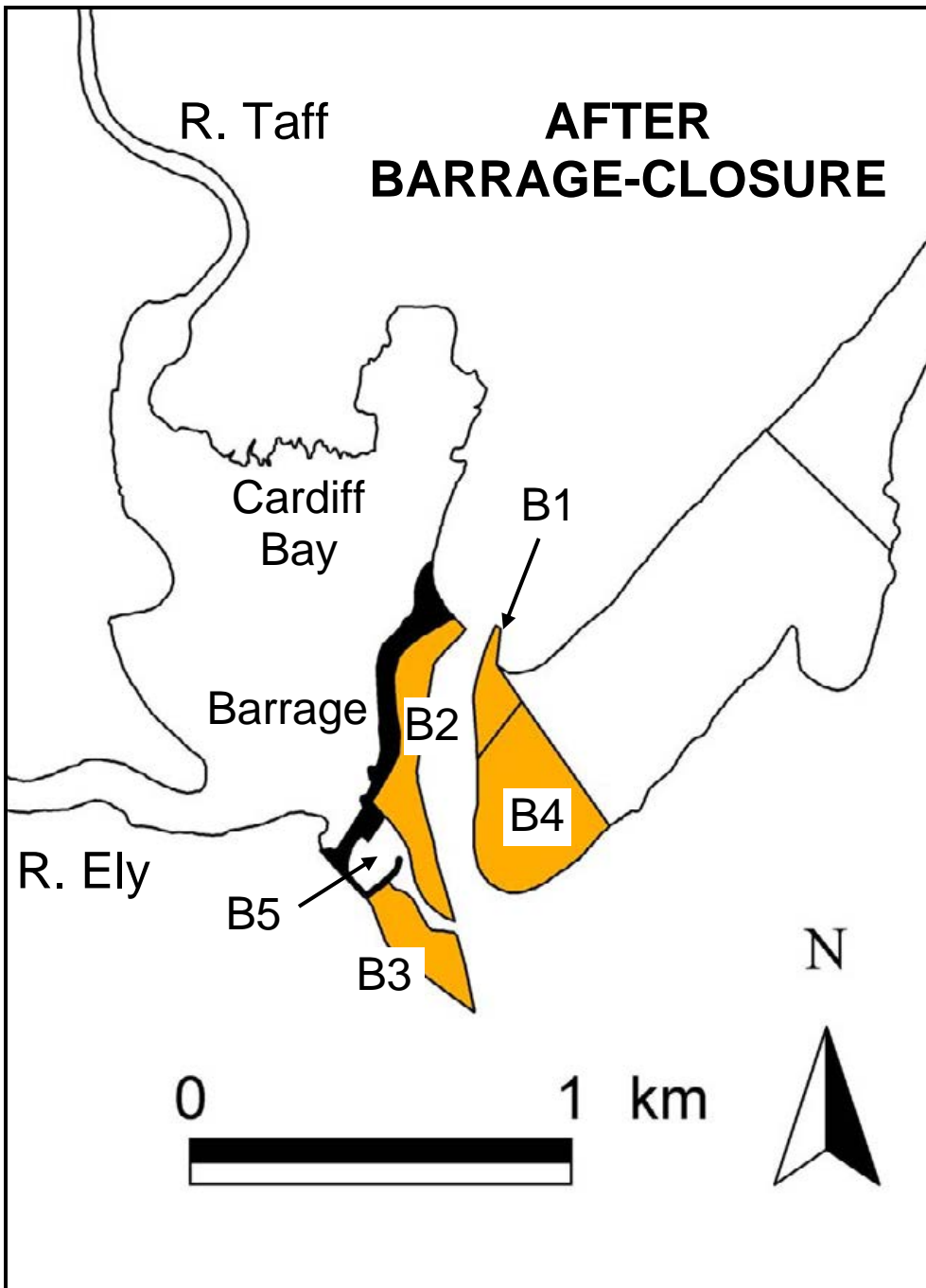
Only species recorded since August 2001 on mudflats affected by dredging (shown italicised) are included.

	Jan 2005	Mar 2005
<b>Black-headed Gull</b>		
<i>Mudflat B2</i>	20	23
<i>Mudflat B3</i>	5	54
<i>Mudflat B5</i>	16	98
Mudflat B1	3	77
Mudflat B4	74	102
<b>Common Gull</b>		
<i>Mudflat B2</i>	0	0
<i>Mudflat B3</i>	0	0
<i>Mudflat B5</i>	0	0
Mudflat B1	0	0
Mudflat B4	6	0
<b>Lesser Black-backed Gull</b>		
<i>Mudflat B2</i>	4	8
<i>Mudflat B3</i>	3	22
<i>Mudflat B5</i>	3	16
Mudflat B1	3	12
Mudflat B4	84	34
<b>Herring Gull</b>		
<i>Mudflat B2</i>	1	3
<i>Mudflat B3</i>	9	13
<i>Mudflat B5</i>	3	13
Mudflat B1	0	1
Mudflat B4	31	38
<b>Great Black-backed Gull</b>		
<i>Mudflat B2</i>	3	2
<i>Mudflat B3</i>	0	3
<i>Mudflat B5</i>	0	0
Mudflat B1	2	2
Mudflat B4	4	1

**Table 3.3** Continued.



**Figure 2.1** The Cardiff Bay barrage showing areas (shaded grey) subject to maintenance dredging.



**Figure 2.2** The Cardiff Bay barrage showing numbered mudflat count areas (shaded grey) used between August 2001 and March 2005.

**Appendix 1** National importance thresholds for waterbird species referred to in this report (taken from Pollitt *et al.* 2003).

Cormorant <i>Phalacrocorax carbo</i>	130
Mute Swan <i>Cygnus olor</i>	260
European White-fronted Goose <i>Anser albifrons albifrons</i>	6000
Shelduck <i>Tadorna tadorna</i>	750
Gadwall <i>Anas strepera</i>	300
Mallard <i>Anas platyrhynchos</i>	5000
Oystercatcher <i>Haematopus ostralegus</i>	3600
Dunlin <i>Calidris alpina</i>	5300
Curlew <i>Numenius arquata</i>	1200
Redshank <i>Tringa totanus</i>	1100
Black-headed Gull <i>Larus ridibundus</i>	19000
Common Gull <i>Larus canus</i>	9000
Lesser Black-backed Gull <i>Larus fuscus</i>	500
Herring Gull <i>Larus argentatus</i>	4500
Great Black-backed Gull <i>Larus marinus</i>	400

