



**Svalbard Barnacle Goose distribution around the
Solway Firth 2013-2014: Flock counts from the
Solway goose Management Scheme area**

WWT Conservation Programmes Report

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Executive Summary

A total of 14 route counts were carried out in winter 2013-2014 within the Solway Barnacle Goose Management Scheme area. Flock counts were made for all goose and swan species encountered, with flocks assigned to fields by code. The times of day, the days of the week and the starting points at which the counts were conducted were varied as much as possible to avoid bias in when a section was surveyed. Instances of direct disturbance aimed at geese and of conversations with farmers were also noted. Data are also presented on the coordinated Solway population (JNCC) counts of the Svalbard Barnacle Goose and on brood size and productivity estimates for this population. The adopted total for this population wintering on the Solway was 38,100 geese (the mean of five counts that were within 10% of the maximum of 38,885 recorded, rounded up to the nearest 100), an increase of 7,100 birds on last winter's adopted estimate of 31,000 geese. This increase was probably due to an improved breeding season in 2013 compared to 2012 and also due to the winter being far more benign in 2013-2014 compared to the harsh winter of 2012-2013 which meant that the birds were probably far less spread out across the Solway in pursuit of food and much more concentrated in the typical count areas making them easier to count, i.e. the winter 2012-2013 population figure could well have been an underestimate. Brood sizes were larger this winter at 1.98 goslings per family – which is close to the average of 2.06 for the current ten year period - with some larger broods recorded (range 1-4 goslings; 80 families sampled), with an average juvenile productivity of 7.0% (range 2.0-30.8% young; 14 flocks and 10,135 birds sampled) compared to 1.6 goslings and 5.5% young respectively for last winter. A minimum of three different leucistic Barnacle Geese was recorded in winter 2013-2014 including a cohort of two that probably represents two associates from the cohort of three seen together last winter on similar parts of the south side of the Solway. The leucistic birds were mainly seen in the Bowness to Grune area or at Rockcliffe, Cumbria with single birds occasionally seen in the Caerlaverock area.

1 Introduction

The Solway Firth is an internationally important site for a number of wetland bird species being a key site for the wintering Svalbard Barnacle Goose population. By mid-winter 100% of the population utilise five main sites around the Solway, with three of those being on the north side of the Firth, including Caerlaverock, Kirkconnell (Nith), and Southwick. This century with the growth of the population to over 35,000 birds, the distribution has spread west towards the Outer Solway with geese now visiting the areas around Colvend and Auchencairn on a regular basis, with significant flocks at Wigtown typically in March and April.

The geese mainly feed within established nature reserves or within the Solway Barnacle Goose Management Scheme area, often choosing stubbles in early autumn and improved pastures and saltmarsh throughout the rest of the winter. SNH has run this management incentive scheme on the Solway since 1995 in order to integrate farming and goose grazing needs on areas of improved agricultural land. On land entered into the scheme, tiered payments are made to help cover the extra costs of managing for Barnacle Geese. Fields are classified as 'Feeding', 'Buffer' (which receive a tiered payment) or 'Scaring' (non-payment) zones depending in large part on the typical level of winter goose use. Controlled scaring is encouraged in the non-payment zone to try to keep the geese within the feeding or buffer zones and is also permitted to a limited extent in April, as due to budgetary constraints imposed since 2012, not all fields in the Scheme area can now receive payments for the April period.

1.1 Objective

The overall objective of the survey is to assess the distribution and abundance of the Svalbard Barnacle Goose and other goose and swan species on the fields and saltmarsh of the north side of the Solway Firth in relation to the Solway Barnacle Goose Management Scheme area.

2 Methods

2.1 Management Scheme route counts

Unlike previous surveys of the Scheme area, due to funding cuts, counts were carried out within a 14-day cycle and the starting points were varied to prevent counting any area at the same time of day, with count days spread evenly throughout the week including weekends. Geese and swans in larger flocks were counted in tens on a tally counter, while those in smaller flocks of <100 were counted individually. All flocks were mapped and coded according to the SNH convention on the field maps provided. Each day was broken down into four counting periods to cover the four main count areas, starting at first light with allowance made for weather conditions, e.g. geese tend to be slow to move off the roost during periods of frost such as those geese flighting off the Blackshaw Bank roost to utilise fields up the River Nith at Greenmerse and Kirkconnell. The time of observer arrival at each count section was recorded. Where significant numbers of geese moved during a count, the field the geese moved from and to was recorded with a “Comment” added within the Excel spreadsheet provided. Observations of leucistic geese have also been added.

As agreed with SNH, in a modification to the previous methodology, only data from the official Scheme count days are included in this report as coded field counts. Summary census counts for the whole Solway and reproductive success estimates as provisioned under the JNCC contract are also provided in summary form for reference. The count route repeated every 14-days covered areas to the east as far as Hurkledale and to the west as far as Colvend. Significant use of any fields outwith the intensive survey area was noted during the census counts.

Areas where there are difficulties observing the fields from the road are well known as are the high vantage points which can be utilised to count them from. Otherwise approach on foot was adopted with prior permission being sought for access.

The presence and nature of any disturbance to the geese, intentional or otherwise, was noted using the SNH field code system provided.

Impromptu discussion with any landowners during the surveys was welcomed and a record of each conversation along with those had during arranged visits or calls to a farmer regarding the geese was logged.

Care was taken in relation to biosecurity and disease prevention, and where access to fields was required there was compliance with any precautions required by the landowners, with gates being left as they were found.

Table 1 – Count sections covered within the counting periods.

Count Period 1	Count Period 2	Count Period 3	Count Period 4
Thwaite	Nith	Southernness	Colvend
Nith	Thwaite	Colvend	Southernness
Southernness	Colvend	Nith	Thwaite
Colvend	Southernness	Thwaite	Nith

As with last winter it soon became clear that the Priestside area was being used occasionally by the Barnacle Geese whereas the section to the northeast of Ward Law covering the Quay Hill was not being used and was therefore not surveyed on a regular basis although it was covered during the co-ordinated counts. In previous years the Priestside section has been dropped due to a lack of goose use but this winter it was surveyed. During the co-ordinated counts of geese on the Solway, geese were rarely recorded in the Auchencairn/Rascarrel area in mid-winter and from February onwards small numbers of Barnacle Geese began using the Wigtown area with sporadic use of the Redkirk/Baurch/Gretna area too (especially Redkirk Merse) but this could not be economically covered via the route count budget.

2.2 Coordinated Svalbard Barnacle Goose total population counts

Each winter WWT has conducted total population counts of the Svalbard Barnacle Geese present on the Solway from arrival to departure. This involves a network of staff and volunteers counting the geese in survey sections within a one hour to two hour time period at the same time on the same day. There are weekly counts during the arrival period in October and during the departure period in April/May, with monthly counts from November to March.

2.3 Brood sizes and juvenile productivity of the Svalbard Barnacle Goose

Each winter WWT carefully assesses the brood sizes and juvenile productivity of a large proportion of the Barnacle Geese from as many sites as possible around the Solway. The dates, land use types, and flock sizes used for sampling are varied as much as possible to avoid any bias in the average estimate obtained, as are the sampling units within the flocks as families with young can tend to associate at the edges of a flock, particularly at the front. All observations were carried out by an experienced observer.

2.4 Tide tables

Tide tables are presented in the following figures for the months during which the geese were present in the Barnacle Goose Management Scheme area.

SEPTEMBER 2013 LAVER'S LIVERPOOL (Gladstone) TIDES
All times shown are GMT – add one hour from 0100 31 March to 0100 27 October

Date	HIGH WATER						LOW WATER						SUN MOON				
	Morning		Afternoon		Morning		Afternoon		Rise	Set	Rise	Set	Ph.	Ph.			
	Time	M	Ft	Time	M	Ft	Time	M							Ft		
1 Sun	0617	7.4	24.3	2042	7.8	25.7	0230	3.1	10.3	1447	3.1	10.3	0521	1901	0109	1648	
2 Mon	0906	7.9	25.9	2127	8.3	27.3	0326	2.6	8.7	1537	2.7	8.8	0523	1659	0211	1716	
3 Tue	0948	8.3	27.3	2204	8.7	28.6	0412	2.2	7.2	1619	2.2	7.3	0525	1667	0317	1741	
4 Wed	1023	8.7	28.5	2238	9.0	29.6	0452	1.8	5.9	1657	1.9	6.1	0527	1654	0424	1803	
5 Thu	1056	9.0	29.4	2310	9.2	30.3	0529	1.5	4.9	1735	1.6	5.2	0528	1662	0534	1824	1136
6 Fri	1127	9.2	30.1	2342	9.4	30.7	0605	1.3	4.1	1812	1.4	4.5	0530	1649	0644	1846	
7 Sat				1200	9.3	30.4	0641	1.1	3.7	1848	1.3	4.1	0532	1647	0756	1909	
8 Sun	0015	9.4	30.9	1235	9.3	30.5	0715	1.1	3.7	1924	1.3	4.3	0534	1645	0910	1934	
9 Mon	0050	9.4	30.7	1311	9.2	30.2	0750	1.3	4.3	1959	1.5	4.9	0535	1642	1024	2003	
10 Tue	0127	9.2	30.2	1350	9.0	29.4	0824	1.6	5.2	2036	1.6	5.9	0537	1640	1137	2039	
11 Wed	0207	8.9	29.2	1433	8.6	28.3	0900	2.0	6.4	2118	2.2	7.1	0539	1637	1247	2124	
12 Thu	0255	8.5	27.8	1528	8.2	27.0	0945	2.4	7.9	2212	2.6	8.4	0541	1635	1351	2218	1710
13 Fri	0358	8.0	26.2	1641	7.9	25.9	1046	2.9	9.4	2326	2.8	9.3	0542	1632	1447	2323	
14 Sat	0524	7.7	25.1	1808	7.8	25.7				1215	3.0	9.9	0544	1630	1533		
15 Sun	0656	7.8	25.5	1923	8.2	26.9	0101	2.7	8.9	1344	2.8	9.0	0546	1628	1611	0036	
16 Mon	0812	8.2	27.0	2036	8.6	28.7	0223	2.3	7.4	1456	2.2	7.3	0547	1625	1642	0154	
17 Tue	0912	8.8	28.8	2130	9.3	30.4	0332	1.7	5.4	1557	1.7	5.5	0549	1623	1710	0314	
18 Wed	1001	9.2	30.2	2217	9.7	31.7	0430	1.2	3.8	1649	1.3	4.1	0551	1620	1734	0434	
19 Thu	1045	9.5	31.1	2300	9.9	32.4	0520	0.8	2.6	1736	1.0	3.2	0553	1618	1758	0553	1113
20 Fri	1124	9.6	31.4	2339	9.9	32.4	0603	0.7	2.1	1817	0.9	2.8	0554	1615	1822	0710	
21 Sat				1202	9.5	31.3	0642	0.7	2.3	1855	1.0	3.1	0556	1613	1848	0825	
22 Sun	0016	9.7	32.0	1237	9.4	30.7	0717	0.9	3.1	1931	1.2	4.0	0558	1610	1917	0937	
23 Mon	0054	9.4	31.0	1311	9.1	29.8	0749	1.3	4.4	2005	1.6	5.3	0600	1608	1950	1045	
24 Tue	0130	9.0	29.6	1345	8.7	28.5	0818	1.8	6.0	2037	2.1	7.0	0601	1605	2028	1147	
25 Wed	0206	8.5	28.0	1423	8.3	27.1	0847	2.4	7.8	2111	2.7	8.7	0603	1603	2103	1243	
26 Thu	0246	8.0	26.2	1507	7.8	25.6	0918	2.9	9.6	2153	3.2	10.4	0605	1601	2203	1331	
27 Fri	0339	7.4	24.4	1607	7.3	24.0	1002	3.4	11.3	2255	3.6	11.6	0607	1598	2259	1412	0356
28 Sat	0451	7.0	22.9	1730	7.1	23.2	1111	3.6	12.5				0608	1596	2359	1447	
29 Sun	0620	6.9	22.7	1856	7.2	23.7	0027	3.6	11.9	1250	3.8	12.5	0610	1593		1516	
30 Mon	0737	7.3	23.8	2002	7.7	25.2	0147	3.3	10.8	1406	3.4	11.2	0612	1591	0103	1542	

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LAVER'S LIVERPOOL (Gladstone) TIDES **OCTOBER 2013**
All times shown are GMT – add one hour from 0100 31 March to 0100 27 October

Date	HIGH WATER						LOW WATER						SUN MOON				
	Morning		Afternoon		Morning		Afternoon		Rise	Set	Rise	Set	Ph.	Ph.			
	Time	M	Ft	Time	M	Ft	Time	M							Ft		
1 Tue	0633	7.8	25.5	2051	8.2	26.8	0247	2.8	9.2	1501	2.9	9.4	0614	1748	0209	1605	
2 Wed	0915	8.3	27.2	2130	8.6	28.3	0335	2.3	7.4	1547	2.4	7.7	0616	1746	0317	1627	
3 Thu	0951	8.7	28.6	2206	9.0	29.6	0418	1.8	6.0	1628	1.9	6.2	0617	1744	0428	1649	
4 Fri	1025	9.1	29.8	2240	9.3	30.5	0458	1.5	4.8	1709	1.5	5.1	0619	1741	0540	1712	
5 Sat	1059	9.4	30.7	2315	9.5	31.2	0537	1.2	3.9	1748	1.3	4.2	0621	1739	0654	1737	0034
6 Sun	1134	9.5	31.3	2351	9.6	31.5	0615	1.1	3.4	1827	1.2	3.8	0623	1737	0809	1806	
7 Mon				1211	9.6	31.4	0652	1.1	3.4	1905	1.2	3.8	0624	1734	0925	1840	
8 Tue	0029	9.5	31.3	1250	9.5	31.1	0729	1.2	4.0	1943	1.3	4.4	0626	1732	1038	1923	
9 Wed	0109	9.3	30.6	1333	9.2	30.3	0805	1.5	5.0	2024	1.6	5.4	0628	1729	1145	2015	
10 Thu	0154	9.0	29.4	1420	8.9	29.0	0845	2.0	6.4	2109	2.0	6.7	0630	1727	1243	2117	
11 Fri	0247	8.5	27.9	1518	8.4	27.6	0933	2.5	8.0	2207	2.4	8.0	0632	1725	1331	2227	2304
12 Sat	0354	8.0	26.2	1631	8.1	26.4	1038	2.9	9.5	2325	2.7	8.8	0634	1722	1411	2342	
13 Sun	0518	7.7	25.3	1754	8.0	26.3				1205	3.0	10.0	0635	1720	1444		
14 Mon	0645	7.8	25.7	1912	8.3	27.2	0051	2.6	8.4	1329	2.8	9.1	0637	1718	1512	0059	
15 Tue	0757	8.3	27.1	2017	8.7	28.7	0208	2.2	7.2	1439	2.3	7.6	0639	1716	1537	0217	
16 Wed	0854	8.7	28.6	2111	9.2	30.1	0313	1.7	5.7	1538	1.9	6.1	0641	1713	1600	0334	
17 Thu	0942	9.1	29.8	2157	9.5	31.0	0409	1.4	4.5	1628	1.5	4.9	0643	1711	1624	0450	
18 Fri	1023	9.3	30.5	2238	9.6	31.5	0455	1.2	3.8	1712	1.3	4.2	0645	1709	1649	0505	2338
19 Sat	1101	9.4	30.9	2316	9.6	31.5	0536	1.1	3.5	1752	1.2	3.9	0646	1707	1716	0717	
20 Sun	1136	9.4	30.9	2353	9.5	31.0	0612	1.2	3.8	1829	1.3	4.1	0648	1704	1747	0827	
21 Mon				1210	9.3	30.5	0645	1.3	4.4	1904	1.5	4.8	0650	1702	1823	0932	
22 Tue	0028	9.2	30.3	1243	9.1	29.8	0715	1.6	5.3	1935	1.8	5.8	0652	1700	1905	1031	
23 Wed	0103	8.9	29.2	1316	8.8	28.9	0744	2.0	6.6	2009	2.2	7.1	0654	1698	1954	1123	
24 Thu	0138	8.5	28.0	1352	8.5	27.7	0812	2.4	7.9	2041	2.6	8.4	0656	1696	2046	1207	
25 Fri	0217	8.1	26.5	1433	8.0	26.4	0844	2.8	9.3	2120	3.0	9.8	0658	1694	2146	1245	
26 Sat	0303	7.6	25.0	1524	7.6	25.0	0925	3.3	10.8	2212	3.3	10.9	0700	1691	2248	1316	2342
27 Sun	0400	7.2	23.8	1632	7.3	23.9	1021	3.7	12.0	2325	3.5	11.5	0702	1689	2353	1343	
28 Mon	0521	7.0	23.0	1754	7.2	23.8	1142	3.8	12.5				0703	1687		1407	
29 Tue	0641	7.2	23.6	1907	7.5	24.7	0048	3.4	11.1	1309	3.6	11.7	0705	1685	0059	1429	
30 Wed	0744	7.6	25.0	2003	8.0	26.2	0156	3.0	9.7	1415	3.1	10.2	0707	1683	0208	1451	
31 Thu	0832	8.2	26.8	2049	8.5	27.8	0251	2.5	8.1	1507	2.6	8.4	0709	1681	0318	1513	

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NOVEMBER 2013 LAVER'S LIVERPOOL (Gladstone) TIDES

● New Moon ● First Quarter ○ Full Moon ● Last Quarter															
HIGH WATER				LOW WATER				SUN MOON							
Morning		Afternoon		Morning		Afternoon		Rise	Set	Rise	Set	Rise	Set		
Date	Time	M	Ft	Time	M	Ft	Time	M	Ft	Time	M	Ft	Time	M	Ft
1 Fri	0914	8.7	28.4	2130	8.9	29.2	0339	2.0	6.5	1555	2.1	6.9	0711	1639	0431 1637
2 Sat	0652	9.1	29.9	2209	9.3	30.4	0425	1.6	5.2	1640	1.6	5.4	0713	1637	0547 1604
3 Sun	1030	9.5	31.0	2248	9.5	31.3	0508	1.3	4.2	1724	1.3	4.3	0715	1636	0704 1637 1250
4 Mon	1110	9.7	31.8	2330	9.7	31.7	0550	1.1	3.5	1807	1.1	3.7	0717	1634	0820 1717
5 Tue	1151	9.8	32.1				0630	1.0	3.4	1850	1.1	3.5	0719	1632	0932 1806
6 Wed	0012	9.6	31.6	1235	9.7	31.8	0711	1.2	3.8	1933	1.2	3.9	0721	1630	1035 1907
7 Thu	0059	9.4	31.0	1321	9.5	31.1	0752	1.4	4.7	2018	1.4	4.7	0723	1628	1129 2016
8 Fri	0148	9.1	29.8	1412	9.1	30.0	0836	1.8	6.0	2103	1.8	5.8	0724	1626	1212 2131
9 Sat	0243	8.6	28.3	1510	8.7	28.7	0927	2.3	7.5	2207	2.1	7.0	0726	1625	1247 2249
10 Sun	0348	8.2	26.9	1618	8.4	27.6	1031	2.7	8.9	2317	2.4	7.8	0728	1623	1316 0559
11 Mon	0503	7.9	26.0	1732	8.3	27.1	1148	2.9	9.4	0730	1621	1342 0906			
12 Tue	0521	7.9	26.0	1846	8.3	27.4	0301	2.4	7.8	1304	2.8	9.1	0732	1620	1405 0122
13 Wed	0731	8.2	26.8	1951	8.6	28.2	0142	2.2	7.3	1412	2.5	8.1	0734	1618	1428 0237
14 Thu	0830	8.5	27.9	2048	8.8	28.0	0246	2.0	6.5	1512	2.2	7.1	0736	1617	1452 0351
15 Fri	0919	8.8	28.9	2136	9.0	29.7	0342	1.8	5.8	1604	1.9	6.1	0738	1615	1517 0503
16 Sat	1001	9.0	29.6	2217	9.2	30.1	0429	1.6	5.4	1649	1.7	5.5	0739	1614	1546 0612
17 Sun	1039	9.2	30.1	2256	9.2	30.2	0509	1.6	5.2	1700	1.6	5.2	0741	1612	1620 0719
18 Mon	1115	9.2	30.2	2332	9.2	30.0	0544	1.6	5.3	1806	1.6	5.2	0743	1611	1700 0820
19 Tue	1148	9.2	30.1				0616	1.7	5.5	1911	1.7	5.5	0745	1610	1746 0915
20 Wed	0007	9.0	29.6	1221	9.1	29.8	0646	1.8	6.0	1914	1.9	6.1	0747	1608	1838 1003
21 Thu	0041	8.8	28.0	1254	8.9	29.2	0716	2.1	6.7	1945	2.1	6.9	0748	1607	1935 1043
22 Fri	0116	8.6	28.2	1330	8.7	28.4	0746	2.3	7.6	2019	2.4	7.7	0750	1606	2035 1117
23 Sat	0153	8.3	27.1	1407	8.4	27.4	0820	2.6	8.6	2056	2.7	8.7	0752	1605	2133 1146
24 Sun	0233	7.9	26.0	1450	8.0	26.3	0900	3.0	9.7	2141	2.9	9.6	0754	1604	2243 1210
25 Mon	0321	7.6	24.9	1542	7.7	25.3	0948	3.3	10.8	2236	3.2	10.4	0755	1602	2349 1233 1930
26 Tue	0421	7.3	24.0	1646	7.5	24.6	1048	3.5	11.8	2343	3.2	10.6	0757	1601	2438 1254
27 Wed	0532	7.3	23.9	1758	7.5	24.7				1203	3.5	11.6	0758	1600	0057 1315
28 Thu	0642	7.5	24.7	1905	7.8	25.6	0056	3.1	10.0	1318	3.3	10.7	0800	1600	0208 1337
29 Fri	0742	8.0	26.1	2003	8.2	27.0	0202	2.7	8.8	1423	2.8	9.2	0802	1559	0321 1402
30 Sat	0834	8.5	27.8	2054	8.7	28.5	0300	2.2	7.3	1529	2.3	7.5	0803	1558	0436 1431

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LAVER'S LIVERPOOL (Gladstone) TIDES DECEMBER 2013

● New Moon ● First Quarter ○ Full Moon ● Last Quarter															
HIGH WATER				LOW WATER				SUN MOON							
Morning		Afternoon		Morning		Afternoon		Rise	Set	Rise	Set	Rise	Set		
Date	Time	M	Ft	Time	M	Ft	Time	M	Ft	Time	M	Ft	Time	M	Ft
1 Sun	0921	9.0	29.4	2142	9.1	29.9	0351	1.8	5.9	1612	1.8	6.0	0805	1567	0533 1507
2 Mon	1006	9.4	30.8	2227	9.4	30.9	0441	1.4	4.7	1702	1.4	4.6	0806	1566	0708 1552
3 Tue	1051	9.7	31.8	2314	9.6	31.6	0527	1.2	3.8	1751	1.1	3.6	0808	1566	0816 1649
4 Wed	1136	9.9	32.4				0613	1.0	3.4	1839	0.9	3.1	0809	1565	0918 1756
5 Thu	0002	9.7	31.8	1224	9.9	32.5	0659	1.1	3.4	1927	0.9	3.0	0810	1565	1008 1912
6 Fri	0051	9.6	31.4	1312	9.8	32.7	0744	1.2	4.0	2015	1.1	3.4	0812	1564	1048 2032
7 Sat	0141	9.3	30.5	1403	9.5	31.2	0831	1.5	5.0	2105	1.3	4.3	0813	1564	1120 2152
8 Sun	0235	8.9	29.3	1457	9.2	30.7	0921	1.9	6.3	2159	1.7	5.5	0814	1564	1147 2311
9 Mon	0332	8.5	27.9	1557	8.8	28.8	1017	2.3	7.6	2257	2.0	6.7	0815	1563	1211 1513
10 Tue	0436	8.2	26.7	1700	8.5	27.7	1121	2.6	8.7				0817	1563	1234 0027
11 Wed	0545	7.9	26.0	1809	8.3	27.1	0000	2.3	7.6	1230	2.8	9.1	0818	1563	1258 0141
12 Thu	0656	7.9	26.0	1918	8.2	27.0	0107	2.4	8.0	1339	2.7	9.0	0819	1563	1322 0253
13 Fri	0800	8.1	26.6	2021	8.4	27.4	0212	2.4	7.9	1443	2.6	8.4	0820	1563	1349 0403
14 Sat	0855	8.4	27.5	2114	8.5	28.0	0312	2.3	7.5	1539	2.3	7.6	0821	1563	1421 0509
15 Sun	0941	8.6	28.3	2159	8.7	28.5	0402	2.2	7.1	1628	2.1	6.9	0821	1563	1458 0612
16 Mon	1021	8.8	29.0	2239	8.8	28.9	0444	2.1	6.7	1711	1.9	6.4	0822	1563	1541 0709
17 Tue	1057	9.0	29.5	2315	8.9	29.1	0520	2.0	6.4	1748	1.8	6.0	0823	1563	1630 0759 0929
18 Wed	1132	9.1	29.7	2351	8.9	29.1	0553	1.9	6.3	1823	1.8	5.9	0824	1564	1725 0842
19 Thu				1205	9.1	29.8	0624	1.9	6.3	1856	1.8	6.0	0824	1564	1820 0919
20 Fri	0024	8.8	28.9	1238	9.0	29.5	0655	2.0	6.4	1928	1.9	6.2	0825	1564	1927 0949
21 Sat	0057	8.7	28.6	1312	8.9	29.1	0727	2.1	6.8	2001	2.0	6.8	0826	1565	2031 1015
22 Sun	0132	8.5	28.0	1345	8.7	28.4	0802	2.2	7.3	2036	2.2	7.3	0826	1565	2136 1038
23 Mon	0208	8.3	27.2	1421	8.4	27.6	0839	2.5	8.1	2115	2.5	8.1	0827	1566	2242 1059
24 Tue	0248	8.0	26.3	1503	8.2	26.8	0920	2.8	9.1	2158	2.7	8.9	0827	1567	2350 1120
25 Wed	0333	7.8	25.5	1551	7.9	26.0	1007	3.1	10.0	2250	2.9	9.6	0827	1567	1441 1350
26 Thu	0430	7.6	24.9	1651	7.8	25.4	1106	3.2	10.6	2354	3.0	9.9	0827	1568	0059 1203
27 Fri	0538	7.6	24.8	1803	7.8	25.4				1218	3.3	10.7	0828	1569	0211 1229
28 Sat	0650	7.8	25.6	1917	8.0	26.2	0109	2.9	9.4	1336	3.0	9.8	0828	1600	0325 1300
29 Sun	0756	8.2	26.9	2022	8.4	27.5	0220	2.5	8.3	1445	2.5	8.3	0829	1601	0440 1339
30 Mon	0854	8.7	28.6	2120	8.8	29.0	0321	2.1	6.8	1543	2.0	6.5	0829	1602	0553 1428
31 Tue	0946	9.2	30.3	2212	9.3	30.4	0417	1.6	5.3	1644	1.5	4.9	0828	1603	0659 1530

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Figure 1. Tide table for the period from September to December 2013. High tide is seen on the Inner Solway approximately 30 minutes after the time given.

JANUARY 2014 LAVER'S LIVERPOOL (Gladstone) TIDES

● New Moon ● First Quarter ○ Full Moon ● Last Quarter															
HIGH WATER				LOW WATER				SUN MOON							
Morning		Afternoon		Morning		Afternoon		Rise	Set	Rise	Set	Rise	Set		
Date	Time	M	Ft	Time	M	Ft	Time	M	Ft	Time	M	Ft	Time	M	Ft
1 Wed	1036	9.6	31.6	2303	9.6	31.4	0509	1.2	4.0	1738	1.0	3.4	0828	1604	0756 1643
2 Thu	1125	9.9	32.6	2353	9.7	32.0	0590	1.0	3.1	1830	0.7	2.3	0828	1605	0842 1803
3 Fri				1213	10.1	33.1	0648	0.8	2.7	1919	0.5	1.8	0827	1606	0919 1927
4 Sat	0042	9.7	31.9	1301	10.1	33.0	0735	0.9	2.8	2006	0.6	1.9	0827	1607	0949 2049
5 Sun	0130	9.5	31.3	1349	9.9	32.3	0821	1.1	3.5	2053	0.9	2.8	0827	1608	1016 2210
6 Mon	0218	9.2	30.2	1437	9.5	31.1	0906	1.5	4.8	2139	1.3	4.3	0826	1610	1040 2327
7 Tue	0306	8.8	28.7	1528	9.0	29.6	0954	1.9	6.3	2227	1.8	6.0	0826	1611	1104
8 Wed	0400	8.3	27.2	1623	8.5	27.9	1046	2.4	7.9	2321	2.3	7.7	0825	1613	1128 0041
9 Thu	0500	7.9	25.9	1727	8.1	26.4	1148	2.8	9.2	0825	1614	1155 0153			
10 Fri	0611	7.6	25.0	1839	7.8	25.6	0024	2.7	9.0	1259	3.0	9.9	0824	1615	1224 0301
11 Sat	0724	7.7	25.1	1951	7.8	25.6	0133	2.9	9.5	1411	3.0	9.7	0823	1617	1259 0405
12 Sun	0830	7.9	25.9	2054	8.0	26.2	0239	2.8	9.3	1515	2.7	8.9	0823	1619	1339 0504
13 Mon	0922	8.2	27.0	2143	8.3	27.1	0335	2.6	8.6	1609	2.4	7.9	0822	1620	1426 0556
14 Tue	1006	8.5	28.0	2225	8.5	27.9	0423	2.4	7.8	1654	2.1	7.0	0821	1622	1519 0642
15 Wed	1042	8.8	28.8</												

MARCH 2014 LAYER'S LIVERPOOL (Gladstone) TIDES

All times shown are GMT – add one hour from 0100 30 March to 0100 26 October

Date	HIGH WATER						LOW WATER						SUN MOON				
	Morning			Afternoon			Morning			Afternoon			Rise	Set	Rise	Set	
	Time	M	Ft	Time	M	Ft	Time	M	Ft	Time	M	Ft					
1 Sat	1057	9.9	32.5	2324	9.7	32.0	0632	0.8	2.5	1802	0.3	1.1	0700	1750	0640	1830	0803
2 Sun	1142	10.1	33.3				0618	0.5	1.5	1847	0.2	0.5	0659	1752	0706	1952	●
3 Mon	0007	9.8	32.2	1224	10.1	33.3	0701	0.4	1.2	1927	0.2	0.8	0656	1753	0732	2110	
4 Tue	0048	9.7	31.8	1306	9.9	32.6	0742	0.5	1.7	2006	0.6	1.9	0653	1755	0759	2226	
5 Wed	0126	9.4	30.8	1346	9.5	31.3	0819	0.9	3.0	2041	1.1	3.7	0651	1757	0828	2337	
6 Thu	0204	9.0	29.5	1425	9.0	29.5	0857	1.5	4.5	2115	1.8	5.8	0649	1759	0901		
7 Fri	0243	8.5	27.8	1508	8.4	27.4	0935	2.1	6.9	2151	2.5	8.1	0646	1801	0938	0042	●
8 Sat	0329	7.9	26.0	1600	7.7	25.3	1019	2.7	9.0	2236	3.1	10.1	0644	1803	1021	0141	1327
9 Sun	0429	7.4	24.2	1709	7.2	23.5	1123	3.3	10.7	2348	3.5	11.6	0641	1805	1109	0233	
10 Mon	0549	7.1	23.2	1837	7.0	22.9	1251	3.4	11.2	0639	1807	1203	0639	1807	1203	0317	
11 Tue	0716	7.2	23.5	1957	7.2	23.8	0121	3.6	11.8	1412	3.2	10.4	0637	1809	1301	0354	
12 Wed	0826	7.6	24.8	2056	7.7	25.2	0236	3.2	10.6	1515	2.7	9.0	0634	1810	1403	0425	
13 Thu	0915	8.0	26.3	2139	8.1	26.7	0330	2.8	8.1	1603	2.3	7.4	0632	1812	1506	0452	
14 Fri	0955	8.4	27.7	2215	8.5	27.9	0413	2.3	7.6	1644	1.9	6.1	0629	1814	1612	0517	
15 Sat	1030	8.8	28.8	2247	8.8	28.8	0450	1.9	6.3	1719	1.5	5.0	0627	1816	1718	0539	○
16 Sun	1103	9.0	29.5	2318	9.0	29.6	0525	1.6	5.2	1753	1.3	4.2	0625	1818	1826	0600	1711
17 Mon	1133	9.2	30.1	2349	9.2	30.0	0559	1.3	4.3	1826	1.1	3.7	0622	1820	1935	0622	
18 Tue				1205	9.2	30.3	0633	1.2	3.8	1900	1.1	3.6	0620	1822	2045	0645	
19 Wed	0021	9.2	30.2	1236	9.2	30.3	0708	1.1	3.7	1932	1.2	3.9	0617	1823	2156	0711	
20 Thu	0054	9.2	30.1	1309	9.1	30.0	0742	1.3	4.1	2004	1.4	4.6	0615	1825	2306	0740	
21 Fri	0129	9.0	29.6	1346	8.9	29.3	0816	1.5	4.9	2038	1.7	5.6	0613	1827		0816	
22 Sat	0209	8.8	28.7	1428	8.6	28.2	0854	1.8	6.0	2115	2.1	7.0	0610	1829	0014	0859	
23 Sun	0255	8.4	27.6	1521	8.2	26.8	0939	2.2	7.2	2206	2.6	8.4	0608	1831	0116	0952	●
24 Mon	0356	8.0	26.2	1632	7.7	25.3	1039	2.6	8.4	2318	2.9	9.6	0605	1833	0211	1055	0148
25 Tue	0515	7.7	25.4	1803	7.6	24.9			1204	2.7	8.9	0603	1834	0257	1205		
26 Wed	0641	7.8	25.7	1928	7.9	25.9	0654	2.9	9.5	1336	2.4	8.0	0600	1836	0337	1322	
27 Thu	0757	8.3	27.2	2038	8.4	27.6	0217	2.5	8.0	1453	1.9	6.2	0558	1838	0410	1442	
28 Fri	0859	8.9	29.1	2133	8.9	29.3	0324	1.9	6.1	1558	1.3	4.3	0556	1840	0439	1603	
29 Sat	0951	9.4	30.7	2221	9.3	30.6	0422	1.3	4.3	1663	0.8	2.7	0553	1842	0505	1723	●
30 Sun	1037	9.7	31.9	2303	9.6	31.4	0512	0.9	2.8	1740	0.5	1.7	0551	1844	0531	1843	1848
31 Mon	1121	9.9	32.4	2344	9.7	31.7	0557	0.6	1.9	1822	0.4	1.3	0548	1845	0557	2000	

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LAYER'S LIVERPOOL (Gladstone) TIDES APRIL 2014

All times shown are GMT – add one hour from 0100 30 March to 0100 26 October

Date	HIGH WATER						LOW WATER						SUN MOON				
	Morning			Afternoon			Morning			Afternoon			Rise	Set	Rise	Set	
	Time	M	Ft	Time	M	Ft	Time	M	Ft	Time	M	Ft					
1 Tue				1202	9.9	32.3	0639	0.5	1.7	1901	0.5	1.7	0546	1847	0626	2114	
2 Wed	0022	9.6	31.4	1241	9.6	31.6	0717	0.7	2.1	1936	0.8	2.8	0543	1849	0657	2224	
3 Thu	0059	9.3	30.6	1319	9.3	30.4	0754	1.0	3.2	2009	1.3	4.3	0541	1851	0733	2327	
4 Fri	0135	9.0	29.4	1357	8.8	28.9	0829	1.5	4.9	2040	1.9	6.2	0539	1853	0814		
5 Sat	0212	8.5	28.0	1437	8.3	27.1	0904	2.0	6.7	2112	2.5	8.1	0536	1854	0901	0023	
6 Sun	0254	8.1	26.4	1525	7.7	25.3	0944	2.6	8.5	2150	3.0	9.9	0534	1856	0954	0111	●
7 Mon	0347	7.5	24.7	1627	7.2	23.6	1036	3.1	10.1	2247	3.5	11.5	0532	1858	1051	0151	0632
8 Tue	0458	7.1	23.4	1748	6.9	22.7	1155	3.4	11.0				0529	1900	1151	0225	
9 Wed	0623	7.1	23.2	1909	7.1	23.2	0018	3.7	12.1	1321	3.3	10.7	0527	1902	1254	0254	
10 Thu	0737	7.3	24.1	2013	7.5	24.5	0145	3.5	11.3	1427	2.9	9.4	0524	1904	1358	0319	
11 Fri	0833	7.8	25.5	2100	7.9	26.0	0246	3.0	9.8	1520	2.4	7.8	0522	1905	1504	0342	
12 Sat	0916	8.2	26.9	2139	8.4	27.5	0334	2.5	8.1	1604	2.0	6.4	0520	1907	1611	0404	
13 Sun	0955	8.6	28.1	2213	8.7	28.6	0415	2.0	6.6	1644	1.6	5.2	0517	1909	1720	0425	
14 Mon	1030	8.9	29.1	2247	9.0	29.6	0454	1.6	5.3	1721	1.3	4.3	0515	1911	1831	0448	○
15 Tue	1103	9.1	29.8	2321	9.2	30.2	0533	1.3	4.3	1758	1.1	3.6	0513	1913	1942	0513	0745
16 Wed	1138	9.2	30.3	2356	9.3	30.6	0611	1.1	3.6	1835	1.0	3.4	0511	1914	2055	0542	
17 Thu				1214	9.3	30.4	0648	1.0	3.4	1911	1.1	3.5	0508	1916	2205	0616	
18 Fri	0033	9.3	30.6	1252	9.2	30.2	0726	1.1	3.5	1946	1.3	4.2	0506	1918	2310	0657	
19 Sat	0112	9.2	30.2	1334	9.0	29.5	0804	1.3	4.2	2023	1.6	5.2	0504	1920	0748		
20 Sun	0156	9.0	29.4	1421	8.7	28.4	0845	1.6	5.2	2105	2.0	6.5	0501	1922	0808	0848	
21 Mon	0246	8.6	28.2	1517	8.2	27.0	0933	1.9	6.3	2157	2.4	7.9	0459	1924	0857	0956	●
22 Tue	0348	8.2	27.0	1628	7.9	25.8	1036	2.3	7.4	2309	2.7	9.0	0457	1925	1018	1111	0753
23 Wed	0503	8.0	26.2	1751	7.8	25.4	1156	2.4	7.8				0455	1927	0132	1228	
24 Thu	0622	8.1	26.4	1910	8.0	26.7	0036	2.7	9.0	1318	2.2	7.2	0453	1929	0241	1346	
25 Fri	0735	8.4	27.5	2017	8.4	27.5	0154	2.4	7.9	1430	1.8	6.0	0450	1931	0308	1504	
26 Sat	0836	8.8	28.8	2112	8.8	28.8	0301	1.9	6.4	1534	1.4	4.7	0448	1933	0333	1622	
27 Sun	0929	9.1	30.0	2158	9.1	29.0	0359	1.5	4.9	1628	1.1	3.7	0446	1934	0358	1738	
28 Mon	1015	9.4	30.7	2241	9.3	30.5	0449	1.2	3.8	1715	0.9	3.1	0444	1936	0425	1853	●
29 Tue	1059	9.5	31.1	2321	9.4	30.7	0534	1.0	3.7	1755	0.9	2.9	0442	1938	0454	2005	0618
30 Wed	1139	9.4	31.0	2358	9.3	30.6	0615	0.9	2.9	1833	1.0	3.2	0440	1940	0528	2111	

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Figure 2. Tide table for the period from January to April 2014. High tide is seen on the Inner Solway approximately 30 minutes after the time given.

2.5 SNH field code maps

A field code system has been used by SNH to cover all of the fields within the Management Scheme area typically used by the geese. These are the codes used in the results tables. Where geese were recorded in an uncoded field, the coding was extended in a logical and consecutive manner. The figures are ordered in a sequence from east (Priestside area) to west (Colvend area).

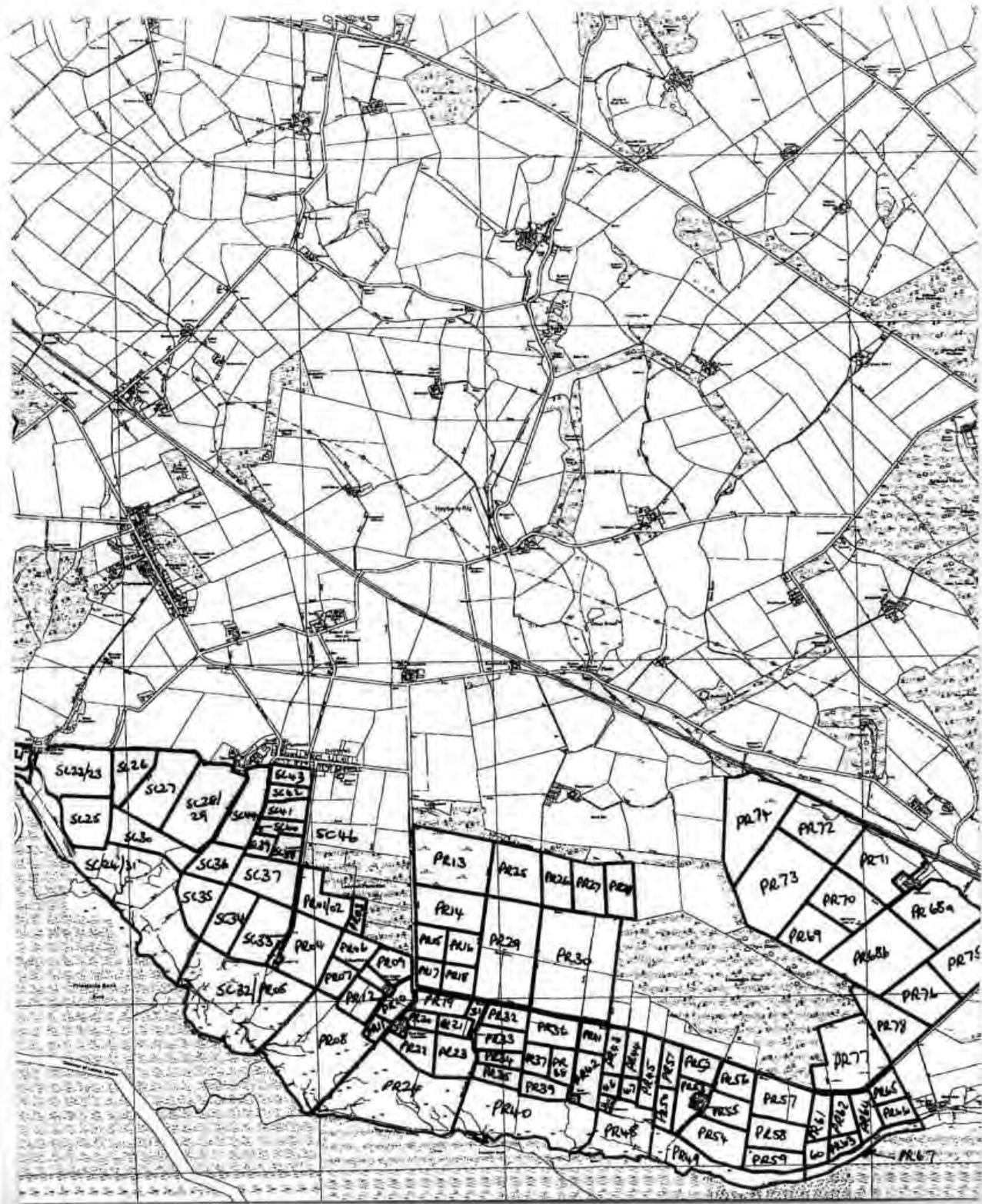


Figure 3. Field codes for the Priestside/Hurkledale/Thwaite area of the Goose Management Scheme.

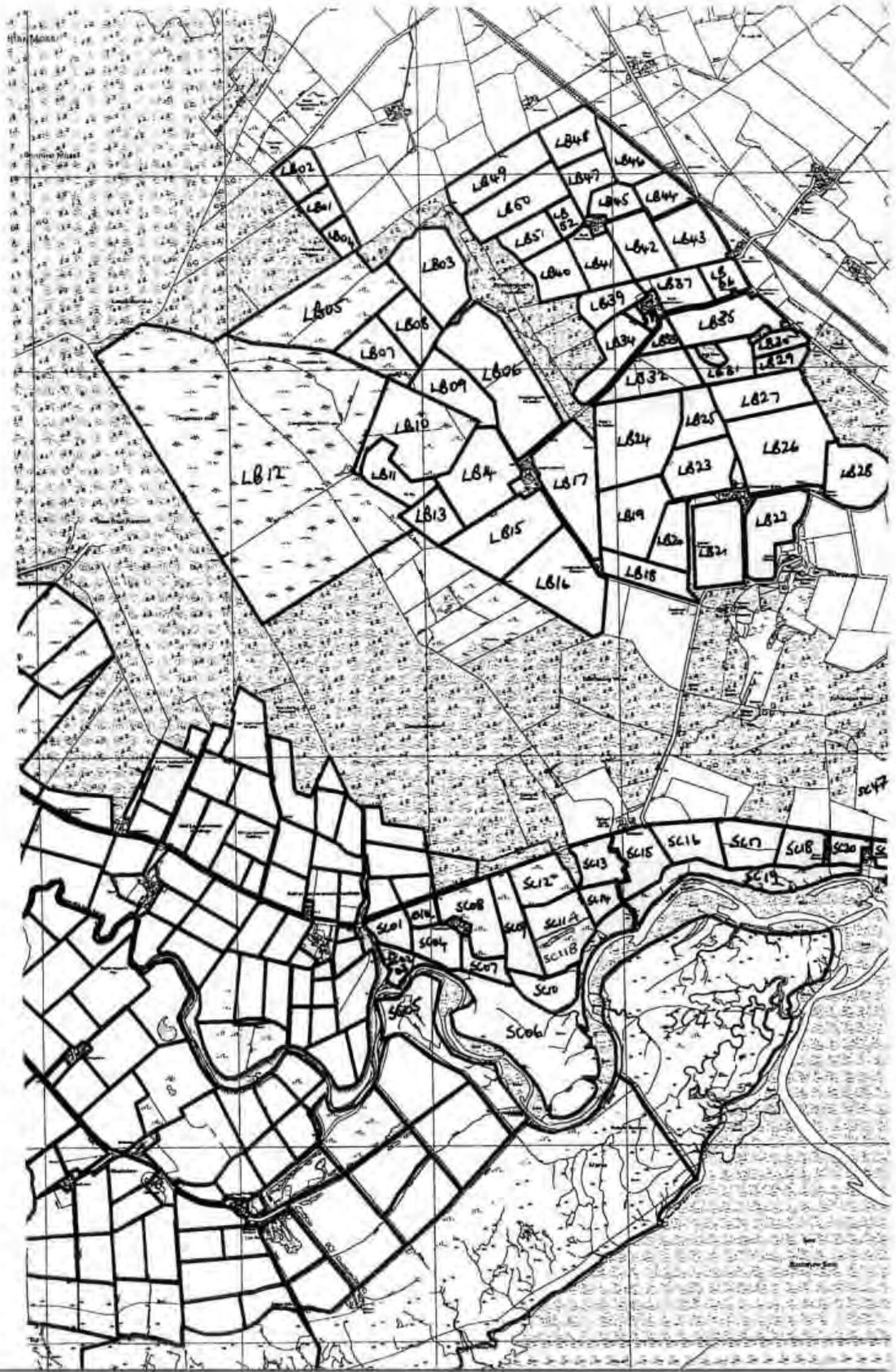


Figure 4. Field codes for the Powhillon/Stanhope/Longbridgemuir area of the Goose Management Scheme.

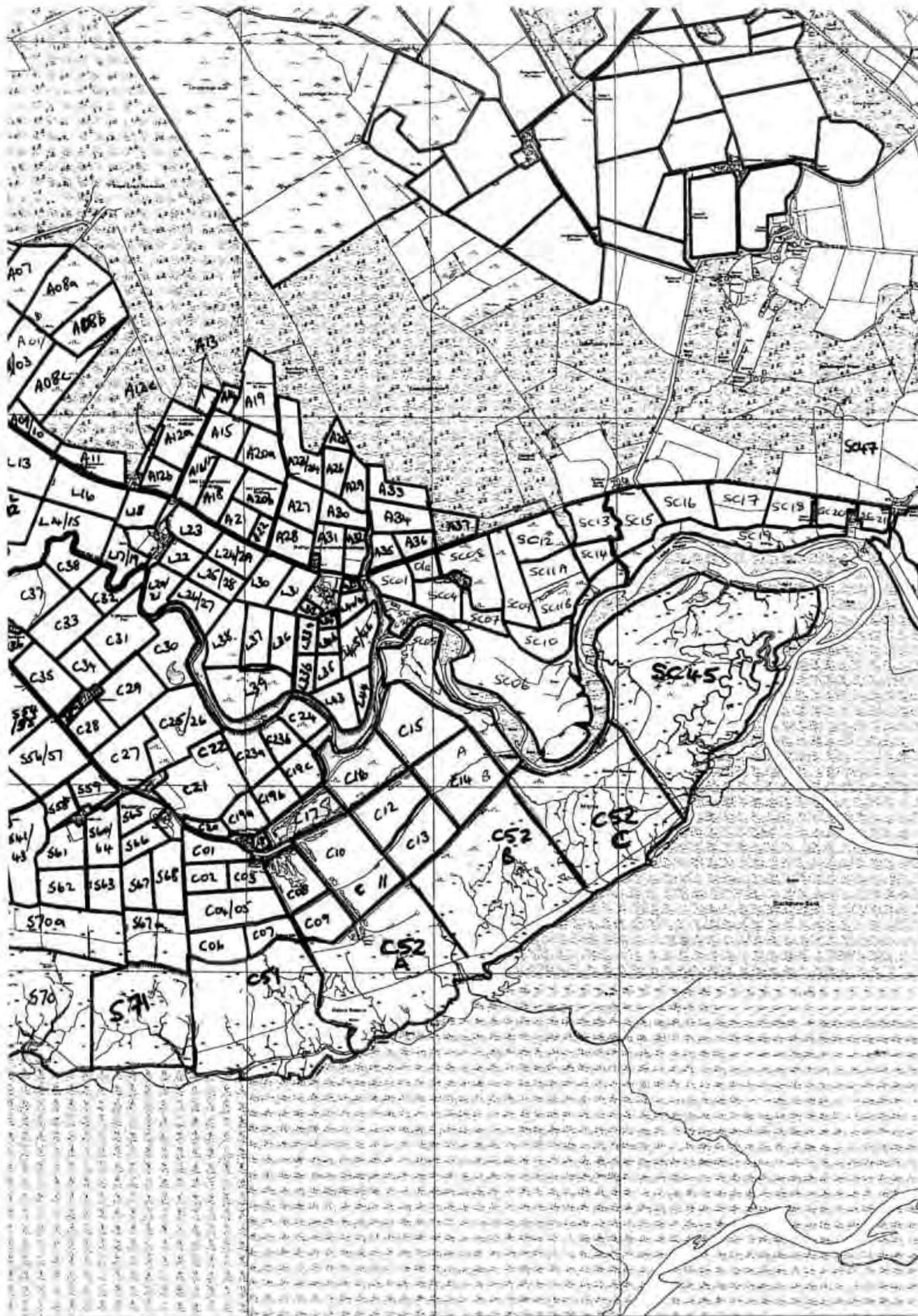


Figure 5. Field codes for the Caerlaverock/Nether Locharwoods area of the Goose Management Scheme.

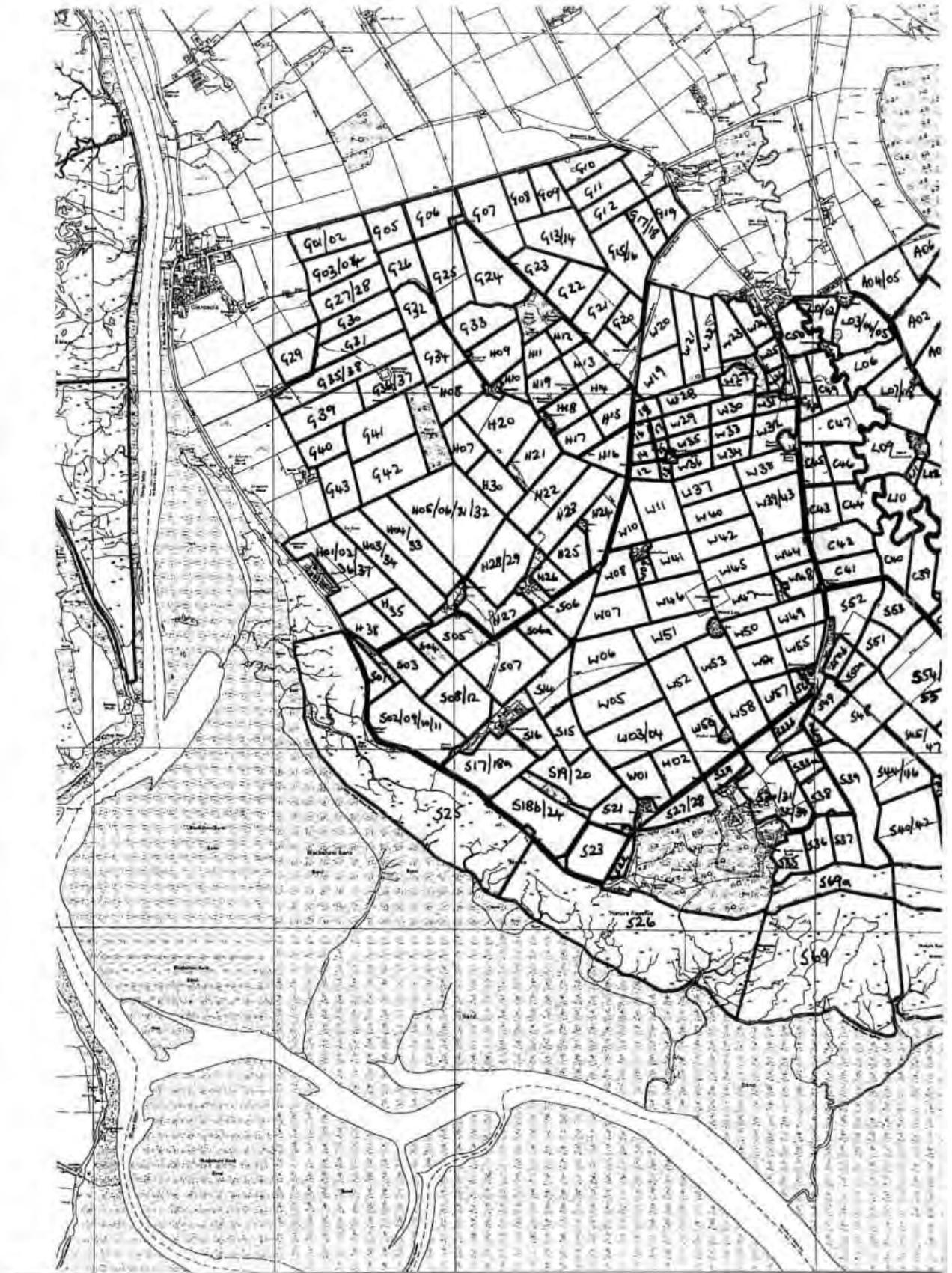


Figure 6. Field codes for the Lantonside/Ward Law area of the Goose Management Scheme.

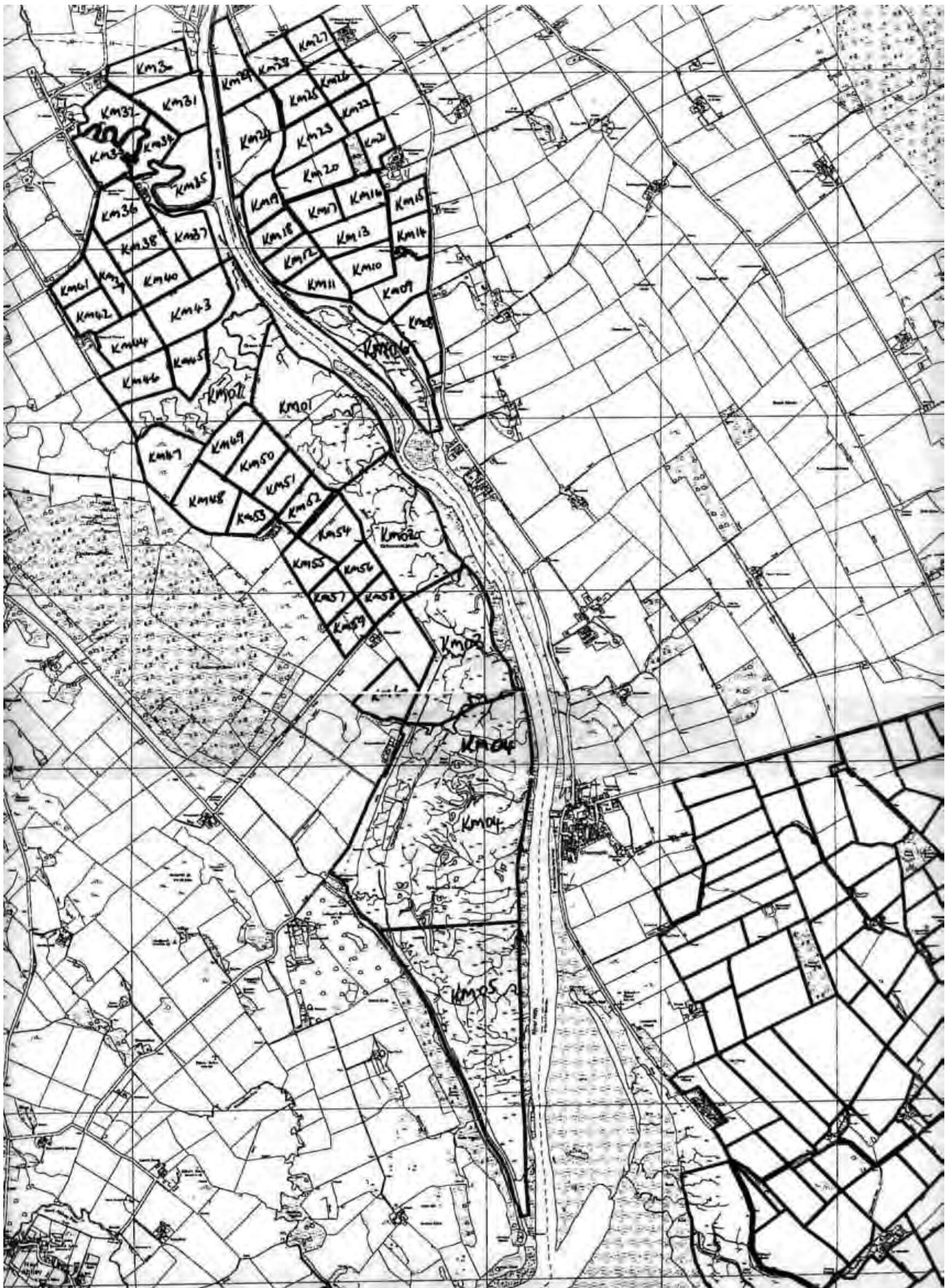


Figure 7. Field codes for the Kelton/Greenmerse/Kirkconnell area of the Goose Management Scheme.

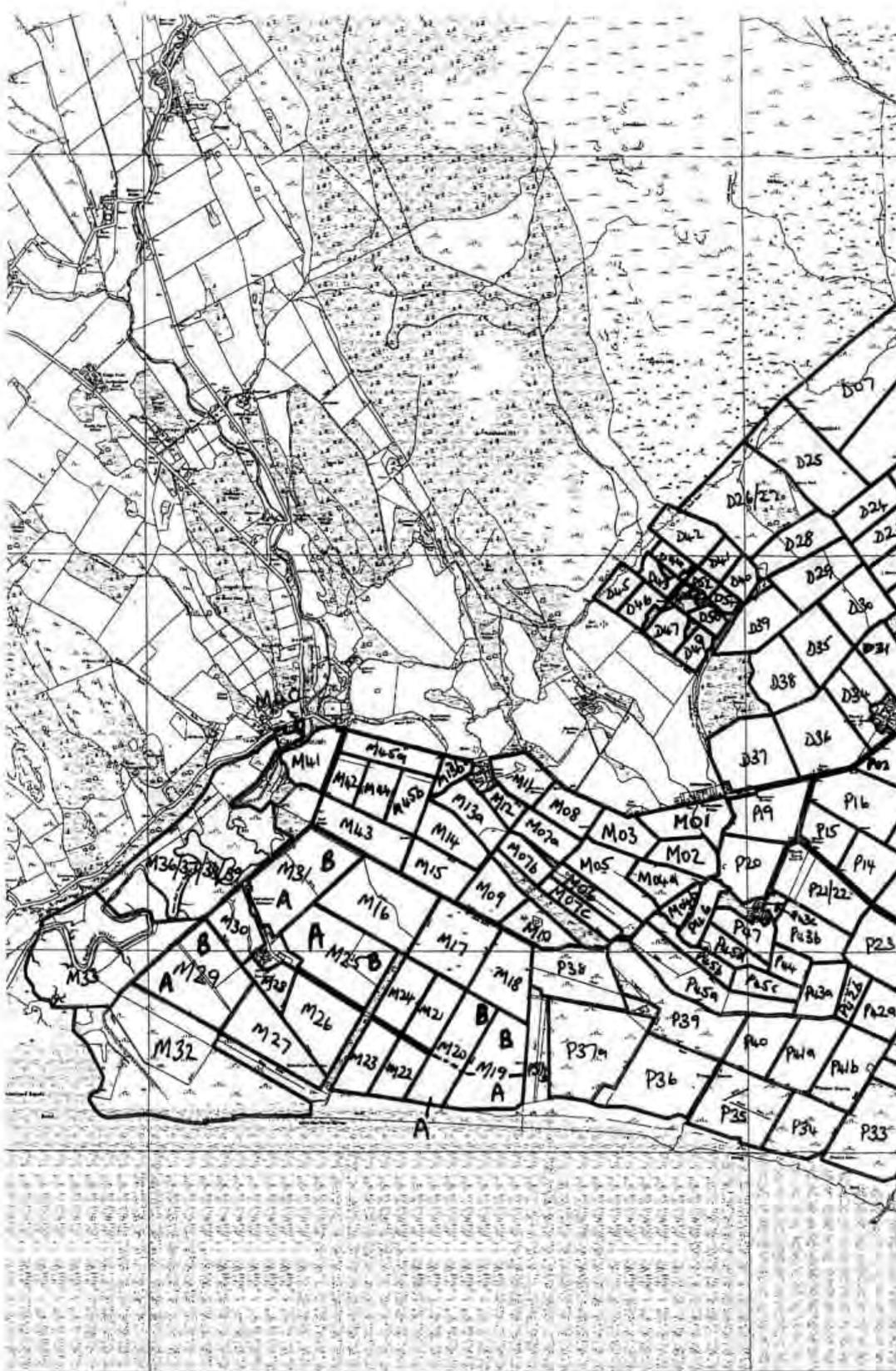


Figure 9. Field codes for the West Preston/Cowcourse/Mersehead area of the Goose Management Scheme.



Figure 10. Field codes for the Boreland of Colvend/Glenstocken area of the Goose Management Scheme.

3 Results

3.1 Barnacle Goose counts within the Management Scheme area

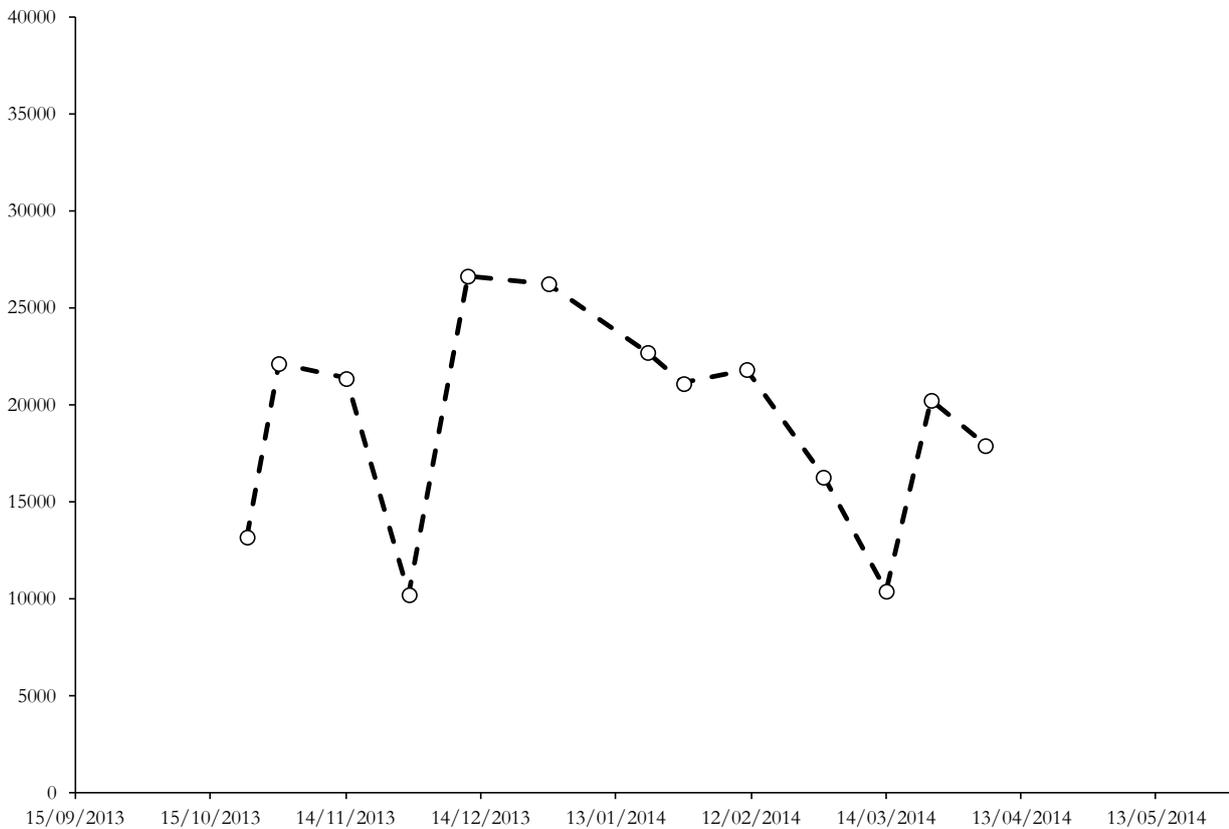


Figure 11. Svalbard Barnacle Goose route count totals within the Management Scheme area.

Some totals are greater than others because double counting of flocks that move between fields often occurs over the course of a route count. The methodology does not seek to remove this bias as the aim is to record the numbers of geese using individual fields. Fluctuations in goose numbers within the Scheme area also occur due to the effect of high tides pushing geese off low lying saltmarsh areas on the south side of the Solway and due to geese dispersing mid-winter after peak arrival to foraging areas outside the Scheme.

The mean number of geese recorded during the route counts was 18,809 for the period from the end of October (when the contract started) to the end of April (19,918 in 2012-2013) ranging from a minimum of 10,215 mid-winter on 28 November 2013 up to a maximum of 26,665 (27,115 in 2012-2013). On the final route count on 20 April 2013, 12,944 geese were still present within the Scheme area. During other census counts and monitoring the last 220 were recorded in the Caerlaverock area on 10 May as the birds moved east to congregate on Rockcliffe Marsh, Cumbria, prior to spring departure. Overall within the Scheme area there tends to be a decline in goose use as food resources within the area are depleted by the end of January. Winter 2013-2014 was fairly benign with no periods of prolonged snow or ice cover and with only one or two days of ground frost. Grass growth appeared to continue throughout the winter and even at the end of the season the fields looked relatively green compared to winter 2012-2013. In 2012-2013 conditions were tough, initially due to poor grass availability within the Scheme area due to flooding after a very wet summer and secondly due to very cold weather which lingered into May as temperatures struggled to get into double figures and grass growth remained poor.

Flock size and field distribution of the Barnacle Geese within the Management Scheme area are given in Table 2.

Table 2. Svalbard Barnacle Goose flock sizes recorded during the Management Scheme route counts.

Field code	23/10/13	30/10/13	14/11/13	28/11/13	11/12/13	29/12/13	20/01/14	28/01/14	11/02/14	28/02/14	14/03/14	24/03/14	05/04/14	20/04/14	Total
A18			45												45
C01					20	20	75	9	360	15					499
C02	406	2385	2		1700				32						4525
C03					840	760	5		125	25					1755
C04/05			510	381		890			620	110		2190	85		4786
C07	46							2	1380			310			1738
C08		240	6	21		880								10	1157
C09		490	280		680		9								1459
C10/11		190	1172				1130		2				60	1300	3854
C12				1360			120	160							1640
C13					440										440
C14		100					1300	210							1610
C15		290		1	230										521
C16							80				5				85
C17									29						29
C19a			33	80			12	16			75				216
C19b			270	340	110		50		920		75				1765
C19c							560	2					5		567
C20			270		100		175	102	240	170					1057
C21/22							117	37	4						158
C23a					1240		135		730				40		2145
C23b				1340					320						1660
C25/26						2880									2880
C27		2950								1930					4880
C28			42					720							762
C29						810									810
C30						2960								420	3380
C31							1410				17		120		1547
C42												4			4
C51/S71	2450	260	210		1360	500	700	550		600	150	570	1500	460	9310
C52	3233	155	330		570	210	1100	410	55		1030	830	900	1620	10443
Corbelly/Overton							1400								1400
Drumrum Merse								310			160		200		670
G15/16	17														17
JP44						580									580
JP46						355									355
JP48			422			2		175	515						1114
JP49								310							310
JP51					470										470
KM01	15		490	1120					760						2385
KM02	47	1950				210	2360		1850	750	80		9		7256
KM03									2000			26	55		2081
KM04		600	2800		500			410			1240	190	1640		7380
KM05								280				510			790
KM06			200			960		23	210		560				1953
KM09	10														10
KM10	771											490			1261
KM12								1100					55		1155
KM14	2														2
KM31					70			620							690
KM43						850									850
KM50											910				910
L20/21						1330		1320							2650
L24/29		350					3						21		374
L25/28		1410													1410
L30		1760													1760
L31		1760													1760
L36		1600													1600
M01								21							21
M02								510							510
M04b													930		930
M05													870	180	1050
M13a							120								120
M16			64				205			32					301
M17					47		35								82
M18								5							5
M19	450		55					680							1185
M20	200	6	175					95						75	551
M21	290												320		610
M22	170				1200									65	1435
M23		53												40	93
M24					490										490
M25	14		295	1410	3	240	180	30	440	1210		990	165		4977
M26	590		73		1190						320		730		2903
M27			1			15		310	250					6	582

M28				322	455							320	130	1227
M29						70						30	163	263
M30		660	75		95								140	970
M31			7		1455	420	340	650						2872
M32	800		1990			48	830	95	130					3990
M33	205							590					580	1375
M41					430	21		310	115			160		1036
M45a								310						310
N08									360					360
N10												190		190
N24	290													290
N28					2670									2670
N32					3040									3040
N34	1400													1400
N41									750					750
N46									160					160
N47								330						330
N51								145						145
N52						1970		150	360					2480
N53									125					125
P11											2070			2070
P14								1230						1230
P15						630								630
P19					840	840								1680
P20						780							16	796
P21/22		540	450					640				3060	4060	8750
P24				1800		610								2410
P25	210	2100	2420		830	1970						1		7531
P31								260						260
P33			560					980	160		870			2570
P34				520		600		1230				220	1220	3790
P35	230	1240	480			150			210			5450		7760
P36									90			350		440
P37a			5					235					60	300
P39									610				770	1380
P40	660						1000			2400			260	4320
P41a		60					1000		810	1400		2000		5270
P41b			120		50	16	2100		1090	1800	2	2900	460	8538
P42a		110	270		670	260					445			1755
P42b											270		240	510
P43a						170						210		380
P43b			85	150					170				47	452
P44			1160						160					1320
P45a			560				960		270	1640			78	3508
P45b										20				20
P45c			73	570			170		725	1350				2888
P45d			620				260	210	7	150				1247
P46							730							730
P47			740	800			1150							2690
PR04													6	6
PR08					530									530
PR22								870						870
PR30	150													150
PR36													1	1
PR39											1860			1860
PR54										280				280
PR58											145			145
PR68a												390		390
PR74	300													300
PR75									3	40				43
PR76					190			2			380			572
R03								65						65
R05								710						710
R11					200	410								610
S02/09/10/11						270								270
S18b/24							480							480
S25									95			950	390	1435
S26	200									280				480
S39													8	8
S51											2			2
S53	2							310						312
S54/55								310						310
S60/64			550											550
S61	32													32
S63								650						650
S66			350		130			4						484
S67								270						270
S68			15											15
S69								300	950			360		1610

S70								660		140			1100	560	2460
SC06								7						155	162
SC08								24							24
SC17						4									4
SC18					2580										2580
SC20							12	49							61
SC22/23										2250					2250
SC24/31					70							270			340
SC27			3100											2	3102
SC32/PR05							430								430
SC36													760		760
SC45		890			3750		720	1100	1400	1820		1200	2150	1330	14360
W01							1260								1260
W40										120					120
Total	13190	22149	21375	10215	26665	26271	22723	21113	21842	16282	10396	20250	17911	12944	263326

3.2 Pink-footed Goose counts for the Management Scheme area

Pink-footed Goose counts are very variable as the extent to which geese remain in the area tends to be very weather and crop dependent. Typical peak times include the autumn as geese arrive back from Iceland into the UK and from February to April as birds from further south in the UK move north again on migration.

Table 3. Pink-footed Goose flock sizes recorded during the Management Scheme route counts.

Field code	23/10/13	30/10/13	14/11/13	28/11/13	11/12/13	29/12/13	20/01/14	28/01/14	11/02/14	28/02/14	14/03/14	24/03/14	05/04/14	20/4/14	Total
A01/03	500														500
A02			75												75
C23b				2											2
C30														60	60
C41												150			150
C42						130						210			340
C45					200										200
JP43						110				770					880
JP48			60			6									66
JP51						270									270
KM03							100						12		112
KM04													130		130
KM10	97														97
KM12													35		35
KM30				1100						720					1820
KM40								22							22
N08									850						850
N10												600	120		720
N14							85								85
N39						62									62
N40						155	450	220							825
PR18													85		85
PR25		20													20
PR30											60				60
PR36													102		102
PR39											160				160
PR58											26				26
PR68a												2600			2600
PR75									240	850					1090
PR76								155			280				435
R11				46											46
S02/09/10/11						80									80
S39														115	115
S40/42								23							23
S51											320				320
SC06												520			520
SC36													4		4
W01							240								240
W39/43													360		360
W40										370					370
W54										380					380
Total	597	20	135	1148	200	813	875	420	1090	3090	846	4080	848	175	14337

3.3 Greylag Goose counts for the Management Scheme area

Small numbers of Greylag Geese were recorded within the Scheme area, most records occurring on the ponds and fields at WWT Caerlaverock or nearby. Post-moult flocks usually build up in this area during the late summer, with numbers declining from a few hundred to less than ten over the course of the winter.

Table 4. Greylag Goose flock sizes recorded during the Management Scheme route counts.

Field code	23/10/13	30/10/13	14/11/13	28/11/13	11/12/13	29/12/13	20/01/14	28/01/14	11/02/14	28/02/14	14/03/14	24/03/14	05/04/14	20/04/14	Total
C17				2	9	4	22		4						41
C52	14														14
S02/09/10/11	1														1
Total	15	0	0	2	9	4	22	0	4	0	0	0	0	0	56

3.4 Canada Goose counts for the Management Scheme area

Small numbers of Canada Geese were recorded within the Scheme area, most records occurring on the ponds and fields at WWT Caerlaverock or nearby. As with the Greylag Geese with which they often associate in mixed flocks, post-moult flocks usually build up in this area during the late summer, with numbers declining from a few hundred to less than ten over the course of the winter.

Table 5. Canada Goose flock sizes recorded during the Management Scheme route counts.

Field code	23/10/13	30/10/13	14/11/13	28/11/13	11/12/13	29/12/13	20/01/14	28/01/14	11/02/14	28/02/14	14/03/14	24/03/14	05/04/14	20/04/14	Total
C17		80	60	102	129	80	35	140	25	9					660
PR68a			24												24
S56/57		20													20
Total	0	100	84	102	129	80	35	140	25	9	0	0	0	0	704

3.5 Whooper Swan counts for the Management Scheme area

The Scheme area and fields at its fringe especially around WWT Caerlaverock, Kelton and Thwaite generally hold up to 500 Whooper Swans throughout the winter, with numbers increasing gradually as the swans arrive from Iceland up to mid-November and decreasing rapidly at the end of March as birds head north on migration. Some flocks occurring on fields outside the Scheme area are noted as comments on the Excel database but do not contribute to the totals given in Table 6.

Table 6. Whooper Swan flock sizes recorded during the Management Scheme route counts.

Field code	23/10/13	30/10/13	14/11/13	28/11/13	11/12/13	29/12/13	20/01/14	28/01/14	11/02/14	28/02/14	14/03/14	24/03/14	05/04/14	20/04/14	Total
A01/03		42				15									57
C08	1						2					14			17
C17	1	70	70	125	149	157	90	145	105	320	155	70	1		1458
C28							53	9							62
C52	11														11
KM12						6									6
KM19			6												6
KM24					15										15
KM40		25													25
PR68a			107		60										167
PR68b		15										55			70
PR70						35	31			62	45				173
S56/57	33	15													48
Total	46	167	183	125	224	213	176	154	105	382	200	139	1	0	2115

3.6 Mute Swan counts for the Management Scheme area

Mute Swans mainly occur on the ponds at WWT Caerlaverock with scattered pairs elsewhere.

Table 7. Mute Swan flock sizes recorded during the Management Scheme route counts.

Field code	23/10/13	30/10/13	14/11/13	28/11/13	11/12/13	29/12/13	20/01/14	28/01/14	11/02/14	28/02/14	14/03/14	24/03/14	05/04/14	20/04/14	Total
C08												4			4
C17	57	45	60	54	80	60	21	35	46	50	35	56	32	5	636
C52													2	2	4
KM10	2														2
M16												2			2
M32														2	2
PR74											2				2
R03														2	2
Total	59	45	60	54	80	60	21	35	46	50	37	62	34	11	654

3.7 Deliberate disturbance to geese in the Management Scheme area

Records of disturbance activities specifically directed towards the geese were as follows within the Management Scheme area:

- From the end of October 2013 through to the end of March 2014, there was a regular grid of canes with red and white tape streamers on them (some of which fell over with time) deployed in a reseed at Newfield (C03) which, with reference to the daily Farmhouse Tower counts carried out by WWI, proved incredibly effective at deterring geese from this field even though many thousands used the fields around it. The geese did not start using this field until mid-November 2013;
- In the Newmains area nearer Kirkbean, two fields (N29 & N43) had various bags on canes, scarecrows and more latterly a gas gun on them from mid-November 2013 until the end of March 2014. It is not clear if these were directed towards geese or other birds using the cereal fields;
- From the end of December 2013 until the end of March 2014 a few tape streamers on canes were noted on a field near Carsethorn (JP49);
- Four blue barrels were noted on a field at Newmains, Caerlaverock (C28) from mid April 2014;

3.8 Count section dates and times of coverage

Table 8. Survey dates and times for the Management Scheme route count sections.

	Wednesday	Wednesday	Thursday	Thursday	Wednesday	Sunday	Monday	Tuesday	Tuesday	Friday	Friday	Monday	Saturday	Sunday
	23/10/13	30/10/13	14/11/13	28/11/13	11/12/13	29/12/13	20/01/14	28/01/14	11/02/14	28/02/14	14/03/14	24/03/14	05/04/14	20/04/14
Thwaite	10:15	11:00	10:30	13:30	10:00	15:15	09:30	14:15	14:30	10:00	15:30	10:00	11:30	12:00
Nith	09:00	09:15	08:30	11:30	08:45	14:30	12:30	13:15	13:30	08:00	12:00	08:00	07:00	10:00
Southernness	12:00	10:30	12:30	09:30	11:00	09:00	15:00	09:15	10:15	13:00	10:45	13:45	15:00	07:30
Colvend	11:30	10:30	14:00	08:30	09:45	13:00	16:00	11:00	12:00	14:30	08:30	15:30	16:00	09:00

In summary, these dates represent an even spread of two counts on each day of the week except Sunday when there was one and Wednesday when there were three, giving 14 counts in total.

3.9 Farmer liaisons regarding geese

As counts were conducted within the Scheme area, any significant conversations about goose numbers with the farmers were noted. Sometimes these were on days on which a count was not being conducted. Farmers were also contacted by phone in February and March to arrange meetings to discuss goose issues. All conversations were about goose numbers and whether or not the counts being conducted gave a good representation of what the farmer's impression of field use was like; generally the farmers felt that the counts probably gave a reasonable representation of what was happening on their land although many also felt that the reduced frequency of counts would not give a good representation of goose use. Farmers engaging in conversations about geese are noted in Table 9.

Table 9. Records of conversations with farmers regarding goose activity in the Scheme area.

23/10/13	
30/10/13	
14/11/13	
28/11/13	Stephen Roan at Boreland of Colvend said about 1,500 barnacles had been coming into the fields early morning and had turned the grass to soil
11/12/13	
29/12/13	Jim Kirkland felt use was fairly typical although more use north of the road.
20/01/14	Alastair Wylie felt that it was a typical winter so far although grass was still growing.
28/01/14	Spoke to Jack Graham on 3rd Feb and he felt there had been quite a few flocks on S66 but had no counts from SNH yet.
11/02/14	Spoke with Jim Kirkland about goose counts so far and he felt they were representative.
28/02/14	Spoke with Jack Graham about goose counts and payments he said he would feel happy with a simple April supplement. Alastair Martin felt goose counts captured some of the times geese were using the fields but not others but understood that was a limitation of the methodology and that it was important to take more casual observations of geese and local knowledge into account too.
14/03/14	Jim Kirkland said geese had been normal and thought it likely he would accept April payment for any of his fields. Alastair Wylie said it was quiet on his fields at present but had been plenty a few days before but thought things were normal and that grass was getting away. Andrew Marshall - Powhillon - felt geese had used some fields on lower lying areas but that it had been fairly normal.

	James Worthington - Herries farms - said he would get back to me on email if there were any issues with the counts after consulting with farm staff on the ground; an email three weeks later detailed where his staff had recorded geese - it did not differentiate between pink-footed and barnacle geese.
	John Jamieson - Upper Locharwoods - said that barnacle-wise it had not been too bad this winter and agreed count summary showed that. Remarked how bad it had been at end of last winter and it was nothing like that this winter and agreed it was likely due to the abnormal cold conditions at end of last winter that had caused the problem. Mr Oliphant - mid-Locharwoods area - felt the goose count summary gave a good representation of goose numbers and where they had been. Sandy Forsyth - Southwick farm manager - disappointed that some big fields taken out of the Scheme this winter, and fears that once taken out they don't go back in, and says that his men are disappointed that geese are not recorded on these fields when it is clear later that they cannot get their early silage cut. He said the geese were on them early and late in the day and said they have been on the barley fields below Torrorie and the men have to chase them off with dogs as bangers don't work. He seemed unclear if they were definitely barnacle geese though as he was getting messages third hand. He agreed that his fields that have become very rushy near Mershead have been little used and agreed roadside field and corner field have been used, though he said roadside field (probably M45a) is not in the Scheme - is this correct? Mr Swan - mid-Locharwoods - basically felt that the Scheme was useless in that his fields north of the road and L23 and L22 get huge amount of goose use but this is not recognised. Apparently when Graeme Dalby puts his sheep on, lots of barnacles are put off the fields to the north of the road such as A15 etc. No longer useful to him for pink-footed goose shooters because of the barnacle geese being there all the time in such numbers. Roger Guy - Nether Locharwoods - couldn't say that L33/L34 group of fields had been used this winter but that they were good fields for geese but were used more than the fields to the north side of the road. He was not convinced of equity of treatment because he felt some nearby fields had similar low or zero use and yet were still in the Scheme. He wondered what the confidence intervals were for the counts and if they were fit for purpose in terms of sampling frequency if the goose use was clumped in time. I said that SNH had analysed the sampling protocol here and in Islay and concluded that a count every two weeks would be enough to represent goose use of fields when averaged over many years. Mr Guy wondered about satellite imagery being used to monitor goose flocks across broader areas more often and the conversation then turned to whether trail cameras could be deployed in certain areas to check on validity of counts or whether farmers could keep a diary of goose use when they check their stock. It was suggested they might need to take a photo of any flock seen, perhaps using mobile phone, as evidence of the size of any flocks seen. Said he couldn't really see the point in ringing in that we count what's there and that's that really. Doug Freeman - Stanhope - said he doesn't pay any attention, took it counts were OK and takes it he can trust "us lot" to count them and put them in the Scheme. He had seen a lot of use of the field between Shore Cottages and Stanhope, the field with the big flood pool. Stuart Brown - Hollands - said he had spoken with his brother and that there were no real issues with the counts as he understands the limitations on count frequency due to budget constraints but felt it would be useful if some sort of actual damage assessment in spring could be made in order to understand actual economic loss better although again he understood this would have cost implications.
24/03/14	
05/04/14	Email reply from James Worthington detailing fields used by geese as seen by the workers at the farm (does not distinguish between barnacle geese and pink-footed).
20/04/14	

3.10 Coordinated Svalbard Barnacle Goose population count totals

Table 10. Coordinated Svalbard Barnacle Goose population count totals for the Solway 2013-2014.

Count section	02- Oct	09- Oct	23- Oct	30- Oct	13- Nov	11- Dec	11- Feb	25- Mar	22- Apr	29- Apr	02- May	06- May	13- May	18- May	20- May
Annan to Gretna	0	0	2000	245	1150	0	0	140	600	0	nc	0	0	nc	0
Ruthwell to Cummertrees	0	0	450	0	3100	790	2253	660	2	0	0	0	0	0	0
Longbridgemuir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caerlaverock	1313	1000	6369	7620	3545	11170	7167	5464	5708	2500	1300	850	0	0	0
Kirkconnell & Ward Law	0	0	862	2550	3490	570	4915	2166	0	0	0	0	0	0	0
Mershead to Airds Pt	390	438	5503	4769	11608	13935	8260	6018	8155	2555	nc	nc	0	0	0
Caulkerbush to Rascarrel	0	0	26	0	0	200	0	0	0	nc	nc	nc	nc	nc	nc
Dundrennan to Wigtown	0	25	12	12	43	0	191	250	250	0	nc	nc	nc	nc	nc
Rockcliffe Marsh	0	16	8000	11200	10230	3120	7660	14020	17330	20780	9000	11480	13050	1200	300
Burgh Marsh	0	0	0	0	2600	6500	5600	0	4000	0	nc	0	0	nc	0
Bowness to Grune	0	0	3090	3810	1653	2591	2806	7300	2840	1500	nc	3	0	nc	nc
Total	1703	1479	26312	30206	37419	38876	38852	36018	38885	27335	10300	12333	13050	1200	300
Notes											1			1	

¹ Not an "official" coordinated count but most birds recognised as being on Rockcliffe by May.

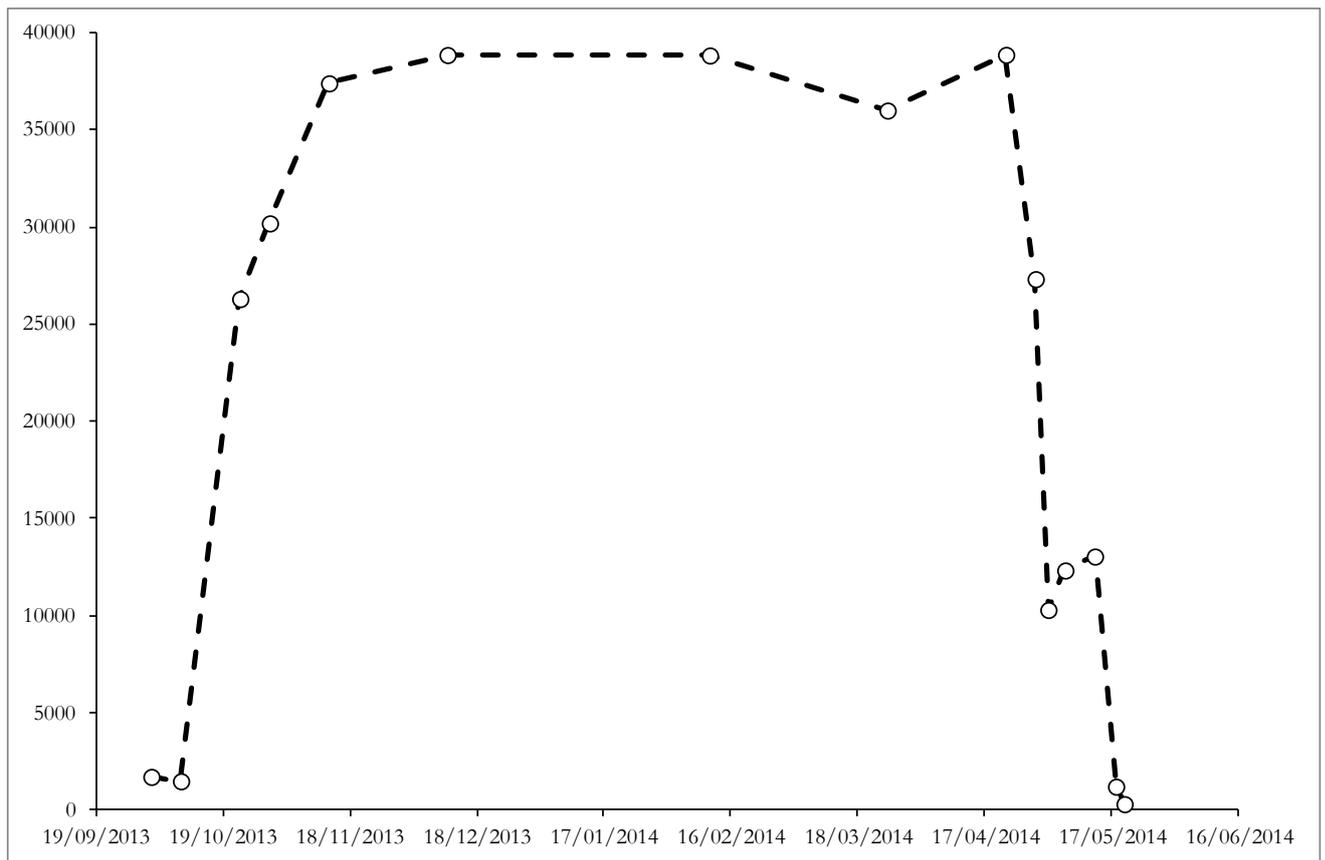


Figure 12. The total population of Svalbard Barnacle Geese recorded on the Inner Solway from October 2013 to May 2014.

Total population counts of Svalbard Barnacle Geese were slow to build up with less than 2,000 recorded on the whole Solway by 9 October. The first three possible Svalbard birds were recorded on Newmains Farm, Caerlaverock on 19 September, but numbers never rose above seven until 26 September 2013 when 370 were recorded at Caerlaverock (Table 10; Figure 12). The numbers recorded then built fairly steadily up to the end of October when over 30,000 birds were present on the Solway and continued to rise to over 37,000 by mid November. Numbers did not fluctuate as much as in previous winters and a fairly constant 36,000 to 38,900 was recorded from 13 November 2013 to 22 April 2014 across five censuses. This consistency in the counts was perhaps due to the constancy of the weather during the winter in that very few episodes of freezing conditions were recorded and so it was felt the geese did not spread out across the Solway as much as usual due to food resources being largely maintained. The first sign of spring migration was seen by 27 April when numbers across the Solway had dropped to nearly 27,000 with up to 13,000 birds remaining on Rockcliffe until mid May 2014.

Due to count variation, with possible inaccuracies and the chance of double-counting, an adopted count total for the population is usually derived by averaging those counts within 10% of the maximum recorded during the winter. In 2013-2014 the counts of 37,419 on 13 November, 38,876 on 11 December, 38,852 on 11 February, 36,018 on 25 March and 38,885 on 22 April (the maximum count recorded), fulfil this criterion and are thus averaged to produce **an adopted population total of 38,100 Barnacle Geese** (rounded up to the nearest 100; compared to 31,000 in 2012-2013).

3.11 Brood size and juvenile productivity of the Svalbard Barnacle Goose

Table 11. Brood size and juvenile productivity for Svalbard Barnacle Geese on the Solway in winter 2013-2014.

Date	Flock Size	Sample Size	Total Juvs	Field	Crop	Brood of 1	Brood of 2	Brood of 3	Brood of 4	Brood of 5	Brood of 6	Single Juvs	% juvs	Obs
02/10/2013	236	236	18	O5	pasture	9	3	1					7.6	LRG
09/10/2013	327	327	30	OM1	merse	1	1						9.2	LRG
11/10/2013	2500	1880	83	O3	pasture	5	9	1	3				4.4	LRG
01/11/2013	300	286	9	A9/10	pasture	2	2	1					3.1	LRG
01/11/2013	180			O4	pasture	2		1						LRG
01/11/2013	760	354	7	O3	pasture	1	1	1					2.0	LRG
04/11/2013	3120	755	53	P5	pasture								7.0	LRG
04/11/2013	2600	620	56	G12	pasture								9.0	LRG
04/11/2013	2600			G12	pasture	6	15	9	2					LRG
08/11/2013	6100	3030	65	O3	pasture								2.1	LRG
11/11/2013	2400	866	261	NF44	pasture								30.1	LRG
12/11/2013	850	750	45	P5	pasture								6.0	LRG
13/11/2013	26	26	8	BH17	pasture	1	2	1					30.8	LRG
29/12/2013	355	335	43	X107	pasture								12.8	LRG
29/12/2013	780	370	18	T9	pasture								4.9	LRG
29/12/2013	840	300	13	T12	pasture								4.3	LRG
Total		10135	709											
Overall juv%			7.00			Brood size totals:								
						27	33	15	5	0	0	Total broods	80	
						Number of juveniles per brood size category:						Max %juvs	30.8	
						27	66	45	20	0	0	Total juvs	158	
												Mean brood	1.98	

The juvenile productivity of the Svalbard Barnacle Goose observed in flocks sampled on the Inner Solway from October 2013 to December 2013 from the Anthorn area, Cumbria, to Burch near Gretna in the east to Mersehead in the west ranged from 2.0% to 30.8% (0.8% to 15.0% in 2012-2013) with a mean of 7.0% young from 14 flocks with 10,135 geese sampled (5.5%; n = 21 flocks; 12,372 geese sampled in 2012-2013). Across the same area, the total number of broods sampled was 80, with a mean family size of 1.98 young, range 1-4 young (1.6 young, n = 172, range 1-5 young in 2012-2013).

3.12 Leucistic Barnacle Geese

A minimum of three different leucistic Barnacle Geese was recorded in winter 2013-2014 including a cohort of two that probably represents two associates from the cohort of three seen together last winter on similar parts of the south side of the Solway. The leucistic birds were mainly seen in the Bowness to Grune area or at Rockcliffe, Cumbria with single birds occasionally seen in the Caerlaverock area.

3.13 Other geese

A Red-breasted Goose with a yellow leg ring was reported from the south side of the Solway throughout the winter and a bird without a leg ring was seen at WWT Caerlaverock during late April 2014.

3.14 Acknowledgements

Thanks go to Mike Carrier and Bob Jones for conducting census counts in the Rockcliffe/Burgh Marsh area, Dave Blackledge for counts covering the Bowness to Grune route, Marian & Dave Rochester for covering the Borgue to Wigtown route, Paul Tarling for covering Crook of Baldoon, David Charnock (who replaced Peter Williams) for covering Rascarrel to Sandyhills and Colin Bartholomew for covering the Southwick area to Drumburn. Counts in the Caerlaverock area were also made by Mike Youdale.