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Winter bird survey of the proposed route of the Lackenby-Picton overhead transmission lines

A report to the National Grid Company plc
by the British Trust for Ornithology

by

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EXECUTIVE SUMMARY

1.Fieldwork was carried out between December 1991 and March 1992 to assess the patterns of bird movements across the routes of two proposed 400kV power line options.

2.A higher number of bird species of acknowledged nature conservation importance were seen to cross the path of the Northern ("Portrack") route. However few species were recorded crossing either route option in sufficient numbers to enable an assessment to be made of their patterns of movement.

3.Gulls and corvids (crows) were found to be the most numerous bird species crossing both route options, although large numbers of Lapwing, Woodpigeon and Starling were found regularly to cross certain sections of the two routes.

4.The largest and most regular movements of birds were found to relate to movements of gulls and corvids to and from their nocturnal roosts. These movements were found to cross both of the proposed routes.

5.The bird movements of greatest nature conservation importance were considered to be those of Shelduck and Redshank between the intertidal areas along the banks of the Tees and the water bodies of Saltholme and Dorman's Pools and the ICI reclamation pond. Although not actually crossing the proposed Northern route option on the days this area was surveyed, this flight line was seen to run very close to the proposed path of this route.

6.The stretch of the Northern route option between Haverton Hill and the Teesside Industrial Estate was found to be crossed by particularly large numbers of a variety of species, predominantly gulls and Lapwing.

7.Large numbers of wildfowl were seen roosting on water bodies or marshes at several points along the Northern route option. The movements of these species at night could not be determined from the fieldwork carried out, although it is likely that at least some would cross the Northern route option.

1INTRODUCTION

This study presents the results of fieldwork designed to assess the ornithological impact, during the winter months, of a proposed high voltage (400kV) overhead power line which will transmit electricity from the National Grid substation at Wilton (or that at nearby Lackenby) to the existing 400kV line at Picton. Two options for the route of this new line have been proposed. The Northern, or "Portrack", Route (Figure 1.1) crosses the River Tees north west of the Wilton substation, then runs parallel to three existing power transmission lines, passing just north of the village of Saltholme. This route then runs south west to recross the Tees just west of the A19(T) road bridge before running south roughly parallel with the A19(T). South of the Teesside Industrial Estate, the route runs south west, crossing the Leven Valley, before joining the existing 400kV line near Picton. This route extends over several types of habitat, including intertidal areas adjacent to the Tees, wet marshes, pools and rough grazing land around Saltholme and the Portrack marshes, mainly arable farmland south west of the Teesside Industrial Estate and woodland around Picton.

The second option is the Southern Route (Figure 1.2), which runs more directly south west from the Lackenby or Wilton substation. This route runs across fewer types of habitat than the previous option, with most of the proposed route crossing arable farmland. However there are a few small areas of woodland along this route.

It has long been known that considerable numbers of birds can die through collision with suspended power lines (eg. Borell, 1939). The subject has received particular attention in the USA (eg. James & Haak, 1979; Avery *et al*, 1988; Dailey, 1988), Norway (Bevanger & Thingstad, 1988), Sweden (Stolt *et al*, 1986) and Britain (Scott *et al*, 1972; Rose & Baillie, 1989). In their analysis of ringing recoveries (ie. birds which have been ringed and are subsequently found dead), Rose & Baillie (1989) found that larger birds, particularly larger wildfowl, raptors and herons, are more at risk from colliding with overhead wires than smaller species, presumably since they are less manoeuvrable in bad weather. It is also possible that because the wires are smaller relative to body size they may be less obvious in poor light. Further analysis suggested that, in terms of death by collision with man-made objects, striking overhead power lines came between road deaths and colliding with windows although there was considerable variation in the importance of these causes of death between species. There was found to be a tendency for younger birds to be more prone to striking wires although geographical region and month were found to be the two factors most likely to influence the probability of a bird of a certain species being killed by collision with overhead power lines. Geographical region is likely to have an effect because of variations in the lengths of power lines in different regions and variations in the numbers of observers as well as the geographical distribution of the species in question. The time of year is important because large numbers of migrants may be at risk from collision at certain times of year. Scott *et al* (1972) found that nocturnal migrants such as thrushes and warblers were found dead under power lines in larger numbers than diurnal migrants, although there was no provision made for the overall numbers of nocturnal and diurnal migrants being greatly different. Largest numbers of corpses were collected from under power lines during periods of migration, although experiments showed that up to 50% of these

corpses could be removed at night by predators which associate power lines with a good supply of food.

Observations on Teesside (Teesmouth Bird Club, *per* A. Cooper *in litt*) suggest that the single earthing wire at the top of the pylons is likely to cause the most casualties. Possible reasons for this are that the single wire is less detectable than the bunched transmission lines and that birds may be able to detect the current in the transmission lines and thereby avoid them whilst no detection in this manner is possible for the earthing wire. This theory has been borne out by recent research which suggests that the higher the voltage in the line, the lower the chances of bird strike (Mead, 1992). Scott et al (1972) suggested that tying fluorescent strips around the earthing wire might reduce mortality in poor weather or light. Bevanger & Thingstad (1988) suggested a number of other features of pylon design which may affect the likelihood of bird strike and suggested measures which could be used to reduce potential bird mortality.

2.METHODS

The proposed routes of the two power line options were assessed on the ground from large scale maps. The routes were divided into a total of 33 count sections (shown in Figs 2.1 and 2.2) which could be observed from a series of observation points. The Northern route option was broken down into 19 count sections (N1 to N19 in Figure 2.1). The Southern route option was broken down into 11 count sections (S1 to S11 in Figure 2.2) and the length of proposed new line in the Picton area which will be common to both routes into three count sections (P1 to P3 in Figure 2.2). Details were recorded of the number and species of birds crossing the line of the proposed power lines, the direction of flight and the height of flight. An assessment was made as to whether the birds were flying at a height at which they could potentially have struck power lines. In the case of sections of the new power lines which will run along the lines of existing power lines, an assessment was made of the numbers of birds flying over, through and under the existing lines. Observations were carried out on 22 days between December 1991 and early March 1992. A total of 185 count section observations were made throughout the study period (an average of 5.6 observations per count section). Observations varied in length from 30 mins to 1 hour. In order to standardise these observations, the average numbers of each species crossing the count section per hour during the early morning, day and evening were calculated.

Since large movements of birds of certain species, such as gulls and corvids (ie. crows and allies), are known to occur early and late in the day as they move to and from nocturnal roosts, an attempt was made to count each section of the proposed routes at least once during the early morning or evening. This was not possible for all sections due to poor visibility on several count days. Table 2.1 gives the number of observations carried out at each count section during the early morning, day and evening. Only one section could not be counted at all throughout the study period. The area between count sections N4 and N5 (see Figure 2.1) was, at the time of the survey, a busy works site to which access could not be gained, although distant observations of this area from other observation points suggested that there were no large-scale movements of birds across it.

Certain count sections were of necessity rather long, with a maximum distance from the observation point of up to 2km. Although it was relatively easy to detect movements of larger birds over these distances with the use of a telescope, it is likely that in some sections birds smaller than a Starling were missed. However, since it is known that smaller birds are far less prone to striking power lines, this was not thought to be an important omission from the point of view of assessing the ornithological implications of the two proposed routes.

Certain birds, in some cases in very large numbers, were often impossible to identify down to species level due to distance or to poor weather conditions. This problem applied particularly to the corvids (in this case Carrion Crows, Rooks and Jackdaws) and gulls, although several flocks of unidentified thrushes were also observed. In such cases, the numbers of birds in these "species groups" which were seen crossing the

count sections were also calculated. These include those birds specifically identified as well as those not identified.

The following results highlight the broad patterns of bird movement across the two proposed routes based on data obtained during the winter of 1991/92.

3. RESULTS

A total of 49 species were observed crossing the paths of one or both routes (Table 3.1), although the majority of these were recorded on only a few occasions or in small numbers. Table 3.1 lists the 43 species which were seen crossing the path of the proposed Northern route option. Of these, 11 are of national nature conservation importance as defined by Batten *et al* (1990). A total of 27 species was observed crossing the Southern route option; of these only 5 are of national nature conservation importance. The short Picton section (count sections P1-P3 in Figure 2.2), common to both Southern and Northern route options, recorded 16 species. The higher species total recorded from the Northern route option reflects the greater diversity of habitats crossed whilst the higher number of species of conservation importance reflects the rarity or value of these habitats. However the average number of species recorded crossing each count section (Table 3.2) was similar for both routes (11 for the Southern route option compared with 11.5 for the Northern route option). It should be noted that certain species are considered by Batten *et al* (*op cit*) to be of national conservation importance for their breeding, rather than their wintering, populations.

The results of the fieldwork are summarised in Tables 3.3 to 3.9. These show the numbers of birds per hour crossing each count section of the proposed power lines during the early morning, day and evening and the percentage of these birds which were estimated as flying at a height at which they would be prone to collision with overhead wires (the "potential strike rate"). For ease of interpretation, birds crossing the proposed routes in any direction have been considered to have crossed the power lines in one of only two directions which run approximately perpendicular to the proposed routes. Although bird movements are considered in the tables and figures to be in one of only two directions, details were kept on the exact direction of large movements of birds and these are detailed in the species accounts where relevant.

During the study period, no birds were seen to strike existing power lines and few birds were seen to need to take evasive action. Where birds were observed crossing existing power lines, most were seen to prefer flying over the wires rather than through or beneath them. This might increase the risk of these birds colliding with the earthing wire.

The following species, and species group, accounts highlight the patterns of movement detected between December 1991 and early March 1992 for those species and groups of species which were observed in greatest numbers and thus which are most likely to be affected by any future power line developments. As well as providing data for corvid and gull species groups, two further groups of species (ducks and raptors) have been combined in the figures and tables respectively since numbers of each individual species were too low to give any indication of the importance of any particular count section, yet these groups of birds are known to be particularly susceptible to collision with power lines. The following species accounts give further details of the patterns of movement found.

Section numbers refer throughout to those shown in Figures 2.1 and 2.2. In all cases, reference should be made to Table 2.1 when assessing the reliability of the observed movements. Patterns of movement based on larger numbers of observations are likely to be accurately assessed. Caution must be used when assessing apparent movements based on only one or two observations.

3.1 Duck Species

Three species of duck were observed crossing the path of the proposed routes (see Table 3.1). Certain sections of the Northern route option were found to be crossed by small numbers of duck at all times of the day, with largest numbers crossing during the evening (Figures 3.1 - 3.3), although it was thought that tidal and disturbance movements were more important than crepuscular roost movements. Duck crossing section N5 were predominantly Teal and Shelduck. Teal movements were generally low across the water and of short distance, resulting in a low potential strike rate. Shelduck crossing this section did so not up and down the river but in a north-westerly direction across the western end of this section. This occurred when the advancing tide pushed birds off the intertidal mud which lies along the banks of the River Tees. These birds then moved to Dorman's Pool to roost through the high tide period. Although many birds moved from the Tees and back again in response to the changing tide, few of these actually crossed the path of the proposed Northern route option. However the potential for collision remained high in this area since large movements of birds pass very close to the proposed route. For those birds which did cross the line of the proposed route, the potential strike rate was less than 50% (Table 3.3).

The north/south movement of duck across section N7 was thought to be the result of birds arriving from or departing to Seal Sands. It was thought that some of the large numbers of duck seen on Saltholme and Dorman's Pools fed at some time on the intertidal mudflats of Seal Sands. Larger movements could well have occurred at night, since wildfowl are known to feed predominantly at night on many estuaries (eg. Clark *et al*, 1990). The potential strike rate varied considerably between species and times of day at this section (Table 3.4), probably a result of the small numbers of birds involved. It was thought likely that the observed movements of duck across section N7 could have been at a reduced level due to the fact that on several count days, the water bodies south of this section were completely frozen over.

The largest movements of duck observed during the study period were between Saltholme Pool, Dorman's Pool and the ICI Reclamation Pond. These movements, which included regular flights of several hundred Wigeon and several Mute Swans, did not involve the crossing of any part of the proposed Northern route option as depicted in Figure 2.1.

The small numbers of duck seen crossing sections N12, N14 and N15 refer to Mallard (Table 3.5). In sections N14 and N15, these movements referred to birds disturbed from the old channel of the River Tees.

Large numbers of Teal (up to 200 birds) were seen roosting on Portrack Marshes in the vicinity of section N12. Although these birds were not seen to cross this proposed section, the potential exists for collision at night. The nocturnal movements of these birds are not known.

3.2 Raptor Species

Records of raptors crossing the path of the proposed power lines were widespread at count sections of both Northern and Southern route options but with very small numbers of birds involved (Tables 3.3 - 3.9). Sparrowhawk and Kestrel were the most frequently recorded species (recorded in similar numbers), although there were single records of Peregrine and Short-eared Owl. Numbers were too low to obtain a meaningful potential strike rate. Raptors are known to be particularly susceptible to striking wires but the species observed during the present study are predominantly diurnal, even on migration. This considerably reduces the risk of collision with overhead power lines.

3.3 Golden Plover

This is a wader species which is associated in winter particularly with arable farmland. Fieldwork carried out for the present study did not reveal any large-scale movements of this species around the study site, although small groups of birds were observed moving across certain sections of the routes of both proposed options. Too few birds were observed to allow an accurate assessment of the potential impact of the proposed power lines on this species.

3.4 Lapwing

In winter, the Lapwing is predominantly a bird of open arable land, often gathering in large flocks. Perhaps surprisingly, given the large areas of arable farmland crossed by the Southern route option, the largest movements of this species were found to be across the length of the Northern route option which runs approximately north-south between Haverton Hill and the Teesside Industrial Estate. This is a heavily industrialised area with much disturbance. These movements were observed to occur at all times of the day, although fewer movements were seen in the evenings (Figures 3.4 to 3.6). Many of the observed movements were thought to relate to two large flocks, one moving between fields just east of the A19(T) road and Portrack marshes, the other moving between Saltholme Pool and fields to the north west of Haverton Hill. The movements of these birds were in many cases thought to be related to human disturbance, although this species is known to wander widely in winter. Potential strike rates varied considerably but were generally high (Tables 3.4, 3.5).

The largest movements of this species across the Southern route option occurred across count section S8 (Figures 3.7, 3.8). These related to the movements of a single flock

of around 200 birds which roosted on a flooded field near Tunstall Farm. As with the Northern route option, potential strike rates for this species were generally high (Table 3.8).

3.5 Redshank

This species was recorded in appreciable numbers only on count section N5, where large movements recorded during the evening were due to tidal conditions and not to roost movements. Up to 300 Redshank fed at low tide on the intertidal areas along the banks of the River Tees due south of the ICI Teesmouth works. As these birds were displaced by the rising tide, up to half of these birds left the site in a north westerly direction to spend the high tide period roosting on Dorman's Pool. These birds followed the route used by Shelduck when moving between the same areas and consequently the majority narrowly missed the path of the proposed Northern route option. The large numbers of birds recorded crossing the count section were moving up and down the river after being disturbed from their high tide roost on the banks of the Tees. These movements were just above the river leading to a very low potential strike rate.

3.6 Gulls

Gulls were generally the most numerous birds seen crossing the paths of the proposed route options. Although five species were recorded, only three were seen in appreciable numbers. Of these, the Black-headed Gull was the commonest in terms of overall numbers and also the most widespread and frequently recorded. This species was recorded crossing every count section of both the Northern and Southern route options, demonstrating this species' ability to utilise a very wide range of habitats. The Common Gull was nearly as widespread, being recorded crossing all but two count sections of the Northern and Southern route options, but was found in generally far smaller numbers than the previous species. This species has adapted to feeding to a great extent on agricultural land, where large feeding and roosting flocks may be found during the day. Nocturnal roosts, however, are generally formed with other gull species on open waters. The Herring Gull was recorded crossing twenty of the thirty count sections of the Northern and Southern route options, being absent from the more agricultural areas in the south west of the study area. This species is usually more closely associated with coastal habitats than the previous two species.

Large numbers of gulls went unidentified due to distance or poor visibility or in some cases to the large numbers of birds passing in a short period of time. Consequently all gull species have been combined in the figures and tables, although detailed results relating to each species can also be found in the tables.

No sizeable gull movements were detected across the Northern route option during the first hour of light (Figure 3.9). Such movements that were detected showed no clear directional pattern. This suggested that gulls did not disperse from their nocturnal roost sites along set flight paths. Larger numbers of birds were seen crossing the Northern route option during the day (Figure 3.10), particularly across count sections N9, N11 and N12. These movements generally involved individuals or small groups rather than large flocks. The majority of these birds were Black-headed Gulls. The potential strike rate varied greatly between different count sections. In general, birds moving short distances, particularly when feeding on fields or over open water,

flew close to the ground and would thus pass under any power lines. This was the case at section N5, where gulls moving up and down the Tees did so at height well beneath the proposed high-level crossing of the river. Birds moving longer distances across relatively flat or undeveloped terrain tended to do so at a height at which action to avoid wires might have to be taken, leading to a higher potential strike rate.

Evening movements of gulls across the Northern route option to their nocturnal roost sites were particularly pronounced across count sections N5, N11, N12 and N13 (Figure 3.11). Easterly movements of very large numbers of birds across sections N11 to N13 referred to birds following the course of the Tees to their roost site on the river south of the ICI Teesmouth works. Many of these birds had spent the day feeding around the sewage works at Portrack and on the fields and marshes to the west. Very large numbers of birds, mainly Black-headed Gulls, crossed count section N5 in a westerly direction to reach the same large roost site. Many of these birds originated from a sub-roost on the ICI Reclamation Pond or from Seal Sands. Large numbers of birds returned down-river towards Seal Sands, accounting for the strong easterly movement of birds across section N5. Potential strike rates varied between count sections but were generally high.

Movements of gulls across the Southern route option during the early morning were generally in a southerly or south-easterly direction (Figure 3.12) as birds dispersed from roosts around Teesmouth to feed on agricultural land south of Middlesbrough. The largest movements were recorded crossing count section S1, which birds tended to cross at a considerable altitude as they benefited from the updraught resulting from air rising up the steep escarpment of Eston Moor. This resulted in an extremely low potential strike rate (Table 3.7). During the day, gull movements were widespread but with relatively small numbers involved (Figure 3.13). Many of the observed movements were of birds moving low over fields, resulting in a generally low potential strike rate. The only large evening movement observed was over count section S9 and consisted mainly of Black-headed Gulls (Figure 3.14). The potential strike rate across this section was high (Table 3.8). There was found to be no return movement of gulls over section S1.

3.7Woodpigeon

The Woodpigeon is a common resident bird throughout much of Britain and Ireland and favours agricultural land in winter, often forming large flocks. Given this habitat preference, it is perhaps not surprising that the largest numbers of this species seen to cross the proposed power line routes did so over the Southern route option, which crosses extensive areas of agricultural land. The only large movements of this species across the Northern route option were at section N19, which also crosses agricultural land. The large numbers of this species seen crossing sections S8 and S9 (Figures 3.15 to 3.17) were due to several large flocks of birds moving between fields in this area. Large numbers of this species roosted at night in the small conifer plantation just north of Tunstall Farm. Potential strike rates varied greatly between the two count sections, being low across S9 as birds crossed the proposed route at heights of over 30m. However the potential strike rate was generally higher across section S8.

The Woodpigeon was found to be the most numerous and widespread of all the pigeons and doves. The numbers and potential strike rates of Stock Dove, Collared Dove and Feral Pigeon are given in Tables 3.3 to 3.9.

3.8Corvids

Three species are included in this section; the Carrion Crow, the Rook and the Jackdaw. As a result of Carrion Crows and Rooks being notoriously difficult to distinguish in flight at a distance, a high proportion of the records of corvids made during the study period were of birds which were not specifically identified. However it was thought that the majority of the corvids seen over agricultural land were Rooks, whilst most of those seen in industrial or urban areas were Carrion Crows. Jackdaws were seen at a relatively small number of count sections, particularly across the Southern route option.

The Rook is primarily a bird of agricultural land in winter, tending to form large feeding flocks and even larger roosting flocks, often in association with Jackdaws and Carrion Crows. The Carrion Crow forms large flocks less often than the previous species and places less reliance on agricultural areas during the winter. This has resulted in generally lower numbers of this species amongst those corvids specifically identified, compared with the numbers of Rooks.

Early morning observations along the route of the Northern route option showed that movements of corvids were concentrated along the south-westerly, primarily agricultural, areas of the route (Figure 3.18), where the majority of birds not identified to species were thought to be Rooks. These movements did not occur predominantly in one particular direction, suggesting that they were not associated with movements from nocturnal roosts. The potential strike rates varied greatly between count sections. Observations made during the day again showed a concentration of corvid species in the south western count sections of the Northern route option, although noticeable movements of Carrion Crows were observed across count sections N1 to N4 (Figure 3.19). In all cases, potential strike rates varied greatly. Few movements of corvids were apparent from evening observations, although a westerly movement of Carrion Crows across section N12 was notable (Figure 3.20). There was a low potential strike rate across this section since birds were flying too low to risk striking power lines.

Movements of corvids across the Southern route option during the early morning were widespread, but particularly large movements were observed across sections S4, S7 and S10 (Figure 3.21). These movements refer to birds dispersing from large nocturnal roosts and consisted mainly of Rooks and Jackdaws. Potential strike rates were generally low (Tables 3.7, 3.8). Patterns of movement during the day were generally less pronounced (Figure 3.22). The large numbers of birds crossing count section S5 were localised movements involving mainly Rooks and Jackdaws. Movements across the Picton section of the proposed routes related mainly to short distance movements of Rooks. Evening movements were concentrated across the

three sectors S8, S9 and P1 (Figure 3.23). These related to movements of mixed flocks of corvids towards nocturnal roosts. Once again, potential strike rates varied greatly between sites.

3.9Starling

This was the only species of passerine (song-bird) to be recorded in sufficient numbers to assess patterns of movement across the proposed power line routes. The only major movement of this species in the early morning was in a southerly direction across section S1. This was the result of birds which roosted at night around Teesmouth moving south to feed on fields to the south of the Middlesbrough. Birds crossing section S1 were flying too high to risk collision with power lines. Large scale movements towards nocturnal roosts in the evening were made across count sections N2, N3, N13 and S9. It is likely that all these movements were towards the very large Starling roost seen on several occasions around Teesmouth. Up to 5,000 birds were present in this roost on one occasion. Potential strike rates were high across sections N2, N3 and N13 but low across S9.

3.10Thrush species

A number of thrush species were recorded crossing the path of the proposed power line routes, by far the most numerous being Fieldfare with smaller numbers of Redwings and Mistle Thrushes. The only large movements of thrushes noted crossing the count sections were at S9 and P1, where the vast majority of birds were accounted for by large flocks of Fieldfares. At Section N10, Mistle Thrushes were the commonest thrush species noted.

3.11Other Species

Over twenty further species were observed crossing the path of the proposed route options. Many of these were small passerines recorded in small numbers from only one or two sections and hence excluded from the species accounts above. Of the larger species, observations were made of a single Mute Swan and Short-eared Owl and there were two records of Grey Heron. These species are known to be most at risk from collision with power lines but the numbers of birds observed in the current study were extremely small.

3.12Total Birds

Figures 3.24 to 3.29 show the patterns of movement of all bird species listed in Tables 3.3 to 3.9 combined. Early morning movements across the Northern route option were dominated by Lapwings and gulls (Figure 3.24), whereas gulls and Starlings dominated movements across the Southern route option (Figure 3.25). Bird movements across both route options were evenly distributed in the early morning.

During the day, gulls and corvids dominated the bird movement across the Northern route option (Figure 3.26), with a notable concentration of movements between N9 and N15. Across the southern route, corvids and Woodpigeons caused a concentration of movements between count sections S5 and S9 (Figure 3.27). Evening movements of birds across the Northern route option were dominated by roost movements of gulls, particularly across sections N5, N11 and N13 (Figure 3.28), although movements of Redshank, Lapwing and Starling were also important. Across the Southern route option, gull and corvid roost movements across the sections S8 and S9 accounted for the most prominent movement patterns detected along this route (Figure 3.29).

5.DISCUSSION AND CONCLUSIONS

Fieldwork carried out between December 1991 and March 1992 has demonstrated the existence of a number of important flight lines for several bird species or species groups. The study has identified certain sections of the proposed routes that are clearly crossed by certain species more than are others. One surprising discovery has been the importance to a number of species of the section of the Northern option between Haverton Hill and the Teesside Industrial Estate. Lapwings and gulls regularly crossed this line during the study period in considerable numbers, often at heights which would render them susceptible to striking wires. Certain sections of the Southern route option were also identified as being crossed by large numbers of birds, although at section S1, where large movements of gulls were observed in the early morning, few birds were thought to be at risk from striking wires due to the height at which they crossed the path of the proposed route. However at sections S8 and S9, many corvids and Woodpigeons were thought to be at risk from striking wires.

A greater species diversity and a larger number of species of recognised conservation importance were seen to cross one or more sections of the Northern route option due to the greater diversity of habitats crossed by this route. However few species were recorded in numbers sufficient to allow an assessment to be made of the patterns of movement and the potential strike rates of these birds. Across both the Northern and Southern route options, gulls and corvids accounted for the majority of the birds recorded during the study period, although considerable numbers of Lapwing and several pigeon or dove species were also recorded. Only very small numbers of those species known to be most at risk from collision with power lines were recorded crossing either route, although more were recorded crossing the Northern route, particularly across sections N5 and N7.

In terms of species of national nature conservation importance, the most important movements detected were those of Shelduck, Redshank and Curlew between the intertidal habitats along the banks of the River Tees and the water bodies of Saltholme and Dorman's Pools and the ICI Reclamation Pond. These movements were tidal and likely to occur not only during the day but also at night. Although the majority of the birds seen moving along this flight path did not cross the western end of section N5, and hence were not recorded in the figures and tables presented in this report, movements took birds close enough to the proposed Northern route option to suggest that collision with wires, particularly at night, might prove a serious threat.

The extent of the potentially substantial nocturnal movements of wildfowl between Saltholme and Dorman's Pools and the estuary of Seal Sands at night could not be assessed from the present study. The same uncertainty surrounds the movements at night of the large numbers of Teal seen during the day around Portrack marshes.

The fieldwork carried out for the present study provided an assessment of the pattern of bird movements over a single winter. It should be emphasised that patterns of movement in different winters or other seasons could possibly vary markedly, although it is

likely that the major flight lines identified by the present study exist from winter to winter.

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Section	Morning	Day	Evening
N1	0	3	1
N2	0	3	1
N3	0	3	1
N4	1	5	1
N5	0	7	1
N6	2	4	1
N7	3	4	2
N8	0	5	0
N9	0	4	0
N10	1	4	0
N11	1	2	1
N12	0	4	2
N13	1	4	1
N14	0	4	1
N15	1	5	0
N16	1	2	0
N17	1	5	0
N18	1	5	0
N19	2	5	0

Table 2.1(a) The number of counts made at each count section of the Northern ('Portrack') route option at different times of day.

Section	Morning	Day	Evening
S1	2	3	1
S2	1	2	0
S3	0	2	0
S4	2	3	0
S5	2	2	0
S6	2	2	1
S7	2	2	1
S8	2	2	2
S9	3	3	3
S10	2	4	1
S11	2	5	1

Table 2.1(b) The number of counts made at each count section of the Southern route option at different times of day.

Section	Morning	Day	Evening
P1	1	5	1
P2	1	5	1
P3	1	2	0

Table 2.1(c) The number of counts made at each count section of the Picton section at different times of day.

Table 3.1 Species observed crossing the Northern (N), Southern (S) and Picton (P) sections of the proposed power line options. Species of national nature conservation importance as defined by Batten *et al* (1990) are marked in column NNCI.

Species	N	S	P	NNCI
Cormorant	_			
Shag	_			
Grey Heron	_		_	
Mute Swan	_			
Shelduck	_			_
Teal	_		_	_
Mallard	_		_	
Sparrowhawk	_	_		
Kestrel	_	_		
Peregrine	_			_
Grey Partridge	_			_
Oystercatcher	_			_
Ringed Plover	_			_
Golden Plover	_		_	_
Lapwing	_	_	_	
Dunlin	_			_
Curlew	_	_		_
Redshank	_			_
Black-headed Gull	_	_	_	
Common Gull	_	_	_	
Herring Gull	_	_		
Lssr. Blk-Bkd. Gull	_	_		
Gtr. Blk-Bkd. Gull	_			
Feral Pigeon	_	_		
Stock Dove	_	_	_	
Woodpigeon	_	_	_	

Species	N	S	P	NNCI
Collared Dove	_	_		
Short-eared Owl	_			
Skylark	_			
Meadow Pipit	_			
Pied Wagtail	_			
Blackbird	_	_		
Fieldfare	_	_	_	_
Redwing		_		_
Mistle Thrush	_	_		
Blue Tit	_			
Great Tit		_		
Jay		_		
Magpie	_	_	_	
Jackdaw	_	_	_	
Rook	_	_	_	
Carrion Crow	_	_	_	
Starling	_	_	_	
Chaffinch		_		
Greenfinch		_		
Goldfinch	_			
Linnet	_			
Yellowhammer			_	
Reed Bunting	_			

Table 3.1 (Cont.)