British Trust for Ornithology

BTO Research Report No. 87

PRELIMINARY REPORT

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

P. F. Donald

February 1992

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Published in January 1994 by the British Trust for Ornithology
The Nunnery, Thetford, Norfolk IP24 2PU, U.K.

ISBN 0-903793-38-5

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1. INTRODUCTION TO PRELIMINARY REPORT

This preliminary report summarises the results of fieldwork carried out between 18th December 1991 and 8th February 1992. More detailed analyses will be carried out for the final report when additional fieldwork data have been collected. It must therefore be stressed that the findings presented in this preliminary report are provisional and that further fieldwork, to be undertaken in late February and early March 1992, may reveal different patterns of bird movements. It must also be stressed that the fieldwork upon which this report is based was carried out over a relatively short period during a single winter. Patterns of bird movement may well be different from those observed during the present study in different seasons of the year or in different winters. Certain sections of this preliminary report, such as parts of the introduction, methods and species account sections, will be reproduced, possibly in a modified form, in the final report. The results will be presented in more detail in the final report, which is due for completion before March 31st 1992.

2 INTRODUCTION

This study aims to assess the ornithological impact of a proposed high voltage overhead power line which will transmit electricity from the National Grid substation at Wilton (or that at nearby Lackenby) to the existing 400 kV 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 road bridge before running south roughly parallel with the A19. South of the Teesside Industrial Estate, the route runs south west, crossing the Leven Valley, before joining the existing 400kV lines 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 Teeside 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 to be killed by collision with overhead power lines. Geographical region is likely to have an affect 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 Teeside (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. 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 increase the likelihood of bird strike and suggested measures which could be used to reduce potential bird mortality.

3. METHODS

The proposed routes of the two power line options were assessed on the ground from large scale maps. The routes were divided into sections (shown in Figs 2.1, 2.2) which could be observed from a series of observation points. 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.

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 and evening. This was not possible for all sections due to poor visibility on several count days.

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.

The following results highlight the broad patterns of bird movement across the two proposed routes based on data obtained up until February 1992. Certain sections of the northern route have not been fully assessed at the time of this preliminary report; these are shown in Figure 2.3. Full details of the fieldwork data and general habitat descriptions of the different count sections will be presented in the final report.

4. RESULTS

The results to date are presented in Tables 1-3. These show the numbers of birds per hour crossing each count sector of the proposed power lines 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. For the sake of 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.

The following species, and species group, accounts highlight the patterns of movement detected to date for those species and groups of species which were observed in greatest numbers and which thus are most likely to be affected by any future power line developments. In certain cases, particularly on larger areas or during poor weather, groups of birds could not be specifically identified. These include the corvids (with Carrion Crow and Rook being particularly difficult to separate in flight at a distance) and in some cases the gulls. For these two groups of birds the totals given in the columns in the tables labelled "Corvids" and "All Gulls" include all records of these groups, both identified and unidentified. Two further groups of species (ducks and raptors) have been combined 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 colliding with power lines. The following species accounts give further details of the patterns of movement found to date.

Section numbers refer throughout to those shown in Figures 2.1 and 2.2. The Northern route option was broken down into 19 count lines (N1 to N19 in Figure 2.1). Many of these areas have not been surveyed at the time of writing due to problems of access which are being resolved by National Grid. These areas are shown in Figure 2.3. The Southern route option was broken down into 11 count lines (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 (P1 to P3 in Figure 2.2). Section P3 has not yet been assessed.

4.1 Duck Species

The area of greatest movement of duck species across the proposed power line was found, as expected, along section N8 (Table 1), where the proposed Northern route option crosses north of Saltholme and Dorman's Pools and the reclamation pond to the east. These are areas of known ornithological interest, particularly for wildfowl and wader species. The majority of the wildfowl noted crossing the line of the proposed route did so in a southerly direction (Figure 3.1) and it is likely that these birds were arriving at the site from Seal Sands to the north. The majority of the wildfowl were Mallard, with smaller numbers of Teal and a few Shelduck. The descent of these birds to the open

water of the pools and reclamation pond meant that all were likely to risk the danger of striking wires.

Considerable movement of wildfowl was noted between Saltholme and Dorman's pools and the reclamation pond, although this did not bring the birds into contact with areas affected by the power line proposals.

4.2 Raptor Species

Records of raptors crossing the path of the proposed power lines were widespread but with very small numbers of birds involved (Tables 1-3). Sparrowhawk and Kestrel were the most frequently recorded species, although there were single records of Peregrine and Short-eared Owl.

4.3 Golden Plover

As with the Lapwing, this is a wader species which is associated in winter particularly with arable farmland, with a wintering population in Britain and Ireland of 200-300,000 (eg. Fuller, 1986b). Fieldwork to date has not revealed any large-scale movements of this species around the study site, with small groups moving across certain sections of the routes of both proposed options. Too few birds have been observed to allow an accurate assessment of the potential impact of the proposed power lines on this species.

4.4 Lapwing

In winter, the Lapwing is predominantly a bird of open arable land, often gathering in large flocks, and has a wintering population of over 1 million birds in Britain and Ireland (eg. Fuller, 1986a). 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 section of the Northern route option which runs approximately north-south between Haverton Hill and the Teeside Industrial Estate (Figure 3.2). Many of the observed movements were however thought to relate to one or two large flocks, one feeding on fields just east of the A19(T) road and the other, or possibly part of the same flock, at Portrack marshes. The movements of these birds were in many cases thought to be related to human disturbance, although it was suspected that birds moving south east over section N10 were moving towards Saltholme pool, where up to 300 birds were counted. A high proportion of birds were seen to cross the proposed routes of power lines at a height at which they could risk striking power cables.

Smaller numbers of Lapwing were noted crossing various count sections of the Southern and Picton routes, although too few birds were seen to detect any overall pattern of movement.

4.5 Black-headed Gull

This was in most areas the most numerous gull species recorded. The species was widely recorded, with birds crossing most count sections (Tables 1-3). On the Northern route, birds were found to cross the path of the proposed lines in particularly large numbers in section N10, where birds appeared to be moving between fields around Billingham towards Saltholme and Dorman's pools and the reclamation pond (Table 1). On the Southern route, large movements of birds were observed crossing section S1 in a southerly direction in the early morning. These were presumably birds which had roosted overnight on Seal Sands or on surrounding water bodies and were moving off towards the arable fields to the south to feed during the day. A reverse movement was observed in the evening across section S9, with birds returning northwards to roost. Birds tended to cross section S1 at a considerable altitude as they benefited from the updraught resulting from air rising up the steep escarpment of Eston Moor. A higher proportion of birds were at risk from striking power lines when returning north across section S9. Elsewhere the proportion of birds at risk from striking power lines varied considerably. Feeding parties of this species tend to fly low across fields, putting them at little risk from overhead power lines. When roosting flocks are disturbed from fields, however, or when in more direct flight, birds may be more prone to striking wires.

The British and Irish wintering population of this species probably exceeds 3,000,000 birds, around two thirds of which are of Continental origin (Flegg, 1986).

4.6 Common Gull

This species was generally found to be less numerous than the previous species, although considerable numbers were observed crossing the proposed Northern route at section N10, in company with the large numbers of Black-headed Gulls in that section. On the Southern route, large numbers were observed crossing section S5. This was due to disturbance of the often very large flock of this species feeding on fields just south of the A171 road.

The British and Irish wintering population of this species is estimated to be around 700,000 birds (Vernon, 1986).

4.7 Total Gulls

As well as the small numbers of larger gulls, such as Herring and Lesser Black-backed Gulls, large numbers of the previous two species often went unidentified due to poor visibility sometimes combined with long distances. The total numbers of gulls of all species crossing each count section per hour is shown in Tables 1-3 and in Figures 3.3 and 3.4. In addition to the flight

lines mentioned for the previous two species, a further flight line emerges as being of importance. This involves the easterly movement of very large numbers of gulls of different species in the evening along Billingham Beck (section N12). This movement is likely to be of birds which feed during the day at the sewage works at Portrack marshes and the fields west of Middlesbrough following the Beck towards their night roost. This section has not yet been counted in the morning, so it is not known whether a reverse movement occurs at this time or whether birds use a different route to return to their feeding grounds.

4.8 Woodpigeon

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 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 were due to several large flocks of birds moving between fields in this area. Although a high proportion of birds were thought to be flying at a height likely to make them prone to colliding with power lines in section S8, where birds had to rise to cross an area of woodland, only a small proportion of birds were at risk in section S9.

The British and Irish wintering population of this species is thought to be between five and ten million birds (Inglis, 1986)

4.9 Stock Dove

This species was recorded in far lower numbers than the previous species, although recorded from the same types of habitat. Primarily a species of open fields, the Stock Dove is far less common in Britain and Ireland than is the previous species, with an estimated wintering population of around 100,000 birds (O'Connor, 1986).

4.10 Rook

As with the two previous species, the Rook is primarily a bird of agricultural land in winter, often forming large feeding flocks and even larger roosting flocks, often in association with Jackdaws and Carrion Crows. As might be expected, the majority of records of this species crossing the proposed power line routes came from the Southern route and the more agricultural areas crossed by the Northern route. Large numbers of birds were observed leaving woods in the early morning and crossing eastwards across section S4.

However the largest movement of this species is likely to be across section S8 during the evening flight to roost. This species was thought to make up the majority of the large numbers of corvids seen in this section on one visit in February 1992 (see section 3.12 below and Figure 3.7).

Vast numbers of this species were seen on the mornings and evenings flighting to and from roosts (containing up to 5,000 birds) at Ten Acre Bank at the western end of Eston Moor and around the villages of Great Ayton and Hutton Gate. These flocks were not seen to cross the route of the proposed power lines.

The British and Irish wintering population of this species is estimated at around four million birds (Brenchley, 1986).

4.11 Carrion Crow

This species has a similar wintering population size in Britain and Ireland to the previous species and yet was recorded throughout the study area in consistently lower numbers (Tables 1-3). This is at least partly due to this species forming large flocks less often than the previous species and to less reliance on agricultural areas during the winter. It is likely, however, that this species has been under-recorded, as individuals often join larger flocks of Rooks, particularly on the evening flight to roost.

4.12 Total Corvids

It was thought likely that the majority of unidentified corvids were Rooks, this being the commonest species amongst those identified. The movements of all corvids, identified and otherwise, are shown in Figures 3.5 and 3.6.

4.13 Starling

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. By far the largest observed movement of this species was a southerly movement of birds across section S1 in the early morning. This was probably due to birds which roosted in Middlesbrough moving south to feed on fields to the south of the city. Large numbers of this species were also observed crossing section N10. Birds crossing section S1 were flying too high to risk collision with power lines.

The wintering population of this species in Britain and Ireland is estimated to be in the region of 37 million birds (Feare, 1986).

4.14 Thrush 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. For the purposes of this preliminary report, all thrush species have been combined in Tables 1-3. 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.

4.15 Other 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 involved in the current study are extremely small.

5. DISCUSSION AND CONCLUSIONS

Fieldwork carried out up to the middle of February 1992 has brought to light a number of important flightpaths for several different species or species groups. The study so far has identified certain sections of the proposed routes that are clearly more important for certain species 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 cross this line in considerable numbers, often at heights which would render them prone to striking wires. Certain sections of the Southern route option were also identified as being of concern, although at section S1, where much bird movement was observed, few birds were thought to be at risk from striking wires due to the height at which they crossed the path of the route. However at sections S8 and S9, many corvids and woodpigeons were thought to be at risk from striking wires. In terms of species diversity and conservation value, the Northern option appears to present the greatest concern, particularly when it is taken into account that large sections of this route have not yet been surveyed. This concern results from the greater diversity of habitats crossed by the Northern option.

More fieldwork has yet to be carried out and further data analysis may reveal patterns of movement not yet detected. This might change the preliminary assessment such that, in terms of ornithological impact, the Southern route is preferable to the Northern one. The final report will include recommendations on ameliorating the ornithological impact of the chosen route.

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	N4			N7			N8			N9			N10			N11		
	N	S	%	E	W	%	N	S	%	N	S	%	N	S	%	E	W	%
Total Duck Day	-	-	-	0	0	0	0	21.5	100	1.3	11	0	0	0	0	0	0	0
Total Duck M/E	0	0	0	0	0	0	8	17.4	36.6	-	-	-	-	-	-	-	-	-
Raptors Day	-	-	-	0	0	0	0	0	0	0	1	0	1	0.5	0	1	0	0
Raptors M/E	0	0	0	0	0	0	0.2	0.2	100	-	-	-	-	-	-	-	-	-
Golden Plover Day	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Golden Plover M/E	0	0	0	0	0	0	0	6	100	-	-	-	-	-	-	-	-	-
Lapwing Day	-	-	-	0	0	0	0	0	0	0	80	0	0	63	100	12.6	0	100
Lapwing M/E	0	0	0	7	0	0	1	24.6	53	-	-	-	-	-	-	-	-	-
Black-headed Gull Day	-	-	-	4	1.5	9	0	1	100	1.3	6	0	25.5	175	88	7.3	6.6	29
Black-headed Gull M/E	32	0	0	0	0	0	2.4	6.8	70	-	-	-	-	-	-	-	-	-
Common Gull Day	-	-	-	4	0	0	0.5	2	20	0	5	0	3	84	89.6	18.6	15.3	51
Common Gull M/E	0	0	0	0	0	0	0.4	2.4	57	-	-	-	-	-	-	-	-	-
Total Gulls Day	-	-	-	8	3.5	4.3	1.3	6	42				27.5	261	89.4	26	25	46
Total Gulls M/E	0	0	0	0	0	0	10	11	43	-	-	-	-	-	-	-	-	-
Wood Pigeon Day	-	-	-	0	0	0	0	0	0	0	0	0	13	5.5	83.7	3.3	5.3	15.4
Wood Pigeon M/E	0	0	0	0	0	0	0	0.4	100	-	-	-	-	-	-	-	-	-
Stock Dove Day	-	-	-	0	0	0	0	0	0	0	0	0	1	4.5	18	1.3	0	100
Stock Dove M/E	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-
Rook Day	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rook M/E	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-
Carrion Crow Day	-	-	-	0	0	0	0	0	0	0	0.7	0	0.5	0	0	0	1.3	0
Carrion Crow M/E	0	0	0	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-
Total Corvids Day	-	-	-	0	0	0	0	0	0	0	0.7	0	3	6	47.3	1	2	25
Total Corvids M/E	0	0	0	0	0	0	0	2	0	-	-	-	-	-	-	-	-	-
Starling Day	-	-	-	0	0	0	0	0	0	0	5	0	92	62.3	86.6	0	0	0
Starling M/E	0	0	0	0	0	0	0.2	0	100	-	-	-	-	-	-	-	-	-
Thrush spp. Day	-	-	-	0	0	0	0	0	0	0	0	0	4	5	0	0	0	0
Thrush spp. M/E	0	0	0	0	0	0	0	0.4	0	-	-	-	-	-	-	-	-	-

Table 1 The number of birds per hour crossing count sections along the Northern route during the day and during morning/evening (M/E). Percentages refer to the estimated percent of birds passing at a height likely to expose them to the danger of striking wires. Section numbers refer to those shown in Figure 2.1.

	N12			N13			N15			N17			N18			N19		
	E	W	%	E	W	%	E	W	%	E	W	%	E	W	%	E	W	%
Total Duck Day	0	0	0	0	0	0	0	1.5	0	0	0	0	0	0	0	0	0	0
Total Duck M/E	0	0	0	-	-	-	-	-	-	0	0	0	-	-	-	0	0	0
Raptors Day	0	0	0	0	0	0	1	0	100	0	0	0	0	0	0	1.2	0	33
Raptors M/E	2	0	100	-	-	-	-	-	-	0	0	0	-	-	-	0	0	0
Golden Plover Day	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Golden Plover M/E	0	0	0	-	-	-	-	-	-	0	0	0	-	-	-	0	9	0
Lapwing Day	22	0	100	0	280	50	103	88	58	0	3.2	100	0	0	0	0	0	0
Lapwing M/E	70	0	100	-	-	-	-	-	-	0	0	0	-	-	-	0	0	0
Black-headed Gull Day	34	28	65	0	0	0	34	12	24	0.4	1.2	50	10	0	20	11	8.2	40
Black-headed Gull M/E	0	0	0	-	-	-	-	-	-	26	0	0	-	-	-	8	8	100
Common Gull Day	6	40	83	0	0	0	4.5	3.5	36	0	0	0	0	8	0	1.6	2.8	0
Common Gull M/E	0	0	0	-	-	-	-	-	-	2	0	0	-	-	-	20	9	21
Total Gulls Day	48	80	64	0	0	0	37	14.5	23	0.4	1.2	50	10	8	11	12.6	11	45.7
Total Gulls M/E	556	0	0	-	-	-	-	-	-	28	0	0	-	-	-	28	17	48.8
Wood Pigeon Day	0	0	0	0	0	0	28	1	100	0	0	0	2	0	100	109	1	54
Wood Pigeon M/E	0	0	0	-	-	-	-	-	-	0	0	0	-	-	-	0	0	0
Stock Dove Day	0	0	0	0	0	0	0.5	0	100	0	0	0	0	28	21.4	0	0	0
Stock Dove M/E	0	0	0	-	-	-	-	-	-	0	0	0	-	-	-	1	0	0
Rook Day	0	0	0	0	0	0	0.5	1	33	9.2	6.4	61	0	0	0	24.5	1.6	52
Rook M/E	0	4	0	-	-	-	-	-	-	4	8	66	-	-	-	49	3	6
Carrion Crow Day	0	0	0	0	0	0	1	1	100	0.4	0	0	0	6	100	1.6	0	100
Carrion Crow M/E	0	0	0	-	-	-	-	-	-	2	16	100	-	-	-	0	0	0
Total Corvids Day	0	0	0	0	0	0	4	2	50	9.6	6.4	70	2	8	20	100	4	76
Total Corvids M/E	0	4	0	-	-	-	-	-	-	8	30	88	-	-	-	49	36	30
Starling Day	0	0	0	60	0	100	13	37	68	11.2	0	0	0	0	0	0	0	0
Starling M/E	0	0	0	-	-	-	-	-	-	0	0	0	-	-	-	0	0	0
Thrush spp. Day	0	4	0	0	0	0	0	2.5	100	0	0	0	0	0	0	0	0	0
Thrush spp. M/E	0	0	0	-	-	-	-	-	-	0	0	0	-	-	-	0	0	0

Table 1 (Continued)

	S1			S2			S3			S4			S5			S6		
	N	S	%	N	S	%	E	W	%	E	W	%	E	W	%	E	W	%
Total Duck Day	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Duck M/E	0	0	0	0	0	0	-	-	-	0	0	0	0	0	0	0	0	0
Raptors Day	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Raptors M/E	0	1	100	0	2	100	-	-	-	0	0	0	0	0	0	1	0	100
Golden Plover Day	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Golden Plover M/E	0	0	0	0	0	0	-	-	-	0	0	0	0	0	0	0	0	0
Lapwing Day	0	0	0	0	0	0	0	0	0	0	0	0	0	32.5	0	0	0	0
Lapwing M/E	0	0	0	0	0	0	-	-	-	0	0	0	0	0	0	0	0	0
Black-headed Gull Day	0	1	100	0	0	0	0	8	100	0	1.5	100	0	0	0	0	0	0
Black-headed Gull M/E	0	79.5	5.66	4	40	0	-	-	-	3	0	0	0	5	100	0	0	0
Common Gull Day	0	1	0	5	2	28.6	0	0	0	0	0	0	91	192	96.5	2	6	0
Common Gull M/E	0	15	0	0	8	0	-	-	-	1	0	0	0	8	0	1	0	0
Total Gulls Day	0	2	50	5	2	14.3	0	8	100	0	7	21.4	91	192	96.5	2	6	0
Total Gulls M/E	0	220	3.6	8	76	0	-	-	-	4	26	86.7	40	23	27.3	1	0	0
Wood Pigeon Day	0	0	0	4	3	57.1	0	4	100	0	3	0	0	34	100	0	0	0
Wood Pigeon M/E	0	3	100	2	4	50	-	-	-	13	0	61.5	0	0	0	0	0	0
Stock Dove Day	0	0	0	0	0	0	0	0	0	7	0	100	0	0	0	0	0	0
Stock Dove M/E	0	0	0	0	0	0	-	-	-	0	0	0	0	0	0	0	0	0
Rook Day	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	23	4	29.6
Rook M/E	0	0	0	0	0	0	-	-	-	124	66	34.7	5	21	80.95	10	3	61.5
Carrion Crow Day	0	1	0	0	7	28.6	0	4	100	0	0	0	0	0	0	0	0	0
Carrion Crow M/E	0	1	0	15	2	13.3	-	-	-	0	0	0	1	0	0	0	0	0
Total Corvids Day	0	1	0	1	7	0.25	0	4	0	1.5	2.5	37.5	32.5	54.5	50.6	23	4	29.6
Total Corvids M/E	0	9.5	36.84	17	2	0	-	-	-	128	66	35.6	6	21	73.1	16	3	50
Starling Day	0	0	0	0	0	0	0	0	0	0	0	0	20	12	0	0	24	75
Starling M/E	0	197	0	4	18	0	-	-	-	2	0	100	0	0	0	0	0	0
Thrush spp. Day	0	0	0	0	0	0	0	0	0	0	0	0	0	16	0	1	0	100
Thrush spp. M/E	0	0	0	0	0	0	-	-	-	0	1	0	0	0	0	0	0	0

Table 2 The number of birds per hour crossing count sections along the Southern route during the day and during morning/evening (M/E). Percentages refer to the estimated percent of birds passing at a height likely to expose them to the danger of striking wires. Section numbers refer to those shown in Figure 2.2.

	S7			S8			S9			S10			S11		
	N	S	%	N	S	%	N	S	%	N	S	%	N	S	%
Total Duck Day	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Duck M/E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Raptors Day	1	0	0	0	0	0	0	0.7	100	0.67	0	0	0	0	0
Raptors M/E	0	0	0	0	0	0	0	0	0	0	0.67	0	0	0	0
Golden Plover Day	0	0	0	0	0	0	3	0	100	0	0	0	0	0	0
Golden Plover M/E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lapwing Day	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0
Lapwing M/E	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-headed Gull Day	0	0	0	8	0	0	2	6	58.3	25.3	49.3	5.2	2.4	3.2	0
Black-headed Gull M/E	2	0	50	12	8	100	124.6	31	83.9	3.3	11	0	0	0	0
Common Gull Day	0	0	0	0	0	0	6	3.3	14.2	5.3	0	0	0	2.8	0
Common Gull M/E	2	0	50	0	1	0	12.8	19.6	4.9	0	10.7	0	0	0	0
Total Gulls Day	0	0	0	8	0	0	8	9.3	34.6	30.67	49.3	5	2.4	6	0
Total Gulls M/E	5	0	40	12	9	96.6	142.4	50.6	83.7	3.3	21.3	0	1.3	4.67	0
Wood Pigeon Day	0	0	0	70	0	100	238.6	117.3	11.2	2	18	90	13.2	0.4	0
Wood Pigeon M/E	0	0	0	145	12	93.6	60	16.8	3.4	21.3	0	0	0	0	0
Stock Dove Day	0	0	0	2	0	100	0	0	0	0	0	0	0	0	0
Stock Dove M/E	0	0	0	0	0	0	0	0.4	100	0	8	100	0	0	0
Rook Day	4	0	0	26	2	86	0	0.7	100	2	4	0	6	16.8	24.6
Rook M/E	3	1	75	0	0	0	1.2	0.4	0	1.3	4	0	0	4.67	100
Carrion Crow Day	0	0	0	0	6	0	0	0.7	0	0	0	0	0	0	0
Carrion Crow M/E	4	0	100	0	0	0	0	6.4	100	0	5.3	0	0.67	6.67	0
Total Corvids Day	4	0	0	26	8	70.5	0	1.4	50	6.7	17.3	55.55	14	19.2	16.9
Total Corvids M/E	26	15	51.2	800	0	100	1.2	47.2	93.3	133.3	18	15.4	0.67	24.7	47.4
Starling Day	86	24	45.45	0	0	0	0	60	11	0	0	0	0.8	0	0
Starling M/E	5	3	100	0	0	0	42.4	6.4	13.9	1.7	23.3	0	0.4	0	0
Thrush spp. Day	0	0	0	0	0	0	66.6	13.3	0	0	0	0	0	0	0
Thrush spp. M/E	0	0	0	0	9	0	0	4	100	0	0	0	0	4	0

Table 2 (Continued)

	P1			P2		
	E	W	%	E	W	%
Total Duck Day	0	0	0	0	0	0
Total Duck M/E	0	0	0	20	0	100
Raptors Day	0	0	0	0	0	0
Raptors M/E	0	0	0	0	0	0
Golden Plover Day	0	0	0	0	3.6	100
Golden Plover M/E	0	0	0	0	0	0
Lapwing Day	0.4	0	0	0	0	0
Lapwing M/E	0	0	0	0	0	0
Black-headed Gull Day	0.8	3.2	20	0	0	0
Black-headed Gull M/E	0	0	0	0	0	0
Common Gull Day	1.2	0.8	60	1.6	3.6	23
Common Gull M/E	0	0	0	0	2	100
Total Gulls Day	2	4	33	1.6	3.6	23
Total Gulls M/E	0	0	0	0	2	100
Wood Pigeon Day	2	0	0	0.4	0.8	100
Wood Pigeon M/E	2.4	0	0	0	80	100
Stock Dove Day	0	0	0	0.8	0	100
Stock Dove M/E	0	0	0	0	0	0
Rook Day	33	0	2.5	0	0	0
Rook M/E	0	66	100	0	0	0
Carrion Crow Day	0.2	3.6	100	1.6	6.4	80
Carrion Crow M/E	12	0	100	0	2	0
Total Corvids Day	65	3.6	7	12.4	6.4	32
Total Corvids M/E	12	0	100	0	4	0
Starling Day	11	0	0	0	0	0
Starling M/E	0	0	0	0	0	0
Thrush spp. Day	37	0	100	0	0	0
Thrush spp. M/E	0	0	0	0	0	0

Table 3 The number of birds per hour crossing count sections along the Picton route during the day and during morning/evening (M/E). Percentages refer to the estimated percent of birds passing at a height likely to expose them to the danger of striking wires. Section numbers refer to those shown in Figure 2.2.

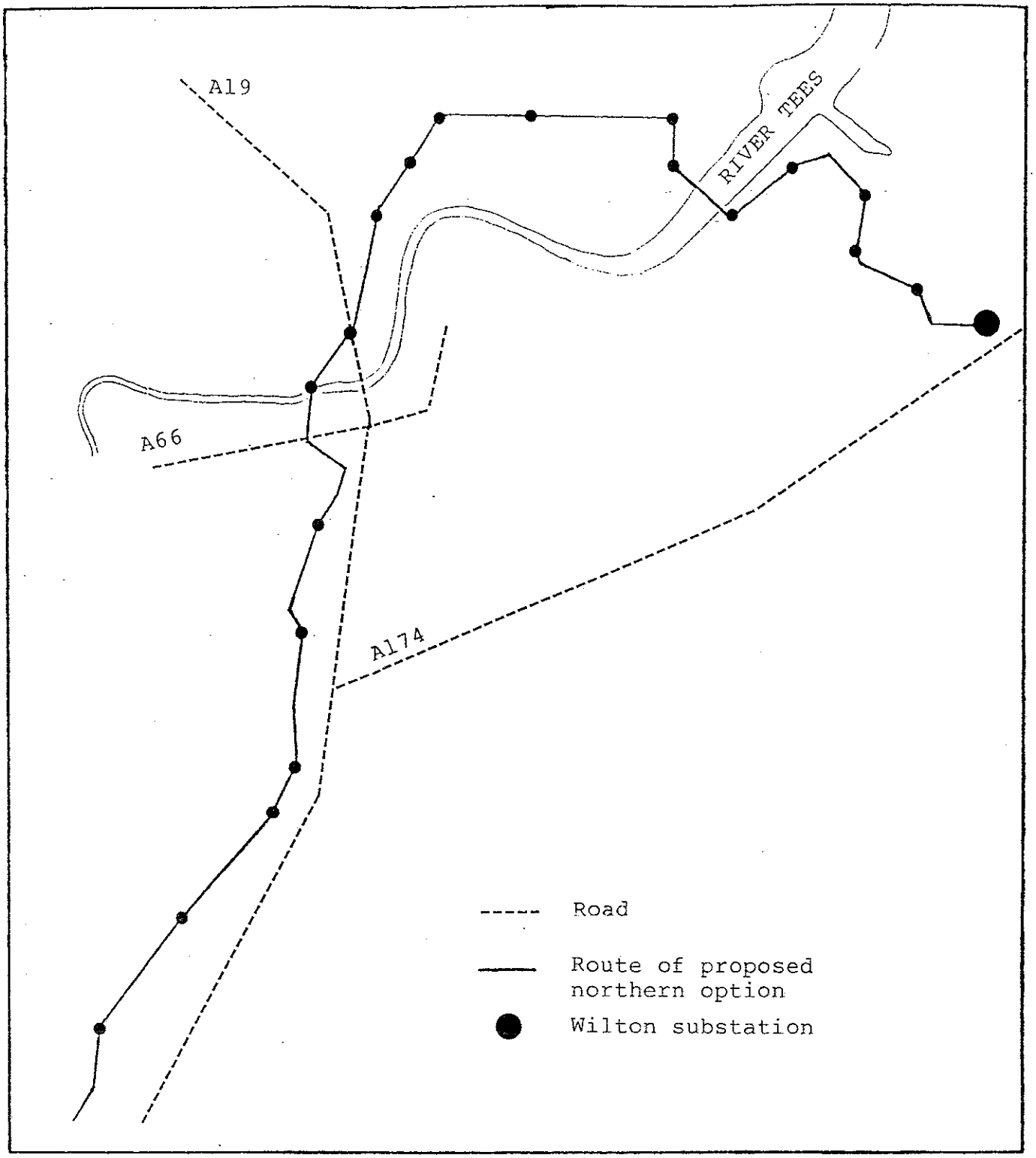

Figure 1.1 The Northern ("Portrack") option.

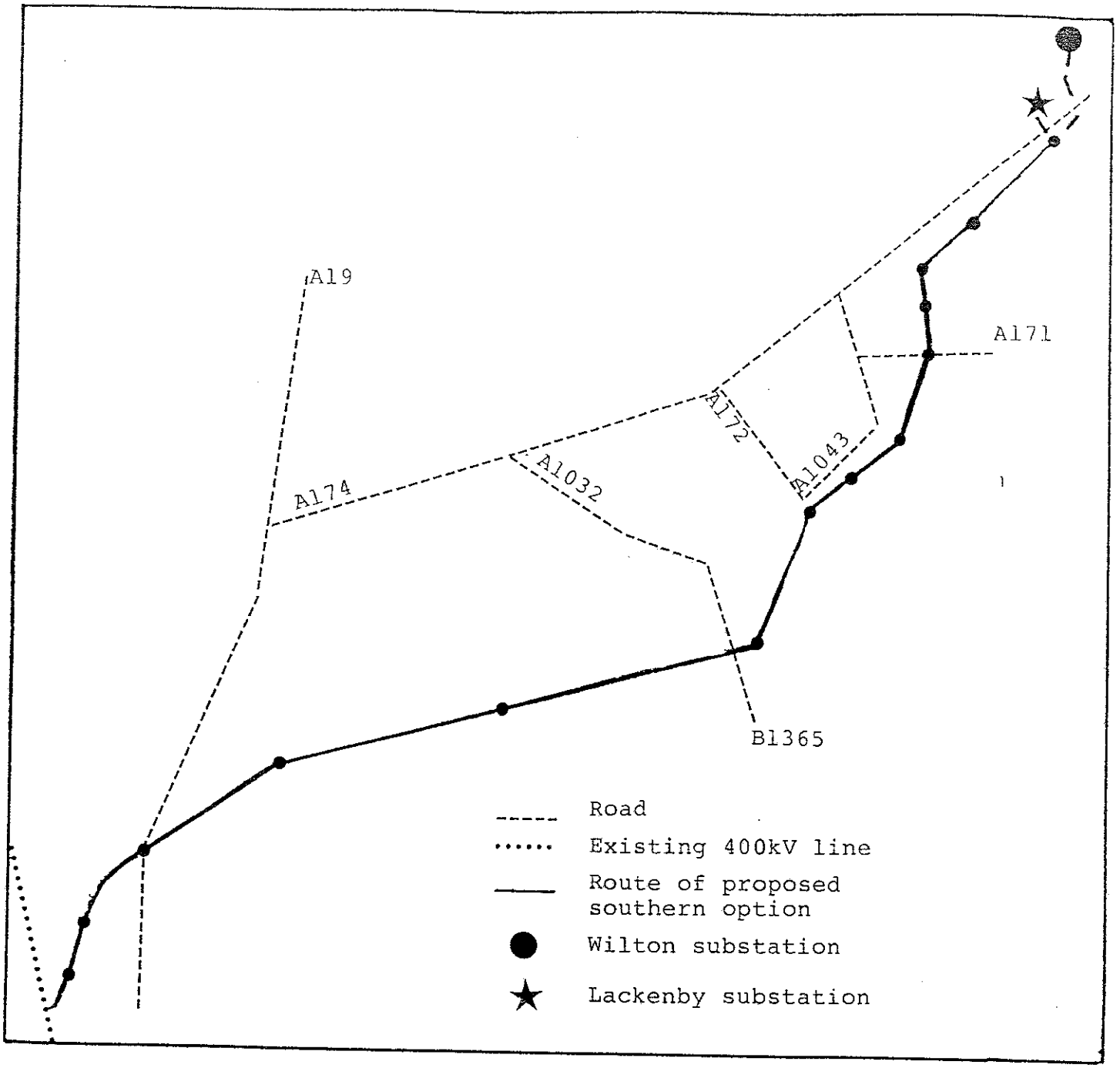

Figure 1.2 The Southern option.

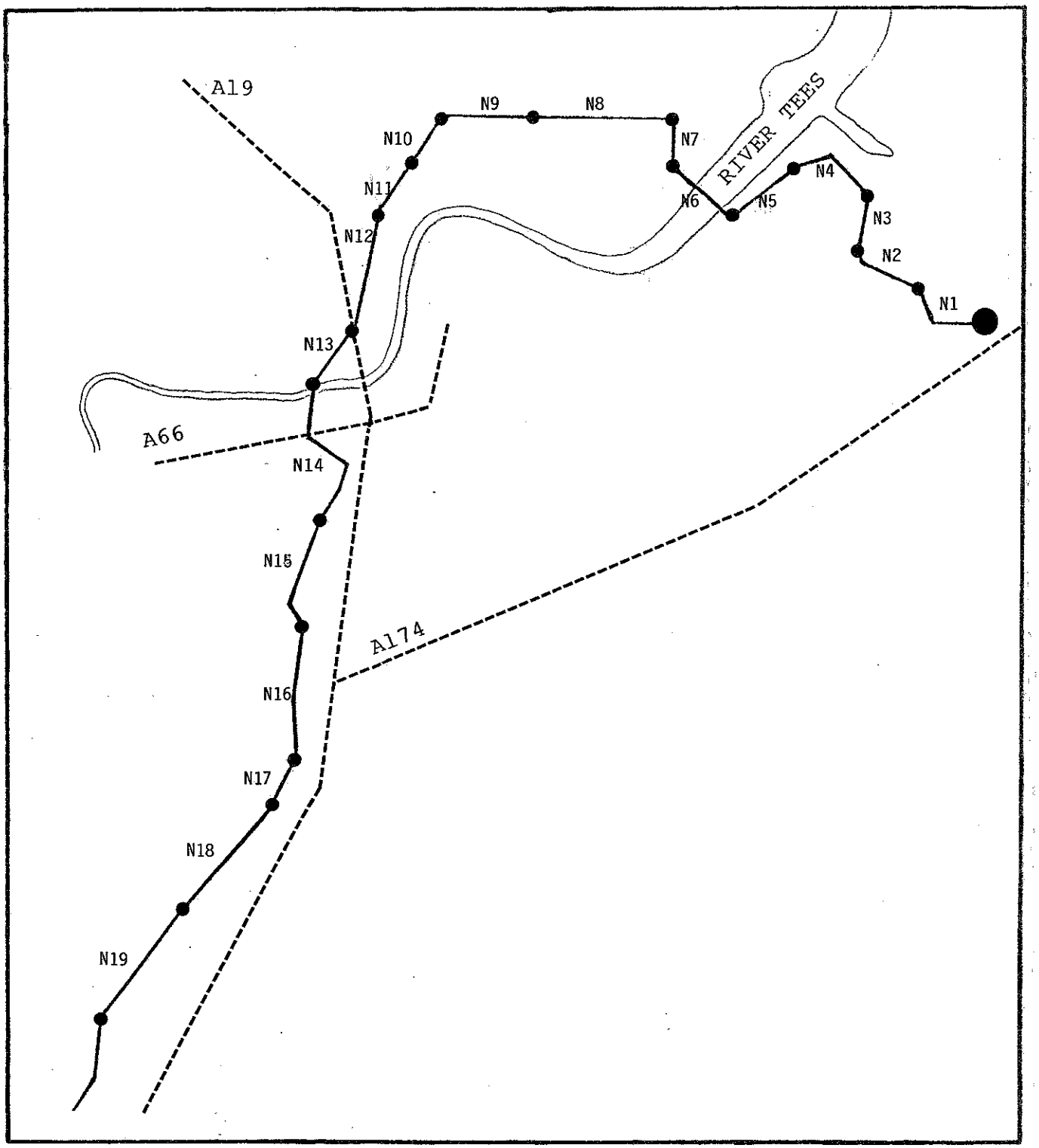

Figure 2.1 Count sections on the Northern option.

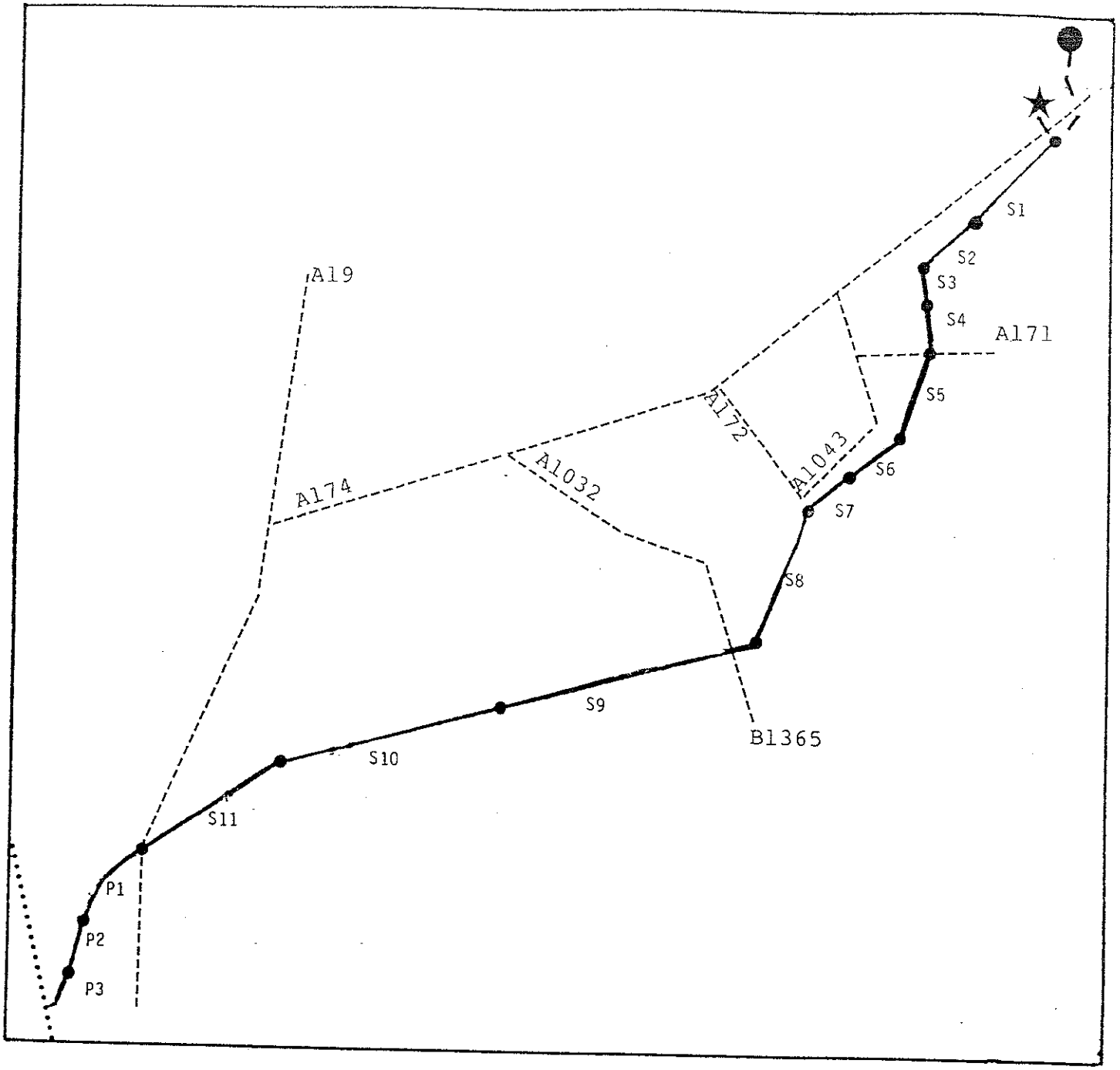

Figure 2.2 Count sections on the Southern option and the Picton section.

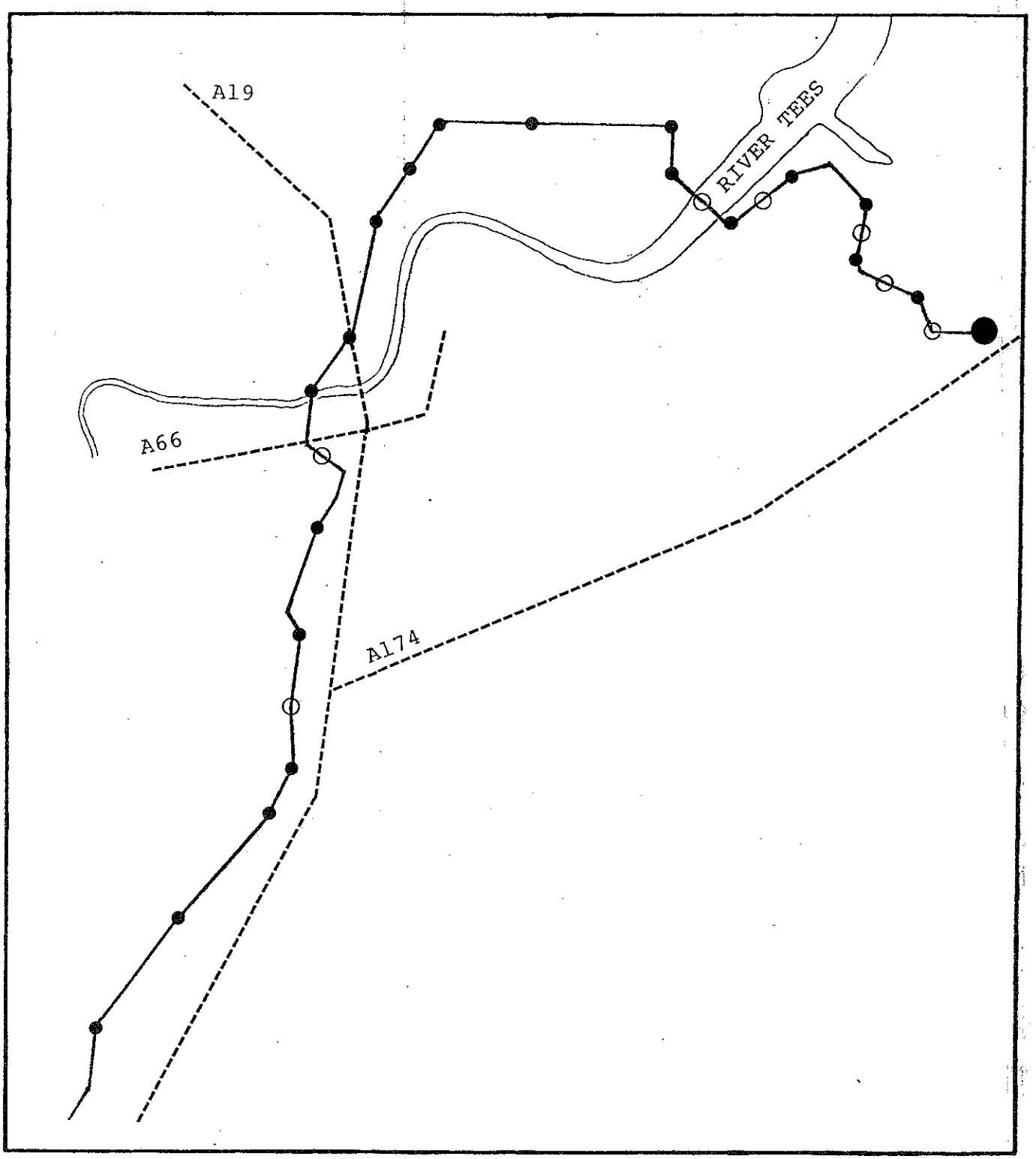

Figure 2.3 Count sections for which no data are available at the time of writing (marked with 0).

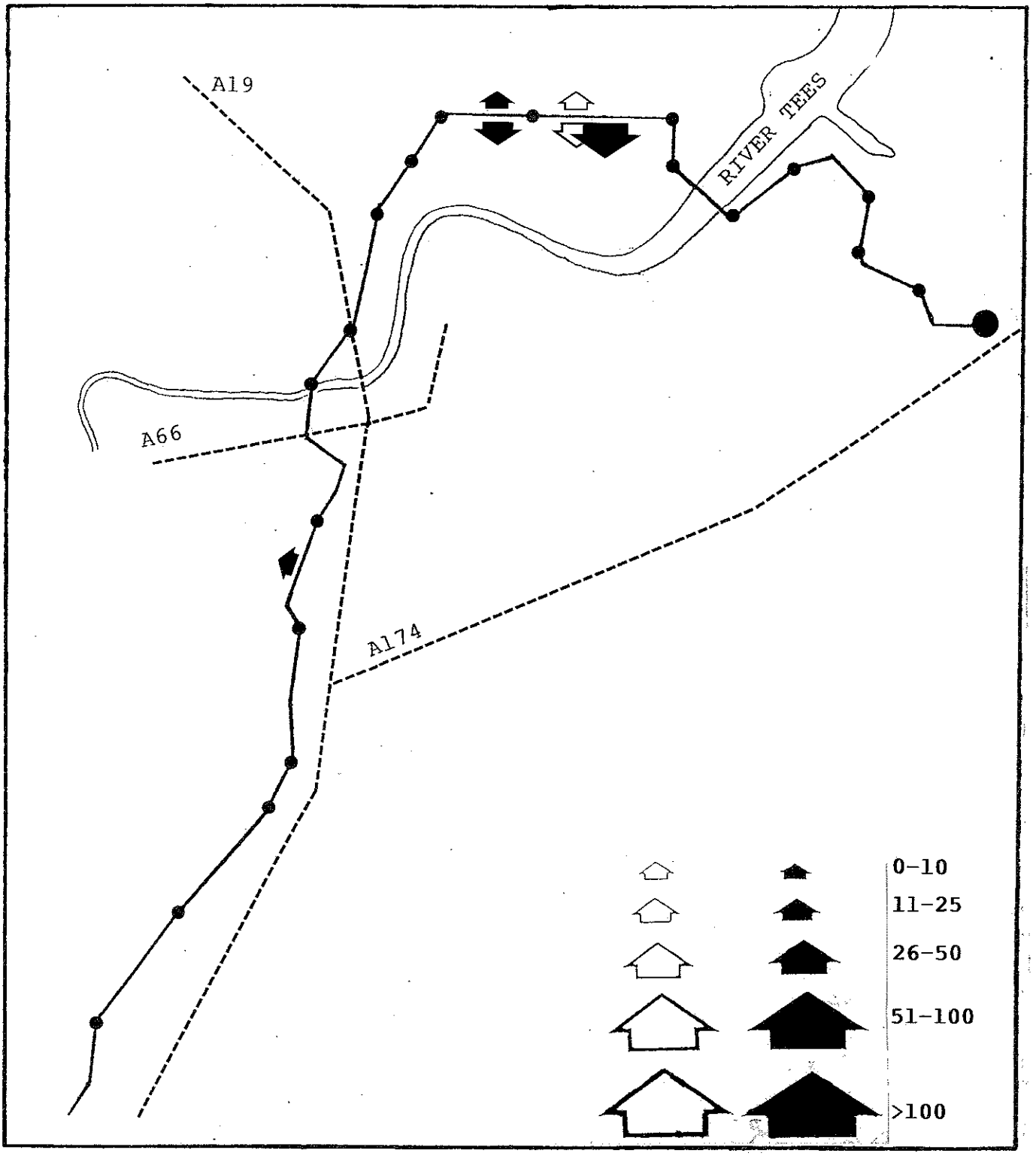

Figure 3.1 The number of ducks per hour crossing count sections along the northern route during the day (filled arrows) and during the morning/evening (open arrows).

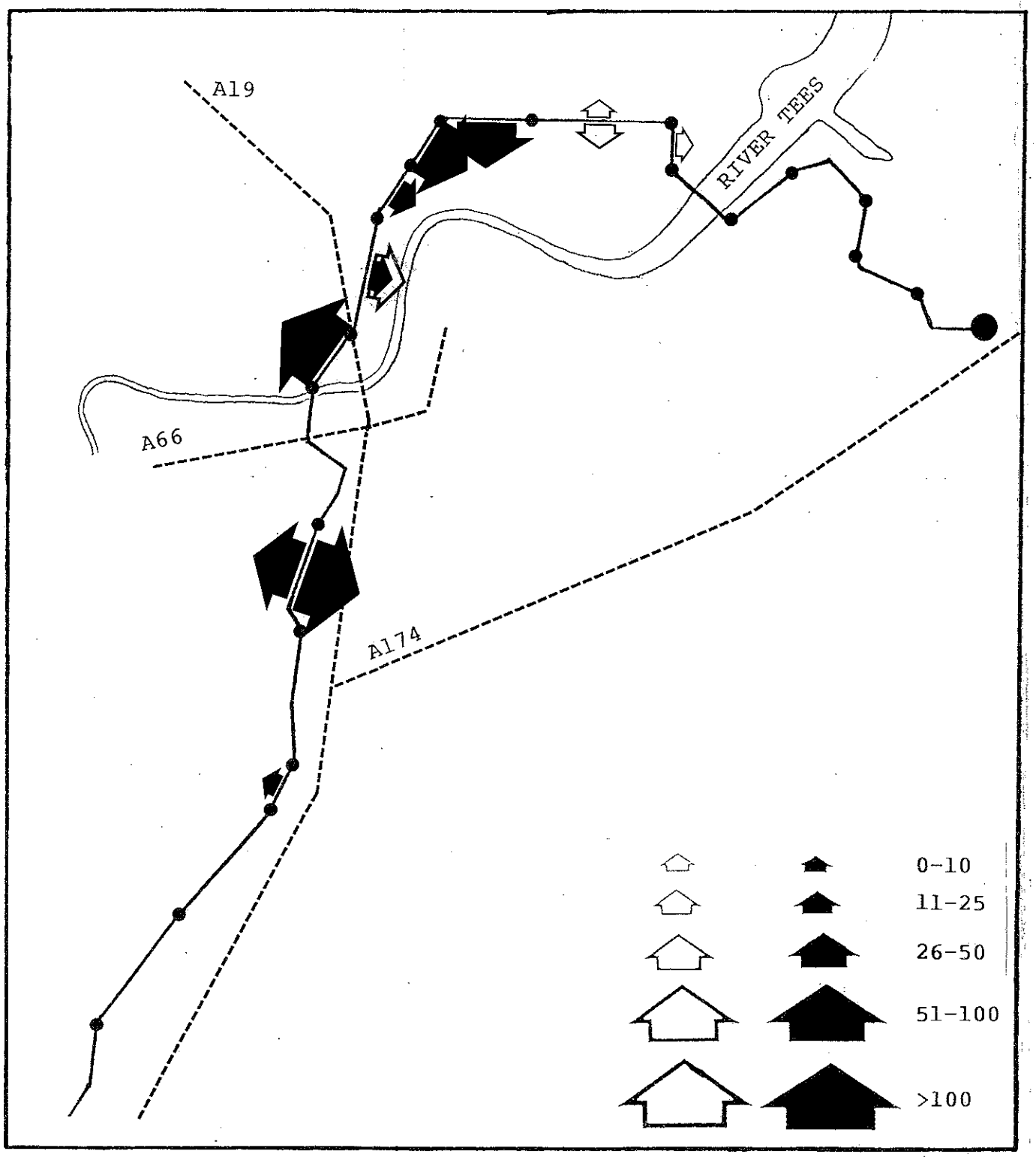

Figure 3.2 The number of Lapwing per hour crossing count sections along the northern route during the day (filled arrows) and during the morning/evening (open arrows).

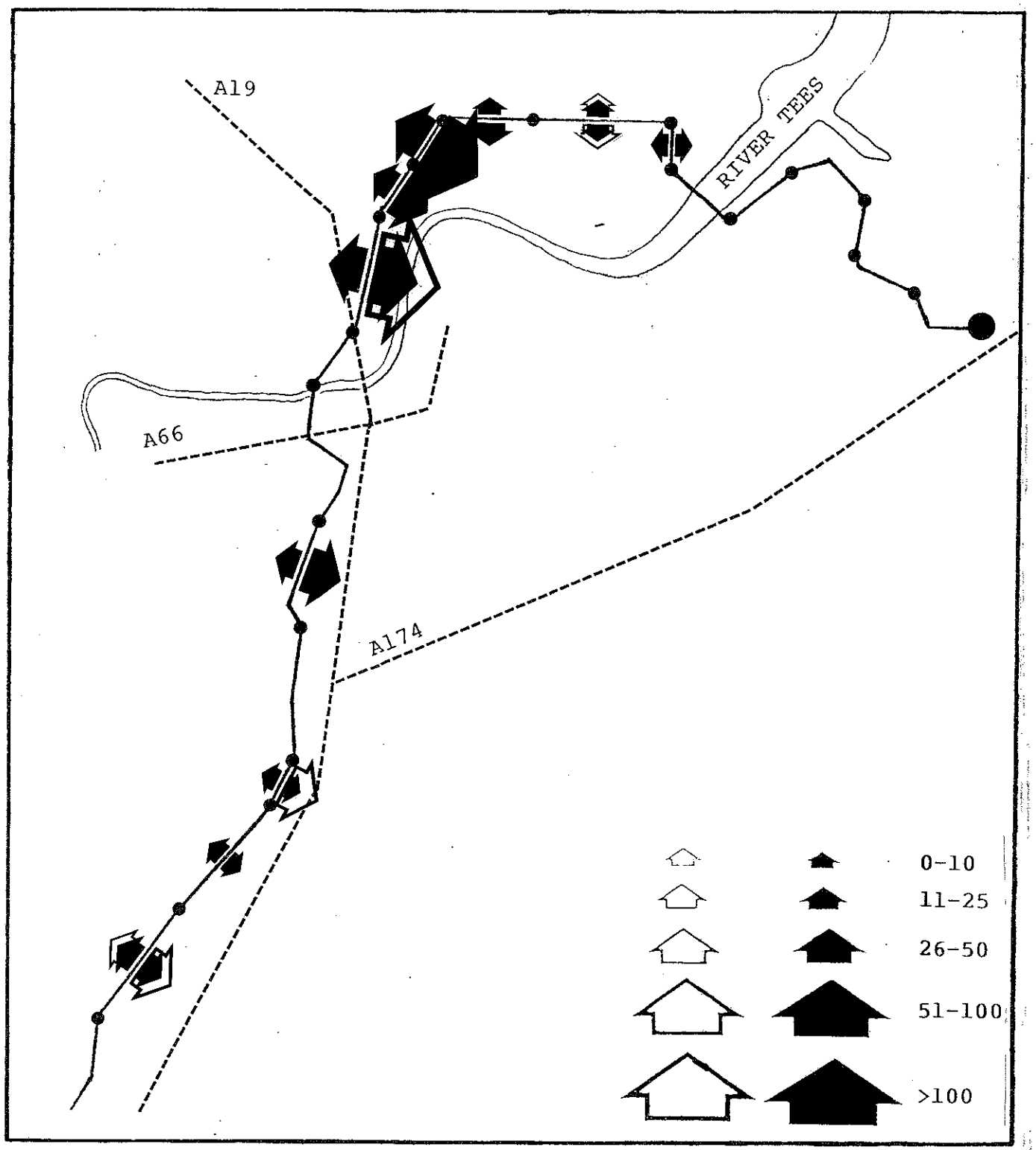

Figure 3.3 The number of all gulls per hour crossing count sections along the northern route during the day (filled arrows) and during the morning/evening (open arrows).

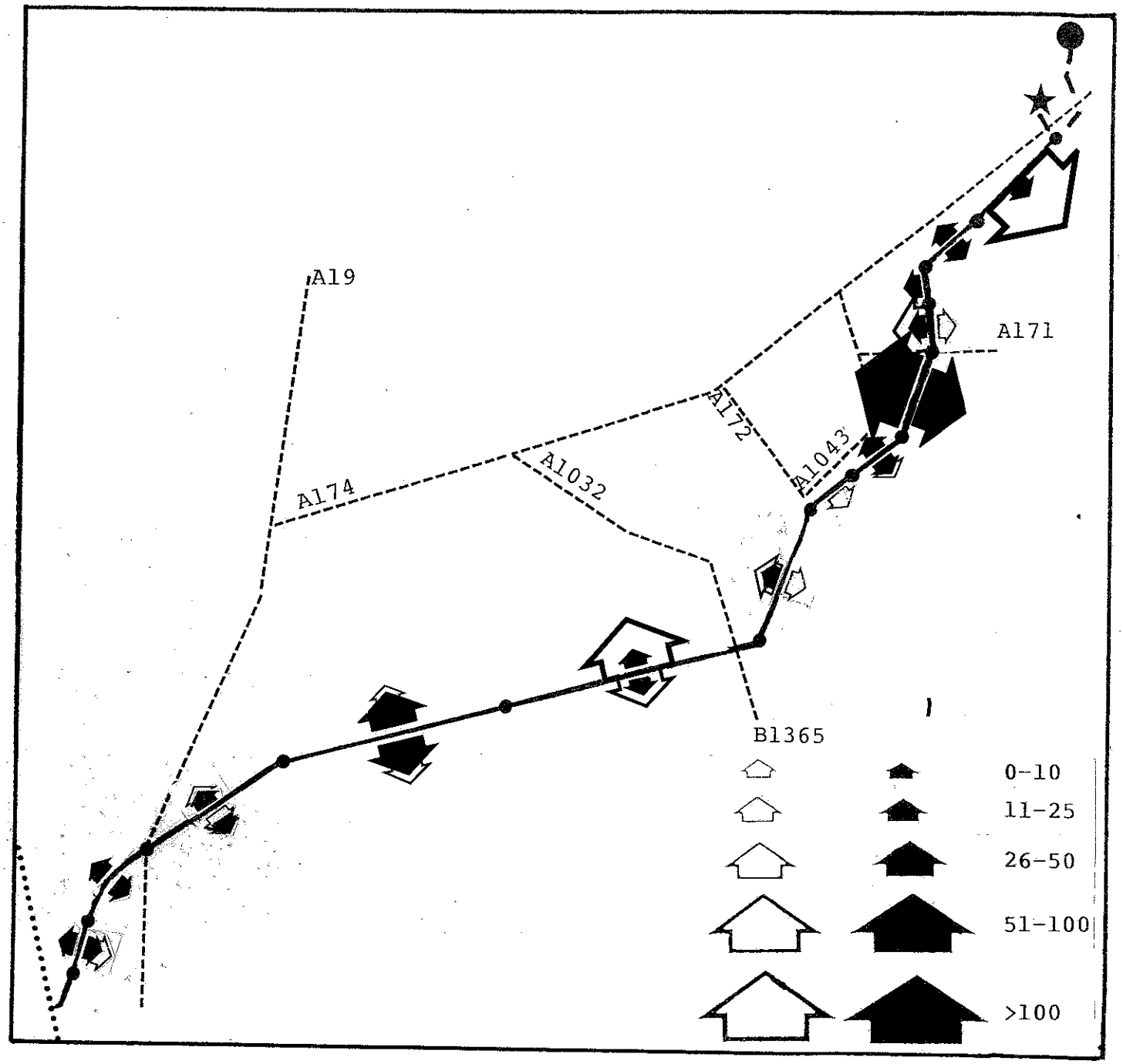

Figure 3.4 The number of all gulls per hour crossing count sections along the southern route during the day (filled arrows) and during the morning/evening (open arrows).

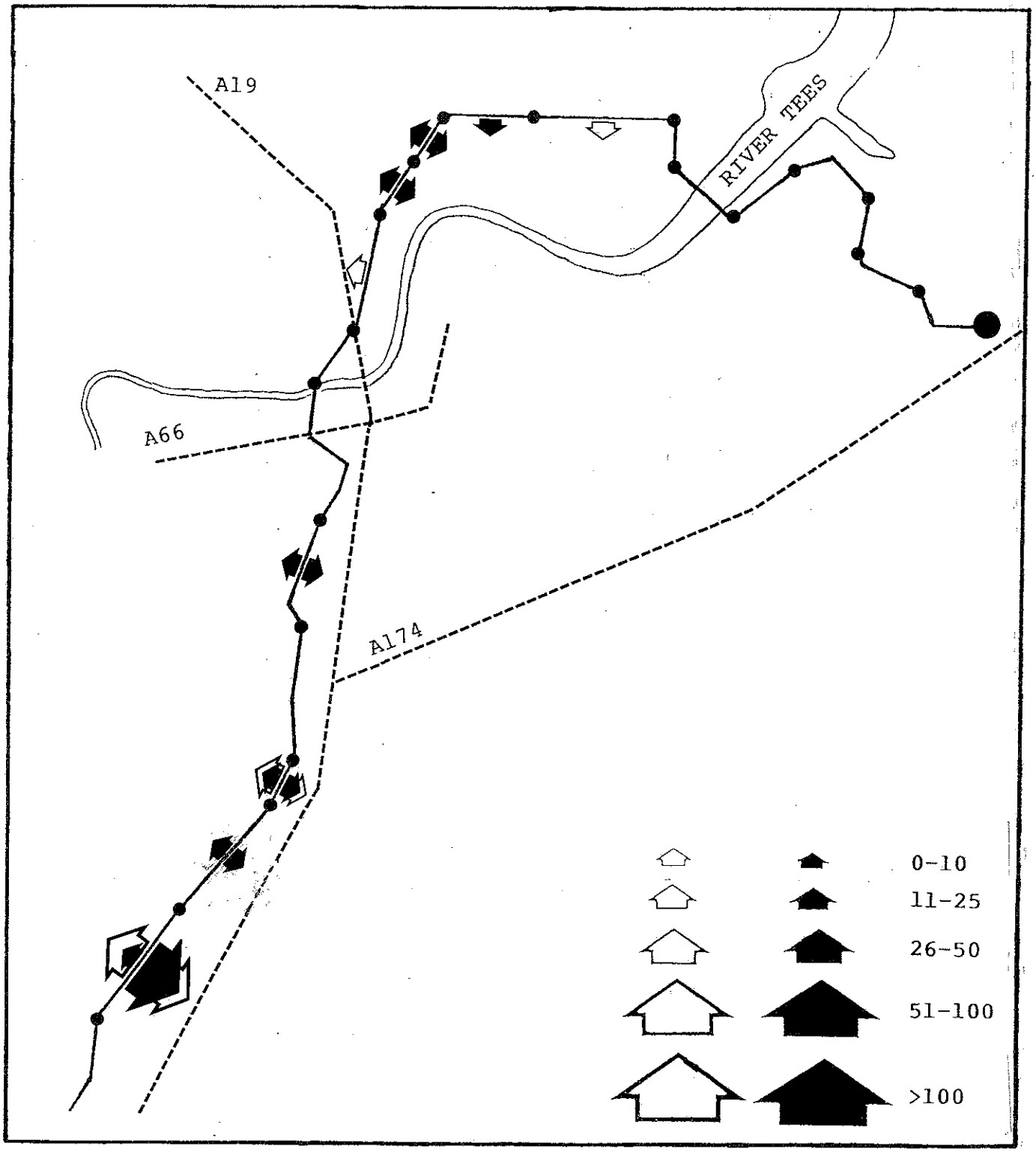

Figure 3.5 The number of corvids per hour crossing count sections along the northern route during the day (filled arrows) and during the morning/evening (open arrows).

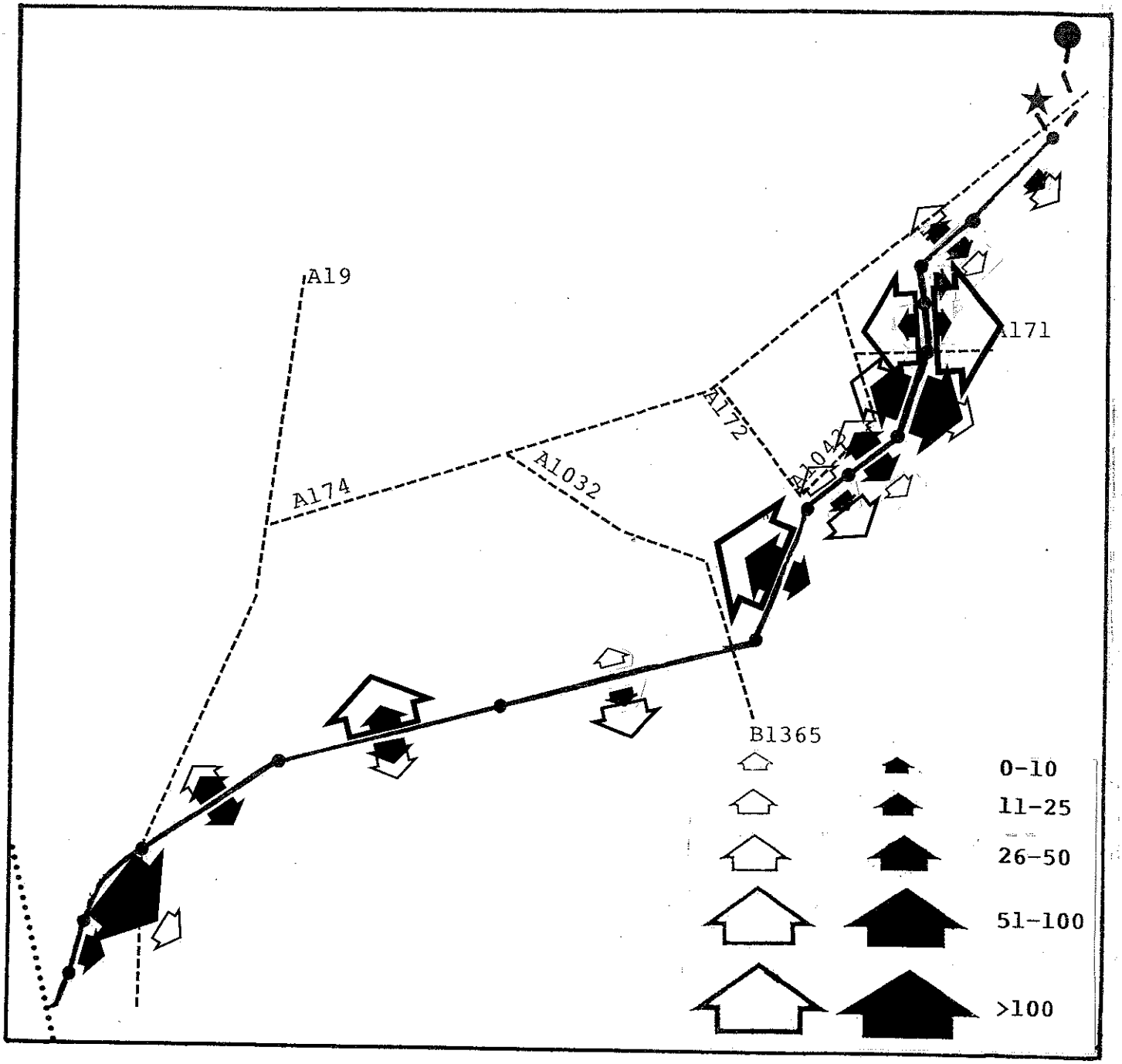

Figure 3.6 The number of corvids per hour crossing count sections along the southern route during the day (filled arrows) and during the morning/evening (open arrows).