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A survey of the east Kent grazing marshes for the freshwater snail *Segmentina nitida*

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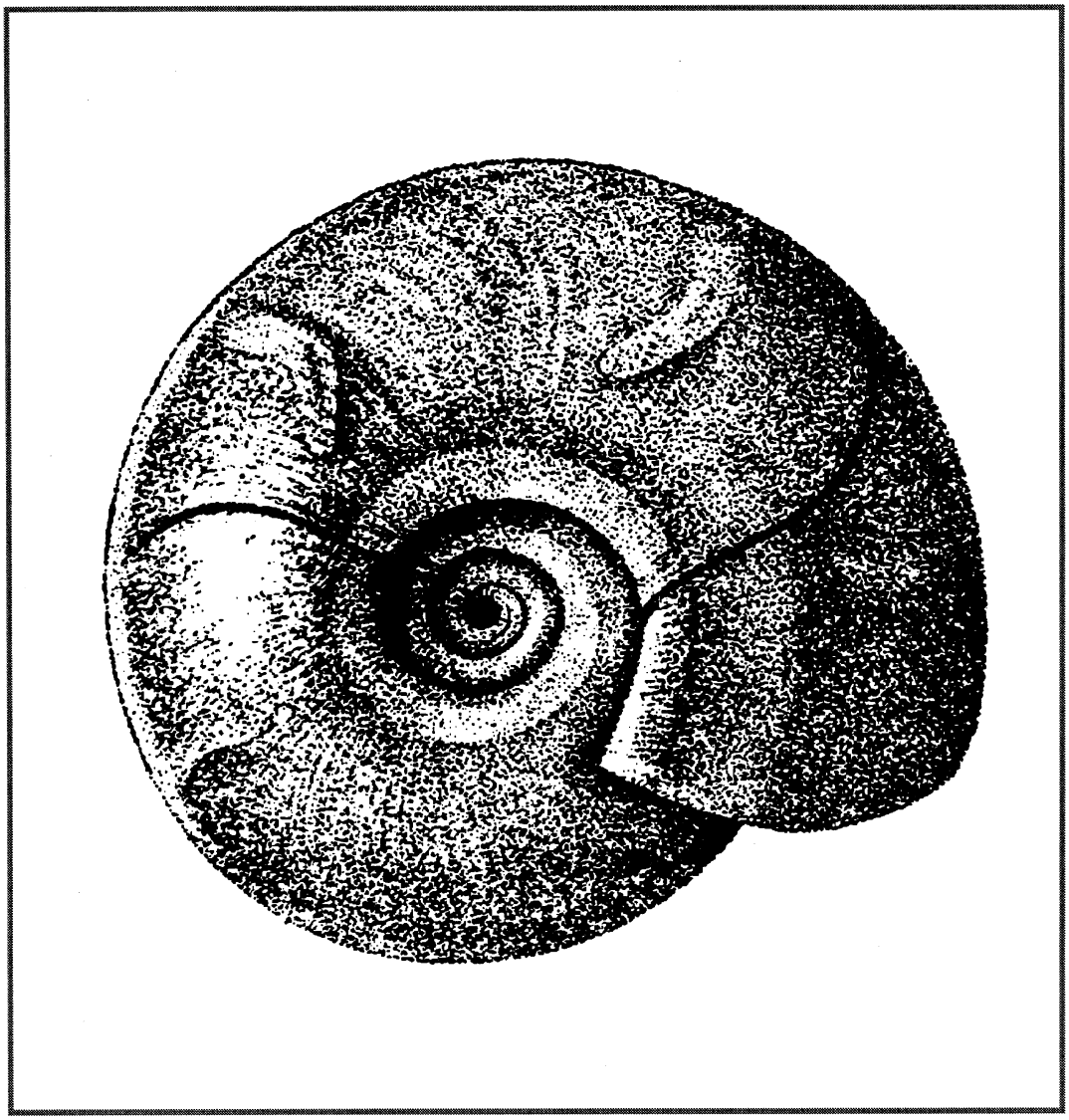

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A survey of the East Kent grazing marshes for the freshwater snail *Segmentina nitida*

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Summary

Segmentina nitida is a planorbid water snail which inhabits richly vegetated ditches in grazing marsh complexes with a preference for those in an advanced stage of plant succession.. It is classed as endangered (RDB1) in the British Red Data Book (Bratton 1991) and is on the short list of priority species on the UK Biodiversity Action Plan (HMSO 1996).

In 1996, a wide-ranging survey of the molluscs of grazing marsh ditches in East Anglia and south-east England confirmed that *Segmentina nitida* continued to survive in Kent. To take forward actions listed in the Species Action Plan and recommendations made following the 1996 survey, a further study has been carried out on the East Kent Levels with the following objectives:

1. Carry out a wide-ranging survey of potentially suitable ditches on Stodmarsh SSSI, Ash Level and Preston Valley to determine the extent of the *Segmentina nitida* population.

2. To revisit most of the ditches in which *S. nitida* was recorded in 1996 to determine any change.

The results of this survey have shown that *Segmentina nitida* is still living in ditches over a wide area of the East Kent Levels. It was found in 48 (46%) of the 104 ditches sampled and which may be summarised:

Site	No. of ditches sampled	No. with *Segmentina nitida*
Preston Marshes	22	8
Ash Level	30	23
Westmarsh	7	6
Stodmarsh (not in NNR)	9	8
Stodmarsh NNR	20	3
Hersden	5	0
Westbere	11	0
Total:	**104**	**48**

A comparison of ditches sampled in both 1996 and 1999 has shown that there has been remarkably little change in the abundance of *Segmentina nitida*. In most ditches there have either been small increases or decreases in abundance or no change. Two of the ditches in which the snail was absent in 1996 have become colonised.

The results of this survey have confirmed previous observations on the habitat requirements for *Segmentina nitida*. At all the Kent sites the ditches supporting the snail were generally similar, usually being surrounded by traditional unimproved or semi-improved grazing grassland and in a very advanced stage of vegetational succession.

The East Kent Levels are a nationally important site for *Segmentina nitida* and which should be given a high conservation priority. The key factors to the survival of the species are preservation of traditional grazing practice and appropriate, low intensity management. However, most of the best *Segmentina* ditches are on land not covered by SSSI or ESA

status. Countryside Stewardship (CS) schemes have been proposed for parts of Preston Marshes and Westbere, but none for Ash Level. It is strongly recommended that plans for CS should proceed but these should also include Ash Level. In the meantime a closer liaison should be developed between the interested parties to raise awareness on the importance of the sites and to provide advice on sympathetic management regimes.

A section of the report discusses conservation and management issues and includes recommendations for ditch management, methods for assessing conservation value, population monitoring and possible introductions.

1. Background & objectives

Segmentina nitida is a planorbid water snails which inhabits richly vegetated ditches in grazing marsh complexes with a preference for those in an advanced stage of plant succession.. It is local and declining throughout its central and southern European range. It has undergone a major decline in Britain during the 20th century as a result of inappropriate ditch management, loss of habitat resulting from change in agricultural practice from traditional grazing to arable, lowering of water tables and nutrient enrichment. It is classed as endangered (RDB1) in the British Red Data Book (Bratton 1991) and is on the short list of priority species on the UK Biodiversity Action Plan (HMSO 1996).

In 1996, a wide-ranging survey of the molluscs of grazing marsh ditches was carried out on behalf of English Nature in East Anglia and south-east England (Killeen & Willing 1997). Part of the survey was carried out in Kent on the grazing marshes to the east of Canterbury which includes Stodmarsh SSSI. The results confirmed that *Segmentina nitida* continued to survive in Kent. The snail was found in 15 of the 23 ditches sampled on Ash Level and at Stodmarsh.

The Species Action Plan for *S. nitida* includes an action for further survey. To take forward this action and recommendations made following the 1996 survey, a further study has been carried out on the East Kent Levels with the following objectives:

1. Carry out a wide-ranging survey of potentially suitable ditches on Stodmarsh SSSI, Ash Level and Preston Valley to determine the extent of the *Segmentina nitida* population.

2. To revisit most of the ditches in which *S. nitida* was recorded in 1996 to determine any change.

This work was carried out under two separate contracts. The survey of Stodmarsh SSSI was funded by English Nature, Peterborough as part of the Species Recovery Programme. The survey of Ash Level and Preston Valley was funded by the Environment Agency South East Region.

2. Site selection and descriptions

This survey has been carried out on three principal areas of the East Kent Levels from where *Segmentina nitida* was recorded in 1996: Stodmarsh SSSI, Ash Level and Preston Valley. Previous work in Kent and elsewhere has shown that the snail is absent from, or very rare in areas on arable farmland, and, therefore, this survey has focused on ditches in parts of the levels which still contain traditional grazing marshes. Location of suitable areas was based upon suggestions from local English Nature and Environment Agency officers in addition to information gathered from land use/field survey maps.

The selection of ditches within each site was based on previous experience of where *S. nitida* lives. Only ditches in a relatively advanced stage of vegetational succession were sampled.

A total of 104 ditches were examined from the following areas of the East Kent Levels:

Area	No. of ditches	Site numbers
Preston Valley	22	1 - 15, 98 - 104
Ash Level	30	16 - 45
Westmarsh (part of Ash Level)	7	46 - 52
Stodmarsh SSSI		
Stodmarsh (not in NNR)	9	53 - 61
Stodmarsh NNR	20	62 - 81
Hersden	5	82 - 86
Westbere	11	87 - 97

The locations of these sites are shown in Appendix 1 (Figures 1 - 6). Descriptions of each main site are given in the following sections and those for each individual ditch sampled are given in Appendix 2.

2.1 Preston Valley (Sites 1 - 15 & 98 - 104; Map Figure 1)

The area referred to as Preston Valley comprises grazing pasture and arable land which extends for a length of c. 2km in a more or less north/south direction. The southern end of the site is referred to as Deerson Valley on the OS maps. The site is bounded to the west by the River Little Stour, by Grove Road at the northern end, and by woodland slopes and settlements on the eastern side. There are broadly three types of land use in the valley. The most northern end is rough, cattle-grazed pasture, although probably improved at some stage. A section of the north-eastern side is under cereals, but the majority of the site is semi-improved sheep-grazed grassland. Many of the ditches, particularly at the northern end, were in an advanced stage of the vegetational succession.

2.2 Ash Level (Sites 16 - 45; Map Figure 2)

Ash Level lies on the south side of the River Stour and comprises an area of approximately 12km^2 which extends from East Stourmouth in the west to Richborough in the east. Much of the area of Ash Level is now intensively farmed with many of the fields used for orchards, cereals, potatoes and cash crops such as flax. The ditches around these fields tend to be deep with dense stands of *Phragmites* and an impoverished aquatic flora. Many such ditches were sampled in 1996 and found to have a low diversity molluscan fauna containing no notable species. Ditches south of Pluck's Gutter where *S. nitida* had been found in the 1990s now lie amongst arable fields.

There are, however, small areas of traditionally farmed areas of grazing marsh and semi-improved grassland, principally in the north-eastern part of Ash Level and at Westmarsh (see section 2.3). Many of the ditches in these areas are less frequently managed and have reached an advanced stage of vegetational succession. Most of these ditches are fairly shallow and choked with a rich flora dominated by *Hydrocharis*, *Lemna trisulca* and *Berula erecta* (water parsnip).

2.3 Westmarsh (Sites 46 - 52; Map Figure 3)

The area surveyed comprises a *c.*12ha block of land bounded to the north by Richborough Stream and to the south by Westmarsh vilage. Much of the southern part of the site is rough, species-rich pasture with little evidence of improvement. The northern end contains some semi-improved grassland. Most of the ditches are choked with a relatively low diversity of plants, and many are dominated by *Glyceria maxima.*

2.4 Stodmarsh (outwith NNR) (Sites 53 - 61; Map Figure 4)

The section surveyed lies to the north-west of Newsome's farm and is bounded by dense reedbed to the west and a farm track to the east. A network of mainly shallow ditches intersect lightly-grazed grassland. A range of ditch types were present, some supported dense stands of *Phragmites* with only a few open pools, whereas others were choked with *Hydrocharis* and *Lemna* spp. There were also open ditches with a poor aquatic flora and some that were completely dry (including one which supported *S. nitida* in 1996).

2.5 Stodmarsh NNR (Sites 62 - 81; Map Figure 4)

Stodmarsh NNR lies on the south side of the River Great Stour and comprises mainly grazed grassland intersected by ditches. Much of the western end is flooded in winter. Most of the ditches are in a relatively advanced stage of vegetational succession with a rich and diverse plant community.

2.6 Hersden (Sites 82 - 86; Map Figure 5)

The site comprises semi-improved grassland and flood meadow at the eastern end with rough pasture and patches of fen at the eastern end. The site is dominated by one large, deep drain (82) with a relatively poor aquatic flora. The associated smaller ditches (83-85) are more choked but none support good indicator plants such as *Hydrocharis.* Water levels across much of the western end of the site were very high and above the level of the ditches, suggesting that the area is periodically flooded. The ditch at the eastern end (86) appeared polluted and may be receiving effluent from the nearby industrial park.

2.7 Westbere (Sites 87 - 97; Map Figure 6)

The grazing marshes on the south side of the River Great Stour comprise semi-improved, cattle-grazed grassland intersected by drainage ditches, most of which drain into the river. Many of the ditches were in an advanced stage of vegetational succession often with margins of mainly dense *Glyceria maxima*, and in some, *Carex acutiformis,* most of which are poached by cattle. At the eastern end of the site there is an area of ungrazed marsh dominated by *Phragmites australis* and *Glyceria maxima.*

3. Methodology

The methodology for mollusc sampling was the same as that used in previous English Nature ditch surveys (e.g. Killeen & Willing 1997):

Samples of molluscs were collected in the field using a 17cm diameter stainless steel kitchen sieve (0.5mm mesh) attached to a wooden pole. To ensure collection of both the bivalves (which mainly live in the sediment) and the gastropods (which mainly live on the weeds), the samples were obtained from the interface between the sediment and the aquatic vegetation. Ten scoopfuls were collected from each sampling ditch, five from near to one end and a further five approximately half way along the ditch. Sampling for previous projects has indicated that this technique is a reliable method for collecting all mollusc species present and for assessing relative species abundances.

At all sites the samples were tipped into a plastic box. The sample was agitated in water to release snails from the weed, allowed to settle, and then snail-free vegetation (particularly *Lemna* spp.) was removed. Not all of the samples were retained for quantitative analysis.

Approximately half (56) of the samples were examined in the field by tipping the molluscs into a white tray, inspected for presence of *Segmentina nitida* and relative abundance recorded. The other 48 samples were placed in labelled jars or self-seal bags and then preserved in 80% alcohol until examined microscopically in the laboratory. All species of freshwater molluscs were identified and species abundances were estimated or, for low numbers, were counted. The data were quantified according to an ACFOR scale:

Table 1: Mollusc abundance scale

Abundant	A = >101	specimens
Common	C = 51 - 100	specimens
Frequent	F = 16 - 50	specimens
Occasional	O = 6 - 15	specimens
Rare	R = 1 - 5	specimens

At each sampling station the width of the ditch at water level was estimated, and the water depth measured using a graduated cane. Descriptions of bank structure, marginal, emergent and submerged flora, and the management regime of the adjacent land were recorded. This information is tabulated and included as Appendix 2.

The survey was carried out in two phases in early July and mid-August 1999.

4. Results

Segmentina nitida was found in 48 (46%) of the 104 ditches sampled (Table 2).

Table 2: Summary of number of ditches by site supporting *Segmentina nitida*

Site	No. of ditches sampled	No. with *Segmentina nitida*
Preston Valley	22	8
Ash Level	30	23
Westmarsh	7	6
Stodmarsh (outwith NNR)	9	8
Stodmarsh NNR	20	3
Hersden	5	0
Westbere	11	0
Total:	**104**	**48**

Ash Level, including Westmarsh, proved to the richest site for *S. nitida* with the species occurring in 29 of the 37 ditches sampled over a wide area. In Preston Valley it was found in 8 of the 22 ditches but was confined mainly to those in the northern and central part of the survey area. All but one of the 9 ditches sampled on Stodmarsh outwith NNR supported *S. nitida* but in contrast, the snail was found in only 3 of the 20 ditches sampled within the NNR. The snail could not be found at either Hersden or Westbere.

Table 3 shows the abundance of *S. nitida* in the 48 ditches in which it was found. There were none where the snail was abundant and only 7 where it occurred commonly.

Table 3: Relative abundance of *Segmentina nitida*

Abundance	No. of ditches
Rare	12
Occasional	20
Frequent	9
Common	7
Abundant	0

A comparison of ditches sampled in both 1996 and 1999 (Table 4) shows that there has been remarkably little change in the abundance of *Segmentina nitida*. In most ditches there have either been small increases or decreases in abundance or no change. In no case has there been a significant increase in abundance of *S. nitida*. However, two of the ditches in which the snail was absent in 1996 have become colonised.

Table 4: Comparison of *Segmentina nitida* abundance in ditches sampled in 1996 and 1999

			Segmentina nitida	
Site	**1996 site No.**	**1999 site No.**	**1996**	**1999**
Stodmarsh	S3	64	absent	R
	S4	67	R	O
	S5	69	absent	absent
Preston Valley	7	1	F	F
	8	2	F	O
	10	15	O	O
	11	13	F	C
Westmarsh	4	48	O	O
Ash Level	20	35	absent	O
	21	26	absent	absent
	22	16	R	O
	23	17	F	R
	24	20	R	absent

A comparison of the overall molluscan fauna (Table 5) from 1996 to 1999 shows a broadly similar picture. The results are compared using Conservation Scores and Indices developed for assessing change in grazing marsh ditch faunas (see Killeen 1998 for details). In most ditches there have only been small changes in Conservation Score (CS), No. of taxa, Average Score per Taxon (ASPT) and the Molluscan Conservation Index (MCI). There are exceptions, for example Preston ditch 2 and Ash ditch 20. In these ditches the number of species present has decreased and thus values for CS, ASPT and MCI are lower.

Of considerable surprise was the discovery of the land snail *Vertigo moulinsiana* at Westbere Ten specimens were retrieved from the sample collected in Ditch 97 and which had fallen off the taller marginal vegetation. This is the first living record for Kent having previously been known only as Postglacial fossils and represents a considerable extension of its known range in Britain (see Kerney 1999). A survey to determine the extent of the population is currently being undertaken on behalf of English Nature (Killeen in press).

Table 5: Comparison of the overall molluscan fauna of ditches sampled in 1996 and 1999

SPECIES	Conservation Value	1999 DITCH NUMBER: Preston 1		Preston 2		Preston 13		Ash 16		Ash 17		Ash 20		Ash 26		Ash 35		Stodmarsh 64		Stodmarsh 67		Stodmarsh 69	
		96	99	96	99	96	99	96	99	96	99	96	99	96	99	96	99	96	99	96	99	96	99
Valvata cristata	3	F	F	F	R	O	O	C	F	C	F	F	O	C	F	-	F	F	F	F	O	F	-
Potamopyrgus antipodarum	2			C	A	C	A	-	-	-	-	-	-	-	-	-	-	R	O	-	-	-	-
Bithynia tentaculata	3	O	F	F	C	O	F	F	F	F	F	F	O	-	-	O	O	O	O	O	F	F	F
Bithynia leachii	5	C	A	C	-	R	A	A	C	A	A	A	F	R	R	R	F	C	A	C	A	C	A
Lymnaea stagnalis	3	-	-	-	-	-	-	-	O	O	O	R	R	-	-	F	-	R	-	-	-	-	R
Lymnaea palustris	3	F	R	C	C	C	R	F	F	F	O	R	O	F	F	C	O	O	O	O	F	-	O
Lymnaea peregra	1	F	A	F	R	F	C	F	C	F	C	C	O	C	F	C	C	F	F	C	A	F	C
Acroloxus lacustris	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	R	R	R	R	-	O
Planorbis planorbis	3	A	A	A	F	A	A	O	F	F	O	A	F	-	F	A	C	F	O	C	A	F	C
Anisus vortex	3	C	F	F	-	F	F	R	O	O	O	C	O	-	-	O	-	F	O	C	O	F	O
Bathyomphalus contortus	3	C	-	C	O	F	-	A	A	A	C	A	F	A	C	R	F	A	A	A	A	A	A
Armiger crista	3	-	-	-	-	-	-	-	-	-	-	-	F	-	-	R	R	-	-	-	-	-	-
Hippeutis complanatus	4	C	F	C	-	C	C	O	A	F	O	O	F	R	C	R	O	R	F	F	F	O	F
Segmentina nitida	9	F	F	F	O	F	C	R	O	F	R	R	-	-	-	-	O	-	R	R	O	-	-
Planorbarius corneus	4	O	F	R	-	-	O	R	F	R	F	O	-	O	R	F	O	-	-	-	O	O	-
Physa fontnalis	2	-	-	-	-	-	F	C	C	A	C	F	O	R	F	-	O	O	F	F	A	F	A
Sphaerium corneum	3	R	F	R	-	O	F	F	F	F	O	O	O	R	O	-	O	O	O	F	O	F	F
Musculium lacustre	3	-	-	-	-	-	-	F	O	-	O	O	-	-	-	-	-	O	-	F	R	O	F
Pisidium obtusale	6	F	F	F	F	F	F	-	-	R	R	R	R	-	-	-	-	R	O	O	R	-	-
Pisidium milium	4	-	-	-	-	-	-	-	-	O	R	R	-	-	-	-	-	R	-	O	O	R	O
Pisidium pseudosphaerium	8	C	F	R	-	R	O	C	F	O	F	-	-	-	-	R	R	O	O	C	O	O	F
*Conservation Score		58	55	60	33	56	59	57	60	67	70	62	45	28	31	43	54	63	62	67	71	53	52
*No. of Taxa		14	13	15	9	14	15	15	16	17	18	17	14	9	10	12	14	18	16	17	18	14	15
*Average Score per taxon		4.14	4.23	4.00	3.67	4.00	3.93	3.80	3.75	3.94	3.89	3.65	3.21	3.11	3.10	3.58	3.86	3.50	3.87	3.94	3.94	3.79	3.47
*Highest value taxon		9	9	9	9	9	9	9	9	9	9	9	6	5	5	8	9	8	9	9	9	8	8
*MCI		37.3	38.1	36.0	33.0	36.0	35.4	34.2	35.0	35.5	35.0	32.8	19.3	15.6	15.5	28.7	34.7	28.0	34.9	35.5	35.5	30.3	27.7

* See Killeen (1999) for full details - CS - obtained by summing the conservation values of all species present, ASPT - obtained by dividing this total by the number of taxa used to calculate the Conservation Score (CS), MCI - calculated by multiplying the ASPT by the Conservation Value of the highest-scoring species present.

5. Discussion

The distribution of *S. nitida* in Preston Valley and on Ash Level is almost certainly determined by adjacent land use and ditch management. At both sites the snail occurred most often and abundantly in the areas of predominantly rough, cattle or sheep-grazed pasture. The shallow water levels and advanced stage of vegetational succession suggests that there has been no management for a considerable number of years. The ditches in much of the central and southern part of Preston Valley, where *S. nitida* was absent, lie within semi-improved grassland and are probably cleared more frequently with evidence of spoil tips along some banks. However, many support dense growths of plants, particularly *Hydrocharis*, suggesting that plant recolonisation is relatively rapid.

The reasons for the rarity of *S. nitida* on Stodmarsh NNR compared with the area outwith the NNR are unclear. Most of the ditches are in an advanced stage of vegetational succession with a rich and diverse plant community. Few of the ditches have been managed within the last 10 years and those that have are only cleared in sections. To encourage birds, much of the western section is deliberately flooded in winter with water that is presumably brackish. Therefore it is possible that *S. nitida* is unable to survive in these more unstable conditions of fluctuating water levels and salinity. A detailed examination of ditch hydrochemistry may reveal (significant) differences, but at present, the rarity of *S. nitida* remains an enigma.

The ditches at Hersden are considered unsuitable on the basis of their poor plant community. However, as with Stodmarsh, fluctuating water levels and hydrochemistry may be controlling factors.

Although *S. nitida* was not found at Westbere, the associated molluscan fauna is generally similar to that in the ditches at other sites in which it was found and includes *Pisidium pseudosphaerium* (2 ditches). The reasons for the absence of *S. nitida* may in part be a function of the ditch management cycle. Some of the ditches had been recently cleared (probably in late 1998) whereas others had not been cleared for some time, were in an advanced stage of vegetational succession, and appeared to be very suitable. It is understood from the landowner that ditch clearance is infrequent (several years) but owing to the difficulty in getting machinery on site, the ditches are completely cleared. Thus, it appears that the management cycle may be too short to allow the ditches to become suitable for the snail. Furthermore, as few of the ditches are inter-linked (most drain into the River Stour) and without *S. nitida* present even in one ditch, there is little scope for colonisation.

Work carried out by Hingley (1979) on Pevensey Levels demonstrated that recolonisation by molluscs of ditches following clearance was rapid but the rate varied according to species. In particular, *Segmentina nitida* was a less rapid and less frequent colonist. The results of the present survey reinforce this view. The comparison of ditches sampled in both 1996 and 1999 (Tables 4 and 5) shows little change in the abundance of *S. nitida,* although two of the ditches in which the snail was absent in 1996 have become colonised. As none of the thirteen ditches appear to have been managed in the intervening period, it might be expected that the ditches would become more choked and thus more suitable for *S. nitida.* However, these results suggest that *S. nitida* populations increase in abundance over a much longer period than may have previously been believed. The management implications are discussed in the following section.

6. Conservation and management

The east Kent levels are a nationally important site for *Segmentina nitida* and which should be given a high conservation priority. Based upon the results of this study and other previous surveys, the habitat requirements for *S. nitida* appear to be conclusive. The key factors to the survival of the species appear to be preservation of traditional grazing practice and appropriate, low intensity management.

Research on the autecology and biology of *Segmentina niida* is being undertaken as part of a PhD project by Alisa Watson at the University of Wales Cardiff. Part of this work is to attempt to correlate in greater detail the presence/absence of *S. nitida* with land use, ditch management and water chemistry. This research may reveal critical factors which are at present unrecognised. However, until such data are available, a policy for conservation and management has to be based upon existing knowledge.

The subject of ditch management has been covered in a recent article in *British Wildlife* on another threatened snail of grazing marsh ditches, *Anisus vorticulus* (Willing & Killeen 1999). Although this species does not occur in Kent, and does not appear to require ditches in such an advanced stage of succession as *Segmentina nitida*, the suggestions for ditch clearance are similarly applicable:

- never clearing a whole ditch at any one time
- learing ditches from one side only and then only to the centre, leaving the far half relatively undisturbed
- clearing ditches in stages with occasional stretches left untouched until the following season
- leaving occasional connected ditch 'spurs' and side sections untouched for much longer periods of time than the main ditches

Ditches treated in this way continue to allow free flow of water, but maintain a diverse array of emergent and aquatic plants from a number of ditch seral stages at the same point in the ditch. Such policies also maintain ditches that retain late successional molluscan populations. One of the problems of this ditch management policy is that it does require careful training and initial supervision of ditch digger workers that it is more timely and skilled than continuous, complete clearance approaches. However, management of ditches specifically for *Segmentina* poses a problem in that the snail only becomes abundant in ditches which have attained such a late successional stage, with only a few pools of standing water, that they no longer fulfil their functions as land drains. In the longer term it may be necessary to maintain a few ditches in this state. Evidence from other sites suggests that a ditch becomes unsuitable for *Segmentina* when it is completely dry or is dry throughout much of the year. These ephemeral ditches are often characterised by significant numbers of drought tolerant snails such as *Aplexa hypnorum* and *Anisus leucostoma.*

Whilst such management prescriptions are easily implemented on Nature Reserves, it may be much more difficult on privately owned land where there is no direct involvement with the conservation agencies. This the case in Kent where most of the best *Segmentina* ditches are

on land not covered by SSSI or ESA status. Countryside Stewardship (CS) schemes have been proposed for parts of Preston Marshes and Westbere, but none for Ash Level. It is strongly recommended that plans for CS should proceed but these should also include Ash Level. In the meantime a closer liaison should be developed between the interested parties to raise awareness on the importance of the sites and to provide advice on sympathetic management regimes.

There is unlikely to be an easy and fool-proof solution for conservation and management of ditch mollusc faunas. Even if an intelligent strategy can be devised, ditch management will ultimately depend upon the interest and cooperation of landowners. A relatively straightforward and unambiguous method is needed to assess grazing marsh ditches for their molluscan value, to measure change and to enable the setting up of management strategies. Statistical analysis of molluscan data from Pevensey Levels has been examined to determine if it possible to develop a scheme whereby molluscs may be used as biological indicators to determine when ditches should be cleared (Killeen 1998). As bio-indicators, the species present may be useful in determining a ranking order for setting the proportion of ditches in each cleaning cycle. The indices may have their greatest application in monitoring natural change in ditches unaffected by outside factors.

It would be desirable to initiate a monitoring programme at selected *Segmentina* ditches. It is recommended that 3 or 4 ditches in each of the main areas of the east Kent levels are selected and sampled quantitatively. The results of this survey indicate that a time interval of 2-3 years would be adequate. It might be possible for this work to be undertaken by Environment Agency biologists. However, at the end of the day it may be more important to develop a relationship with the landowners, thus preventing any wholesale ditch clearance, rather than focus on population monitoring.

The reasons for the rarity of *S. nitida* within Stodmarsh NNR are discussed in Section 5. There is a suggestion that in some parts of the site, the snail may be unable to tolerate the unstable conditions brought about by winter flooding. If this could be substantiated, then the flooding policy may need to be reviewed. However, given the importance of Stodmarsh as a winter bird site, there may be little scope for alterations to the present management regime. There are very few ditches linking the NNR the ditches outside and, therefore, there is little scope for *S. nitida* to colonise from outside. As the NNR ditches can be managed positively for the snail, English Nature may wish to consider an introduction programme. Providing the water chemistry of the supplier and receptor ditches are similar, there are no reasons why such an experiment should not succeed. Given that most of the NNR ditches inter-link, this may allow the snail to colonise the site at a faster rate than is prevailing at present.

7. References

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Appendices

Appendix 1 Sample Location Maps

Appendix 2. Site Descriptions

Appendix 3. Quantitative Molluscan Analysis

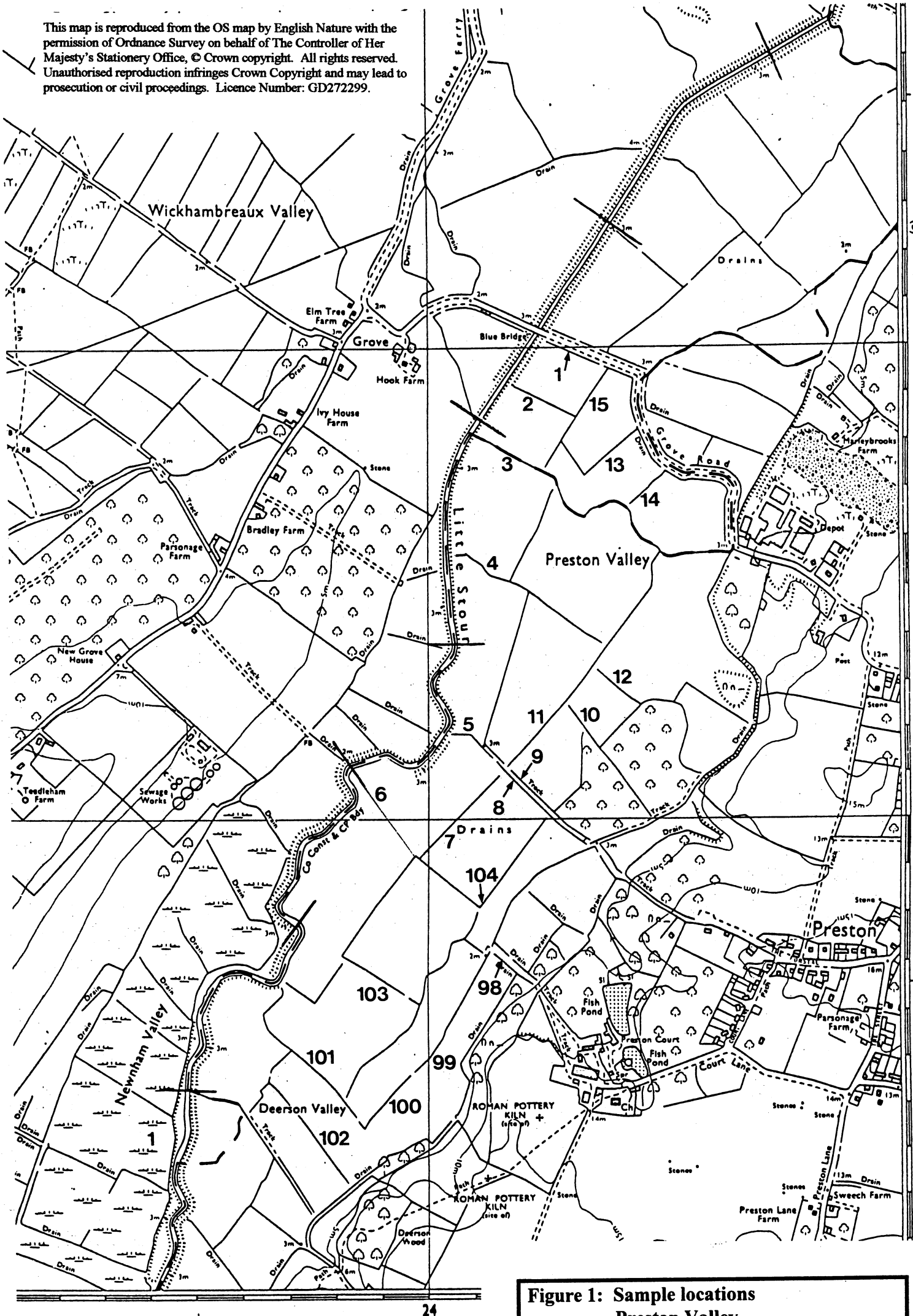

Figure 1: Sample locations
Preston Valley

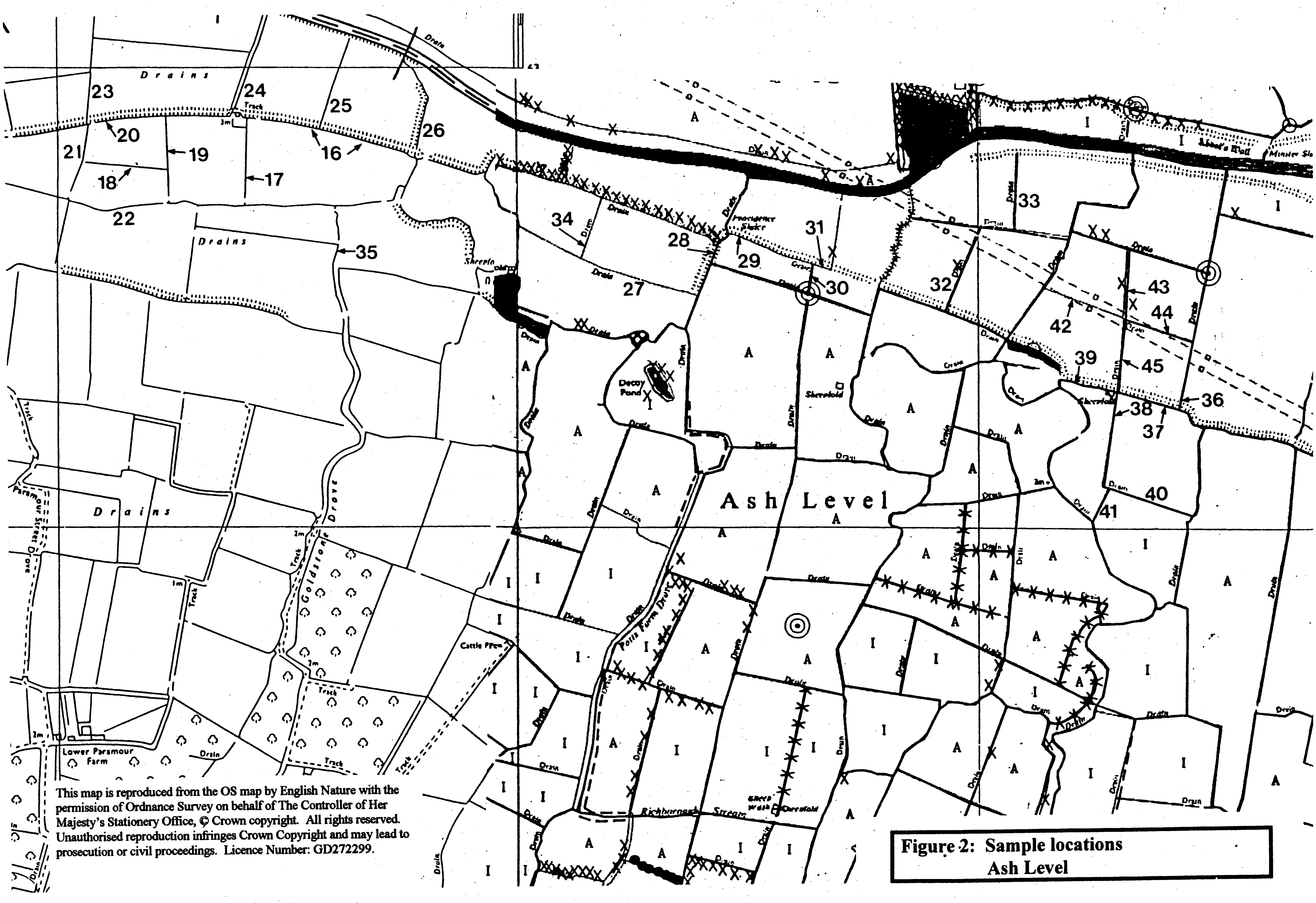

Figure 2: Sample locations Ash Level

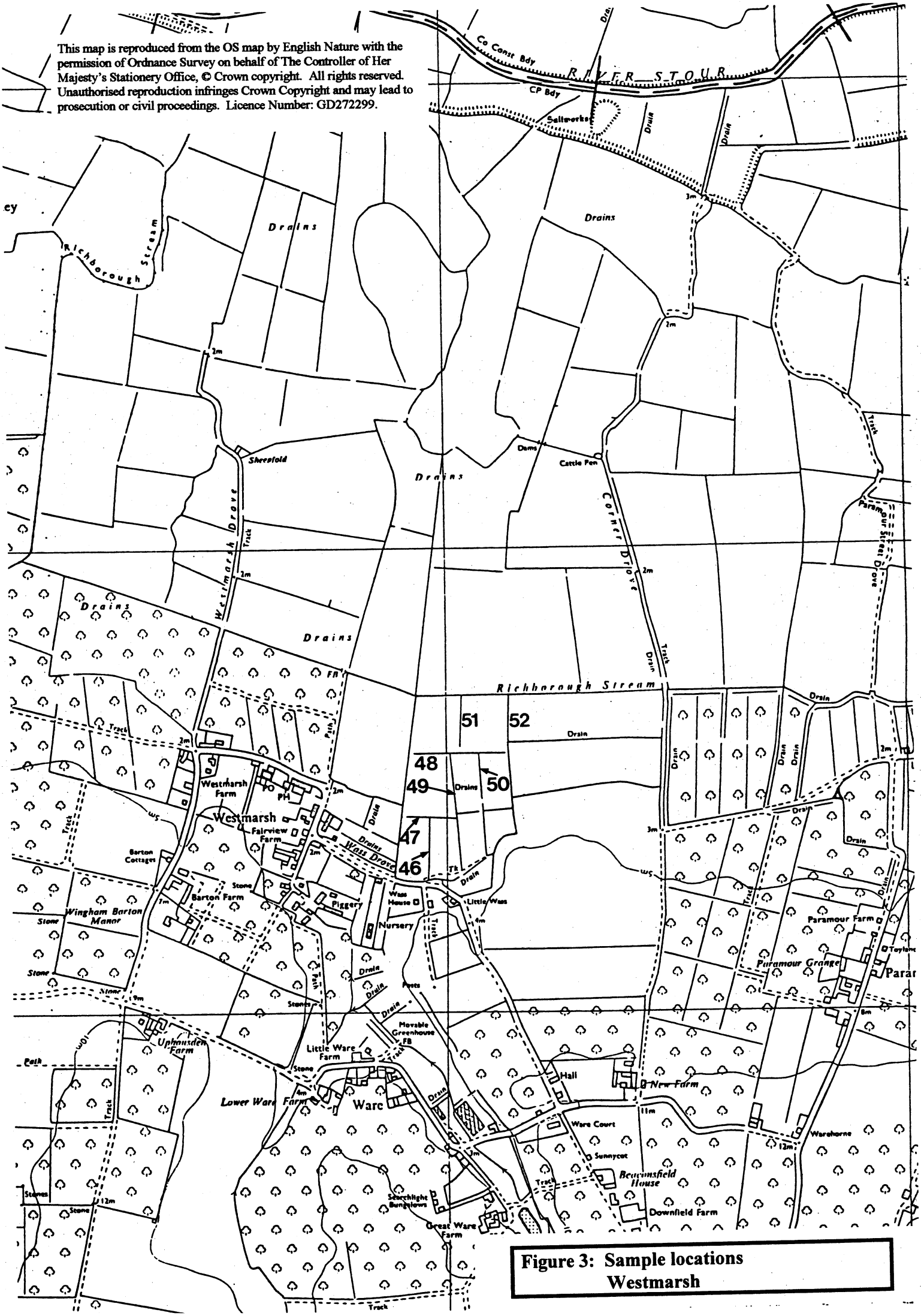

Figure 3: Sample locations Westmarsh

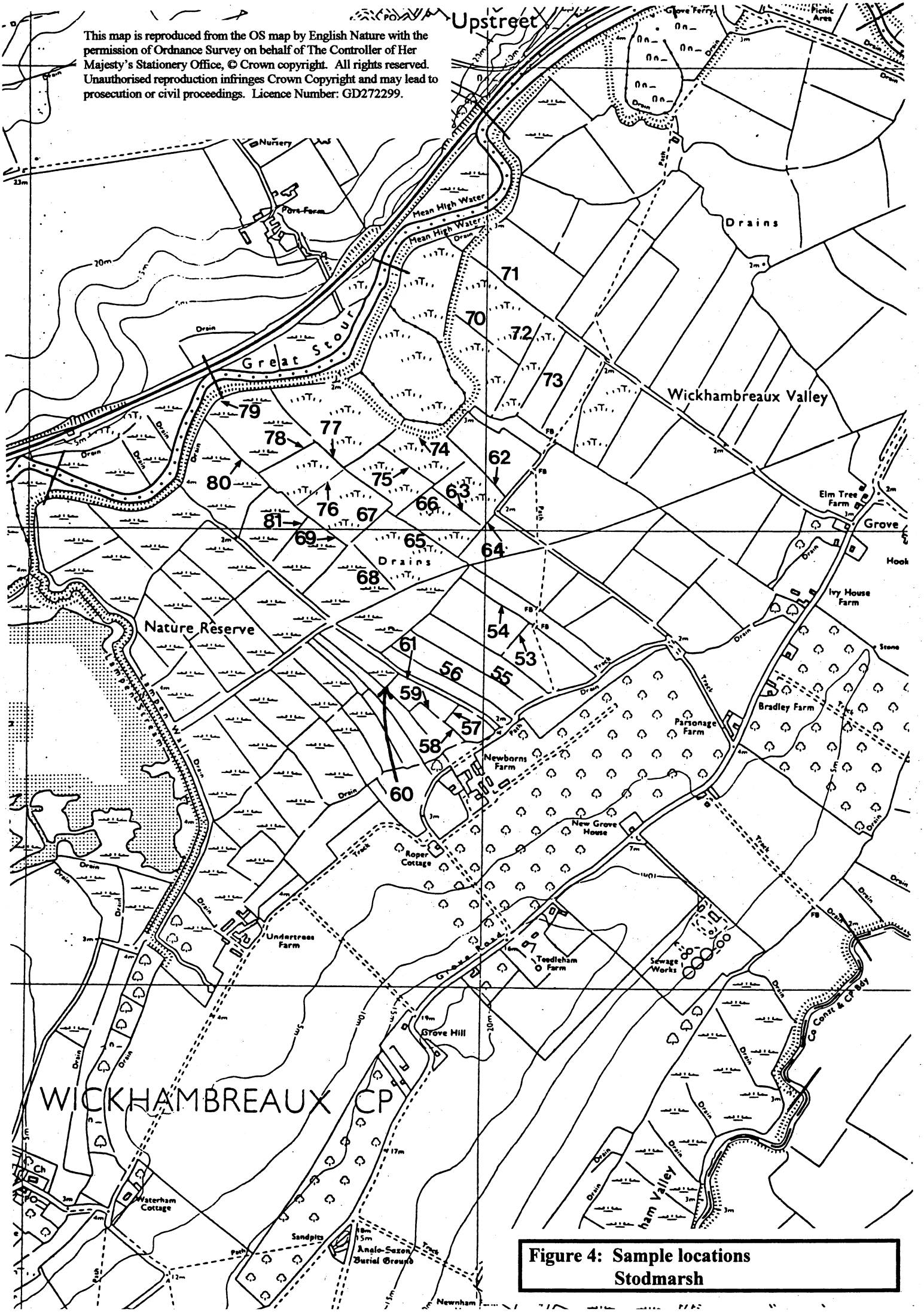

Figure 4: Sample locations Stodmarsh

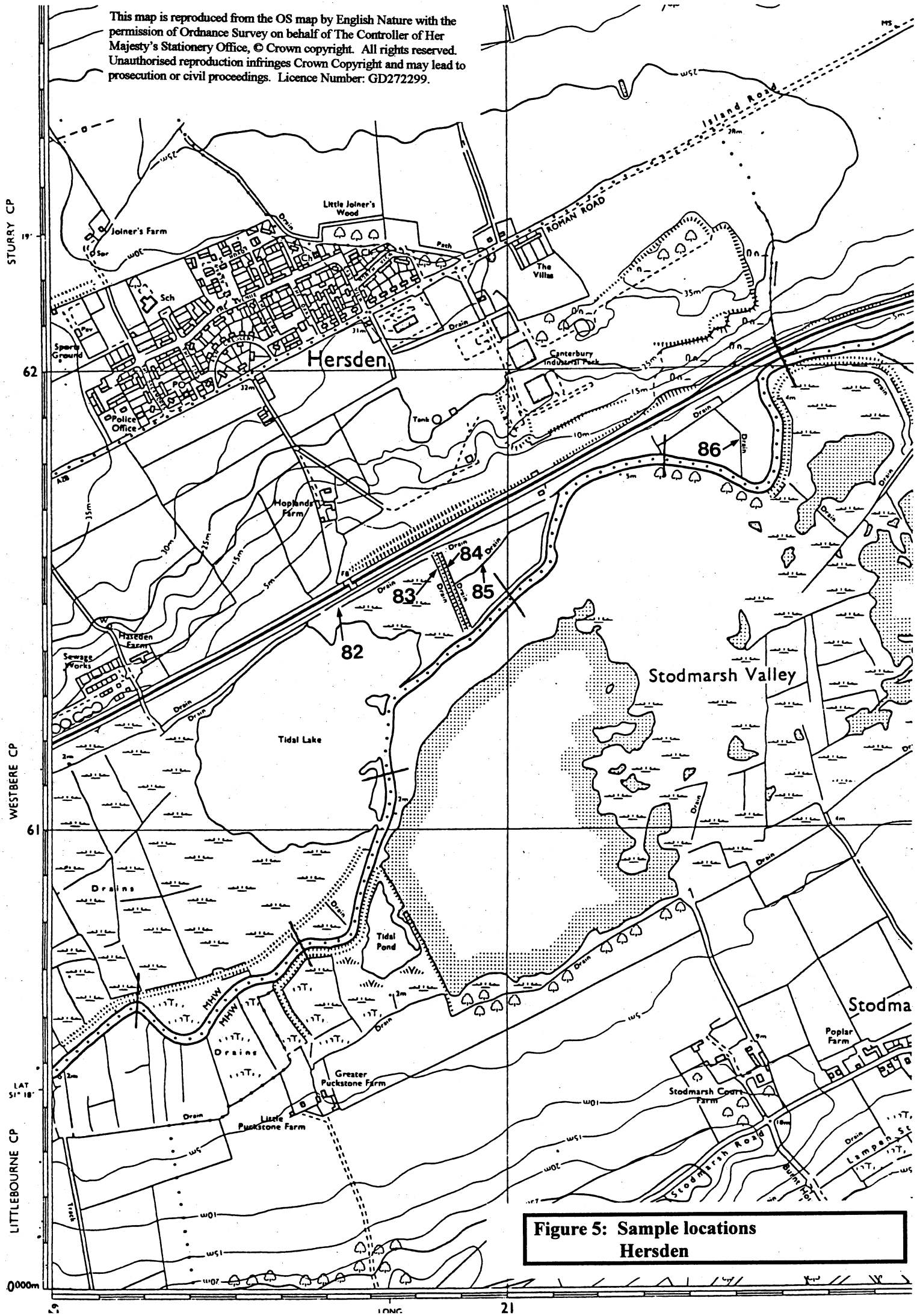

Figure 5: Sample locations Hersden

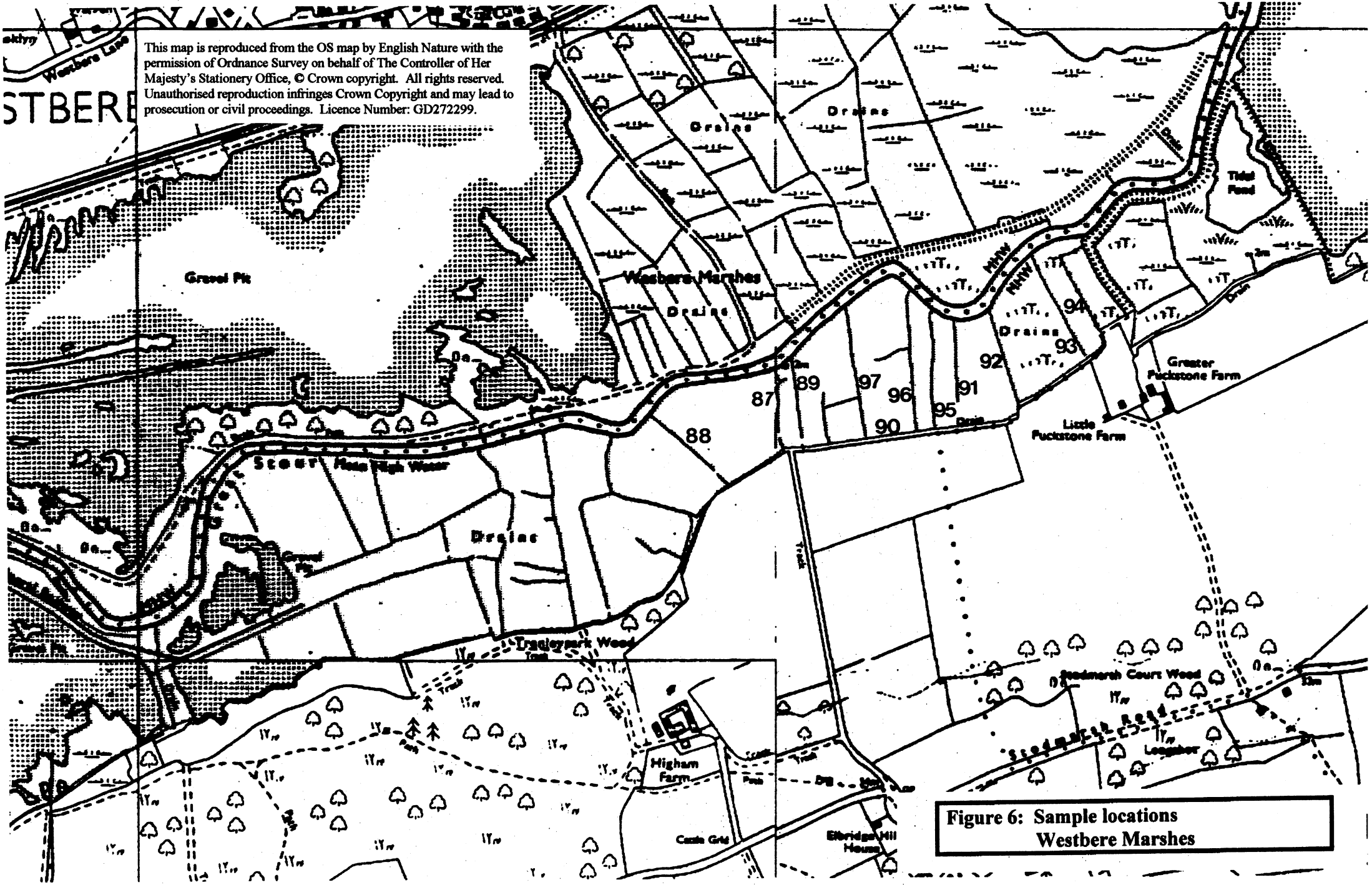

Figure 6: Sample locations Westbere Marshes

APPENDIX 2: SITE DESCRIPTIONS

Ditch No:1	**Date:** 7.vii.1999	**Grid Ref (1km):** TR2461	**Site:** Preston Valley
Width (m): 1.5	**Depth (m):** 0.7	**Ditch Profile:**	
Adjacent land use: Road on north, cattle grazed grassland on south			
Margins: Solid *Phragmites* on north, *Juncus* and *Carex* on south (trampled and grazed)			
Ditch plants: Solid *Hydrocharis*			
Sampling method:	**Quantitative:** YES	**Qualitative:**	
***Segmentina nitida*:** PRESENT - FREQUENT			
Comments: *Segmentina* frequent in 1996			

Ditch No: 2	**Date:** 7.vii.1999	**Grid Ref (1km):** TR2461	**Site:** Preston Valley
Width (m): 1.5	**Depth (m):** < 0.25	**Ditch Profile:**	
Adjacent land use: Grassland/cattle grazed pasture			
Margins: *Juncus, Carex* and grasses - shallow and trampled on both sides			
Ditch plants: *Carex, Juncus*, grasses, *Berula*			
Sampling method:	**Quantitative:** YES	**Qualitative:**	
***Segmentina nitida*:** PRESENT - OCCASIONAL			
Comments: molluscs dominated by *Potamopyrgus antipodarum. Segmentina* frequent in 1996			

Ditch No: 3	**Date:** 7.vii.1999	**Grid Ref (1km):** TR2461	**Site:** Preston Valley
Width (m): 2.5 - 3	**Depth (m):** < 1.3	**Ditch Profile:**	
Adjacent land use: Grassland pasture on N, improved grassland on S			
Margins: Grasses and herbs on S, *Carex & Juncus* on N			
Ditch plants: Thick *Lemna* spp. And blanket algae; occasional *Berula* and *Hydrocharis*			
Sampling method:	**Quantitative:** YES	**Qualitative:**	
***Segmentina nitida*:** Absent			
Comments:			

Ditch No: 4	**Date:** 7.vii.1999	**Grid Ref (1km):** TR2461	**Site:** Preston Valley
Width (m): 1.5 - 2	**Depth (m):** > 1	**Ditch Profile:**	
Adjacent land use: Improved grassland			
Margins: *Phragmites* and grasses			
Ditch plants: *Lemna polyrhiza*, blanket algae			
Sampling method:	**Quantitative:**	**Qualitative:** YES	
***Segmentina nitida*:** Absent			
Comments: low mollusc species diversity; dominated by *Planorbis planorbis*			

Ditch No: 5	**Date:** 7.vii.1999	**Grid Ref (1km):** TR2461	**Site:** Preston Valley
Width (m): 2.5 - 3	**Depth (m):** 0.8	**Ditch Profile:**	
Adjacent land use: Improved grassland			
Margins: *Juncus, Phragmites, Glyceria maxima, Typha*			
Ditch plants: (at margins and end) *Hydrocharis, Lemna trisulca, Alisma, Potamogeton* sp. (narrow leaved), *Polygonum*			
Sampling method:	**Quantitative:** YES	**Qualitative:**	
***Segmentina nitida*:** Absent			
Comments:			

Ditch No: 6	**Date**: 7.vii.1999	**Grid Ref** : TR239610	**Site**: Preston Valley
Width (m): 3 - 3.5	**Depth (m)**: >1	**Ditch Profile**:	
Adjacent land use: Rough pasture on S, semi-improved grassland on N			
Margins: Mainly *Phragmites, Juncus* and *Glyceria maxima*			
Ditch plants: *Lemna minor* and *L. trisulca*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: not present			
Comments:			

Ditch No: 7	**Date**: 7.vii.1999	**Grid Ref (1km)**: TR241610	**Site**: Preston Valley
Width (m): 3.5 - 4	**Depth (m)**: > 1	**Ditch Profile**:	
Adjacent land use: Semi-improved grassland			
Margins: Mainly *Phragmites* and *Juncus*, some *Berula* in shallow areas			
Ditch plants: Blanket algae, *Lemna trisulca* and *L. major*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: not present			
Comments:			

Ditch No: 8	**Date**: 7.vii.1999	**Grid Ref (1km)**: TR242611	**Site**: Preston Valley
Width (m): 1.5 - 2	**Depth (m)**: 0.7	**Ditch Profile**:	
Adjacent land use: Semi-improved grassland			
Margins: Dense *Phragmites* on N, *Phragmites, Carex* and *Juncus* on S			
Ditch plants: Dense *Hydrocharis* and *Lemna trisulca*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, COMMON			
Comments: Ditch on south side of track			

Ditch No: 9	**Date**: 7.vii.1999	**Grid Ref (1km)**: TR242611	**Site**: Preston Valley
Width (m): 1 - 1.5	**Depth (m)**: < 0.7	**Ditch Profile**:	
Adjacent land use: Semi-improved grassland			
Margins: *Phragmites*			
Ditch plants: Dense *Hydrocharis* and *Lemna trisulca*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, COMMON			
Comments: Ditch on north side of track			

Ditch No: 10	**Date**: 7.vii.1999	**Grid Ref (1km)**: TR243612	**Site**: Preston Valley
Width (m): 1.5 - 2	**Depth (m)**: >1	**Ditch Profile**:	
Adjacent land use: Semi-improved grassland on S, barley on N			
Margins: *Phragmites*, dense on N			
Ditch plants: Layer of *Lemna* spp.			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Not present			
Comments:			

Ditch No: 11	**Date**: 7.vii.1999	**Grid Ref (1km)**: TR243613	**Site**: Preston Valley
Width (m): 2	**Depth (m)**: >1	**Ditch Profile**:	
Adjacent land use: Semi-improved grassland/barley			
Margins: Dense *Phragmites, Typha* etc			
Ditch plants: *Lemna* spp.			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Not present			
Comments:			

Ditch No: 12	**Date**: 7.vii.1999	**Grid Ref (1km)**: TR244613	**Site**: Preston Valley
Width (m): 1 - 1.5	**Depth (m)**: >1	**Ditch Profile**:	
Adjacent land use: Barley			
Margins: *Phragmites*			
Ditch plants: *Lemna* spp.			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Not present			
Comments:			

Ditch No: 13	**Date**: 7.vii.1999	**Grid Ref (1km)**: TR244618	**Site**: Preston Valley
Width (m): 2	**Depth (m)**: <0.2, shallow pools only	**Ditch Profile**:	
Adjacent land use: Grazed grassland/pasture			
Margins: Heavily poached *Juncus* and *Carex*			
Ditch plants: Dense *Berula, Juncus, Equisetum, Carex*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, COMMON			
Comments: molluscs dominated by millions of *Potamopyrgus antipodarum. Segmentina* occasional in 1996.			

Ditch No: 14	**Date**: 7.vii.1999	**Grid Ref (1km)**: TR245617	**Site**: Preston Valley
Width (m): 2.5 - 3	**Depth (m)**: 0.8	**Ditch Profile**:	
Adjacent land use: Grazed grassland/pasture on W, semi-improved grassland on E			
Margins: *Phragmites* on E, *Carex, Juncus* on W			
Ditch plants: Moderate cover of *Hydrocharis, Berula, Lemna spp. & Alisma*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, COMMON			
Comments:			

Ditch No: 15	**Date**: 7.vii.1999	**Grid Ref (1km)**: TR24356195	**Site**: Preston Valley
Width (m):	**Depth (m)**:	**Ditch Profile**:	
Adjacent land use: Grazed grassland/pasture on W, semi-improved grassland on E			
Margins: *Carex* and *Juncus*			
Ditch plants: *Lemna* spp., blanket algae, occasional *Hydrocharis* and *Berula*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments: *Segmentina* occasional in 1996.			

Ditch No: 16	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR296628	**Site**: Ash Level, N of Lower Goldstone
Width (m): 2	**Depth (m)**: 0.7	**Ditch Profile**:	
Adjacent land use: Sheep pasture on S, bank on N			
Margins: Hawthorn, *Phragmites, Juncus* on N, *Juncus*, sparse *Phragmites* and *Carex* on S			
Ditch plants: Dense *Lemna major* and *minor*, *Hydrocharis* and *Berula*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments: *Segmentina* rare in 1996			

Ditch No: 17	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR294628	**Site**: Ash Level, N of Lower Goldstone
Width (m): 2	**Depth (m)**: 0.6	**Ditch Profile**:	
Adjacent land use: Sheep grazed grassland			
Margins: *Juncus, Phragmites, Carex*			
Ditch plants: *Lemna* spp. (inc. *trisulca*), *Hydrocharis*, *Berula*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, RARE			
Comments: *Segmentina* frequent in 1996			

Ditch No: 18	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR292628	**Site**: Ash Level, N of Lower Goldstone
Width (m): 1.5 - 2	**Depth (m)**: 0.5	**Ditch Profile**:	
Adjacent land use: Sheep grazed grassland			
Margins: *Juncus, Phragmites, Carex, Glyceria maxima*, occasional hawthorn			
Ditch plants: Thick *Lemna major & trisulca*, occ. *Hydrocharis, Berula* & blanket algae, *Alisma* at W end			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, RARE (1 SPECIMEN)			
Comments:			

Ditch No: 19	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR	**Site**: Ash Level, N of Lower Goldstone
Width (m): 2	**Depth (m)**: > 1	**Ditch Profile**:	
Adjacent land use: Sheep grazed grassland			
Margins: *Juncus, Phragmites, Carex, Glyceria maxima*			
Ditch plants: Thick *Lemna* spp. including *trisulca*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Not present			
Comments:			

Ditch No: 20	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR29156288	**Site**: Ash Level, N of Lower Goldstone
Width (m): 2	**Depth (m)**: > 0.7	**Ditch Profile**:	
Adjacent land use: sheep grazed grassland, bank			
Margins: *Juncus, Phragmites, Carex, Glyceria maxima, Typha, Sparganium*, hawthorn			
Ditch plants: Thick *Lemna* x 3, occasional *Hydrocharis*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 21	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR29066285	**Site**: Ash Level, N of Lower Goldstone
Width (m): 3	**Depth (m)**: > 1.2	**Ditch Profile**:	
Adjacent land use: sheep grazed grassland on E, rough ?set aside on W			
Margins: Dense *Phragmites* on W, *Juncus, Phragmites, Carex* on E			
Ditch plants: Thick cover of *Lemna* spp. and blanket algae			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments:			

Ditch No: 22	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR29126268	**Site**: Ash Level, N of Lower Goldstone
Width (m): 3 - 4	**Depth (m)**: > 1.2	**Ditch Profile**:	
Adjacent land use: sheep grazed grassland on N, potatoes on S			
Margins: *Phragmites, Juncus*, hawthorn			
Ditch plants: mainly *Lemna* and blanket algae			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: Dredged in places, tractor pumping, agricultural rubbish			

Ditch No: 23	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR29076295	**Site**: Ash Level, N of Lower Goldstone
Width (m): 2.5	**Depth (m)**: < 0.3	**Ditch Profile**:	
Adjacent land use: Set aside on W, improved grassland on E			
Margins: *Glyceria maxima, Juncus, Carex*, hawthorn			
Ditch plants: *Lemna* spp.			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: recently drained/drying out? lots of dead animals and plants (smelly)			

Ditch No: 24	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR29386295	**Site**: Ash Level, N of Lower Goldstone
Width (m): 2.5	**Depth (m)**: < 0.3 at S end	**Ditch Profile**:	
Adjacent land use: improved grassland on W, semi-improved on E			
Margins: (at S end) *Carex, Juncus & Glyceria maxima*			
Ditch plants: (at S end) Dense *Glyceria, Berula, Lemna* x3			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, RARE			
Comments: ? recently drained			

Ditch No: 25	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR296629	**Site**: Ash Level, N of Lower Goldstone
Width (m): 2.5	**Depth (m)**: < 0.2	**Ditch Profile**:	
Adjacent land use: Cattle grazed pasture			
Margins: *Juncus, Glyceria*, hawthorn			
Ditch plants: *Lemna* x 3			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: ? recently drained, almost dried up			

Ditch No: 26	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR29806285	**Site**: Ash Level, N of Lower Goldstone
Width (m): 3	**Depth (m)**: < 0.1	**Ditch Profile**:	
Adjacent land use: Cattle grazed grassland			
Margins: *Juncus, Carex, Glyceria*			
Ditch plants: Dense *Glyceria maxima*, occasional *Lemna* spp.			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments: *Segmentina* not present in 1996 either			

Ditch No: 27	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR302625	**Site**: Ash Level, square TR3062
Width (m): 3	**Depth (m)**: pools, < 0.3	**Ditch Profile**:	
Adjacent land use: Cattle & sheep grazed grassland			
Margins: *Juncus,* poached and trampled			
Ditch plants: *Berula*, grasses, *Juncus, Lemna*, occasional *Phragmites*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments:			

Ditch No: 28	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR30406265	**Site**: Ash Level, square TR3062
Width (m): 2, (3-5) on corner	**Depth (m)**: < 0.3	**Ditch Profile**:	
Adjacent land use: bank, rough grazed pasture			
Margins: hawthorn hedge on N, *Juncus*			
Ditch plants: *Juncus, Berula, Lemna,* grasses, *Glyceria* on corner			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments:			

Ditch No: 29	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR30506265	**Site**: Ash Level, square TR3062
Width (m): 2.5	**Depth (m)**: 0.4 on corner, >1 elsewhere	**Ditch Profile**:	
Adjacent land use: Grassy bank on N, sheep grazed grassland on S			
Margins: *Juncus, Glyceria, Phragmites*, poached			
Ditch plants: *Hydrocharis, Lemna trisulca* and *L.* spp. at W end, otherwise blanket algae and *Phragmites*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, FREQUENT			
Comments:			

Ditch No: 30	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR30776252	**Site**: Ash Level, square TR3062
Width (m): 3	**Depth (m)**: >1	**Ditch Profile**:	
Adjacent land use: grazed grassland			
Margins: *Juncus, Glyceria, Phragmites*			
Ditch plants: Thick *Lemna* spp., occasional *Hydrocharis*, dense *Glyceria* at W end			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, COMMON (AT W END)			
Comments:			

Ditch No: 31	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR30836253	**Site**: Ash Level, square TR3062
Width (m): 3	**Depth (m)**: > 1	**Ditch Profile**:	
Adjacent land use: bank on N, improved grassland on S			
Margins: *Juncus, Phragmites*			
Ditch plants: Dense *Glyceria, Lemna trisulca* and occasional *Hydrocharis* at W end. Cover of *Lemna* and blanket algae elsewhere.			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments:			

Ditch No: 32	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR30956258	**Site**: Ash Level, square TR3062
Width (m): 1.2	**Depth (m)**: usually c. 0.5, but almost dry	**Ditch Profile**:	
Adjacent land use: rough grassland pasture with *Juncus*			
Margins: *Juncus, Carex,* occasional *Typha*			
Ditch plants: Dense *Hydrocharis, Lemna trisulca, Berula* and patchy *Typha*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, RARE			
Comments: ? recently drained, ?sluices opened			

Ditch No: 33	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR31086275	**Site**: Ash Level, square TR3163
Width (m): 2	**Depth (m)**: usually c. 0.5, but almost dry	**Ditch Profile**:	
Adjacent land use: rough grassland pasture with *Juncus*			
Margins: *Juncus*			
Ditch plants *Glyceria, Lemna trisulca, Hydrocharis*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, RARE			
Comments: ? recently drained, ?sluices opened			

Ditch No: 34	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR30136255	**Site**: Ash Level, square TR3062
Width (m): 3	**Depth (m)**: pools, < 0.3	**Ditch Profile**:	
Adjacent land use: Cattle & sheep grazed grassland			
Margins: *Juncus,* poached and trampled			
Ditch plants: *Berula,* grasses, *Juncus, Lemna,* occasional *Phragmites*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments:			

Ditch No: 35	**Date**: 8.vii.1999	**Grid Ref (1km)**: TR29386295	**Site**: Ash Level, N of Lower Goldstone
Width (m): 2.5	**Depth (m)**: c. 0.5	**Ditch Profile**:	
Adjacent land use: potatoes on W, sheep grazed grassland on E			
Margins: dense *Phragmites & Typha* on W, *Juncus* on E			
Ditch plants: *Berula, Lemna* major & minor			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments: *Segmentina* absent in 1996			

Ditch No: 36	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR31456232	**Site**: Ash Level, square TR3162
Width (m): 3 - 3.5	**Depth (m)**: c. 0.7	**Ditch Profile**:	
Adjacent land use: rough grazed pasture on W, peas on E			
Margins: *Juncus* and *Phragmites*			
Ditch plants: *Lemna* x 3, *Hydrocharis, Glyceria maxima*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments:			

Ditch No: 37	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR31426227	**Site**: Ash Level, square TR3162
Width (m): 2.5	**Depth (m)**: < 0.4	**Ditch Profile**:	
Adjacent land use: sheep grazed semi-improved grassland on S, bank on N			
Margins: Mainly *Juncus*, patchy *Phragmites* and grasses			
Ditch plants: *Lemna* x 3, *Berula, Hydrocharis, Glyceria*, curly blanket algae			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, FREQUENT			
Comments:			

Ditch No: 38	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR31306227	**Site**: Ash Level, square TR3162
Width (m): 1.5	**Depth (m)**: 0.4	**Ditch Profile**:	
Adjacent land use: sheep grazed semi-improved grassland			
Margins: *Juncus*			
Ditch plants: *Lemna* spp., curly blanket algae, grassy at N end			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, FREQUENT			
Comments:			

Ditch No: 39	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR31226231	**Site**: Ash Level, square TR3162
Width (m): 2	**Depth (m)**: 0.6	**Ditch Profile**:	
Adjacent land use: sheep grazed semi-improved grassland, bank on N			
Margins: *Juncus, Glyceria*			
Ditch plants: *Hydrocharis, Lemna* x 3, *Berula, Glyceria*, curly blanket algae			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, FREQUENT			
Comments:			

Ditch No: 40	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR31986234	**Site**: Ash Level, square TR3162
Width (m): 1.5	**Depth (m)**: 0.3	**Ditch Profile**:	
Adjacent land use: sheep grazed semi-improved grassland			
Margins: *Juncus, Glyceria*			
Ditch plants: relatively choked, *Lemna* spp., *Berula, Hydrocharis, Glyceria*, grasses			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments:			

Ditch No: 41	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR31276207	**Site**: Ash Level, square TR3162
Width (m): 2	**Depth (m)**: 0.4	**Ditch Profile**:	
Adjacent land use: sheep grazed semi-improved grassland			
Margins: *Juncus, Glyceria*			
Ditch plants: *Lemna* spp., *Glyceria*, curly blanket algae			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, RARE			
Comments:			

Ditch No: 42	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR3125626251	**Site**: Ash Level, square TR3162
Width (m): 2.5	**Depth (m)**: < 0.3	**Ditch Profile**:	
Adjacent land use: rough grazed pasture			
Margins: *Juncus, Glyceria*			
Ditch plants: *Hydrocharis, Lemna* spp., *Berula, Glyceria*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments:			

Ditch No: 43	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR31336255	**Site**: Ash Level, square TR3162
Width (m): 3 - 3.5	**Depth (m)**: > 0.5	**Ditch Profile**:	
Adjacent land use: rough grazed pasture			
Margins: *Juncus, Carex, Sparganium*, hawthorn			
Ditch plants: *Hydrocharis, Lemna* spp., *Berula, Glyceria*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments:			

Ditch No: 44	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR31406224	**Site**: Ash Level, square TR3162
Width (m): 2	**Depth (m)**: < 0.2, few pools with standing water	**Ditch Profile**:	
Adjacent land use: rough grazed pasture			
Margins: *Juncus*			
Ditch plants: Choked, *Typha, Sparganium, Glyceria,* grasses, *Berula, Alisma, Carex pseudocyperus*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, FREQUENT			
Comments: millions of *Bathyomphalus contortus*			

Ditch No: 45	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR31326240	**Site**: Ash Level, square TR3162
Width (m): 2	**Depth (m)**: < 0.2, few pools with standing water	**Ditch Profile**:	
Adjacent land use: rough grazed pasture			
Margins: *Juncus, Sparganium*			
Ditch plants: Choked, *Typha, Sparganium, Glyceria,* grasses, *Berula*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments:			

Ditch No: 46	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR27956142	**Site**: Westmarsh
Width (m): 1 - 1.5	**Depth (m)**: 0.4	**Ditch Profile**:	
Adjacent land use: rough species-rich pasture			
Margins: *Juncus*, hawthorn			
Ditch plants: *Glyceria, Lemna* spp., *Equisetum*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, FREQUENT			
Comments:			

Ditch No: 47	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR27956144	**Site**: Westmarsh
Width (m): 1.5 - 2	**Depth (m)**: 0.5	**Ditch Profile**:	
Adjacent land use: rough species-rich pasture			
Margins: Juncus, Sparganium			
Ditch plants: *Alisma, Sparganium, Berula, Glyceria fluitans, Lemna* spp. (inc. *trisulca*)			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments:			

Ditch No: 48	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR27986157	**Site**: Westmarsh
Width (m): 1.5 - 2	**Depth (m)**: < 0.3 pools	**Ditch Profile**:	
Adjacent land use: rough grassland			
Margins: *Glyceria maxima*			
Ditch plants: Dense *Glyceria*, occasional *Berula, Lemna minor*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments: only few pools of water, *Segmentina* occasional in 1996			

Ditch No: 49	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR28026152	**Site**: Westmarsh
Width (m): 2	**Depth (m)**: < 0.3, pools	**Ditch Profile**:	
Adjacent land use: rough species-rich pasture			
Margins: *Glyceria, Juncus*, grasses, hawthorn			
Ditch plants: relatively dense *Glyceria, grasses, Lemna* spp.			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments:			

Ditch No: 50	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR28076152	**Site**: Westmarsh
Width (m): 1.5	**Depth (m)**: < 0.3, pools	**Ditch Profile**:	
Adjacent land use: rough species-rich pasture			
Margins: *Juncus*, occasional hawthorn			
Ditch plants: *Glyceria*, grasses			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, RARE			
Comments:			

Ditch No: 51	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR28036167	**Site**: Westmarsh
Width (m): 1.5 - 2	**Depth (m)**: 0.4	**Ditch Profile**:	
Adjacent land use: grassland meadow			
Margins: *Glyceria, Juncus*, hawthorn			
Ditch plants: *Glyceria*, grasses			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: molluscs dominated by *Planorbis planorbis, Lymnaea peregra*			

Ditch No: 52	**Date**: 9.vii.1999	**Grid Ref (1km)**: TR28136167	**Site**: Westmarsh
Width (m): 1.5	**Depth (m)**: 0.4	**Ditch Profile**:	
Adjacent land use: rough grassland on W, rape on E			
Margins: *Sparganium, Juncus, Glyceria, Iris*, hawthorn			
Ditch plants: Dense *Glyceria, Lemna* spp.			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments:			

Ditch No: 53	**Date**: 10.vii.1999	**Grid Ref (1km)**: TR23076179	**Site**: Stodmarsh, Newborns Farm (outside NNR)
Width (m): 1.5	**Depth (m)**: < 0.3	**Ditch Profile**:	
Adjacent land use: grassland			
Margins: *Phragmites, Sparganium, Juncus*			
Ditch plants: Dense *Hydrocharis, Lemna* x 3, plus the marginal species			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments:			

Ditch No: 54	**Date**: 10.vii.1999	**Grid Ref (1km)**: TR23056188	**Site**: Stodmarsh, Newborns Farm (outside NNR)
Width (m): 1.5	**Depth (m)**: < 0.3	**Ditch Profile**:	
Adjacent land use: grassland			
Margins: *Phragmites, Sparganium, Juncus*			
Ditch plants: Dense *Hydrocharis, Lemna* x 3, plus the marginal species			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, RARE			
Comments:			

Ditch No: 55	**Date**: 10.vii.1999	**Grid Ref (1km)**: TR23016165	**Site**: Stodmarsh, Newborns Farm (outside NNR)
Width (m): 1	**Depth (m)**: < 0.1	**Ditch Profile**:	
Adjacent land use: cattle grazed grassland			
Margins: very dense *Phragmites*			
Ditch plants: very dense *Phragmites*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, FREQUENT			
Comments: Virtually no water, anoxic mud and decaying *Lemna* substrate			

Ditch No: 56	**Date**: 10.vii.1999	**Grid Ref (1km)**: TR22956165	**Site**: Stodmarsh, Newborns Farm (outside NNR)
Width (m): 2.5 - 3	**Depth (m)**: 0.4	**Ditch Profile**:	
Adjacent land use: grassland			
Margins: *Sparganium, Carex, Glyceria, Phragmites*			
Ditch plants: Dense *Hydrocharis, Lemna* x 3			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, RARE			
Comments:			

Ditch No: 57	**Date**: 10.vii.1999	**Grid Ref (1km)**: TR22936162	**Site**: Stodmarsh, Newborns Farm (outside NNR)
Width (m): 2.5 - 3	**Depth (m)**: almost dried out	**Ditch Profile**:	
Adjacent land use: rough grassland			
Margins: *Sparganium, Carex, Glyceria, Phragmites*			
Ditch plants: thick *Lemna* x 3			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments:			

Ditch No: 58	**Date**: 10.vii.1999	**Grid Ref (1km)**: TR22946158	**Site**: Stodmarsh, Newborns Farm (outside NNR)
Width (m): 1.5	**Depth (m)**: thin veneer over mud & decaying veg.	**Ditch Profile**:	
Adjacent land use: rough grassland			
Margins: thick *Phragmites* and *Lemna* spp.			
Ditch plants: thick *Phragmites* and *Lemna* spp.			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: PRESENT, COMMON			
Comments:			

Ditch No: 59	**Date**: 10.vii.1999	**Grid Ref (1km)**: TR22846164	**Site**: Stodmarsh, Newborns Farm (outside NNR)
Width (m): 3	**Depth (m)**: dry	**Ditch Profile**:	
Adjacent land use: rough grassland			
Margins: *Juncus*			
Ditch plants: Solid *Glyceria*			
Sampling method:	**Quantitative**:	**Qualitative**: None	
Segmentina nitida: Absent			
Comments: dry throughout			

Ditch No: 60	**Date**: 10.vii.1999	**Grid Ref (1km)**: TR22786165	**Site**: Stodmarsh, NNR
Width (m): 2 - 2.5	**Depth (m)**: < 0.5	**Ditch Profile**:	
Adjacent land use: rough grassland/reedbeds			
Margins: *Phragmites, Juncus, Glyceria*			
Ditch plants: *Lemna* x 3, *Hydrocharis, Berula, Rumex*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, COMMON			
Comments:			

Ditch No: 61	Date: 11.vii.1999	Grid Ref (1km): TR22856169	Site: Stodmarsh, Newborns Farm (outside NNR)
Width (m): 2	Depth (m): 0.4	Ditch Profile:	
Adjacent land use: rough grazed grassland			
Margins: *Phragmites, Juncus, Glyceria*			
Ditch plants: *Berula, Hydrocharis, Lemna* x 3			
Sampling method:	Quantitative:	Qualitative: YES	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments:			

Ditch No: 62	Date: 11.vii.1999	Grid Ref (1km): TR23036210	Site: Stodmarsh, NNR
Width (m): 2.5	Depth (m): 0.5	Ditch Profile:	
Adjacent land use: rough grassland			
Margins: *Phragmies, Sparganium, Typha, Juncus*			
Ditch plants: *Hydrocharis, Berula, Lemna* x 3, *Equisetum*			
Sampling method:	Quantitative:	Qualitative: YES	
Segmentina nitida: Absent			
Comments:			

Ditch No: 63	Date: 11.vii.1999	Grid Ref (1km): TR22976206	Site: Stodmarsh, NNR
Width (m): 1.5 - 2	Depth (m): < 0.3	Ditch Profile:	
Adjacent land use: rough grassland			
Margins: *Juncus, Glyceria, Phragmites*			
Ditch plants: *Hydrocharis, Lemna* spp., *Berula*			
Sampling method:	Quantitative:	Qualitative: YES	
Segmentina nitida: PRESENT, RARE			
Comments:			

Ditch No: 64	Date: 11.vii.1999	Grid Ref (1km): TR23006200	Site: Stodmarsh, NNR
Width (m): 3 - 3.5	Depth (m): < 0.5	Ditch Profile:	
Adjacent land use: rough grassland			
Margins: *Phragmites, Sparganium, Iris, Carex, Juncus*			
Ditch plants: *Berula, Lemna* x 3, *Hydrocharis, Equisetum, Alisma, Mentha, Potamogeton* sp.			
Sampling method:	Quantitative: YES	Qualitative:	
Segmentina nitida: PRESENT, RARE (1 SPECIMEN)			
Comments: Segmentina absent in 1996			

Ditch No: 65	Date: 11.vii.1999	Grid Ref (1km): TR22906198	Site: Stodmarsh, NNR
Width (m): 2 - 2.5	Depth (m): 0.5	Ditch Profile:	
Adjacent land use: rough grassland			
Margins: *Phragmites, Sparganium, Iris, Carex, Juncus, Rumex, Typha,* hawthorn			
Ditch plants: *Berula, Lemna* x 3, *Hydrocharis, Alisma, Mentha, Potamogeton* sp.			
Sampling method:	Quantitative:	Qualitative: YES	
Segmentina nitida: Absent			
Comments:			

Ditch No: 66	**Date**: 11.vii.1999	**Grid Ref (1km)**: TR22966205	**Site**: Stodmarsh, NNR
Width (m): 2 - 2.5	**Depth (m)**: < 0.5	**Ditch Profile**:	
Adjacent land use: rough grazed grassland			
Margins: *Juncus*, hawthorn			
Ditch plants: shallow & choked a E end. *Berula, Lemna* x 3, *Hydrocharis, Alisma, Glyceria*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 67	**Date**: 11.vii.1999	**Grid Ref (1km)**: TR22766201	**Site**: Stodmarsh, NNR
Width (m): 2	**Depth (m)**: < 0.4	**Ditch Profile**:	
Adjacent land use: rough grazed grassland			
Margins: open. *Juncus*, grasses			
Ditch plants: *Hydrocharis, Lemna* x 3, *Alisma, Berula, grasses.* Sparse *Glyceria & Phragmites*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT, OCCASIONAL			
Comments: *Segmentina* rare in 1996			

Ditch No: 68	**Date**: 11.vii.1999	**Grid Ref (1km)**: TR22756195	**Site**: Stodmarsh, NNR
Width (m): 3	**Depth (m)**: > 0.6	**Ditch Profile**:	
Adjacent land use: rough grazed grassland			
Margins: *Phragmites, Juncus, Glyceria*			
Ditch plants: *Hydrocharis, Lemna* x 3, *Alisma, Berula, grasses, Nuphar.* Sparse *Glyceria & Phragmites*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments:			

Ditch No: 69	**Date**: 11.vii.1999	**Grid Ref (1km)**: TR22676200	**Site**: Stodmarsh, NNR
Width (m): 3	**Depth (m)**: < 0.6	**Ditch Profile**:	
Adjacent land use: rough grazed grassland			
Margins: *Juncus, Carex, Phragmites*			
Ditch plants: *Hydrocharis, Lemna* x 3, *Alisma, Berula, grasses, Nuphar.* Sparse *Glyceria & Phragmites*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments: *Segmentina* absent in 1996			

Ditch No: 70	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR23006242	**Site**: Stodmarsh NNR
Width (m): ~3	**Depth (m)**: 0.7 max.	**Ditch Profile**:	
Adjacent land use: Unimproved, rough pasture			
Margins: Mainly *Juncus*, with *Phragmites, Glyceria, Sparganium* and occasional Hawthorn			
Ditch plants: *Sparganium, Hydrocharis, Potamogeton* (elliptical leaf), *Mentha, Lemna trisulca, Berula,* blanket algae			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 71	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR23076252	**Site**: Stodmarsh NNR
Width (m): 4 - 5	**Depth (m)**: up to 1	**Ditch Profile**:	
Adjacent land use: Unimproved, rough pasture			
Margins: *Phragmites, Juncus*, some *Typha* and *Carex*, occasional Hawthorn			
Ditch plants: *Hydrocharis, Lemna trisulca*, and *Phragmites* in the channel			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 72	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR23106242	**Site**: Stodmarsh NNR
Width (m): 3 - 4	**Depth (m)**: 0.7 - >1	**Ditch Profile**:	
Adjacent land use: Unimproved, rough pasture			
Margins: *Juncus* and *Sparganium*			
Ditch plants: *Hydrocharis, Lemna trisulca, Sparganium*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: "Molluscs as for site 71, no sample kept"			

Ditch No: 73	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR23126235	**Site**: Stodmarsh NNR
Width (m): ~4	**Depth (m)**: 0.2 - 1 max.	**Ditch Profile**:	
Adjacent land use: Semi-improved, grazed pasture			
Margins: *Phragmites, Juncus*, thistle, dog rose, bramble, young hawthorn			
Ditch plants: *Hydrocharis* (dense), *Berula, Lemna trisulca*, blanket algae			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT RARE			
Comments:			

Ditch No: 74	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR22866221	**Site**: Stodmarsh NNR
Width (m): 2 - 3	**Depth (m)**: <0.6	**Ditch Profile**:	
Adjacent land use: Grassy bank on north, semi-improved pasture on south			
Margins: *Sparganium* and patchy *Typha*			
Ditch plants: *Hydrocharis, Lemna trisulca* (dense), *Potamogeton, Alisma, Berula, Mentha, Rumex hydrolapathum* (patchy)			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 75	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR22856215	**Site**: Stodmarsh NNR
Width (m): ~4	**Depth (m)**: at least 1	**Ditch Profile**:	
Adjacent land use: Semi-improved pasture			
Margins: Young Hawthorn common on both sides, *Juncus*, bramble, thistle			
Ditch plants: *Hydrocharis* (dense), *Berula, Mentha, Alisma, Sparganium, Lemna trisulca, Rumex hydrolapathum, Typha* (mid-channel)			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 76	**Date**: 19.viii.99	**Grid Ref (1km)**: TR22656212	**Site**: Stodmarsh NNR
Width (m): 3.5 - 5	**Depth (m)**: >1	**Ditch Profile**:	
Adjacent land use: Unimproved rough pasture			
Margins: Open on both sides with *Carex*			
Ditch plants: *Hydrocharis* (dense), *Lemna trisulca, Berula, Mentha*, water lilies, patchy *Phragmites* and *Sparganium*, blanket algae			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 77	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR22666217	**Site**: Stodmarsh NNR
Width (m): 3 - 4	**Depth (m)**: >1	**Ditch Profile**:	
Adjacent land use: Unimproved rough pasture			
Margins: *Sparganium, Juncus*, occasional young Hawthorn. Relatively open and evidently poached			
Ditch plants: *Hydrocharis, Lemna trisulca, Berula, Mentha*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 78	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR22566216	**Site**: Stodmarsh NNR
Width (m): 4 - 5	**Depth (m)**: <0.6	**Ditch Profile**:	
Adjacent land use: Unimproved, rough pasture			
Margins: *Phragmites, Juncus*. Relatively open			
Ditch plants: *Berula*, white water lilies, *Hydrocharis, Iris, Lemna trisulca*, 'water nasturtium'. Channel becomes choked westwards			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 79	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR22456230	**Site**: Stodmarsh NNR
Width (m): 5+	**Depth (m)**: >1	**Ditch Profile**:	
Adjacent land use: North marks boundary of NNR with grassy bank, south is unimproved rough pasture			
Margins: *Typha* and *Epilobium* on north; *Typha* (continuous), *Juncus, Rumex* sp. on south			
Ditch plants: *Lemna trisulca, L. minor, Hydrocharis* (dense), *Berula*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: "Molluscs as everywhere"			

Ditch No: 80	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR22456218	**Site**: Stodmarsh NNR
Width (m): 3 - 4	**Depth (m)**: >1	**Ditch Profile**:	
Adjacent land use: Unimproved, rough pasture			
Margins: Poached *Phragmites, Juncus* (continuous). Relatively open			
Ditch plants: *Lemna trisulca, Hydrocharis*, water lilies			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: Molluscs as before (79)			

Ditch No: 81	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR22606200	**Site**: Stodmarsh NNR
Width (m): 3.5	**Depth (m)**: >1	**Ditch Profile**:	
Adjacent land use: Unimproved rough pasture but ditch shows signs of manipulation. Also scrapes present on neighbouring ground			
Margins: *Juncus* and occasional *Phragmites*			
Ditch plants: Water lilies (continuous), immersed *Hydrocharis, Rumex hydrolapathum, Berula, Lemna trisulca, Sparganium*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: "Molluscs as before - *Pisidium pseudosphaerium* and *obtusale*"			

Ditch No: 82	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR20666151	**Site**: Hersden
Width (m): ~5	**Depth (m)**: 0.5 - 1	**Ditch Profile**:	
Adjacent land use: Railway embankment and footpath on north and rough grazed semi-improved grassland on south			
Margins: *Sparganium, Epilobium, Typha,* mixed herbs			
Ditch plants: *Glyceria, Lemna polyrhiza, L. minor, Sparganium, Myosotis, Rumex hydrolapathum, Mentha*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: *Sphaerium, Plan plan, Anisus vortex, Bathy contortus, Bithynia* x 2			

Ditch No: 83	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR20856151	**Site**: Hersden
Width (m): 2 - 3	**Depth (m)**: 0.3	**Ditch Profile**:	
Adjacent land use: Unimproved grassland, very neglected			
Margins: *Phragmites* and *Juncus*			
Ditch plants: Channel choked with *Glyceria, Phragmites*. Occasional *Lemna minor*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: *L. palustris, peregra, Plan plan, B. contortus, V. cristata.* This is west ditch of parallel pair at 90 degrees to railway line			

Ditch No: 84	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR20856151	**Site**: Hersden
Width (m): 2.5 - 3	**Depth (m)**:	**Ditch Profile**:	
Adjacent land use: Unimproved and neglected grassland			
Margins: Open with *Glyceria* and *Juncus*			
Ditch plants: Open channel covered in *Lemna polyrhiza* and *L. minor*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: *Plan plan., A. vortex, B. contortus, Sphaerium, Bithynia* x 2, *peregra, P. milium, L. palustris, Physa.* This ditch is east ditch of parallel pair at 90 degrees to railway line			

Ditch No: 85	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR20976159	**Site**: Hersden
Width (m): 2 (with 20m floodplain)	**Depth (m)**: 0.4	**Ditch Profile**:	
Adjacent land use: Unimproved grassland and marsh			
Margins: *Typha, Glyceria, Sparganium* and *Carex*			
Ditch plants: *Lemna polyrhiza, L. minor, Sparganium*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida:			
Comments: *L. palustris, P. planorbis, L. peregra, Bithynia* x 2, B. *contortus, P. obtusale.* Ditch accessed across marshy grassland with abundant *Mentha.*			

Ditch No: 86	**Date**: 19.viii.1999	**Grid Ref (1km)**: TR21516184	**Site**: Hersden
Width (m): <1.5	**Depth (m)**: <0.1	**Ditch Profile**:	
Adjacent land use: *Glyceria* and *Carex* 'fen', neglected			
Margins: *Glyceria* (grazed), *Mentha*			
Ditch plants: Much of channel choked with poached *Glyceria* and where open water is very murky			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: *peregra, planorbis.* "Water smelly, hard substrate suggests was dry and has only recently been re-flooded. No other ditches at Hersden deemed worth sampling based on *Segmentina* requirements"			

Ditch No: 87	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR20006040	**Site**: Westbere
Width (m): 6	**Depth (m)**: 0.3 - >0.6	**Ditch Profile**:	
Adjacent land use: Semi-improved and cattle grazed			
Margins: *Glyceria* and *Phragmites* swamp			
Ditch plants: *Hydrocharis, Berula, Lemna polyrhiza*, some *Phragmites* migrating from margins			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments: Wide zone of *Glyceria* swamp.			

Ditch No: 88	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR19886032	**Site**: Westbere
Width (m): 6	**Depth (m)**: <0.1	**Ditch Profile**:	
Adjacent land use: Semi-improved cattle grazing pasture			
Margins: *Juncus, Glyceria, Lythrum salicaria*			
Ditch plants: Choked channel with *Glyceria, Rumex hydrolapathum, Mentha, Berula, Equisetum, Typha, Epilobium*. Some *Lemna polyrhiza* and *L. minor* in pool areas			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments: "Not really a proper ditch, difficult to sample the occasional pools"			

Ditch No: 89	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR20036137	**Site**: Westbere
Width (m): 6 (Incl. Swamp margin)	**Depth (m)**: 0.7	**Ditch Profile**:	
Adjacent land use: Semi-improved grassland on west and rough unimproved grassland on east			
Margins: *Glyceria* and *Juncus*			
Ditch plants: *Hydrocharis* (dense), *Lemna polyrhiza, L. minor, L. trisulca, Berula, Ranunculus* (frilly) sp.			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 90	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR20216035	**Site**: Westbere
Width (m): 2.5	**Depth (m)**: <0.2	**Ditch Profile**:	
Adjacent land use: Unimproved on north and wheat field on south			
Margins: *Phragmites*, thistle, land plantain, field weeds			
Ditch plants: *Alisma* (common), *Berula, Glyceria, Lythrum salicaria*, blanket algae			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: *L. peregra, Plan plan, Physa, Bithynia* x 2, *A. vortex.*			

Ditch No: 91	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR20286044	**Site**: Westbere
Width (m): 5 - 6	**Depth (m)**: 0.4	**Ditch Profile**:	
Adjacent land use: Unimproved grassland. Many herbs, but grass green - cut for silage?			
Margins: *Glyceria fluitans, Juncus*, thistle			
Ditch plants: Channel largely open but with blanket algae. *Glyceria, Berula* and 'starwort'			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: *A. vortex, L. palustris, peregra, stagnalis, Plan plan, B. contortus, Bithynia* x 2. ?Recently cleared. 2 further drains in the cattle field look like this"			

Ditch No: 92	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR20376048	**Site**: Westbere
Width (m): 3 - 5	**Depth (m)**: <0.2	**Ditch Profile**:	
Adjacent land use: Improved grassland			
Margins: *Phragmites, Juncus, Glyceria, Mentha*			
Ditch plants: *Glyceria, Berula*, thick *Lemna* spp. coverage through mid-channel			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 93	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR20446060	**Site**: Westbere
Width (m): 3	**Depth (m)**: >0.7	**Ditch Profile**:	
Adjacent land use: Improved grassland			
Margins: *Glyceria, Epilobium, Juncus*, solitary Hawthorn and Alder			
Ditch plants: *Lemna polyrhiza, L. minor, Myosotis, Phragmites, Berula*, true watercress			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 94	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR20506054	**Site**: Westbere
Width (m): 2.5	**Depth (m)**: 0.6	**Ditch Profile**:	
Adjacent land use: Improved grassland on west and Reed bed on east			
Margins: *Phragmites, Lythrum salicaria*, nettle and *Rumex* sp.			
Ditch plants: *Berula, Phragmites*, 'starwort'			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: *Plan plan, corneus, B. contortus, A. vortex, L. peregra, palustris, Physa, Bithynia* x 2, *Sphaerium, Armiger*. Channel mainly choked			

Ditch No: 95	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR20256056	**Site**: Westbere
Width (m): 3.5 - 4	**Depth (m)**: 0.7	**Ditch Profile**:	
Adjacent land use: Improved grazing pasture			
Margins: *Phragmites, Lythrum salicaria, Mentha, Epilobium hirsutum*, thistle, *Rumex* sp.			
Ditch plants: *Glyceria, Sparganium, Alisma*, occasional *Berula*, 'starwort'			
Sampling method:	**Quantitative**:	**Qualitative**:	
Segmentina nitida: Absent			
Comments: Described but not sampled			

Ditch No: 96	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR20226055	**Site**: Westbere
Width (m): 3.5 - 4	**Depth (m)**: 0.7	**Ditch Profile**:	
Adjacent land use: Semi-improved rough grassland on west and improved grazing pasture on east			
Margins: *Phragmites, Lythrum salicaria, Mentha, Epilobium hirsutum*, thistle, *Rumex* sp.			
Ditch plants: *Glyceria, Sparganium, Alisma*, occasional *Berula*, 'starwort'			
Sampling method:	**Quantitative**:	**Qualitative**:	
Segmentina nitida: Absent			
Comments: Described but not sampled			

Ditch No: 97	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR20136038	**Site**: Westbere
Width (m): 4 at south end	**Depth (m)**: 0.3	**Ditch Profile**:	
Adjacent land use: Semi-improved rough grazing pasture			
Margins: *Glyceria, Juncus*			
Ditch plants: *Glyceria, Berula, Lemna polyrhiza, L. minor, Hydrocharis, Epilobium*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments: Choked channel with ditch widening to north (8m) with swamp margin on west. ***Vertigo moulinsiana*** **found in sample.**			

Ditch No: 98	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR24156073	**Site**: Preston Court
Width (m): 3.5	**Depth (m)**: 0.7	**Ditch Profile**:	
Adjacent land use: Track between fields on north and improved sheep-grazed pasture on south			
Margins: *Phragmites, Juncus*			
Ditch plants: *Hydrocharis* (dense and lush), *Berula, Lemna trisulca, L. polyrhiza, L. minor, Typha, Alisma*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 99	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR24006050	**Site**: Preston Court
Width (m): 5	**Depth (m)**: 0.7	**Ditch Profile**:	
Adjacent land use: Improved sheep-grazed pasture			
Margins: *Phragmites, Juncus*, thistles			
Ditch plants: *Hydrocharis* (dense), *Lemna trisulca, L minor, Ranunculus* sp.			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments: "Gravel substrate, ?dredged last winter"			

Ditch No: 100	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR23936044	**Site**: Preston Court
Width (m): 5	**Depth (m)**: 0.7 or >	**Ditch Profile**:	
Adjacent land use: Sheep-grazed improved pasture			
Margins: *Phragmites*			
Ditch plants: *Hydrocharis* (dense), *Berula, Lemna trisulca* and *L. minor*			
Sampling method:	**Quantitative**:	**Qualitative**: YES	
Segmentina nitida: Absent			
Comments: "Masses of snails but diversity looks low - *Planorbarius, Plan plan, A. vortex, L. palustris, peregra, Physa, Bithynia* x 2." This ditch similar to 99, a continuation after gate crossing between the 2 ditches.			

Ditch No: 101	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR23816041	**Site**: Preston Court
Width (m): 6	**Depth (m)**: 1 +	**Ditch Profile**:	
Adjacent land use: Improved sheep-grazed pasture			
Margins: *Glyceria, Juncus, Rumex* sp., *Phragmites*			
Ditch plants: *Hydrocharis* (dense), *Lemna* spp., blanket algae			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 102	**Date**: 20.viii.99	**Grid Ref (1km)**: TR23766022	**Site**: Preston Court
Width (m): 2.5	**Depth (m)**: 0.8	**Ditch Profile**:	
Adjacent land use: Relatively improved sheep-grazed pasture			
Margins: *Carex, Equisetum, Phragmites*. Vegetation looks poached			
Ditch plants: *Hydrocharis* (sparse), *Lemna trisulca* (submerged and unhealthy appearance), *Phragmites*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 103	**Date**: 20.viii.1999	**Grid Ref (1km)**: TR23926067	**Site**: Preston Court
Width (m): 2.5	**Depth (m)**: >0.7	**Ditch Profile**:	
Adjacent land use: Improved sheep-grazed pasture			
Margins: *Phragmites, Glyceria, Sparganium, Typha, Carex*			
Ditch plants: *Hydrocharis* (dense), *Lemna trisulca, L. polyrhiza, L. minor, Ranunculus* sp.			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: Absent			
Comments:			

Ditch No: 104	**Date**: 20.viii.99	**Grid Ref (1km)**: TR24116084	**Site**: Preston Court
Width (m): 2.5	**Depth (m)**: >1	**Ditch Profile**:	
Adjacent land use: Improved sheep-grazed pasture			
Margins: *Phragmites, Typha* occasional			
Ditch plants: *Hydrocharis, Lemna trisulca*			
Sampling method:	**Quantitative**: YES	**Qualitative**:	
Segmentina nitida: PRESENT FREQUENT			
Comments: Site of sampling is corner of 2 ditches (arrowed on map). *Segmentina* seen in the field.			

APPENDIX 3 - QUANTITATIVE MOLLUSCAN ANALYSIS

Site: Preston Valley/Preston Court

SPECIES	DITCH NUMBER													
	1	2	3	5	7	8	13	14	98	99	101	102	103	104
Valvata cristata	F	R	O	O	O	F	O	F	F	O	F	F	O	F
Potamopyrgus antipodarum		A					A	O						
Bithynia tentaculata	F	C	F	F	C	F	F	F	F	O	C	F	C	O
Bithynia leachii	A		C	A	C	F	A	C	A	C	A	A	A	A
Lymnaea palustris	R	C	R	F	F	F	R	O	O		O	F	F	O
Lymnaea peregra	A	R	C	A	A	C	C	F	F	F	C	F	F	O
Acroloxus lacustris						R								
Planorbis planorbis	A	F	A	F	A	F	A	C	F	F	C	A	C	O
Anisus vortex	F		F	O	O	F	F	R		O	O	O	F	R
Bathyomphalus contortus		O	O		F			C					C	
Hippeutis complanatus	F		F	O	F	O	C	O	R		F	C	C	O
Segmentina nitida	F	O				C	C	C						F
Planorbarius corneus	F		O	F			O	O	R	F		R	O	
Physa fontinalis			C	C	C	C	F	C	C	C	F	C	F	C
Sphaerium corneum	F			F	O	F	F	F	O	O	F	O	F	O
Musculium lacustre			F				R	F						R
Pisidium obtusale	F	F		O			F	C	R					R
Pisidium milium				O	F			O			R		O	
Pisidium pseudosphaerium	F						O	F					R	

Site: Ash Level

SPECIES	DITCH NUMBER													
	16	17	18	20	24	26	27	28	29	30	32	35	36	38
Valvata cristata	F	F	O	O	C	F	F	F	F	F	O	F	O	A
Bithynia tentaculata	F	F	C	O			F		C	O	O	O	O	
Bithynia leachii	C	A	F	F	O	R	A		A	C	F	F	A	F
Lymnaea stagnalis	O	O	R	R				R	R	R	R		R	
Lymnaea palustris	F	O	O	O	R	F	F	C	F	F	C	O	F	C
Lymnaea peregra	C	C	O	O	F	F	F	F	C	F	A	C	F	O
Planorbis planorbis	F	O	C	F	F	F	C	F	F	O	C	C	F	C
Anisus vortex	O	O	R	O	O		R		O	O	R		R	
Bathyomphalus contortus	A	C	F	F	A	C	A	F	A	F	A	F	A	A
Armiger crista				F				F	R	R		R		R
Hippeutis complanatus	A	O	O	F	A	C	F		F	F	O	O	F	O
Segmentina nitida	O	R	R		R		O	O	F	C	R	O	O	F
Planorbarius corneus	F	F	O		R	R	R		R	O		O	R	
Physa fontinalis	C	C		O	O	F	F	O	C	F	O	O	O	O
Sphaerium corneum	F	O		O		O		R	C	F	O	O	R	R
Musculium lacustre	O	O							R	F				
Pisidium obtusale		R		R			O		R					
Pisidium milium		R					F		R	R	R			
Pisidium pseudosphaerium	F	F					A	R	R	R	R	R	O	R

Abundance Scale: A = 100+, C = 51 - 100, F = 16 - 50, O = 6 - 16, R = 1 - 5.

Site: Stodmarsh (site 60 is outside NNR)

SPECIES	DITCH NUMBER												
	60	64	66	67	69	70	71	73	74	75	76	77	78
Valvata cristata				O		O	O	F	F	C	O	O	O
Bithynia tentaculata	F		F	F	F	F	F	F	C	C	C	F	F
Bithynia leachii	A		A	A	A	F	A	A	A	A	C	C	A
Lymnaea stagnalis	R				R	F							
Lymnaea palustris	O		R	F	O	F	F	F	F	F	O	F	F
Lymnaea peregra	A		A	A	C	A	F	F	C	C	A	A	C
Acroloxus lacustris	R		R	R	O								
Planorbis planorbis	C		C	A	C	A	C	C	A	A	A	A	A
Anisus vortex	F		R	O	O	F	F	F	F	F	O	O	F
Bathyomphalus contortus	F		A	A	A	F	A	A	C	A	F	A	A
Armiger crista						O							
Hippeutis complanatus	C		F	F	F	F	F	R	R	O	O	R	O
Segmentina nitida	C	R		O				R					
Planorbarius corneus	O		R	O		F	R	O	R	O	R		O
Physa fontinalis	C		A	A	A	O	A	A	A	A	A	A	C
Aplexa hypnorum	O												
Sphaerium corneum	F		F	O	F	O	F	O	C	F	F	F	F
Musculium lacustre			O	R	F			R	R			R	
Pisidium obtusale				R		O			R	R	O	F	F
Pisidium milium			O	O	O	O					O	F	O
Pisidium pseudosphaerium	O		A	O	F		R		C	R	F	C	F

Site: Westbere (Sites 87 - 97) AND Westmarsh (Site 46)

SPECIES	DITCH NUMBER						
	Westbere						Westmarsh
	87	88	89	92	93	97	46
Valvata cristata	F	O	O	R	F	F	O
Bithynia tentaculata			F	R	F		
Bithynia leachii	R		A	R	C	R	
Lymnaea truncatula		O					
Lymnaea stagnalis					R		R
Lymnaea palustris	C			O	F	F	O
Lymnaea peregra	F	O	R		F	F	A
Planorbis planorbis	C	R	F	A	F	F	C
Anisus vortex	O	R	O		O	O	O
Bathyomphalus contortus	C	F	A	A	F	F	F
Armiger crista							A
Hippeutis complanatus	O		A		R		O
Segmentina nitida							F
Planorbarius corneus	O		O		O	F	
Physa fontinalis	F		F		C	C	O
Sphaerium corneum	F	C	F	A	F	F	
Pisidium casertanum					O		
Pisidium obtusale		F	O		R	O	A
Pisidium milium	R	F			F	O	
Pisidium pseudosphaerium			F			C	

Abundance Scale: A = 100+, C = 51 - 100, F = 16 - 50, O = 6 - 16, R = 1 - 5.

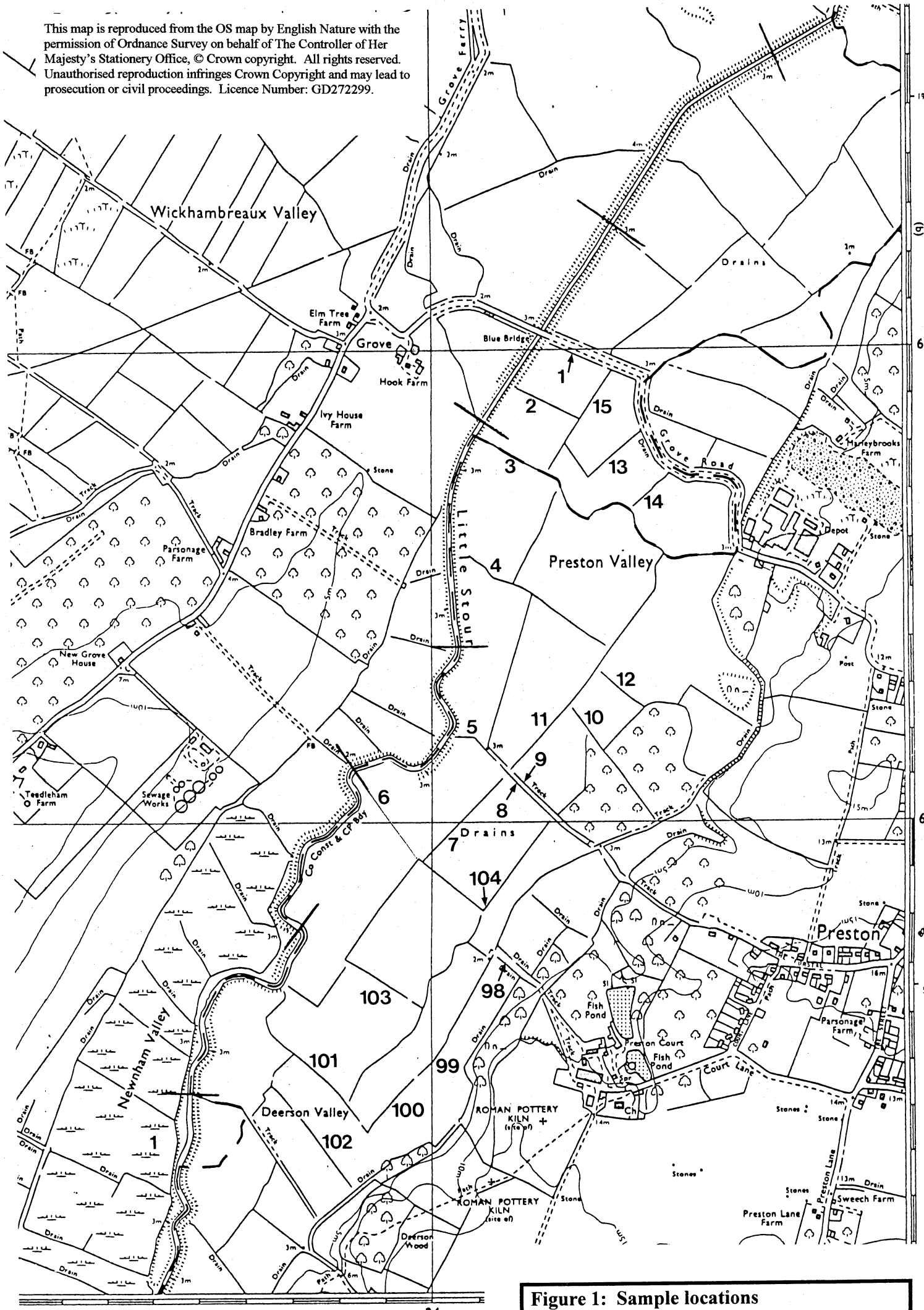

Figure 1: Sample locations Preston Valley

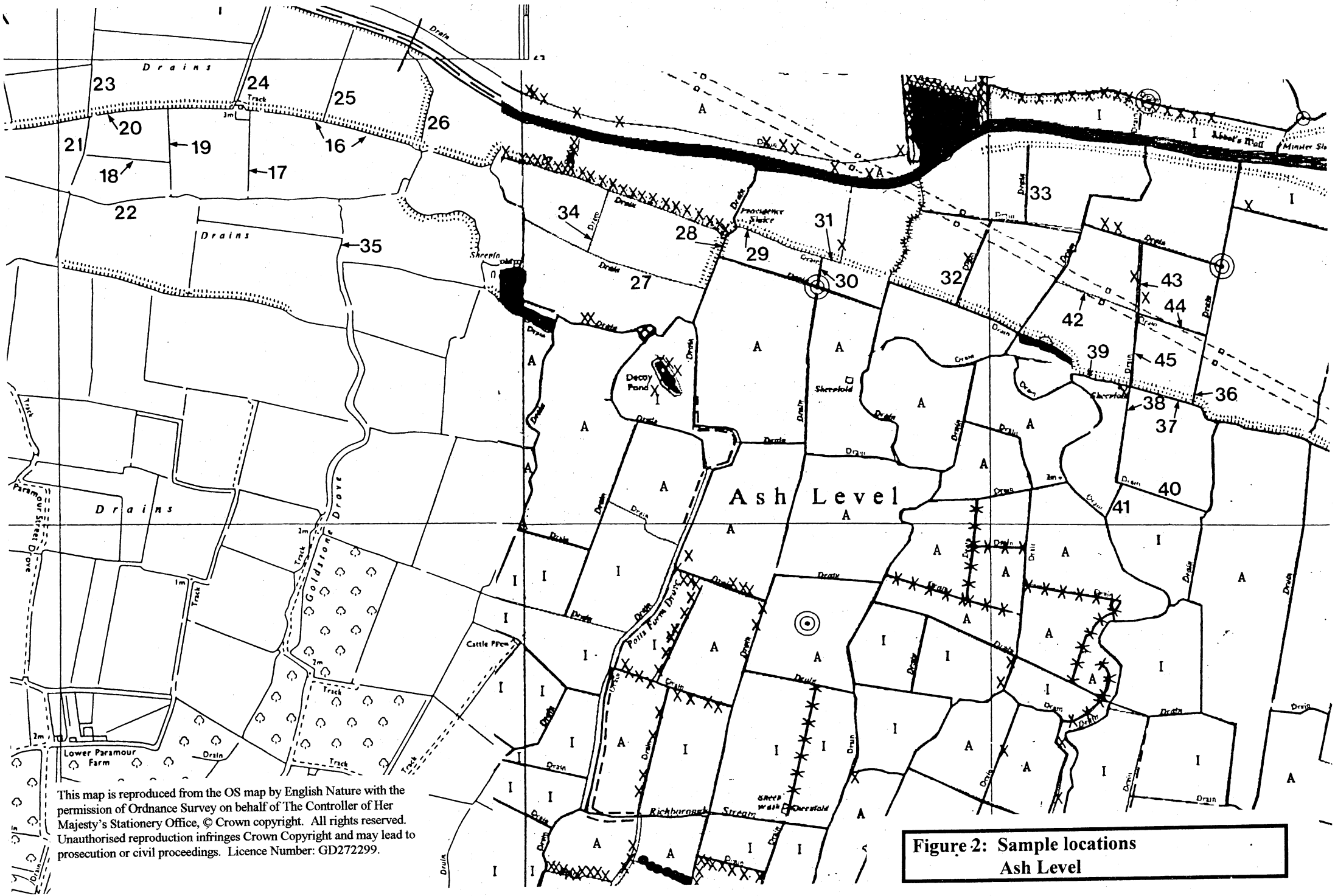

Figure 2: Sample locations Ash Level

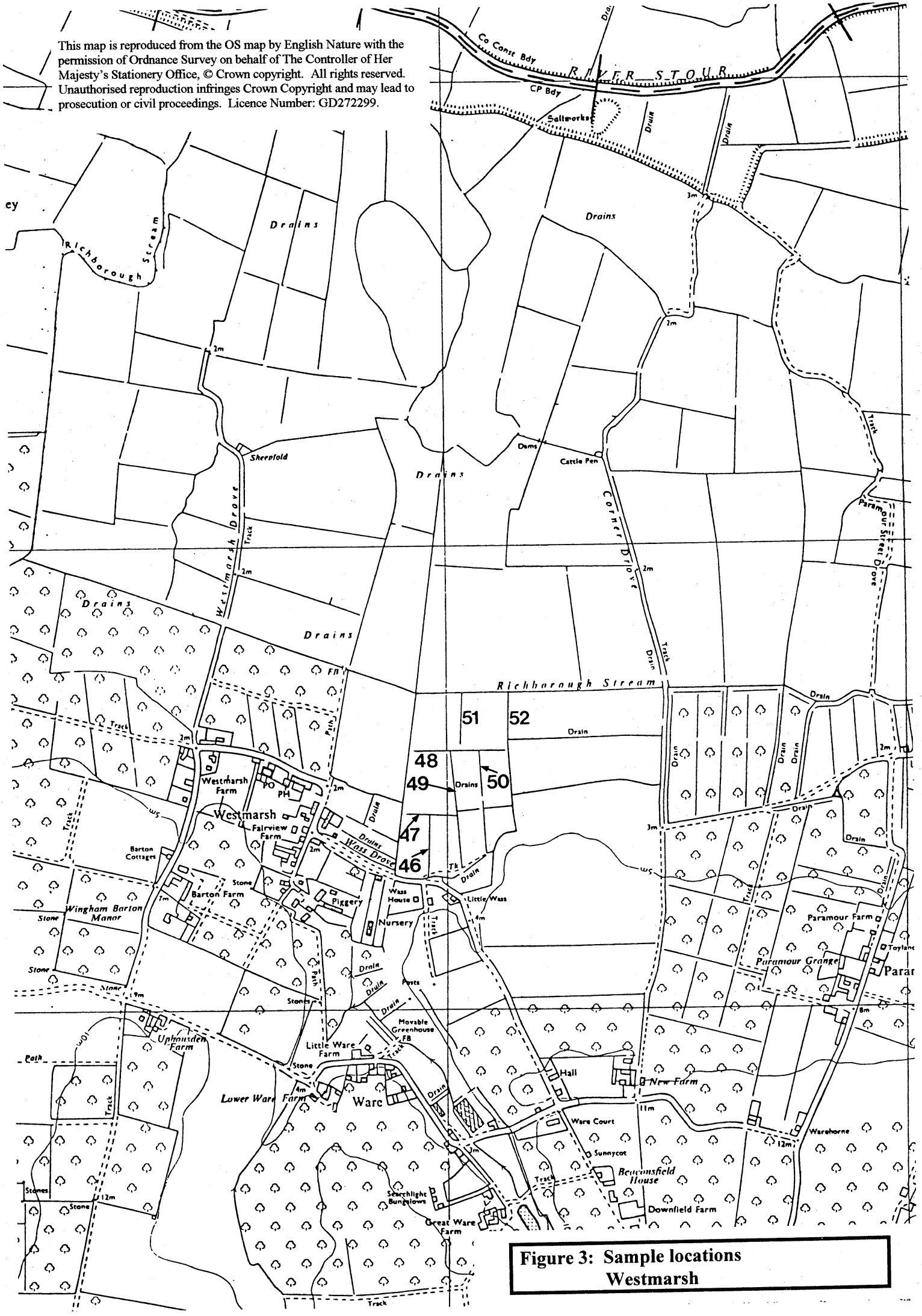

Figure 3: Sample locations Westmarsh

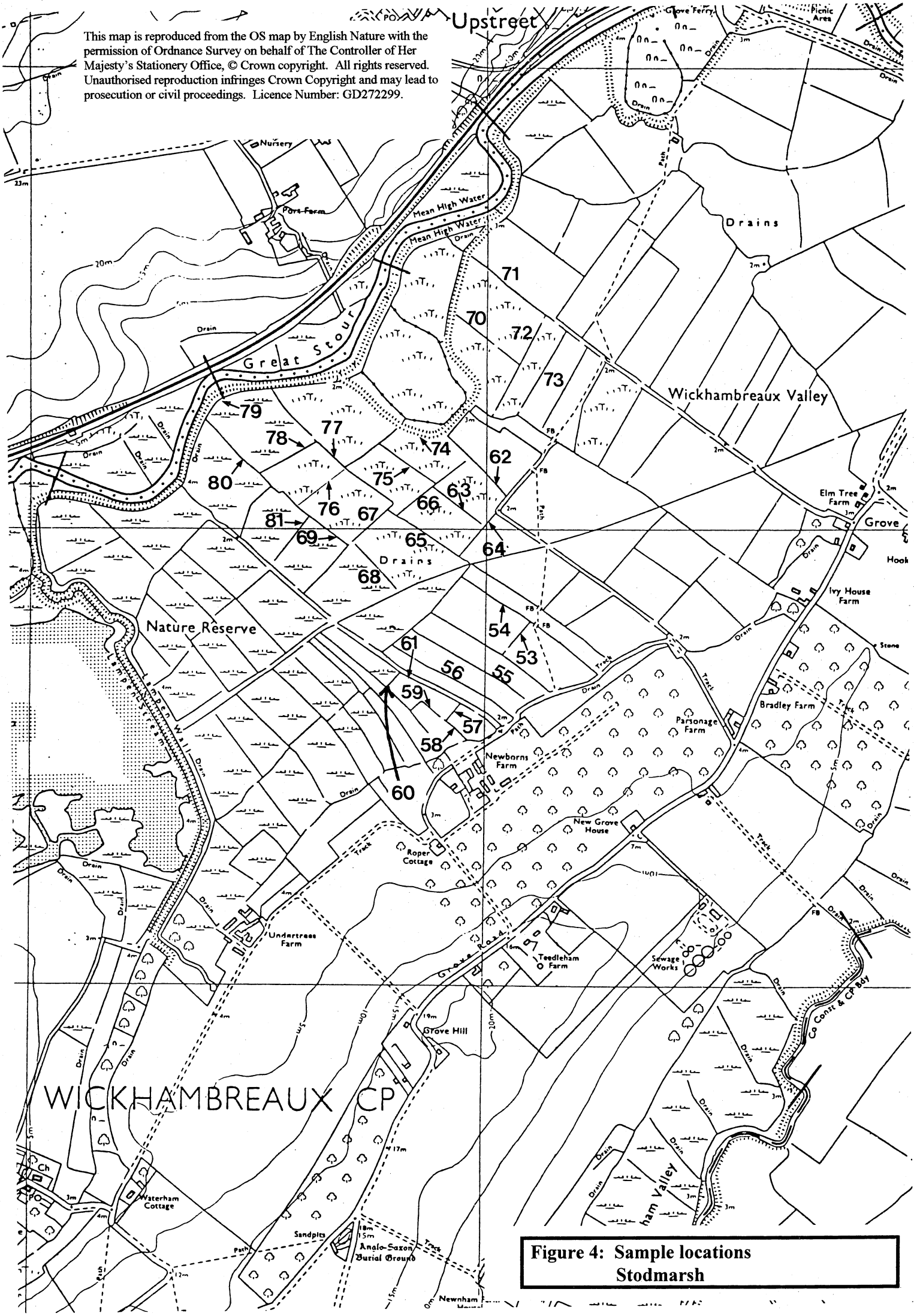

Figure 4: Sample locations
Stodmarsh

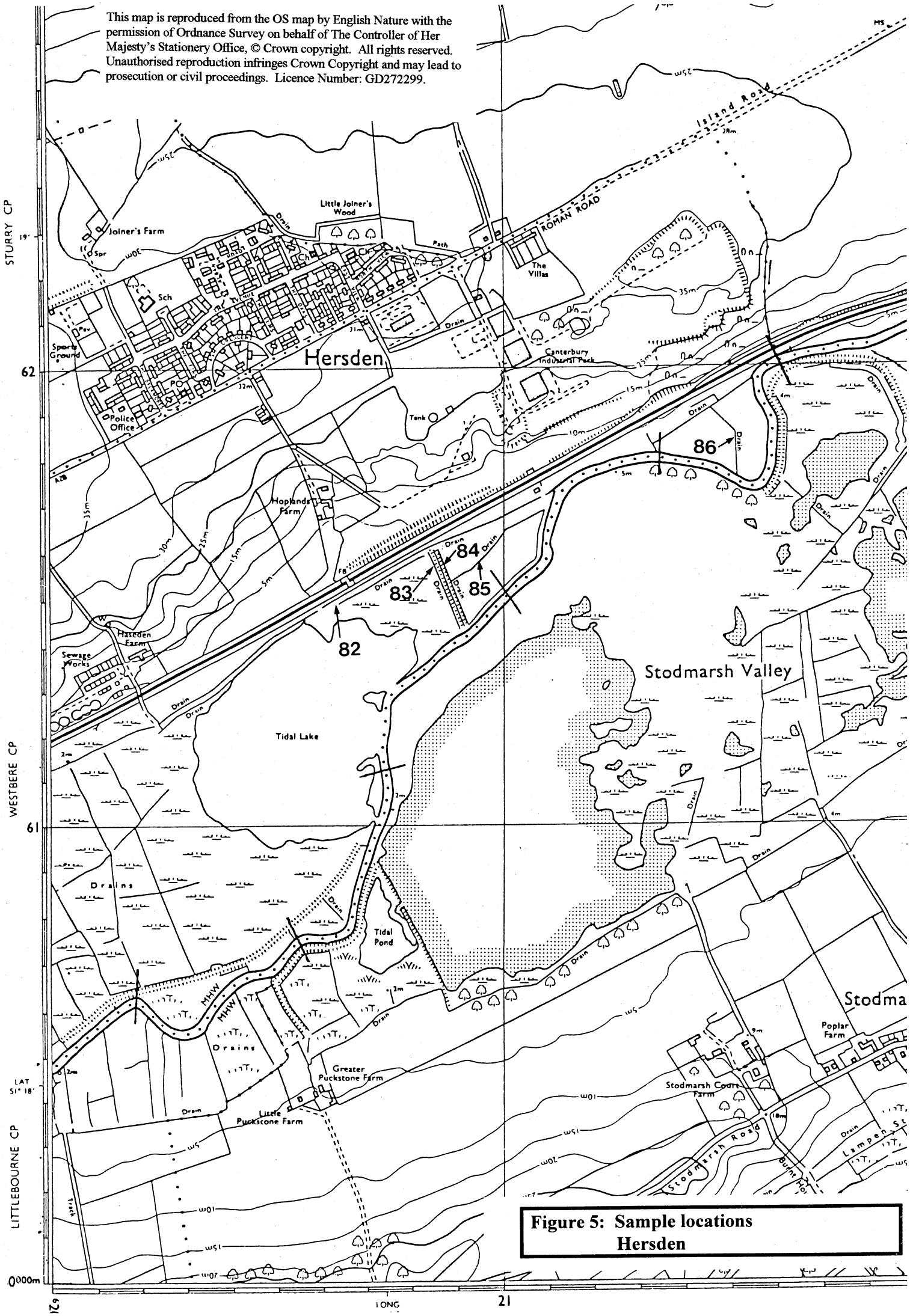

Figure 5: Sample locations Hersden

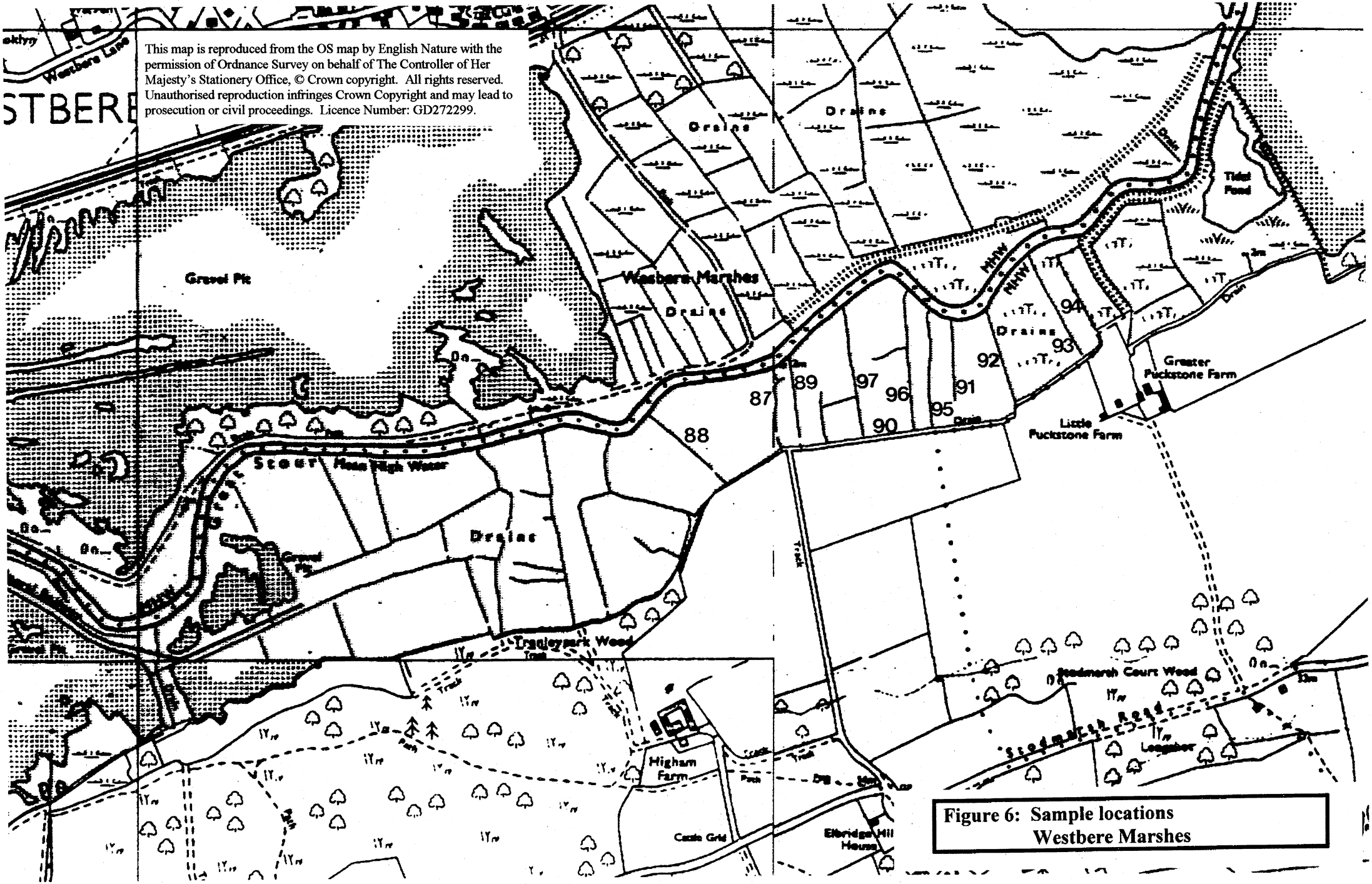

Figure 6: Sample locations Westbere Marshes