

# **The National Soil Map**

**1:250,000 scale**

**Guidelines for survey**

**including the**

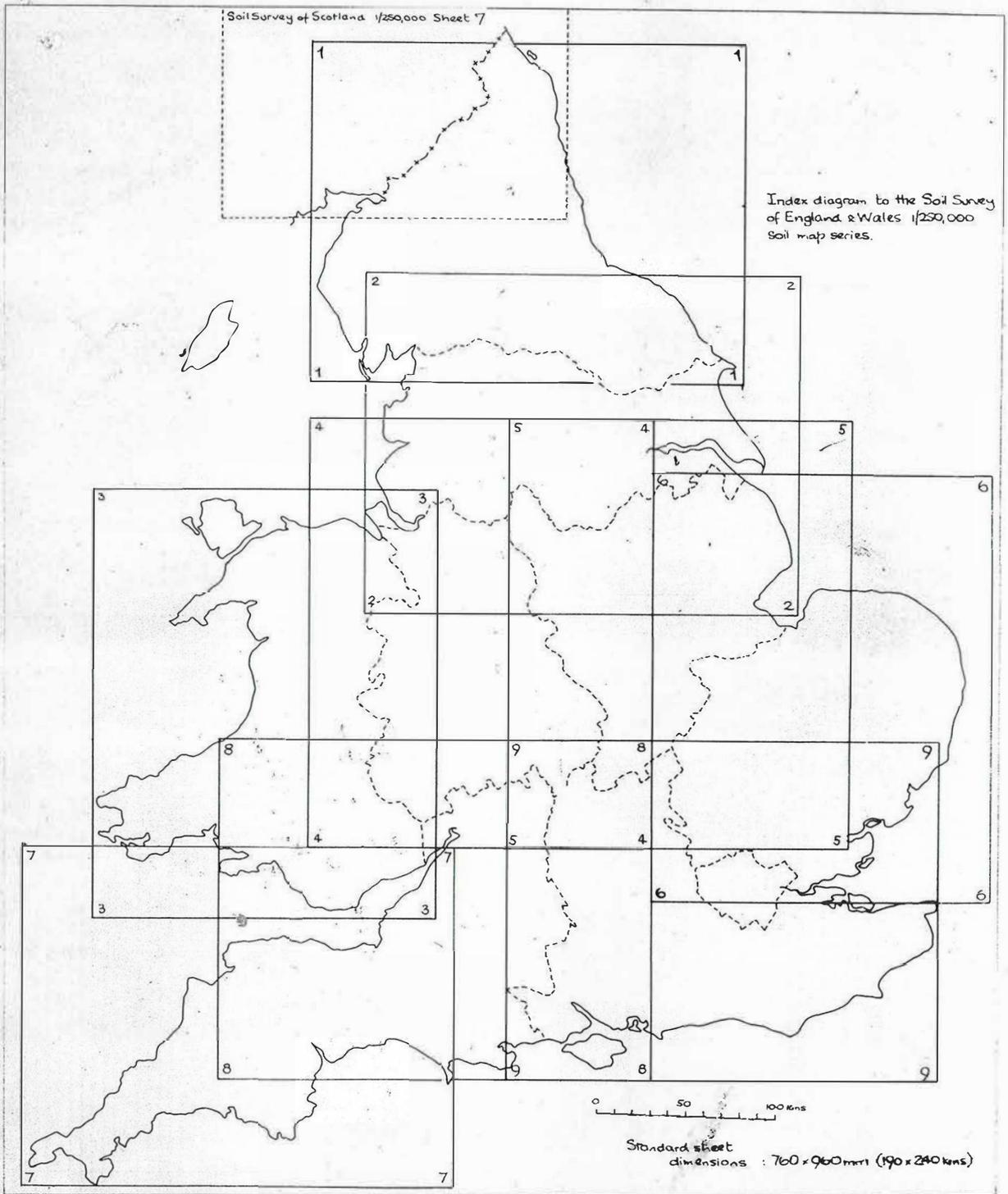
**National Soil Inventory**

**compiled by**

**J. M. Hodgson**

**1979**

**Soil Survey of England and Wales  
Harpenden**



RJAJ

## THE NATIONAL 1:250 000 MAP

### Introduction

The Head of Survey has proposed and our chief customer, M.A.F.F., have approved that the major part of our effort over the next few years should be the compilation of a 1:250 000 map of England and Wales. It is intended that a Land Capability map at 1:250 000 will be published at the same time as the soil map. The soil map will be compiled in such a way that the land capability and other interpretative maps can be derived from it.

Our newly revised contract is to complete the project within 2-5 years and it is the Head of Survey's intention to meet this contract. It is anticipated that the maps and accompanying text when published will not only fulfil the immediate objective of providing complete cover of the country on a more or less uniform basis at a larger scale than hitherto, but that it will stimulate demand for further more detailed mapping and for further soil survey interpretations.

Because of the short 5-year time scale the Survey is about to enter a period of intensive activity which must be synchronised and closely co-ordinated.

### Timetable

Although in the past we have had mapping programmes with implied timetables (e.g. Board Paper 1, K.E. Clare 1966), these have never been met. This is perhaps not because the timetables were unachievable, but because the projects were long term, the timetables were not strictly applied, and staff selected other worthwhile activities, many of which have greatly benefited the Survey.

The new programme differs in that

- (a) the time scale is short,
- (b) the project is broad in scale and large in extent,
- (c) the effort will be concentrated.

The new project thus needs close inter-regional correlation and this in turn means that it is essential that staff keep on schedule. It is obviously important to avoid unrealistic time scales and accordingly the work has been planned to fit the timetable. The aim is to prepare a map of high quality in the time available.

For the purposes of discussion the country is classified into three main categories:

1. Black areas - those for which we have detailed survey published at 1:63 360 or larger.
2. Grey areas - those for which we have reconnaissance surveys published at 1:63360 or smaller.
3. White areas - those for which we have no soil survey at all.

Obviously the quality of mapping within black and grey areas varies greatly, and these two categories could even be considered to overlap in value for the purposes of the 1:250 000 project. However, for clarity, the definitions should be strictly applied in discussions.

As a broad strategy we will tackle the white areas first to the exclusion of other aspects of the programme. Initially field work will be on the more remote white areas.

We have the following general timetable:

- (a) April 1st 1979-May 31st 1981. Fieldwork in hitherto unsurveyed (white) areas.
- (b) June 1st 1981-November 30th 1981. Necessary fieldwork (resurvey) and adaptation of existing small-scale maps in previously surveyed (grey and probably some black) areas.
- (c) December 1st 1981-March 31st 1982. Final correlation and compilation of national map and legend. Preparation of booklet to accompany national map (Headquarters staff, Regional Officers and other staff where necessary).
- (d) April 1st-September 30th 1982. Printing, proof reading of maps and booklet.
- (e) October 1st 1982. Publication of set of national soil maps with booklet.
- (f) December 1st 1981-October 1st 1983. Writing, preparation and editing of regional memoirs. This will initially involve all previously on the project but it is envisaged during this period staff will be gradually transferred back to detailed mapping, contract work and other projects as and when convenient or necessary.

- (g) October 1st 1983-March 31st 1984. Printing, proof reading of regional memoirs.
- (h) April 1st 1984. Publication of regional maps and memoirs.

#### Staffing

Consultations with the Head of Survey and Regional Officers have indicated that staff will be available as in Table I. This table was compiled assuming that all staff will have cleared their backlog of 1:25 000 mapping and writing and that they will be completely clear to start on the date indicated.

The period from April 1st 1979-May 31st 1981 will be one of concentrated effort. In general once a person is on the project he will be committed solely to the programme and will, unless there are exceptional circumstances, undertake no other work. One such exception may be for urgent contract work. It would be unreasonable when the Survey is trying to attract contract work from bodies outside M.A.F.F. not to have staff available. By the time the first stage is over it will be possible to be more relaxed and for staff to become involved in other projects. In general other activities can be deferred until at least the mapping of the white areas is complete.

The estimates of staff availability during the initial period to May 31st 1981 provided by Regional Officers are summarized in Table II, which gives the man/years available during that period by ADAS regions. Table III gives the areas of the counties and regions and Table IV summarizes available mapping and gives the unsurveyed (white) areas for each region. Table V gives a summary of mapped areas and manpower available for the separate regions. Because of the need to concentrate the effort and to synchronise the programme so that all white areas come to completion at about the same time, staff will be asked to work for short periods in other regions when this proves necessary.

Table I Availability of Staff for 1:250 000 Mapping

Region and Office	Name	Present projects	Progress to November 1978	Available for National map	Remarks
Northern Yorks and Lancs Harrogate	R.A. Jarvis	SE85 (Fridaythorpe)	Record to write. Will have 5 Records to edit June 1979	1 April 1979 (part time)	
	R.I. Bradley } J.W. Allen }	SE47 (Dalton)	80% mapped To be written up	1 June 1979	
	D.M. Carroll	Upland survey (1:100 000)(Alston Block)	Work can be incorporated in $\frac{1}{4}$ million project	1 April 1979	
Beverley	R.R. Furness	TA14 (Brandesburton)	Mapping complete To be written	1 June 1979	
	S.J. King	SE97N/98S (Wykeham Abbey)	Mapping complete To be written	1 June 1979	
Penrith	B. Matthews	NY04/05/14/15 (Abbeytown)	Map complete 1st draft text complete?	1 April 1979	
	I.N.L. Kilgour	NY56 (Brampton)	Mapping almost complete Record to write	1 June 1979	
	V.C. Bendelow	Upland survey (1:100 000) Lake District	Work can be incorporated in new $\frac{1}{4}$ million project	1 April 1979	
Eastern Cambridge	C.A.H. Hodge	General RO's duties	6 Records to edit	1 April 1979 (part time)	Say $\frac{1}{3}$ time in supervisory capacity
	R. Evans	Research projects	Almost completed. Will be written up by 1 April	1 April 1979	To do routine work in E. Anglia. Also to arrange air photo supply and to do air photo interpretation of selected lowland areas (in other regions if need be)
	R.G.O. Burton	TF00/10 (Stamford/Peterborough NW) TL54 (Linton)	Writing almost complete Mapping complete Write up to do	1 June 1979	

Table I (cont. 1)

Region and Office	Name	Present projects	Progress to November 1978	Available for National map	Remarks
Eastern Cambridge	R.S.Seale	TL34 (Royston)	Mapping complete Writing to do	1 November 1979	Substantial backlog of writing. TF60/61 started by D. Eldridge. W.M. Corbett currently doing mapping. Abandon this?
		TF60/61 (Downham Market/Kings Lynn S) TL76E/86W (Risby)	9 months field work left. RSS to write up Mapping complete Writing to tidy up		
Norwich	W.M.Corbett	Norfolk map	To be written up Legend not yet finalised	1 November 1979 <sup>U.F.</sup>	TL94 to be abandoned
		TL94 (Lavenham)	Done reconnaissance 3 months work		
	J.R.Price	TMO6 (Finningham)	Half mapped	Unavailable	
East and West Midlands Shardlow	J.M.Ragg			1 April 1979 (part time)	Backlog of work from Scotland?
	M.J.Reeve	SK78N/79S (Gringley on the Hill)	Mapping complete To be written	1 June 1979	
Lincoln	H.George	TF39 (Covenham)	Mapping almost complete Record to be written	1 April 1979	Record will be in brief format
	J.D.Robson	TF45 (Frickney)	30 km <sup>2</sup> mapped	1 June 1979	Will possibly be later than this
	F.W.Heaven	TF36 (Old Bolingbroke)	Mapping 50% done	1 September 1979	Will have help from MJR and New Zealand colleague to finish mapping?
Wolverhampton	R.C.Palmer	S0 85 and 95 (Worcester and Upton Snodsbury)	Mapping complete Writing up	1 April 1979	
	J.M.Hollis	SK00 and 10 (Lichfield)	65% mapped	1 December 1979	
	R.J.A.Jones	SK02 and 12 (Abbot's Bromley and Draycott in the Clay)	Mapping complete Writing up	1 July 1979	

Table I (cont. 2)

Region and Office	Name	Present projects	Progress to November 1978	Available for National map	Remarks
East and West Midlands Wellesbourne	W.A.D. Whitfield	SP 25 and 35 (Stratford-upon-Avon E)	75% mapped To be written up	1 September 1979	
	G.R. Beard	SP27 and 37 (Kenilworth and CoventryS)	75% mapped To be written up	1 September 1979	
South Eastern	M.G. Jarvis		6 Records to edit	1 June 1979	Could give $\frac{1}{2}$ time to field-work. Would do I.O.W. and Hants
	S.J. Fordham	TQ05 (Woking)	80% mapped To be written	1 June 1979	Surrey and West Sussex
Chelmsford Alice Holt	R.G. Sturdy R.H. Allen	TL83 (Halstead)	65% mapped To be written	1 July 1979	Sturdy and Allen to do part of Essex with help from Eastern region and move to new office 1 April 1980.
Oxford	J. Hazelden	SP60 (Tiddington)	Mapped; 1st draft of text complete	1 May 1979	
Wye	R.D. Green	TQ64 (Paddock Wood)	50% mapped	Unavailable	
South Western Bristol	D.C. Findlay	Somerset peat survey	Substantial editing in 1979	1 April 1979 (part time)	
	D.W. Cope	Gloucester county	Mapping more or less complete	1 May 1979	Gloucester mapping to be used for next project. Will work at first with Staines in Cornwall
Starcross	G.J.N. Colborne	SO 61 (Cinderford)	Mapping complete	1 June 1979	
	T.R. Harrod D.V. Hogan	SS74 (Lynton)	Map and Record will be complete 1 May 1979	1 May 1979	Will go temporarily to Cornwall
St. Austell	S.J. Staines	SW61, 62, 71 and 72 (Lizard)	Mapping being tidied up Record to be written	1 May 1979	Has an April 1 deadline

Table I (cont. 3)

Region and Office	Name	Present projects	Progress to November 1978	Available for National map	Remarks
Wales Swansea	B. Clayden	SN50 (Llanelly N) and RO's duties	Mapping complete To be written	1 April 1979	Part of correlation duties to be applied to 1:250 000 map.
	P. S. Wright	SN72 (Llangadog)	Fieldwork complete. Map in preparation. First draft of Record to RO by 28.2.79.	1 April 1979	
Aberystwyth	C. C. Rudeforth	Pembrokeshire County	Mapping complete. Map with Cartography Dept. but legend not finalized. First draft text with RO 30.11.78.	1 August 1979	
Mold	R. Hartnup	SN45/46 (Llanarth/Aberayron)	10% surveyed	1 April 1979	SN45/46 abandoned
	J. W. Lea	SJ24 (Llangollen)	Fieldwork complete. Map in preparation. Record to RO 31.12.78.	1 May 1979	Optimistic date for Record to RO?
	T. R. E. Thompson	SJ21 (Arddleen)	Fieldwork complete. Map in preparation. First draft to RO 31.12.78.	1 April 1979	

Table II Availability of Staff for  $\frac{1}{4}$ -million Mapping and National Soil  
Inventory Duties During Period April 1st 1979-June 1st 1981 by  
ADAS Regions (man/yrs)

↳ Aug 1<sup>st</sup> 1981

R.A. Jarvis (part time)	0.92		M.G. Jarvis (part time)	0.75	
R.I. Bradley	1.92		S.J. Fordham	1.92	
J.W. Allison	1.92		R.G. Sturdy	1.17	
D.M. Carroll	2.17		R.H. Allen	1.17	
R.R. Furness	1.92		J. Hazelden	2.09	
S.J. King	1.92		R.D. Green	<u>0.00</u>	
B. Matthews	2.17		Total South-eastern		7.10
I.N.L. Kilgour	1.92				
V.C. Bendelow	<u>2.17</u>		D.C. Findlay (part time)	0.75	
Total Northern		17.03	D.W. Cope	2.09	
			G.J.N. Colborne	1.92	
C.A.H. Hodge	0.00		T.R. Harrod	2.07	
R. Evans	2.17		D.V. Hogan	2.07	
R.G.O. Burton	1.92		S.J. Staines	<u>2.07</u>	
R.S. Seale	1.57		Total South-western		10.97
W.M. Corbett	1.57				
R.G. Sturdy <sup>1</sup>	0.67		P.S. Wright	2.17	
R.H. Allen <sup>1</sup>	0.67		C.C. Rudeforth	1.85	
J.R. Price	<u>0.00</u>		R. Hartnup	2.17	
Total Eastern		8.57	J.W. Lea	2.09	
			T.R.E. Thompson	<u>2.17</u>	
J.M. Page	0.85		Total Wales		10.45
M.J. Reeve	1.92				
H. George	2.17				
J.D. Robson	1.92		Grand Total		<u>72.05</u>
F.W. Heaven	1.92				
R.C. Palmer	2.17				
J.M. Hollis	1.67				
R.J.A. Jones	1.92				
W.A.D. Whitfield	1.77				
G.R. Beard	<u>1.77</u>				
Total Midland Regions		17.93			

<sup>1</sup> Before transfer from Essex

Staff Available in Other Capacities

J.M. Hodgson	2.00	(Manager)
B. Clayden	1.25	(Series correlation)
A.J. Thomasson	0.50	(Applications/land capability aspects)

Table III England and Wales Areas of Counties and Grouped ADAS Regions  
(Figures from Whittakers Almanac)

Northern and Yorks and Lancs	km <sup>2</sup>	Eastern	km <sup>2</sup>	East Midland and West Midland	km <sup>2</sup>	South Eastern	km <sup>2</sup>
Cumbria	6807	Cambridgeshire	3409	Hereford and Worcester	3926	Isle of Wight	380
Durham	2436	Norfolk	5355	Salop	3490	Hampshire	3781
Lancashire	3039	Suffolk	3807	Staffordshire	2716	Surrey	1679
Northumberland	5033	Essex	3674	Warwickshire	1980	West Sussex	2016
Yorkshire North	8309	Hertfordshire	1634	West Midlands	889	Berkshire	1255
South	1560	Bedfordshire	1234	Cheshire	2328	Oxfordshire	2611
West	2039	Greater London (half)	789	Derbyshire	2631	Buckinghamshire	1881
Cleveland	583			Leicestershire	2553	Kent	3732
Greater Manchester	1284			Lincolnshire	5886	East Sussex	1795
Humberside	3511			Northamptonshire	2367	Greater London (half)	789
Merseyside	646			Nottinghamshire	2164		
Tyne and Wear	539						
<b>Total</b>	<b>35786</b>		<b>19902</b>		<b>30930</b>		<b>19919</b>

South Western	km <sup>2</sup>	Wales	km <sup>2</sup>	England and Wales
Cornwall	3546	Gwent	1376	
Devon	6710	Gwynedd	3866	
Gloucestershire	2641	Dyfed	5765	
Somerset	3449	Glamorgan West	818	
Wiltshire	3481	Mid	1018	
Dorset	2654	South	416	
Avon	1346	Clwyd	2426	
		Powys	5078	
<b>Total</b>	<b>23827</b>		<b>20763</b>	<b>151127</b>

Table IV Detailed Surveys, Small-scale and Reconnaissance Surveys  
and Unsurveyed Areas by (Grouped) A.D.A.S. Regions

Northern and Yorks/Lancs

Detailed survey		
1:63,360 (70,19,75,66,83)	2411	
1:25,000 (NY 04/05/14/15,36/37,53,56; NZ 07; SD 58; SE Castleford, 36,39, 49,49/59,59,60,63 & 73,64,65,74,76, 78/79,85,Parts 88/89/98/99, 97/98; TA 14; SK 59)	<u>2613</u>	5024

Small-scale and reconnaissance surveys

Lancashire	3039	
Merseyside	646	
Greater Manchester	1284	
South Yorkshire	1360	
West Yorkshire	1939	
Pennines (N. Yorks/Durham)	3392	
North York Moors	976	
Northumberland Hill Farm Project	964	
Pennines (Cumbria)	<u>332</u>	13932

Unsurveyed 16530 35486

East and West Midlands

Detailed survey		
1:63,360 (142,125,138,166,187)	2799	
1:25,000 (SJ 32,45/55,65,82; SK 00/10 02/12,05,17,32/42,57,66,78/79,99; TF 28,39,45,16,04; SO 34,52,53,74, 79/89,85 & 95,87; SP 05,25 & 35, 27 & 37,29 & 39,36,47,48,66)	<u>3800</u>	6599

Small-scale and reconnaissance surveys

Derbyshire (less Derby sheet)	2080	
Cheshire	2028	
Salop (less 138,166 and part 181)	<u>2318</u>	6426

Unsurveyed 17905 30930

Eastern

Detailed survey		
1:63,000 (173,188,238 Part)	1304	
1:25,000 (TG 14/13,11,31; TM 12,28, 49; TF 00/10,60,61,82; TL 34,54, 26,18/28,38,39,76/86,71,83,94; TQ 59,99; Breckland)	<u>2525</u>	3829

Small-scale and reconnaissance surveys  
(excludes included detailed mapping)

Saffron Walden	1662	
Luton and Bedfordshire	1768	
Norfolk	4125	
Cambridge and Ely (less 173,188 and Norfolk)	529	
Hertfordshire (excluding Luton and Beds and Saffron Walden)	<u>517</u>	8601

Unsurveyed 7472 19902

South Eastern

Detailed survey		
1:63,360 (253,268,238 Part)	1491	
1:25,000 (West Sussex; Romney Marsh; TR 04,05; TQ 05,64,86; SU 30,60;	<u>1475</u>	2966

Small-scale and reconnaissance surveys  
(areas given exclude detailed mapping  
within the counties etc. indicated)

Kent	3102	
Banbury	300	
Buckinghamshire	1567	
Oxford	100	
Berkshire	<u>751</u>	5820

Unsurveyed 11133 19919

Table IV (cont.)

South Western

## Detailed survey

1:63,360 (251/265,280,296,279, 325/339)	3301	
1:25,000 (SO 61,72,82; SP 12; SS 30, 61,63,74/75, Exmoor Forest; ST 10, 73; SU 05/06,03; SW 53, The Lizard; SX 18,47,68/78, Teign Valley)	<u>2125</u>	5426

Small-scale and reconnaissance surveys.  
(Areas given exclude detailed mapping)

Avon	560	
Gloucestershire	<u>1751</u>	2311

Unsurveyed	<u>16090</u>	<u>23827</u>
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Wales

## Detailed survey

1:63,360 (94,106,95,107, Anglesey, 262,263,163,178, Pwllheli (ex. Anglesey)	3900	
1:25,000 (SJ 17,21,24,35; SM 90,91; SN 13,24,41,45,50,62,72; SO 09)	<u>1400</u>	5300

## Small-scale and reconnaissance surveys

Pembrokeshire (less detailed mapping)	1290	
Dee catchment (less detailed mapping)	900	
Glamorgan, Brecon and Monmouth (less detailed mapping)	<u>4851</u>	7041

Unsurveyed	<u>8422</u>	<u>20763</u>
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Table V Summary of Mapped Areas and Manpower - (Grouped) ADAS Regions (km<sup>2</sup>)

Region	Total area	Black	Grey	White	Built up <sup>1</sup>	Area of initial survey	Man/yrs <sup>2</sup>	km <sup>2</sup> /man yr <sup>3</sup>
Northern Yorks and Lancs	35786	5024	13932	16530	1600	14930	17.03	877
Eastern	19902	3829	8601	7472	1016 <sup>5</sup>	6456	8.57 <sup>4</sup>	753
East Midland and West Midland	30930	6599	6425	17905	1460	16445	17.93	917
South Eastern	19919	2966	5820	11133	1247 <sup>5</sup>	9886	7.10	1392
South Western	23827	5426	2311	16090	483	15607	10.97	1422
Wales	20763	5300	7041	8422	398	8024	10.45	767
	151127	29144	44131	77552	6204	71348	72.05	

<sup>1</sup> Estimate within white areas

<sup>2</sup> Period April 1st 1979 - June 30th 1981

<sup>3</sup> White areas/man years April 1st 1979 - June 30th 1981

<sup>4</sup> R.G. Sturdy and R.H. Allen to work in Essex until 1st April 1980

<sup>5</sup> Includes half of Greater London

## Classification

### Higher levels

The classification will be that of B.W. Avery's monograph in preparation. At a meeting of D.M., B.W.A., B.C. and J.M.H. on 13 November 1978 it was agreed that it would be inappropriate to publish the 1:250 000 on the present system of classification (Avery 1973, 1977) at approximately the same time as B.W.A.'s new classification would appear. We felt that the 1:250 000 map should reflect the current stage of development of our classification so B.W.A. agreed to produce by June 1st 1979, a working document on the classification to subgroup level which is at least as comprehensive as a combination of the 1973 paper and its 1977 supplement including any necessary changes to horizon definitions as at present in the Handbook. Every effort will be made to speed the printing of this document and it will appear as a slim monograph by September 1st 1979. B.W.A. will introduce the new classification for the mapping programme at the Training Meeting at Keele.

### Soil series

The classification sub-committee have made sufficient progress on the rationalization of soil series for the major series to be grouped where necessary and redefined for use in the 1:250 000 mapping programme. This essential preliminary to the new programme will make the considerable task of correlation during the mapping period much simpler. Ben Clayden intends to present the sub-committee's final proposals by June 1st 1979 and will give an interim outline at Keele.

### Legends

Tony Hodge has suggested that the legend for the 1:250 000 map should be keyed by numbers that relate to our soil classification and that the legend should be open ended. This has the advantage that map units can be added to or deleted from the legend easily. The working legend will therefore be constructed in the following way: map separates are identified by the

'key' subgroup within them. They are labelled by the figure codes of the national classification with the decimal point removed. For example, a map unit in which typic sandy brown soils (Avery (1979) code 2.41) are most extensive will be coded 241. Map units normally have associated subgroups that need to be recorded so they will be affixed a lower case letter. For example, 241a could be the code for a map unit with dominant typic sandy brown soils with associated typic orthic podzols, whilst 241b could be typic brown soils with luvic sandy brown soils. The working legend and the various draft maps will be colour coded to subgroup level (approximately 100 colours). The 'key' subgroup is not necessarily the subgroup known to be most extensive within the map unit, but can be a non-dominant but characteristic subgroup in a unit composed of dissimilar soils. (See Appendix 3 for similar and dissimilar soils and kinds of map units).

The proposed headings for the working legend are as follows:

Key Subgroup (Avery 1979)	Associated Subgroup (up to 2 only)	Simple or Compound	Series names	Geology	County Map No.	Subgroup (Avery 1973/77)
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The published form of the legend will be decided when its scope becomes clear and cartographic aspects can be taken properly into account. Meanwhile the above standard layout will be used.

#### Correlation

Regions have already been asked to prepare drafts at 1:250 000 scale and have compiled provisional lists of their likely more important mapping units. From these a national register of provisional map units is being prepared. The construction of the draft working legend from the provisional list will require skilled if intuitive judgement in the early stages. Judgement of the kinds of soils, the patterns in which they occur and the kinds of map unit to cater for them. The paper 'Soil Map Units 1:250 000 maps and Other Map Scales' given by B.W.A. at the 1973 Regional Officer's meeting on 1:250 000 maps gives a useful appraisal of the different kinds of map units

incorporating ideas from the draft revision of the U.S.D.A. Manual.

Regional staff are asked to review systematically their boundaries with adjacent regions to anticipate correlation problems before they arise. Correlation in the first instance will be between surveyors in adjacent or similar working areas under the guidance of their Regional Officers. Regional Officers are expected to be in close and frequent touch with each other on soils and map units of common interest. The Mapping Manager will assist and advise on the correlation of map units and will prepare the national legend. The decision to confirm a provisional map unit may depend upon one or more of several factors including:

- (a) extent of unit nationally,
- (b) cartographic clarity,
- (c) similarity of surrounding soils,
- (d) ease with which the unit can be mapped in the field.

Ben Clayden will give guidance on series definition and take an active role in series correlation. It is envisaged that the Mapping Manager and the Correlator (B.C.) will spend much of their time travelling between regions. A formal system for the establishment of map units will be set up and there will be a standard procedure for consulting/informing all other possible interested parties. The correlation procedure will necessarily require many arbitrary decisions. In the preliminary stages it is proposed to make the best possible use of existing small-scale and detailed maps and other data. The links between soil, landscape and geology will be exploited to the full. It is hoped that the generalization of map units in surveyed areas based on geology of the landscape will allow extension of these units to unmapped districts in which geological and landscape patterns are clearly recognizable either on the ground or during air photograph interpretation. Help too, in the establishment of map units and the drawing of their boundaries is expected from climatological studies and slope maps.

The Mapping Manager will need considerable help with correlation and will have special links with various individual members of staff (correspondents)

who will advise him on the correlation of soils of particular landscapes or geological formations.

#### Correlation with Scotland

Although England and Wales and Scotland use different soil classifications and different nomenclatures for their map units the nature of the landscape units that will be recognized will be similar. The Heads of Surveys have agreed that we must ensure that the boundaries of the soil map units and units shown on any derived maps (e.g. Land Classification map) must correspond across the Anglo-Scots border. John Bibby has been nominated as liaison officer for Scotland and will work closely with the English Mapping Manager and the Regional Officer, Northern Region.

#### Mapping White Areas

During the survey of white areas sampling for the 1:250 000 map programme and for the national soil inventory will be done in parallel. Staff in all regions should do relatively inaccessible 1:25 000 sheets first. Because in the past we have tended to look at convenient, accessible or pleasant areas there are some notable blanks. Wherever other factors do not interfere, regional staff should tackle the most distant of these first. The aim during the first years is to continue survey all the year round, weather permitting. Regional Officers are asked to plan their mapping programmes so that crop and soil difficulties in the summer months do not interfere with survey. With the wide range of terrain available it is expected that crops and soil conditions will cause little impediment. If necessary staff in lowland areas whose progress is impeded can be transferred for short periods of detached duty to upland areas.

#### The Collection of Computer Compatible Data

Most staff agree the value of systematic recording of the simple field observations. During the field work for the current programme there will be extensive field investigation of white and grey areas so it seems appropriate

that the universally applied system of day to day field recording should be introduced and it would be advantageous if it were computer compatible. The programme is limited in time so any new field recording method should be designed to be friendly to surveyors and not to slow down their rate of survey. When the 1:250 000 map and the national soil inventory are complete the data collected can be used as input to GRIDCAMAP - a computer areal mapping program available at the Edinburgh and Newcastle computing centres. Using this unsophisticated program we can produce cheaply and quickly, line-printer maps of single or combined variables of the whole or part of an spatially organized data set. The user can also compare similarly produced maps of any part of the Agricultural Census which is already arranged on a parish and a 5 x 5 km<sup>2</sup> basis in digital form as part of the CAMAP 6 program at Newcastle.

#### Method and Intensity of Survey

The method and intensity of survey is dictated in part by the time and staff available. I assume that staff will be able to achieve 140 field days per annum. This figure is based on consideration of actual field days achieved by staff on detailed survey. The intensification of effort by all staff during the 1:250 000 mapping programme will make 140 field days a realistic personal target for field staff.

To finish the white areas on schedule each surveyor must complete one 1:25 000 sheet in 10 days including the description of four mini-profiles for the national soil inventory. It is planned that the surveyor will do free survey at a density of approximately 2.5 inspections per km<sup>2</sup>. This estimate assumes that small pit/auger borings can be made at the rate of 30 per day where one farm/estate is visited and 25 per day where two or more farms have to be visited. Actual density will depend upon terrain e.g. fewer borings may be needed on upland peat where boundaries are clear from air photo interpretation and the content of the map unit has proved to be reasonably

uniform. To achieve some degree of national unity the intensity of observations in landscapes of similar types should be at similar densities. There will be about 194 000 observations in white areas and it is estimated that there will be a further 75 000 in grey areas so the national survey will collect brief records for approximately 270 000 subjectively chosen sites.

To facilitate the input of the information from the national soil inventory and these auger borings it is desirable to record an estimate of the proportion of each map unit to within the 5 km square around every inventory sampling point. This can be undertaken at a late stage in the programme by office staff with appropriate supervision. As GRIDCAMAP output, together with GRIDCAMAP 6 Agricultural Census material, will facilitate the writing and enhance presentation of regional memoirs, these estimates will have to be completed before December 1981.

#### Field Recording

Field sheets will be at the 1:25 000 scale. The detailed field procedure however should be flexible and adapted to the area being surveyed. 1:25 000 is the smallest available scale at which observation points can be recorded accurately. Recent editions have useful accurate contours and good topographical details. Many soil survey centres have substantial reference collections of maps at this scale which can be used, so that the expense will be relatively small. These sheets can be used to record preliminary air photograph interpretation in the office and can be used for drawing/revising boundaries in the field.

Standard records will be made of the small pits/auger borings examined during routine survey, giving between 200 and 300 observations on each field sheet. A new recording form has been devised for use in the field (Appendix 1). Details of the profiles can however be made in conventional written form or on portable tape recorders. Using these methods a check list must be used at all times so that complete records are made. The mnemonic tick-box forms have the advantages that they are computer compatible, are not error prone and

can be 'read' by the surveyor. Surveyors wishing to record in the field in more traditional manner may do so and the tick-box cards can be filled in by office staff later. The observations on each field sheet can be distributed in one of several ways. According to terrain, staff may survey individual sample farms, may survey along traverses or may use a limited area of grid to estimate the content of landscape units. It is expected however that the main emphasis will be on the ad hoc checking of boundaries and the intuitive checking of the contents of landscape units. The soil boundaries will be drawn mainly using geology, topography and air photographs before fieldwork starts.

#### Contemporaneous Field Records for the National Soil Inventory

The grid for the inventory is  $5 \text{ km}^2$  giving four sites on each sheet and a total of 6 000+ points. Its origin is  $\sqrt{2} \text{ km}$  ENE of the origin of the National Grid. In other words the south-western most inventory grid point on each sheet is displaced 1 km east and 1 km north from the south-west corner of the sheet and the others are 5 km east, 5 km north and  $\sqrt{50} \text{ km}$  north-east of this point. This grid has been chosen to avoid points on sheet margins and corners.

Standard profile recording cards similar to those for auger borings have been devised for the mini-profile descriptions at these points. A sample card and instructions are given in Appendix 2. 1 165 of the national soil inventory points are in black areas and these will be dug separately after completion of the main 1:250 000 mapping project.

## Access

Staff should aim to consult farmers personally before entering their land. In some districts it may be possible to get widespread access by approaching estate owners. It is recommended that staff approach local ADAS District Advisers some weeks before access is needed and leave them a 1:50 000 map or sketch maps of the localities of the national soil inventory points in their districts (say 10 2½ in. sheets at a time). ADAS officers may know to whom the fields belong or they will be able to find out during the course of their duties if given a few weeks notice. To save time in contacting farmers, the 50 acres or so around the national soil inventory points should normally be surveyed as part of the free survey for the ¼-million map.

## Re-mapping of Grey Areas

Methods of mapping grey areas will vary widely depending on the accuracy of previous mapping and the compatibility with the current framework of the class concepts, legends and map units used originally. No recommendations are therefore made at this stage.

## Cartographical Aspects

### Presentation of the Map

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of 5*

The use that a soil map gets depends greatly on effective presentation. The map sheets should cover useful areas of country which will attract users. The map should be aesthetically pleasing with a good cartographic balance and the key should be informative and easy to read. Because we hope that the new small-scale map project will stimulate demand for soil survey, aspects of presentation are very important and are therefore considered at this early stage.

### Sheet Lines

1:250 000 maps are available on various sheet lines none of which seem

appropriate for our purposes. The main ones available are:

- (a) the 5th edition Ordnance Survey - maps on these sheet lines will be available for some years as the Ordnance Survey has a contract with another agency to keep printing and revising them.
- (b) 6th edition Ordnance Survey - the sheets are too large and do not fit either our regions or ADAS regions.
- (c) the Geological Survey edition - the sheets are small uniform in size, some have substantial areas of sea, they do not fit our regions and the topographical detail is sparse.

Ellis Thomson has investigated the possibility of having standard sheets on our own sheet lines and it is proposed that England and Wales (excluding the Isle of Man) be covered by nine standard sized sheets (76 x 96 cm in area). The South Western and Northern regions because of shape and size require two standard sheets with overlap, other regions are covered by one sheet. The paper size of the proposed sheets is similar to that of the Ordnance Survey 1:50 000 series (90 x 98 cm). The standard sheet size has advantages in presentation, folding and packaging. Each sheet will have a simple key and the expanded explanatory legend will be printed on a separate sheet of the same size. Maps and the legend will be available as a looseleaf atlas of ten sheets folded to A4 size, packaged in a stiff cardboard container with external labels for library display. The standard Ordnance Survey 1:250 000 5th series topography will be used as a base map which will have the National Grid network at 10 km intervals, water features will be shown in blue for clarity. Soil Survey map titles and marginal information will be added as required.

Identical maps will be available for inclusion in the proposed regional publications (see below) and no additional cartography will be required. The regional boundaries can be over-printed if thought necessary. Soil lines, symbols and colours will be continued to the sheet edges and not confined to regional areas. Flat and folded sheets will be available for single sheet sales. As the full legend is to be published on a separate sheet, careful consideration will be given to the explanation of soil units on individual

sheets.

It is possible that there will be a large print run, and the unit cost could be considerably less than that of existing Soil Survey maps. It is proposed that the map has a suitable number (about 100) of appropriately pale colours which do not obscure the underlying base detail.

#### Minimum Map Separate

The basic minimum size of map delineations is 250 ha (16 mm<sup>2</sup>). This is only a guide for field staff. The final map must be clear and cartographically pleasing. The number of delineations per unit area of the map, the soil pattern (whether linear or not), the choice of colours, the relationship of the base detail and to the landscape itself, are all factors which indicate what can be clearly shown. Too many adjacent small delineations may be illegible and they may have to be organized at a late editing stage particularly if symboling becomes too complex. In general, delineations on the final map will be much larger than 16 mm<sup>2</sup> and they will contain their own symbols i.e. there will be few arrows. Thus the size (g) of type-face and the size of map separate will be closely related. Type-face size will be appraised after preliminary drafting of the national map.

#### The Memoirs

The regional memoirs will be substantial volumes to which all regional staff will contribute. Because of the full commitment of staff to field work for the new programme, the output of other publications will presumably decline and it is important for career reasons that all staff receive credit in the form of authorship.

The regional volumes will be uniform in style and layout and reasonably uniform in content. A recommended list of contents and format will be agreed between senior staff before the period of main writing commences. I believe a degree of uniformity is of advantage to, say, an A.D.A.S. user who has

become familiar with the volume for one region when he needs to use the one for another.

To save time and effort some sections will be written centrally. For example, the introductory sections on classification could be drafted by B.W.A. and B.C. These drafts could then be modified slightly if necessary for the individual regions in consultation with Regional Officers.

Another possible candidate for closely co-ordinated centralized writing is climate, the accounts of this should include mainly those aspects relevant to Land Capability and present land use, to soil formation and classification. To avoid unnecessary inconvenience to the Meteorological Office, climatic data for the accounts will be obtained centrally for the whole of England and Wales. This will have other considerable advantages; e.g. all data will be on the same basis. It seems probable that much unnecessary effort will be saved if the climate sections could all be written by one person in co-ordination with regional correspondents. Further consultation will be given to this in consultation with colleagues. If, however, one main author is nominated it is expected that the accounts will not necessarily be uniform in emphasis. Slightly different approaches may be taken for the regions depending upon climatic differences. For example, a large region like Northern Region with a wide range of upland and lowland climates will need more extensive treatment than a small lowland region (Eastern).

Definitive accounts of individual soil series will be written by nominated authors, these will then be circulated to other regions having the series concerned. The accounts can then be slightly modified for the individual region.

It is proposed to issue a set of guidelines and conventions for layout, spelling, nomenclature, etc. so that typescripts need a minimum of minor editing. There will be one version for writers and one for typists to cut down delay. It is hoped that using these guidelines, Regional Officers will

be able to do not only the scientific editing but so process the scripts that the Headquarters editor (D.W.K.) has much less to do and can concentrate on marking up for the printer. Such a set of guidelines will ensure much less reference back to regions, and will considerably increase efficiency and decrease frustration.

*The first time  
the news of X  
to staff*  
The Map Manager invites all staff's views on the content and layout of the memoirs.

#### *we intend.* Communications

To establish clear lines of communication between staff, their Regional Officers and the Mapping Manager, a simple system for monthly progress reporting has been set up. It is hoped that this will not be seen as yet another manifestation of creeping bureaucracy. A simple proforma card for reporting sheets completed, map units encountered and any problems has been devised. As indicated earlier the Mapping Manager hopes to get round all the centres at frequent intervals but it is unlikely that on average he will be able to visit more than one or two centres a week. The introduction of the card is therefore necessary to help anticipate any correlation problems and to monitor progress.

#### Use of Laboratory Resources

With the accent on speed the number of samples sent for mechanical and chemical analysis will be fewer. Pit-digging will not, however, stop completely. There is a need for representative profiles from white areas where new soils may be found and staff will in many cases wish to make new, complete, modern descriptions of profiles from grey or black areas to use as examples in their memoirs. There are still classification problems that need clarification by analysis. It is estimated that on average each surveyor will dig up to eight pits (8 days work) per annum during the next five years for the 1:250 000 project, that is approximately 320 pits, say 1,280 samples

per annum for the survey. In 1977 Rothamsted laboratory dealt with 1,550 samples from 365 profiles and Shardlow 260 horizons from 83 profiles.

#### Land Capability and Applications

A.J.T. is developing Land Capability aspects for the survey. Guidance will be given on the compilation and Land Capability map and on applications aspects of contents of the regional memoirs.

#### Preparation of Draft Regional Maps

All regions have prepared generalized draft maps at 1:250 000 scale so that the possible range, number and nature of landscape units can be assessed at this early stage. From this information a provisional list of the most important map units has been compiled. This will be circulated.

#### Slope Map

The construction of a national slope map at 1:50 000 is under way by vacation workers. This shows three classes:  $\leq 11^\circ$ ,  $11-22^\circ$  and  $>22^\circ$ , and it will be used in making both Soil and Land Capability maps. The maps will be generalized to the 1:250 000 scale.

#### Air Photographs

A preliminary meeting with staff (CCR, DMC, RE) primarily interested in air photograph interpretation was held in November to discuss broad aspects of interpretation and the supply of air photographs. Comprehensive stereoscopic cover of large scale photographs (say 1:10 000) is prohibitively expensive. Good quality small-scale photographs are available and it was decided to get suitable cover for white areas at 1:30 000, 1:50 000 or 1:60 000 that can be used with a magnifying stereoscope. R.E. has picked the best quality available and it has been bought on the 1978/79 account. He has also bought magnifying stereoscopes for centres without them and ancillary

equipment for other centres to bring their stereoscopes up to standard.

R.E. will help regional staff with broad scale pre-mapping interpretation of a limited number of lowland areas for which there are no modern geology maps.

#### Assessment of Upland Grassland

Selected staff have been on a course to Macaulay Institute, Aberdeen, and interpretative guidelines will be prepared for use by staff in upland areas.

#### Project Costing

The project number for the 1:250 000 programme is 08 500. When booking field work in white areas do not forget to book an appropriate time to the National Soil Inventory (1 day in 10). The project number for this will be notified in due course.

#### Peat and Peat Soils

Peat deposits and soils are currently of considerable interest. In their semi-natural state they are the concern of conservationists on reclamation drained peat often forms valuable agricultural land. Lowland peat is increasingly being extracted and there is some concern for the slower permanent loss of peatland by wastage.

The distribution of peat in England and Wales is known in considerable detail but this information has never been brought together in a published map of larger scale than our own 1:1 000 000. The 1:250 000 programme provides us with the opportunity to map peat resources. The minimum map separate will identify most known peat occurrences but because of the local importance of small lowland mires it is suggested that smaller deposits should be identified where possible on the 1:25 000 field sheets.

It is recommended that the following items are recorded in an inventory

of the various peats:

1. The grid reference of its approximate centre.
2. Its area.
3. Thickness range of deposits if known.
4. Its land use, the relative proportions of different uses e.g. active cutting, disused cutting, woodland (kind), grassland, arable, etc.
5. Peat type below 1 m.
6. Organic soil classes in top metre.

Much of this information is already published and D.C.F. will circulate reference lists to Regions.

Detailed mapping and further work on the evaluation of peat reserves could then provide special projects in the period following the national map programme.

#### Acknowledgements

I am indebted to Regional Officers for their contributions to and comments on the timetable and their comments on the original draft; to B.W.A. for notes on map units and similar/dissimilar soils; to B.C. for his appendix on series; to C.A.H.H. for allowing me to plagiarize his scheme for legends; to J.M.R. and R.W. for devising code cards and for ready co-operation; to E.M.T. for clear guidance on cartographic matters.

APPENDIX 1

How to Fill Small Recording Form

Please use a blue or red ball-point pen. Do not use black.

Normal handbook sequence has been kept where possible but some reorganization has been necessary in order to save space. If you must record more than 3 horizons use a second form - but remember to repeat the Grid Reference on the second form. When the record is complete, staple the two forms together.

Environmental Information

Grid Reference - Enter letters representing the 100 km square in the first two boxes, followed by eastings and northings for a 100 m reference point in the remaining blank boxes. If a 10 m reference is required then the dotted zeros in boxes 6 and 10 may be overwritten.

Observer - The surveyor's initials, right justified, should be entered.

Date - Fill in month and year on either side of the thick line.

Series - 12 boxes are provided for series identification using plain language. Left justify the series name. If you wish to save time enter only the first 8 letters of a long series name as this is sufficient for unique identification, e.g.

M O R T O N H A = Mortonhampstead

S bpe - Tick the appropriate class box.

Erosion and Deposition - Tick the appropriate box if applicable.

Rock type - Enter in plain language the appropriate rock type name using standard handbook terminology. The rock name should be left justified. Normal abbreviations such as SANDST and LST are permissible. Be careful to discriminate between the soft limestones (Shelly, Oolitic and Pisolitic) for hard limestone. A typical entry might be:-

O	O	L	I	T	I	C		L	S	T
---	---	---	---	---	---	---	--	---	---	---

If a rock, other than limestone, chalk or calcite mudstone is calcareous, then tick the single box following the rock type name.

Land use - Tick the appropriate box. Please note that all arable crops have been grouped together. One additional class of land has been added to the normal list. It is:

M U G = Made up ground

Recreational ground (Public park, golf course, etc.) has been grouped under one heading 'Rec'.

Stone size - The size class of stones, in the surface horizon only, should be recorded.

Stone type - Record the lithology of stones, in the surface horizon only, should be recorded in a similar manner to rock lithology.

Number of horizons - Until the Computing Department has key-to-disk facilities an individual card will have to be punched for each horizon. So, even though computers can count please enter the number of horizons described; thus we can check that we have not lost a punched card from the record!

#### Soil Horizons

Depth - Record the depth to base of horizon in centimetres.

Matrix colour - Write down the Munsell colour notation in alpha-numeric style.

Hue is entered in the first four boxes using right justification, e.g. within each pair of boxes:

	5		R
--	---	--	---

Ignore decimal points, e.g.

7	5	Y	R
---	---	---	---

Value and chroma are recorded in the last pair of boxes.

Mottle colour - Record in a manner similar to the method described above.

Some fine or very fine ochreous mottles are difficult to match. In such instances do not waste time with hue and value but please do try to enter chroma in the last box.

Mottle abundance - Estimate mottle abundance according to the Handbook definition. Use the standard abundance abbreviations as printed on the bottom of the form.

## APPENDIX I

### HOW TO FILL SMALL RECORDING FORM

The small recording form is designed to log, in a standard and computer compatible manner, some of the main features observed at auger boring sites during the 1:250,000 survey. Normal Handbook sequence and terminology have been retained where possible but some reorganisation has been necessary in order to save space. As the National mapping programme is to be rapid, observations should be restricted to the dominant properties of the main horizons. Unless absolutely necessary ignore horizons < 5cm near the surface and subsoil horizons < 15cm. If you must record more than 3 horizons use a second form - but remember to repeat the Grid Reference on the second form. When the record is complete, staple the two forms together.

Please use a brightly coloured ball-point pen - red, blue or green are all suitable. Do not use black or water-soluble fibre pen inks. In wet weather enter in pencil and ink in later. Always make numerals distinct from letters in the following manner:

Numerals	0	1	2
Letters	$\bar{0}$	I	Z

Additional notes, ad lib, may be put on the back of the form. Brief notes, providing they do not obscure any of the boxes, may be made in free space on the front of the form.

### ENVIRONMENTAL INFORMATION

Grid Reference - Enter letters representing the 100 km square in the first two boxes, followed by eastings and northings for a 100m reference point in the remaining blank boxes. If a 10m reference is required then the dotted zeros in boxes 6 and 10 may be overwritten.

Observer - The surveyor's initials, right justified, should be entered.

Date - Fill in month and year on either side of the thick line.

Series - 12 boxes are provided for series identification using plain language. Left justify the series name. If you wish to save time enter only the first 10 letters of a long series name as this is sufficient for unique identification, e.g.

**27 Series**  

M	O	R	T	O	N	H	A	M	P		
---	---	---	---	---	---	---	---	---	---	--	--

 = Mortonhampstead

It is essential to enter the series name whenever possible. To avoid too much retrospective form filling do your series identification homework beforehand. Consult your local expert, if he is unable to help call up the Correlator. If you identify an intergrade, think again and make up your mind one way or the other. Truly unknown soils can be identified thus:

**27 Series**  

U	N	5	5	1							
---	---	---	---	---	--	--	--	--	--	--	--

where 551 = 5.51 typical brown sand in Avery's classification.

Slope - Tick the appropriate class box.

Erosion and Deposition - Tick the appropriate box if applicable.

Rock type (also Peat type) - Enter in plain language the appropriate rock type name encountered within a profile using standard Handbook terminology. The rock name should be left justified. Normal abbreviations such as SANDST and LST are permissible. Be careful to discriminate between the soft limestones (Shelly, Oolitic and Pisolitic) and hard limestone. A typical entry might be:

**53**  

O	O	L	I	T	I	C		L	S	T	
---	---	---	---	---	---	---	--	---	---	---	--

Rock type

If a rock, other than limestone, chalk or calcite mudstone is calcareous, then tick the single box following the rock type name.

N.B. The uncoded 'Ironstone' in the Handbook may be entered as IRONSTONE or IRONST.

In organic horizons 'peat type' may be entered using the following terms:

WOODY	MIXED (Mixed upland species, e.g. <u>Eriophorum-Sphagnum-Calluna</u> )
MOSSY	GRASSY (Mixed sedge/grass on fen-carr)
COTTONGRASS	REEDY (Mainly <u>Phragmites</u> )
SEDGE	ROOTLET (Poor in identifiable vegetative remains, containing many thread-like roots)

If the auger is stopped before reaching 1m by a stone, hard rock or fragipan, enter H A R D in the Rock Type boxes.

Land use - Tick the appropriate box. Please note that all arable crops have been grouped together. One additional class of land has been added to the normal list. It is:

M U G = Made up ground

Recreational ground (Public park, golf course, etc) has been grouped under one heading 'Rec'.

Stone size - The dominant size class of stones, in the surface horizon only, should be recorded.

Stone type - Record the lithology of stones, in the surface horizon only, in a similar manner to rock type.

Stone abundance - Use the standard abbreviations (listed at the bottom of the form) to record the abundance of stones in the surface horizon only.

Number of horizons - Until the Computing Department has key-to-disc facilities an individual card will have to be punched for each horizon. So, even though computers can count please enter the number of horizons described; thus we can check that we have not lost a punched card from the record!

#### SOIL HORIZONS

Depth - Record the depth to base of horizon in centimetres. Depth to deepest penetration should be entered against the last horizon described. The depth of thin iron pans has to be entered on the form as 1 centimetre deeper than the horizon above. (Due to computing problems no two horizons may have the same depth on any one auger record.) In order to distinguish iron pans please enter XA (extremely abundant) in the 'Fe/Mn concretions' boxes.

Matrix colour - Write down the Munsell colour notation in alpha-numeric style. Hue is entered in the first four boxes using right justification within each pair of boxes:

14 Matrix hue v c  

	5		R		
--	---	--	---	--	--

Ignore decimal points, e.g.

14 Matrix hue v c  

7	5	Y	R		
---	---	---	---	--	--

Value and chroma are recorded in the last pair of boxes.

Mottle colour - Record the main mottle colour in a manner similar to the method described above. Some fine or very fine ochreous mottles are difficult to match. In such instances do not waste time with hue and value but please do try to enter chroma in the last box.

N.B. Due to a printer's error the thick dividing line between the two pairs of boxes has been omitted on the form. c.f. Matrix colour

Mottle abundance - Estimate mottle abundance according to the Handbook definition. Use the standard abundance abbreviations as printed on the bottom of the form.

Organic matter status - Tick the appropriate box.

Peat and peaty horizons - In addition to 'peat type' (see rock type) the following features of organic horizons may be entered in the psc boxes as follows:

von Post Number A field estimate of humification according to von Post (see Table 1) may be entered in col.31.

Nature of O Horizons (Handbook p.21) Peat, sandy peat and loamy peat may be recorded by the letters P, S P and L P (right justified) in cols.33 and 34.

Degree of decomposition The letters referred to in the previous paragraph (P, SP and LP) may be preceded by:

F = Fibrous

M = Semi-fibrous (Mesic)

H = Amorphous (Humified)

Eutrophic and oligotrophic peats will be distinguished by their series name.

An example of a eutrophic, loamy, amorphous organic horizon with von Post humification 8 would be:

**27 Series**  
P R I C K W I L L O W

**31 psc**  
8 H L P

Particle-size class - Use the left hand box for the modifiers F (fine) and C (course) and the three right hand boxes for the standard letter abbreviations.

**31 psc**  
F S L

**31 psc**  
C S

**31 psc**  
S Z L

TABLE 1 Modified version of the von Post Scale for assessing the degree of decomposition of peat and peaty horizons

von Post value (1)	Nature of water expressed on squeezing (2)	Proportion of peat extruded between fingers (3)	Nature of plant residues (4)	Degree of Decomposition (5)
1	Clear, colourless	None	Unaltered, fibrous, elastic	None
2	Almost clear, yellow-brown	None	Almost unaltered	Almost none
3	Slightly turbid, brown	None	Most remains easily identifiable	Very slightly
4	Turbid, brown	None	Most remains identifiable	Slightly
5	Strongly turbid, contains a little peat in suspension	Very little	Bulk of remains difficult to identify	Moderately
6	Muddy, much peat in suspension	One third	Bulk of remains unidentifiable	Well
7	Strongly muddy	One half	Relatively few remains identifiable	Strongly
8	Thick mud, little free water	Two thirds	Only resistant roots, fibres and bark etc identifiable	Very strongly
9	No free water	Almost all	Practically no identifiable remains	Almost completely
10*	No free water	All	Completely amorphous	Completely

\* Enter as 9 on the form.

Marl, as defined in the handbook on p.22, may be entered in cols.31-34 as

M A R L.

Stone abundance - Initial trials with small-form recording have highlighted the need, in some areas and where the surveyor is confident, to record stone abundance in subsoil horizons. Unfortunately no boxes exist for this purpose but the standard abbreviations for abundance may be left justified, clearly and boldly, below the psc boxes as follows:

Fine sandy silt loam with 31 psc  

F	S	Z	L
---	---	---	---

  
 extremely abundant stones X A

If any free hand notes occur in the vicinity of these additional letters they

must be boxed by hand:

1* Depth	14 Matrix hue v c	20 Mottle hue v c	26 Abund.	28 O.M.	31 psc
4 5	5 R 4 4	7 5 Y R 6 8	M	<input checked="" type="checkbox"/> h org	C
	35 - vsi <input checked="" type="checkbox"/> c vc	40 O	many calc nodules		F
	Carbonate	Fe/Mn concretions, abund			

Carbonate - With one exception, estimate carbonate content as defined in the

Handbook and tick the appropriate box. In order that estimations of 'very calcareous' shall correspond with the cut-off in Avery's classification the right hand box labelled vc must only be ticked if the carbonate exceeds 40%. In many cases (e.g. Coombe, Icknield etc) this will be obvious, but if in doubt take a small sample for later estimation using a 'Thanigasalam bottle'.

(N.B. The penultimate box, labelled 'c' represents CaCO<sub>3</sub> equivalent to 5-40%)

Concretions - Record type and abundance of any ferri-manganiferous concretions/nodules. XA should be entered under this heading when an ironpan is encountered.



## Appendix II

### Sampling and Recording for the National Soil Inventory

Field work for the 1:250 000 and inventory of soil data is to be integrated as far as possible. This set of notes describes the procedure for locating sites for the inventory, and for recording and sampling the soil at those sites.

#### The Target Population

The inventory is to contain information about soil that is or can be used for growing crops, pasture or forest. It includes all land currently used for agriculture, forestry, horticulture, and fruit growing. All wild land, eg saltmarsh, mountain and bog, is of interest. So also is open amenity land, such as commons and golf courses. This constitutes the target population. It will include grossly disturbed land, reclaimed land and 'made' land. It will include former hedgerows and other forms of field boundary, ditch and river margins where dredgings have been placed. It will include land close to gates and farm yards. Sites occurring on such land are atypical, of course, but they are a part of the total productive land, and for this survey must be described. Only in this way can an unbiased picture of the soil of this country be obtained.

#### Sampling Scheme

The sites to be visited occur at regular 5 km intervals at principal 1 km points on the National Grid, four per 100 km<sup>2</sup> map sheet. The origin of the sampling grid is 1 km East and 1 km North of the National Grid origin so that the sampling points on each 1:25 000 map sheet are inset 1 km and 6 km East and North of the South West corner of the map.

#### Finding Sites

Although the exact location of all sampling points is defined as above, it is not necessary to find the sites accurately provided bias is avoided. Location accurate to 20m on enclosed land and to 50m or even 100m on open land is a reasonable aim. The following procedure is recommended for finding sites.

Choose from the map (or air photograph) some easily recognizable feature near the grid point, and go there. Estimate from the map the direction and distance to the grid point. Then using either a compass or some other means of siting to give direction pace out the distance. Then stop, and dig.

Do not look around for 'typical', convenient or pleasant places to dig. And do not shorten or lengthen paces to avoid any kind of ground. If uncertain then use a tape or chain to measure the last 10m or 20m. On moorland it might be necessary to find sites by resection.

#### Deviations

Where the soil at a grid intersect is inaccessible, or where there is no soil there (rock or water), the following procedure is to be followed.

1. Record the reason for not being able to observe the soil at the 5 km grid point.
2. Choose a substitute site 100m to North. If the soil there is inaccessible then choose site 100m East, or South or West, in that order.

If that fails to give access then repeat at 200m distance. If that also fails then repeat at 400m distance. Finally, if that fails then abandon site.

3. Record the true grid reference of the substitute, not the original intersect. The computer can be programmed to recognize the latter.
4. In large urban areas where inaccessibility can be inferred from the OS map or air photography record only the grid reference, your initials, reason for non-access, and '0' in the box for number of horizons (see recording form).

#### Observation and Recording

For the inventory small pits are to be dug to 80 cm and the soil inspected by auger to 120 cm in the bottom of the pit if possible. Properties to be recorded are given on a new recording proforma, and with a few exceptions the definitions follow the Field Handbook.

#### The proforma

The new proforma has been designed so that

- (a) it can be completed in the field,
- (b) it is readable in the office,
- (c) the data it bears can be punched for computer without transcription.

Its layout is self evident.

Fill the proformas in as neatly as circumstances allow. Use blue or red pen, rather than black. Write characters boldly, and firmly distinguish the digits 0, 1 and 2 from the letters O, I and Z using the Rothamsted convention of ornamenting the letters (a bar over O, serifs on I and a line through Z).

### Codes

Numeric codes have been replaced for all properties except date and soil sub-group. For size and abundance the commonly used alphabetic mnemonic codes are to be used, and are listed on the proformas. Most other properties are recorded by placing a tick (✓) in the appropriate box, and with two exceptions, namely type of roots and type of nodules, the states are mutually exclusive. The abbreviations in the boxes should be clear. Soil series and the type of rock and stones are not coded. Details are given for each property below.

Map reference. Enter the two letters of the 100 km x 100 km square followed by three digit easting and three digit northing (OS standard to the nearest 100m). Zeros for 10m referencing are dotted. If after digging a pit a surveyor discovers that it is not where he thought and is off the 100m grid the zeros may be overwritten with correct values to 10m.

Date. Enter day, month, year in that order.

Observer. Enter initials.

Series. Enter name, left justified, up to 12 characters.

Sub group. Enter code, without decimal point.

Number of horizons. Enter number recorded. (This is important for data validation).

Soil inaccessible at grid point. Tick the reason. The abbreviations are:

- Urb = Urban - towns, villages, suburbs, factories, docks.
- RB = Rural Building - isolated houses, cottages, farm buildings, mills, public roads, railways.
- Min tip = Mines, tips - all land occupied by mine workings including tip and opencast, quarries, clay pits, gravel pits and their waste, town refuse.
- Fd Bdy = Field Boundary - wall, bank, hedge, or metalled farm track.
- Rok = Rock - bare rock at the surface.
- Wat = Water - lake (artificial or natural), river, canal.
- Oth = Other.
- Ac ref = Access refused.

Made land. Tick.

Urb = Urban - town refuse, factory waste, building rubble.

Min = Mining - colliery spoil, quarry waste.

Oth = Other.

Reclaimed land. Tick.

Urb = Urban - land previously occupied by houses, factories, railway yards.

Min = Mining - land from which coal, or other minerals have been extracted by opencast methods and later restored.

Oth = Other.

Elevation. Record either in metres or feet, and tick the m or ft box as appropriate.

Slope. Record the gradient in degrees from 10m above site to 10m below site, and aspect, either as compass point or azimuth angle in degrees clockwise from North = 0. Tick form.

Rock (also Peat). Abundance of rock (percentage outcrop) refers to the area within 10m of the pit. Tick only the left-most box that applies. Rock type refers to such rock or to rock that is seen in the pit or can be inferred with confidence after augering into the bottom of the pit. Enter the name of the rock, up to 12 characters, left justified. If penetration is prevented by hard material whose character cannot be determined, whether rock, isolated stones, or an indurated layer enter 'HARD'. The common abbreviations SANDST and SDST may be used for sandstone, LST for limestone, and IRONST for ironstone. If rock is calcareous tick box headed 'Calc'. The tick may be omitted for limestone and chalk.

The boxes for rock type may be used to record type of peat at sampling sites using the following terms:

WOODY

MOSSY

COTTONGRASS

SEDGE

MIXED (mixed upland species)

GRASSY (mixed sedge/grass on fen-carr)

REEDY (mainly Phragmites)

ROOTLET (containing many thread-like roots in material otherwise poor in identifiable vegetable remains)

Erosion. Tick as appropriate based on evidence within 10m of pit.

Land capability. Record class and subclass.

Land Use/Vegetation. Tick. Classes are as in the Field Handbook, except:

- (a) Arab = Arable includes all arable forms of land use,
- (b) Amty = Amenity includes all open amenity land.

Litter. Record the thickness in cm.

Spare. Use and definitions to be provided.

Depth. Enter lower limit of horizon in cm. Repeat in third row (this is needed for validation in computer).

Horizon designation. Enter judgement based on field evidence. Use first box for b or numerical prefix only. The second and third boxes are for the main letter eg A,B,C, etc and left justified if there is only one letter. The fourth and fifth boxes are for lower case suffixes, again left justified.

Colours. Enter Munsell codes, omitting decimal points. Record abundance and size of mottles using codes printed.

Particle size. Record the particle size of mineral soil using conventional mnemonics as follows:

S = sand	Z = silt	C = clay
LS = loamy sand	ZL = silt loam	SC = sandy clay
SL = sandy loam	SZL = sandy silt loam	CL = clay loam
	ZCL = silty clay loam	ZC = silty clay

Right justify in right-hand three boxes. Use left hand box to record whether sand fraction is fine (F) or coarse (C). Marl may be recorded by printing MARL in all four boxes. Enter field estimates of clay and silt percentage.

Peat should be recorded as follows in the boxes for particle size class. Enter the von Post number in the box headed 31. Table 1 in appendix I describes the von Post scale. In the unlikely event of finding the value '10' record it as '9'. Then enter

P = peat      SP = sandy peat      or LP = loamy peat  
right justified in the remaining three boxes. Record the nature of the peat by a tick in box headed 'Nature of 0'.

Structure. Enter size of peds (codes given) and tick shape and grade.

Water State. Tick.

Porosity. Tick.

Roots. Tick type (you may tick two or more if no one type is dominant); enter abundance and size as codes.

Organic Matter. Tick '-' or 'h' for mineral horizons.

Coats. Record abundance.

Lower Boundary. Tick distinctness and shape.

Stones. Enter name of type and sub-type as for Rock. Record abundance and size using printed codes. If the same stone type recurs in the second and third horizons you may write 'repeat' in the space provided instead of printing the rock name. The punch operators will be instructed to punch the last named type.

Carbonate. Tick only the left-most box that applies. The boxes labelled '<10' and '>10' should be taken to read '<40' and '>40'. In cases where it is difficult to judge whether soil has >40% carbonate take a sample into office for quick determination and complete the record there.

Nodules. Tick type (you may tick more than one); and enter code for abundance.

Missing data.

When it is impossible to observe the properties listed, especially for horizons examined by auger, leave the relevant sections of the proforma blank. Treat properties such as mottles, roots, nodules, stones where abundance is recorded 0 similarly. But be sure to enter '0' for abundance if there are none. Do not enter 'N' as previously, except for Munsell hue, for which it is standard practice when the chroma is zero.

Additional notes.

Unlike the earlier proformas for recording soil profiles for computer there is no provision for supplementary information. If you wish to make additional notes you may use the back of the form. Very brief notes may be written on the front provided they do not obscure the boxes.

Samples.

Apart from the bulk topsoil sample (see later) a surveyor may wish to take soil from any part of the pit for laboratory analysis. The fact can be recorded by completing the section at the bottom of the proforma. The samples should be numbered serially starting with '1' in the box headed 15, followed by the upper and lower depth limits, then '2' in box headed 22 and so on.

Justification.

Numeric values and mnemonic codes are to be entered right justified in their respective fields, which are separated either by spaces or by heavy lines. Leading zeros in numeric values may be omitted; thus the month of June may be recorded as ' 6' rather than '06'. Names for rock and soil series are to

be left justified. Spaces may be inserted in names to make them readable. Horizon designation should be left justified as described.

Completion.

If fewer than three horizons are recorded score through the unused lower parts of the form. Similarly, if the soil is inaccessible score through all horizon sections and the third and fourth rows of boxes for site.

If more than three horizons are observed then go on to a second proforma. Enter the map reference afresh, score through the section for site, and complete for horizons 4, 5 and 6 as necessary. Again score through unused sections. Check the number of horizons described and enter that number on the first card. Finally, staple the two proformas together before sending for punching.

Bulk sample

A bulked sample of the topsoil from around each pit is to be taken for determination of organic matter, pH, phosphorus and exchangeable K and Mg, and very likely trace elements.

Using a 2.5 cm diameter screw auger take 25 cores from the surface of the soil to 15 cm. The surface in this context is the zero of measurement, i.e. excluding living vegetation and litter (L layers) - see page 14 of the Handbook. Put the soil in a polythene bag and label with B (meaning bulked sample), and the grid reference.

The cores should be taken at approximately 4m intervals within a 20m x 20m square normally with the pit at its centre. However, if the pit is close to a field boundary or obvious physiographic boundary displace the square so that only the one field or physiographic unit in which the pit occurs is sampled.

We are negotiating with the Institute of Geological Sciences (IGS) for it to analyse the soil for some trace metals. If successful the IGS will require duplicate samples at one site in every twenty five. So take an additional bulk sample at every 25th site, again of 25 cores at approximately 4m intervals interpenetrating the original 4m grid within the same 20m x 20m square. Label it identically to the first.

The samples will be air-dried and stored at Rothamsted before they are analysed. To avoid changes in, for example, available P resulting from biological activity the samples should be transferred to Rothamsted at the earliest

opportunity. Such changes can be diminished if the samples are stored in a refrigerator or are opened to air dry at centres while awaiting transfer. In the latter event care must be taken to ensure that the soil is not contaminated by trace metals at this stage.

## Changes in recording procedure

### Small recording form (appendix I)

Soil series (page ii). Enter the series wherever possible. Enter subgroup if series is not known.

Rock type (page ii). Enter rock type encountered in profile. Record 'HARD' if auger is stopped by unidentifiable hard material.

Peat type (page ii). Use boxes for rock type to record type of peat using standard terms listed.

Description of peat (page iv). Codes for peat are changed to:

P = peat    SP = sandy peat    LP = loamy peat,  
which may be preceded by von Post number and

F = fibrous    M = semi-fibrous    H = amorphous

Stone abundance in subsoil (page vi). This may now be recorded for computer by careful positioning of codes.

Carbonate (page vi). It has been agreed that very calcareous (vc) means more than 40% of calcium carbonate.

### Inventory Sites (appendix II)

Tick recording (page 3). The character states for most properties recorded this way are mutually exclusive, so that only one box can sensibly be ticked. However, there can be more than one type of roots, and more than one type of nodules in a soil horizon, and two or more boxes may therefore be ticked.

Rock (page 4). The rock type to be recorded is rock that outcrops within 10m of the pit, or rock that can be seen in the pit or confidently inferred from evidence on the auger. Where penetration is prevented by hard material whose character cannot be determined record 'HARD'.

Type of peat (page 4) may be recorded in the boxes for rock type using specified terms.

Particle size (page 5). Marl may be recorded in the boxes provided for particle size class.

Peat (page 5). The codes for peat are slightly changed to

P = peat    SP = sandy peat    LP = loamy peat

The von Post number is to be entered in box 31.

Carbonate (page 5). It has been agreed that soil with more than 40% calcium carbonate should be distinguished.

Sample storage. Samples will be air-dried and stored at Rothamsted. Transfer them as soon as possible to Rothamsted, but biological activity be diminished in the samples by storing them temporarily at centres in refrigerators or opening them to air-dry there.

Organic matter status - Tick the appropriate box.

Particle-size class - Use the left hand box for the modifiers F (fine) and C (coarse) and the three right hand boxes for the standard letter abbreviations.

F		S	L
---	--	---	---

C			S
---	--	--	---

	S	Z	L
--	---	---	---

Stone abundance - Estimate stone abundance as defined in the Handbook and tick appropriate box.

Carbonate - Estimate carbonate content as defined in the Handbook and tick the appropriate box.

Concretions - Record type and abundance of any concretions.

Provisional Draft of Small Recording Form for Auger Borings

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O = none    F = few    C = common    M = many    VM = very many

The final version of this form will have some modifications. There will be a box for abundance of stones in the surface horizon and the types of concretions will be curtailed.

## Appendix II

### Sampling and Recording for the National Soil Inventory

Field work for the 1:250 000 and inventory of soil data is to be integrated as far as possible. This set of notes describes the procedure for locating sites for the inventory, and for recording and sampling the soil at those sites.

#### The Target Population

The inventory is to contain information about soil that is or can be used for growing crops, pasture or forest. It includes all land currently used for agriculture, forestry, horticulture, and fruit growing. All wild land, eg saltmarsh, mountain and bog, is of interest. So also is open amenity land, such as commons and golf courses. This constitutes the target population. It will include grossly disturbed land, reclaimed land and 'made' land. It will include former hedgerows and other forms of field boundary, ditch and river margins where dredgings have been placed. It will include land close to gates and farm yards. Sites occurring on such land are atypical, of course, but they are a part of the total productive land, and for this survey must be described. Only in this way can an unbiased picture of the soil of this country be obtained.

#### Sampling Scheme

The sites to be visited occur at regular 5 km intervals at principal 1 km points on the National Grid, four per 100 km<sup>2</sup> map sheet. The origin of the sampling grid is 1 km East and 1 km North of the National Grid origin so that the sampling points on each 1:25 000 map sheet are inset 1 km and 6 km East and North of the South West corner of the map.

#### Finding Sites

Although the exact location of all sampling points is defined as above, it is not necessary to find the sites accurately provided bias is avoided. Location accurate to 20m on enclosed land and to 50m or even 100m on open land is a reasonable aim. The following procedure is recommended for finding sites.

Choose from the map (or air photograph) some easily recognizable feature near the grid point, and go there. Estimate from the map the direction and distance to the grid point. Then using either a compass or some other means

Its layout is self evident.

Fill the proformas in as neatly as circumstances allow. Use blue or red pen, rather than black. Write characters boldly, and firmly distinguish the digits 0, 1 and 2 from the letters  $\bar{O}$ , I and Z using the Rothamsted convention of ornamenting the letters (a bar over O, serifs on I and a line through Z).

#### Codes

Numeric codes have been replaced for all properties except date and soil sub-group. For size and abundance the commonly used alphabetic mnemonic codes are to be used, and are listed on the proformas. Most other properties are recorded by placing a tick (✓) in the appropriate box. The abbreviations in the boxes should be clear. Soil series and the type of rock and stones are not coded. Details are given for each property below.

Map reference. Enter the two letters of the 100 km x 100 km square followed by three digit easting and three digit northing (O S standard to the nearest 100m). Zeros for 10m referencing are dotted. If after digging a pit a surveyor discovers that it is not where he thought and is off the 100m grid the zeros may be overwritten with correct values to 10m.

Date. Enter day, month, year in that order.

Observer. Enter initials.

Series. Enter name, left justified, up to 12 characters.

Sub group. Enter code, without decimal point.

Number of horizons. Enter number recorded. (This is important for data validation).

Soil inaccessible at grid point. Tick the reason. The abbreviations are:

Urb = Urban, - towns, villages, suburbs, factories, docks.

RB = Rural Building - isolated houses, cottages, farm buildings, mills, public roads, railways.

Min tip = Mines, tips - all land occupied by mine workings including tip and opencast, quarries, clay pits, gravel pits and their waste, town refuse.

Fd Bdy = Field Boundary - wall, bank, hedge, or metalled farm track.

Rok = Rock - bare rock at the surface.

Wat = Water - lake (artificial or natural), river, canal.

Oth = Other.

Ac ref = Access refused.

Particle size. Record using conventional mnemonics as follows:

S = sand	Z = silt	C = clay
LS = loamy sand	ZL = silt loam	SC = sandy clay
SL = sandy loam	SZL = sandy silt loam	CL = clay loam
	ZCL = silty clay loam	ZC = silty clay
PT = peat	LPT = loamy peat	SPT = sandy peat.

Right justify in right-hand three boxes. Use left hand box to record whether sand fraction is fine (F) or coarse (C). Enter field estimates of clay and silt percentage.

Structure. Enter size of peds (codes given) and tick shape and grade.

Water State. Tick.

Porosity. Tick.

Roots. Tick type; enter abundance and size as codes.

Organic Matter. Tick '-' or 'h' for mineral horizons. Tick nature of 0 if organic.

Coats. Record abundance.

Lower Boundary. Tick distinctness and shape.

Stones. Enter name of type and sub-type as for Rock. Record abundance and size using printed codes. If the same stone type recurs in the second and third horizons you may write 'repeat' in the space provided instead of printing the rock name. The punch operators will be instructed to punch the last named type.

Carbonate. Tick only the left-most box that applies.

Nodules. Tick type, and enter code for abundance.

Missing data.

When it is impossible to observe the properties listed, especially for horizons examined by auger, leave the relevant sections of the proforma blank. Treat properties such as mottles, roots, nodules, stones where abundance is recorded 0 similarly. But be sure to enter '0' for abundance if there are none. Do not enter 'N' as previously, except for Munsell hue, for which it is standard practice when the chroma is zero.

Samples.

Apart from the bulk topsoil sample (see later) a surveyor may wish to take soil from any part of the pit for laboratory analysis. The fact can be recorded by completing the section at the bottom of the proforma. The samples should

require duplicate samples at one site in every twenty five. So take an additional bulk sample at every 25th site, again of 25 cores at approximately  $\frac{1}{2}$ m intervals interpenetrating the original  $\frac{1}{2}$ m grid within the same 20m x 20m square. Label it identically to the first.

Land Use									Vegetation					Code			GV
ley	pgr	rgr	ara	hor	dcd	con	mug	rec	scr	sal	dun	bra	gor				

### SEMI-NATURAL VEGETATION CODES

(Those underlined represent more than 90 per cent. of communities recorded in the uplands.)

#### Grasslands

Rye-grass crested dog's tail	<u>RGG</u>
Dune	DUG
Crested hairgrass	CHG
Sweet vernal - Yorkshire fog	<u>SVG</u>
Meadowgrass - bent	MBG
Bent-fescue	<u>BFG</u>
Blue Sesleria	BSG
Bristle-leaved bent	BLG
Rush pasture	RUG
Nardus (=white bent)	<u>NAG</u>
Rock-rose - fescue	RFG
Tufted hair-grass (= "Tussock grass")	THG
Molinia (=flying bent)	<u>MOG</u>

#### Swamps and bogs

Marsh marigold meadow	MMS
Meadow sweet meadow	MSS
Yellow flag swamp	YFS
Sedge mires	SES
Bog-moss water track	<u>BMS</u>
Blanket bog	<u>BLS</u>
Reed swamp	RES

#### Moorlands and heaths

Dry heather moor	<u>DHM</u>
Moist heather moor	<u>MHM</u>
Bog heather moor	<u>BHM</u>
Bilberry heath	BIM

#### GRAZING VALUE CODES

Relative GV	Code
>8 Very good	V
5-8 Good	G
2-5 Moderate	M
<2 Poor	P

ONLY ONE L.U. BOX CAN BE PUNCHED

If Veg. boxes are completed there is no need to tick a l.u. box. However a l.u. box must be ticked if Veg. boxes not used.

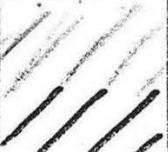
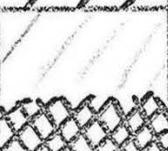
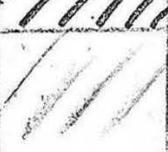
Bra. and Gor. boxes should be used only where these spp are dominant, or (preferably) in conjunction with a Veg. Code - eg for Bent-fescue with bracken.

#### Mountain ("Alpine") vegetation

Viviparous fescue	VFA
Stiff sedge	SSA
Heath-rush	HRA
Alpine club-moss	CMA
Alpine lichen heath	ALA
Fescue-fringe moss heath	FFA

Southern  
Vegetation

- Rapid assessment from  
data in S. Snowdonia,  
mid and S. Wales  
Dartmoor.

	Bent- Fescue	Dry Heather Moor	Nardus	Moist Heather Moor	Molinia	Bog Heather Moor	Blanket Bog
Brown earth							
Brown podzolic							
Podzol							
Stagno- podzol							
Stagnohum- gley							
Peat							

1 Map reference 40

11    01 15 Date Day Month Year 21 Observer Initials 25 Notes 37 No. horizons 41

42  08500 47 Soil inaccessible at grid point 55 Made Reclaimed 61 Elevation 67 (°) Aspect No. horizons 41

11    02 15 Rock % outcrop - <10 <50 <90 >90 20 Rock type Calc? 33 Erosion - silt rill gul wind wat kind l slip 41 t.c.c.

44 Land use/vegetation 61 Litter (cm) 63 spare

---

Horizon 1

11 Depth 1 15 Matrix 21 Main nodules 31 Class 35 size shape 36 distinctness

42 Designation 47 Colour Ped face 53 hue val chr Abund Size 63 Particle size 67 Peds

11 Depth 2 15 Water dry mat wat 18 Porosity VSP SP NP VP EP 23 Roots Wry Fib Fdry Type Ab Size 29 OM - h 31 Nature of O Fib Fib Hum Sed 35 Ab Coats Abund 36 distinctness

44 Type Calc Abund Size 58 Carbonate % <1 <5 <10 >10 63 Type Ca Oyp /a Fe Cl 71 I Boundary Sh Wry Ing Bkn

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Horizon 2

11 Depth 1 15 Matrix 21 Main nodules 31 Class 35 size shape 36 distinctness

42 Designation 47 Colour Ped face 53 hue val chr Abund Size 63 Particle size 67 Peds

11 Depth 2 15 Water dry mat wat 18 Porosity VSP SP NP VP EP 23 Roots Wry Fib Fdry Type Ab Size 29 OM - h 31 Nature of O Fib Fib Hum Sed 35 Ab Coats Abund 36 distinctness

44 Type Calc Abund Size 58 Carbonate % <1 <5 <10 >10 63 Type Ca Oyp /a Fe Cl 71 I Boundary Sh Wry Ing Bkn

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Horizon 3

11 Depth 1 15 Matrix 21 Main nodules 31 Class 35 size shape 36 distinctness

42 Designation 47 Colour Ped face 53 hue val chr Abund Size 63 Particle size 67 Peds

11 Depth 2 15 Water dry mat wat 18 Porosity VSP SP NP VP EP 23 Roots Wry Fib Fdry Type Ab Size 29 OM - h 31 Nature of O Fib Fib Hum Sed 35 Ab Coats Abund 36 distinctness

44 Type Calc Abund Size 58 Carbonate % <1 <5 <10 >10 63 Type Ca Oyp /a Fe Cl 71 I Boundary Sh Wry Ing Bkn

11    3 15 22 29 SAMPLES

SIZE	XF extremely fine	VS very small	O none	A abundant
	VF very fine	S small	F few	VM very many
	F fine	L large	C common	XA extremely abundant
	M medium	VL very large	M many	
	C coarse	B boulders		

### APPENDIX III

#### Map Units for 1:250 000 Map

Because of limitations of scale and the limited number of observations in white areas the map units will often include significant areas of soil having different land use potential and management characteristics. In some places, however, it will be possible to delineate units that are homogenous for interpretative purposes. It is therefore proposed to recognize two kinds of map units: simple units and compound units.

#### Simple map units

Simple units are identified and named by reference to a single class of soil, with the implication that this class is the most extensive in every delineation and that other classes occurring as inclusions are either similar to it for most practical purposes or occupy negligible proportionate areas (<15 per cent.). Simple units are unimodal in properties of interest and the range of these properties is narrow enough for a single L.C. subclass to represent land use potential and management characteristics.

#### Compound map units

Compound map units consist of specified dissimilar soils. Simple map units can be represented as homogenous for practical purposes, compound map units cannot.

Two soil series are generally considered similar if they are alike in most properties and share the limits of those diagnostic properties in which they differ, i.e. there is no intermediate class. For example, Bromyard is similar to Middleton but not to Netchwood. Series that differ in this way in only one diagnostic property are invariably treated as similar e.g. Wick/Newport, Salop/Crewe, Hanslope/Ragdale, Denchworth/Rowsham. Although they may differ significantly in land capability a unit consisting of two such series can reasonably be placed in a single land capability subclass based

on the most extensive series or the one which presents the most limitations. Series that differ in two or three diagnostic properties may also be regarded as similar if only one of the diagnostic differences is considered to affect land capability significantly. For example, Manod (fine loamy typical brown podzolic) and Sannan (fine loamy stagnogleyic brown earth) differ in two diagnostic properties i.e. Bw/Bs and non-gleyed/stagnogleyic, but can be regarded as similar if the brown earth/brown podzolic distinction is considered of negligible land capability significance in relation to the non-gleyic/stagnogleyic distinction.

Normally series belonging to the same subgroup qualify as similar. The exceptions are in subgroups (e.g. typical brown earths) with a wide particle-size range. A coarse loamy and a fine silty series, for example, do not strictly share class limits in the diagnostic property that differentiates them and can be considered dissimilar on this basis unless they share common properties of overriding significance e.g. both are rendzinas over chalk or both are iron-pan stagno-podzols. In cases like this, the likely range and distribution of particle-size classes within the map unit concerned and the practical significance of particle-size in relation to other soil and site characteristics should be considered when determining whether to represent it as simple or compound.

The concepts outlined above are not yet fully developed but their application is exemplified in the following Table by reference to five major series and other series commonly associated with them.

Major Series	Similar soils	Dissimilar soils
Andover	Other rendzinas on chalk or chalky drift Coombe Soham	Winchester Carstens Charity
Ragdale	Denchworth and other pelo-stagnogleys Hanslope Faulkbourne Beccles Oak	Aldeby Stretham Bengeo
Denbigh	Other typical brown earths, possibly excepting coarse loamy series Powys Sannan Eriviat Manod	Cegin Hafren Hiraethog
Clifton	Other typical stagnogleys Salwick Lea Flint	Crewe Blackwood Escrick Wick Ebtree
Newport	Other typical brown sands or sandy brown podzolic soils Wick Ollerton Crannymoor Ebtree	Arrow Escrick Blackwood Quorndon Rufford

## APPENDIX IV

SOIL SERIES RATIONALISATION -  
the problem and a plan for action

B. Clayden

## INTRODUCTION

For the last 6 years we have had '... a nationally uniform, systematic basis for legends of soil maps ...' (Avery 1973) from major group to subgroup level. It is a sad reflection on our organisation that we have never had an agreed systematic basis for the consistent identification and definition of soil series. Our present leaders have wasted no time in recognising this shortcoming and the programme of series rationalisation aims to put this right.

Board Paper (BP)/27 (Avery 1971) was the first comprehensive attempt to provide criteria for soil series and sets out '... systematic guidelines for differentiating soil series as mutually exclusive profile-classes on a country-wide basis.' It made clear that '... series should not transgress the conceptual boundaries of a subgroup ...' and that '... the stratigraphic age of a pre-Pleistocene formation is not to be used as a basis for soil-series differentiation'. Though the criteria were intended for general application, it was recognised that in practice '... no single set of criteria seems appropriate for soil-series separations in all kinds of soil, because the significance of a given property, and the precision with which it can be identified or measured, varies in different soils.'

Unlike the major group to subgroup system of 1973, the criteria for soil series of 1971 was not officially implemented or systematically tested. The vigorous regionalism of the last decade no doubt encouraged individual approaches to the problem.

The Classification Working Group set up in 1975 was a belated recognition that with the preparation of the classification monograph, soil series differentiation, legend approval and other responsibilities, Brian had more on

his plate than he could handle.

The Working Group since its inception has been grappling mainly with the problems of soil series and has produced two lengthy papers on Principles for Series Differentiation of Mineral Soils (1976, 78) together with lists of soil series proposed for most subgroups. This work, while covering a great deal of ground, has not received sufficient acceptance within the group for general circulation. At the same time Doug Carrol has been working on peat soil series for which he has accepted a special responsibility.

Don's memorandum of 3.1.79 on 'A new structure for the Survey' places the ball firmly in my court. In the short term I have to provide lists of consistently defined soil series for the subgroups of Avery 1979 which will be used in the National Map programme. In the long term I have to prepare a comprehensive guide to soil series identification for users of soil maps which include all the 900 odd held by LINDAT.

#### SOIL SERIES

Despite the advances in classification concepts of the last 15 years we have remained (perhaps intentionally) vague about the meaning of soil series and for a long time were content to trot out the time-honoured definition -

'A group of soils showing the same kind and arrangement of horizons in the profile, and developed from the same or similar parent material.'

At the same time the series referred both to a map unit and a profile class.

Most of our current publications make clear that the series is a profile class which gives its name to map units where that series is the dominant class, but criteria for differentiation and the definition of the classes vary widely.

For the purpose of this paper soil series are conceived as mutually exclusive division within subgroups, established on a pragmatic basis within the confines of our understanding of the genesis, characteristics, distribution

and use of British soils. As a provisional definition I suggest -

'A class of soils within a particular subgroup distinguished by certain common features or properties. Most but not all are known to occur in sufficient continuity to be the dominant of such classes in map units at scales of 1:25 000 or larger.'

#### NEED FOR RATIONALISATION

##### Origin of the problem

The need for rationalisation or change may still be questioned, particularly when considering series of post-1973 legends that have been subjected to Brian's thorough scrutiny. Despite Brian's efforts series are in disarray due to the lack of -

1. An agreed definition of a soil series and its relationship to a soil phase.
2. Definitive criteria for series identification and definition.
3. A systematic procedure for the 'registration' of new series.
4. Legend control at the onset of mapping.
5. Adequate correlation within and between regions.
6. A national outlook by the surveyor and his R.O.

Additional factors in the mushrooming of ill-defined series before 1973 were -

1. The lack of clearly defined higher categories.
2. The isolation of survey offices and poor technical management.
3. Soil identification by visiting 'wise men' using indefinable attributes.

##### The Result

1. Series overlap subgroup boundaries, an inevitable hiatus when established low order classes are required to fit the higher categories of a later system. (Fortunately Brian's classification is so arranged that relatively few important series are affected in this way.)
2. Definitions are inconsistent, particularly over time and between regions. These involve particle-size groupings, the use of bedrock and quantity and type

of stones, and mineralogical criteria like 'reddish hue.' (Variation in particle-size definitions was exacerbated by the revised triangular diagram.)

3. Definitions overlap each other.
4. Despite the ruling in BP/27 series are distinguished solely in terms of pre-Quaternary stratigraphy.
5. Series distinguished by the supposed nature and origin of the drift deposits forming the parent material which are not reflected in identifiable profile features.
6. New series were introduced which have apparently identical counterparts in other parts of the country.

The net result is that there are too many soil series; LINDAT holds 900 and more than 500 have been approved in post-1973 legends.

#### OBJECTIVES

The rationalisation programme is seen as an integral part of the development of a revised soil classification for soil survey and aims to -

1. Reduce the number of soil series but to retain as far as possible the concepts of the most extensive.
2. Establish (more or less) mutually exclusive profile classes within each soil subgroup on a pragmatic basis.
3. Provide general guidelines for differentiation. As for family and series differentiae in the U.S. Taxonomy specific application of criteria will vary to some extent with major group, group or subgroup.
4. Base differentiation on observable or measurable profile features, that reflect significant differences in parent material ('lithological type') or mode of origin, and are related to the class limits of the higher categories.
5. Favour criteria -
  - (i) identifiable in the field, and
  - (ii) that are related to agricultural land capability.

6. Provide a revised definition for the 'new' soil series identified and, possibly, an alternative name,\* and to clarify their relationship to soil phases.

#### LITHOLOGICAL TYPES

Attempts by the Working Group to apply cut-offs based on stoniness, stone type and depth to bedrock have proved unacceptable for general application. The approach now being adopted is a compromise solution, more in accord with present usage, which acknowledges for example that some soils like the Rivington are best defined as 'over rock' while others, like many stony soils identified in Wales and the South-west, are best defined by rock type without reference to bedrock which is often impossible to identify consistently. The continued usage of these two modes of specification will be restricted to certain subgroups and related to specific lithological types.

Treatment of stony soils in residual or locally redistributed weathering products can be illustrated by typical brown earths associated with igneous rocks or the Trusham 'lithological type'. Current thinking is as follows -

1. No differentiation should be made on depth to bedrock because relatively shallow profiles are often closely mixed with profiles in deeply weathered rock.
2. Most are more or less stony and differentiation is based on the dominant type of stone, rocks being grouped for this purpose.
3. Few soils are clayey, sandy or silty, though some have been defined as skeletal or fragmental, and few have layers of contrasting particle-size. Most are coarse or fine loamy and, with the exception

\*A memorandum dated 20.2.79 proposing that each 'new' soil series should be called a soil family has been circulated to senior staff.

of granitic soils, series can be defined as such, i.e. loamy ('medial' is proposed for loamy + silty).

4. Most soils are brownish. Reddish variants may be named separately if extensive but have been included with brown soils in the past.

Thus typical brown earths developed more or less in situ on igneous and related metamorphic rocks can be provisionally listed as -

Mayalls	-	very stony loamy granitic (with more than 35% stones)
Gunnislake	-	coarse loamy granitic
Lustleigh	-	fine loamy granitic
Gwaun	-	loamy rhyolitic
Trusham	-	loamy doleritic or dioritic
Tavistock	-	loamy basaltic

By contrast soils developed wholly in drift that differs in lithology from the pre-Quaternary substrate will be distinguished as for example 'fine loamy drift' or 'flinty silty drift'.

Leaving aside soils in Flandrian deposits, Brian has proposed four main 'substrate-types' to encompass soils in Pleistocene and pre-Pleistocene deposits. This concept has been extended so as to place most series into one of several 'lithological types' which will carry the same style of definition. Two examples are given below and it is hoped to illustrate others at the meeting.

1. 'Denchworth type' - 'residual', more or less stoneless soils from soft pre-Quaternary rocks.

Definition - strongly swelling clayey\* (p.s. group + mineralogical criterion if appropriate).

\* 'Clayey' unqualified implies a substrate of clay or soft mudstone.

2. 'Dunnington Heath type' - bi-layer soils distinguished from the Denchworth type by an upper layer of lithologically distinct Quaternary deposit.

Definition - coarse loamy drift over reddish clayey.

#### CORRELATION IN PRACTICE

A complete review of soil series requires an agreed set of guidelines for differentiation dealing with particle-size groupings, bedrock and stoniness, mineralogical characteristics of the fine earth and the age and origin of parent materials. This is beyond the scope of the present paper, though guidelines are in preparation and their application to individual subgroups of Avery 1979 will be available later this year. A great deal has been learnt from the efforts of the Working Group, not least that the rigid application of 'principles' over the whole field can have the undesired effect of increasing the number of classes. We have learnt that guidelines should be stated in general terms and applied selectively. The guidelines in conjunction with the 'lithological types' will determine the style of definition for the 'new' series. Therefore in the following examples of relatively straightforward, 1st-stage correlation no revised definitions are offered. They are included to give a few examples of how some existing series are likely to be grouped. (Regional collaborators will I hope guide me on the selection of geographic names.)

1. Series distinguished by stratigraphic age of otherwise similar pre-Quaternary substrata.

4.21 Alton - clayey over clay-shale (Carboniferous)

Stowe - " " " " or mudstone (Jurassic)

5.41 Bromsgrove - coarse loamy over reddish sandstone (Triassic)  
 Eardiston - " " " " " (Devonian)  
 Ross - " " " " " ( " )  
 Shifnal - " " " " " (Upper Coal  
 Measures)

Rivington - coarse loamy over sandstone (Millstone Grit)  
 Swindon Bank - " " " fine-grained sandstone (Carboniferous)  
 Firby - " " " sandstone (Jurassic)  
 Fatpastures - " " ; drift or residuum from Cretaceous  
 gritstone

Bearsted - coarse loamy over sandy Cretaceous beds  
 Woodnesborough - " " " " Eocene "

2. Series distinguished by the stratigraphy of a limestone substratum.

3.43 Elmton - fine loamy over dolomitic limestone  
 Murton - " " " oolitic limestone or calcareous sandstone  
 Somerton - stony clayey over Jurassic limestone (with interbedded  
 clay-shale)  
 Redhill - " " Cretaceous "

3. Series distinguished by the supposed nature and origin of the drift deposits forming the parent material.

5.42 Sannan-stony fine loamy or fine silty; drift containing mudstone  
 and sandstone (Lower Palaeozoic)  
 Nercwys - " " ; drift (till with sandstone and shale  
 from Carboniferous rocks)  
 Kingsforth - " " ; drift (Head from Coal Measure rocks)  
 Hern - " " ; drift containing Jurassic sandstone

7.11 Clifton - (fine) loamy; reddish till (mainly from Triassic rocks)

Huddleston - fine loamy; reddish till containing dolomitic limestone and sandstone

In alluvial soils -

8.13 Crimble - clayey river alluvium (from Carboniferous rocks)

Wigmore - " " " (mainly from Silurian rocks)

4. Series distinguished because existing concepts were too variable.

5.62 Clwyd - fine silty, alluvium from Lower Palaeozoic rocks

Cummins - " " ; river alluvium (mainly from Silurian rocks)

8.11 Conway - fine silty; river alluvium

Kingsland - fine silty, river alluvium (mainly from Silurian rocks)

5. Series distinguished in ill-defined local terrace deposits.

5.41 Rheidol - fine silty or fine loamy over gravelly; river or glaciofluvial drift from Lower Palaeozoic sediments

Cashfield - stony loamy over sandy or sandy gravelly; glaciofluvial drift

Rudway - fine loamy; drift (terrace deposits)

6. Series distinguished on 'regional' or climatic grounds.

8.61 Isleham - sandy drift (glaciofluvial)

Burton - sandy river or glaciofluvial drift containing sandstone.

These are just some of the more obvious candidates defined since 1973 that seem ripe for correlation. In some cases correlation has been delayed until agreement is reached on differentiae and style of lithological definitions. There is also the firm intention to introduce the

changes together rather than in the ad hoc manner that the Denchworth took over the Charlton Bank.

#### TIMETABLE

At the meeting of Senior Officers in January I was brash enough to include a rather optimistic timetable which I note is already behind schedule. But when the burden of responsibility for the Principality has been lifted from my shoulders I can give my full attention to the outstanding problems!

By mid-summer at the latest I intend to circulate guidelines for differentiation and keys to subgroups to Regional Collaborators of whom only CAHH and DCF are not past or present members of the Working Group. This should enable sufficient time for consultation before agreed lists of series are prepared for use in the extended legend of the 1:250 000 map.

Again at our January meeting I tried to end on a high note by explaining my grounds for optimism in meeting the timetable. They can be summarized as follows:

1. The responsibility for sorting out soil series has been given to one person to work on full-time.
2. Practical results are expected by a definite target date.
3. There has never been such a pressing reason to achieve results as the National Map.
4. The volume of work that has gone before. All attempts at soil classification reveal large areas of ignorance and gaping voids remain.

However, at the present stage of knowledge, many alternative possibilities have been considered. It is the time for Decision.

#### ACKNOWLEDGEMENTS

I acknowledge that many of the thoughts contained above stem from correspondence and discussion with Brian Avery and other members of the Working Group - Doug Carroll, Mike Hodgson and Denis Robson. However I accept full responsibility for this hurriedly compiled paper and hope that any inconsistencies can be ironed out at the meeting.

Mock-up of Completed Monthly Return Form

Region: W Midland		Centre: Wolverhampton	Surveyor: J.M.H.	Month ending: 31.01.79
Sheets worked	Registered Map Units used	Completed	No. field days	No. borings
SJ 80	261a, 263c, 411d, 431c	✓	9	227
SJ 81	261a, 263c, 411d, 441a, 472a		4	120
SJ 91	263c, 441a, 472a, 472d		5	132

Details of proposed new map units

	Sheet No.	Key Sub-group	Other Sub-groups	Series	Geology	Area km <sup>2</sup>	Est. area elsewhere in Region km <sup>2</sup>
1	SJ80	None					
2	SJ 81	412	413, 414	Compton with unnamed series of Thames	Aluvial	2	25
3	SJ 91	431	331	Blackwood and Reese Heath	Sandy drift	1	?
4	SJ 91	273	243	Hodnet and Ebotree	Reddish sandstone & mudstone with loamy sandy drift	5	35

Profiles Sampled for analysis

Profile No.	No. Bag samples	No. Tin samples	No. Micromorph samples
SJ 91/1234	4	12	4

Signature:

A. Surveyor.  
.....

The forms will be in triplicate. The top copy is filled in and sent to the Mapping Manager, the first carbon copy is sent to the R.O., the surveyor retains the other.

Programme - Keele Meeting

March 28th 1979

Arrival 11.30 - 12.30

Lunch 13.00

1st Session - 14.00 - 17.30 Chairman D. Mackney

14.00 - 14.15 Head of Survey's Introduction

14.15 - 15.15 The 1:250 000 map programme (JMH)

15.15 - 16.00 1:250 000 mapping in Scotland (JSB)

16.00 - 16.15 Tea

16.15 - 17.15 Soil Classification for the 1:250 000 map (Part 1) (BWA)

17.15 - 17.30 Discussion

Squash courts available 17.40 - 19.00

Dinner 19.00

Squash courts available 20.20 - 21.40

March 29th 1979

Breakfast 08.00 - 08.30

2nd Session - 09.00 - 13.00 Chairman D.C. Findlay

09.00 - 09.30 Soil Classification for the 1:250 000 map (Part 2) (BWA)

09.30 - 09.45 Discussion

09.45 - 10.45 Soil series rationalization (BC)

10.45 - 11.00 Coffee

11.00 - 11.15 Discussion of soil series rationalization

11.15 - 11.45 Field identification of organic soils (DMC)

11.45 - 12.30 Map units and the working legend (JMH)

12.30 - 13.00 Form of Publications (Maps and memoirs) (JMH)

3rd Session - 14.00 - 17.30 Chairman B.W. Avery

14.00 - 14.30 Field procedure (JMH and RH)

14.30 - 15.00 Aims and means of National Soil Inventory (RW)

15.00 - 15.30 Field recording of soil data for the 1:250 000 map and the National Soil Inventory (JMR)

15.30 - 16.00 GRIDCAMAP (JMR)

16.00 - 16.15 Tea

16.15 - 16.45 API in the lowlands - rapid preliminary interpretation (RE)

16.45 - 17.15 Cartographic aspects (JME and EMT)

17.15 - 17.30 The use of analytical data in soil reports (CLB)

Squash courts available 17.40 - 19.00

Formal Soil Survey Dinner 19.30 - 21.00 followed by social evening.  
Bar extension.

March 30th 1979

Breakfast 08.00 - 08.30

4th Session - 09.00 - 13.00 Chairman D. Mackney

09.00 - 09.45 ADAS and the 1:250 000 map programme (B. Wilkinson ADAS)

09.45 - 10.00 Discussion

10.00 - 10.45 Land Classification Part 1 (AJT)

10.45 - 11.00 Discussion

11.00 - 11.15 Coffee

11.15 - 12.00 Land Classification Part 2 (AJT)

12.00 - 12.15 Discussion

12.15 - 12.30 Report on Aberdeen Meeting on upland vegetation (RH)

12.30 - 13.00 Summary by Head of Survey

13.00 - 14.00 Lunch

Main body disperses 14.00

Regional Officer's Meeting 14.00 - 16.00

SOIL SURVEY OF ENGLAND AND WALES  
AROLWG PRIDD LLOEGR A CHYMRU

MEMO From R. Hartnup To All centres

Trawscoed,  
Aberystwyth,  
Dyfed, SY23 4HT

Telephone: Crosswood ~~305~~ <sup>301</sup>  
(STD Code 09743)

Our ref:

Your ref:

12 July 1979

NATIONAL SOIL INVENTORY- GRAZING CLASSIFICATION

At N.S.I. points in uplands with LUC classes 6 and 7 the grazing classification should be entered in the first four columns of the section labelled "spare" on the WUFF. The words GOOD, MOD or POOR should be written into the spaces, left justified. The next four spaces can be used, optionally, to code the plant communities using the Macaulay Vegetation Survey codes - eg. Moist atlantic heather moor = CULC. These codes must be right justified.

Those to whom this applies should have a copy of the method and relevant data on the grazing value of the more common plants. Let me know if you haven't, or if there are any other problems. If there are any important plants which you cannot identify, send me a complete specimen.

Adapting Cover Abundance Ratings and Domin Scale Values for use in  
Grazing Evaluation

Percentage Cover	Cover Abundance	Domin Scale	Corrected % age Cover
> 50	Dominant	8, 9, 10	75
33-50	Abundant	7	40
25-33	Frequent	6	30
15-25	Common	5	20
5-15	Occasional	4, 3	10
< 5	Rare	2, 1, X	-

Examples:

*Its easier to allocate a percentage in the field*

A. Herb-rich bent-fescue grassland sample No. 72189 (189/72)

	<u>Cover abundance</u>	<u>Domin value</u>	<u>Corrected cover value</u>	<u>Grazing value</u>	<u>Total</u>
<i>Agrostis tenuis</i>	f	6	30	5	150
<i>Festuca rubra</i>	f	6	30	5	150
<i>Lotus corniculatus</i>	f	6	30	6	180
<i>Festuca ovina</i>	c	5	20	3	60
<i>Thymus drucei</i>	o	4	10	1	10
<i>Anthoxanthum odoratum</i>	o	3	10	3	30
<i>Carex caryophylla</i>	o	3	10	2	20
<i>Luzula campestris</i>	o	4	10	2	20
<i>Achillea millefolium</i>	o	3	10	5	50
<i>Galium verum</i>	o	4	10	3	30
<i>Hieracium pilosella</i>	o	3	10	2	20
<i>Potentilla erecta</i>	o	3	10	2	20
<i>Trifolium repens</i>	o	3	10	8	80
					<hr/> 820 <hr/>

Grazing value of sample:  $\frac{820}{100} = 8.20$

Grazing Class: good

B. Dry boreal heather moor sample No. 78202 (008/78)

	<u>Cover abundance</u>	<u>Domin value</u>	<u>Corrected cover value</u>	<u>Grazing value</u>	<u>Total</u>
<i>Arctostaphylos uva-ursi</i>	d	8	75	-	-
<i>Calluna vulgaris</i>	a	7	40	1	40
<i>Juniperus communis</i>	c	5	20	-	-
<i>Vaccinium vitis-idaea</i>	o	3	10	-	-
<i>Festuca ovina</i>	o	4	10	3	30
<i>Carex pilulifera</i>	o	3	10	1	10
					<hr/> 80 <hr/>

Grazing value of sample:  $\frac{80}{100} = 0.80$

Grazing Class: poor

Ordering of Grassland and Moorland Communities in terms of their Grazing Value to Sheep

Community	Grazing Class	Grazing Value
1. Permanent and old ley pastures	Good	11.75
2. Rotational ley pastures	Good	10.80
3. Crested hair-grass grassland	Good	7.40
4. Meadow-grass-bent grassland	Good	7.10
5. Rich bent-fescue grassland	Good	6.60
6. Upland bent-fescue grassland	Good	6.50
7. Milk-vetch - red fescue dune	Good	5.90
8. Acid bent-fescue grassland	Good	5.70
9. Bent-fescue grassland with bracken	Good	5.45
10. Heath-grass - white bent grassland	Good	5.40
11. Sharp-flowered rush pasture	Good	5.15
12. Eyebright - red fescue dune	Good	5.00
13. Soft rush pasture	Good	4.80
14. Rock-rose - fescue grassland	Good	4.80
15. White bent grassland	Good	4.60
16. Flying bent grassland	Moderate	3.90
17. Herb-rich atlantic heather moor	Moderate	2.50
18. Herb-rich boreal heather moor	Moderate	2.15
19. Bog moss water track	Poor	1.65
20. Dry atlantic heather moor	Poor	1.45
21. Moist atlantic heather moor	Poor	1.45
22. Northern atlantic heather moor	Poor	1.40
23. Northern bog heather moor	Poor	1.05
24. Northern blanket bog	Poor	1.05
25. Blanket bog	Poor	0.95
26. Dry boreal heather moor	Poor	0.90
27. Bog heather moor	Poor	0.90
28. Mountain blanket bog	Poor	0.90
29. Moist boreal heather moor	Poor	0.85
30. Lichen-rich boreal heather moor	Poor	0.85
31. Blanket bog - terminal phase	Poor	0.50

After consult<sup>n</sup> with upland survey - decided 3 classes for all that was nec. - few mods here - but many complexes will be mix of bad + good - ... mod.

According to Gillingham all the mod. Moorland grassland is 'much inferior' to heath. Eric d. ... here.

Grazing Values of some Common Plant Species (after Klapp, 1953)

Arctostaphylos uva-ursi	0	Poa annua	5	Geum rivale	2
Calluna vulgaris	1	Poa nemoralis	5	Glaux maritima	3
Empetrum nigrum	0	Poa palustris	7	Glechoma hederacea	1
Erica cinerea	1	Poa pratensis	8	Hieraceum pilosella	2
Erica tetralix	0	Puccinellia maritima	7	Hypochoeris radicata	1
Thymus drucei	1	Sesleria albicans	2	Heracleum sphondylium	5
Vaccinium myrtillus	1	Sieglingia decumbens	2	Iris pseudacorus	0
Vaccinium vitis-idaea	0	Trisetum flavescens	7	Lathyrus pratensis	7
		Poa trivialis	7	Lathyrus montanus	5
Agropyron repens	6	<del>Sow</del>		Leontodon autumnalis	5
Agrostis canina	3	Achillea millefolium	5	Linum catharticum	0
Agrostis tenuis	5	Achillea ptarmica	3	Lotus corniculatus	7
Alopecurus geniculatus	4	Aegopodium podagraria	3	Lotus uliginosus	7
Anthoxanthum odoratum	3	Ajuga reptans	2	Lychnis flos-cuculi	1
Arrhenatherum elatius	7	Alchemilla alpina	2	Medicago lupulina	7
Briza media	5	Alchemilla vulgaris	5	Ononis repens	0
Bromus mollis	3	Angelica sylvestris	2	Orchis spp.	1
Cynosurus cristatus	6	Antennaria dioica	1	Parnassia palustris	1
Dactylis glomerata	7	Anthriscus sylvestris	4	Pimpinella saxifraga	5
Deschampsia caespitosa	3	Armeria maritima	1	Pinguicula vulgaris	0
Deschampsia flexuosa	3	Aster tripolium	4	Plantago lanceolata	6
Festuca ovina	3	Anthyllis vulneraria	5	Plantago major	2
Festuca rubra	5	Astragalus danicus	5	Plantago maritima	3
Festuca vivipara	3	Bellis perennis	2	Polygala spp.	1
Glyceria fluitans	4	Campanula rotundifolia	3	Polygonum amphibium	1
Helictotrichon pratense	2	Capsella bursa-pastoris	1	Polygonum persicaria	1
Helictotrichon pubescens	4	Centaurea nigra	3	Polygonum viviparum	1
Holcus lanatus	4	Cerastium holosteoides	3	Potentilla anserina	1
Holcus mollis	3	Cirsium spp.	0	Potentilla erecta	2
Hordeum secalinum	6	Conopodium majus	1	Primula spp.	2
Koeleria cristata	2	Crepis paludosa	4	Prunella vulgaris	2
Lolium multiflorum	7	Dactylorchis maculata		Ranunculus acris	1
Lolium perenne	8	ericetorum	1	Ranunculus bulbosus	1
Molinia caerulea	2	Eleocharis palustris	2	Ranunculus ficaria	1
Nardus stricta	2	Epilobium spp.	2	Ranunculus flammula	0
Pholaris arundinacea	5	Filipendula ulmaria	3	Ranunculus repens	4
Phleum bertolonii	3	Galium spp.	3	Rhinanthus spp.	0
Phleum phleoides	3	Gentiana spp.	2	Rumex acetosa	4
Phleum pratense	8	Geranium pratense	2	Rumex acetosella	1
Phragmites communis	2	Geranium sylvaticum	2	Rumex crispus	1

Sagina procumbens	1	Carex ovalis	1
Scrophularia spp.	0	Carex pallescens	2
Sedum spp.	0	Carex panicea	2
Senecio aquaticus	0	Carex disticha	2
Senecio jacobaea	0	Carex pilulifera	1
Silene dioica	2	Carex pulicaris	1
Solidago virgaurea	2	Euriophorum angustifolium	1
Spergularia media	2	Eriophorum vaginatum	1
Spergularia marina	2	Juncus acutiflorus	1
Stellaria spp.	2	Juncus articulatus	2
Succisa pratensis	2	Juncus conglomeratus	1
Taraxacum officinale	5	Juncus effusus	1
Teucrium scorodonia	1	Juncus gerardii	2
Tragopogon pratensis	4	Juncus squarrosus	0
Trifolium arvense	4	Luzula spp.	2
Trifolium campestre	6	Schoenus nigricans	0
Trifolium dubium	6	Trichophorum caespitosum	1
Trifolium medium	4	Triglochin spp.	0
Trifolium pratense	7	Typha spp.	1
Trifolium repens	8		
Trollius europaeus	0		
Tussilago farfara	1		
Urtica dioica	1		
Veronica arvensis	1		
Veronica chamaedrys	2		
Veronica officinalis	1		
Veronica serpyllifolia	1		
Vicia angustifolia	5		
Vicia cracca	6		
Vicia hirsuta	5		
Vicia sepium	6		
Viola spp.	1		
<del>Sedum</del>			
Carex binervis	1		
Carex caryophyllea	2		
Carex dioica	1		
Carex echinata	1		
Carex flacca	2		
Carex hostiana	1		
Carex nigra	1		

MEMORANDUM

From R Hartnup

To V C Bendelow

D M Carroll

Date 6 December 1979

D Hogan

I J Kilgour

J W Lea

Subject GRAZING CLASSIFICATION

T R E Thompson

M J Reeve

P S Wright

cc D Mackney

J M Hodgson

At a recent meeting of the Welsh Region, Don Mackney re-emphasized the importance he attaches to the grazing classification.

He requested that as well as recording the grazing values at NSI sites, we also ensure that we have relevant data on selected RUFFS from common upland vegetation types so that their botanical composition and grazing values can be assessed.

MEMORANDUM

From R HARTNUP To - V C BENDELOW  
Date 22 September 1981 D M CARROLL  
Subject PLANT COMMUNITIES ON CLASS 6 LAND D V HOGAN  
R J A JONES  
I N KILGOUR  
J W LEA  
M J REEVE  
T R E THOMPSON  
P S WRIGHT  
J M HODGSON  
C C RUDEFORTH  
D MACKNEY

New guidelines for the allocation of vegetation types to plant communities have recently been prepared by Soil Survey of Scotland. They will be published in the forthcoming T.M. on land capability classification.

For the sake of completeness Don is keen that we should identify any English/Welsh vegetation which does not fit the Scottish classes, a list of which you should have received recently.

Will you please go through your vegetation records for class 6, and attempt to fit them into the Scottish communities, using the keys which you already have. (You will receive a revised key shortly, but Don wants the job done quickly so that he can provide answers for the Land Capability Committee.) Identify any significant areas of vegetation which do not fit the system and inform me of them, sending relevant species lists.

Please let me or David Hogan know if you have any problems with this.

Table 22 Ordering of Plant Communities in terms of their Relative Grazing Value for sheep.

<u>Plant Community</u>	<u>Grazing Division</u>	<u>RGV</u>
1. Permanent and long ley pastures	high	1175
2. Ley pastures	"	1080
MARITIME - dunes, saltings & salt spray communities		
3. Milk-vetch - red fescue dune pasture	high	590
4. Maritime grassland	"	578
5. Sea poa salt marsh	"	534
6. Mud-rush salt marsh	"	515
7. Eye-bright - red fescue dune pasture	"	500
SWAMP		
8. Marsh marigold meadow	moderate	360
9. Meadow-sweet meadow	"	330
10. Yellow flag swamp	low	149
PASTURE - sedge, rush & grassland communities		
11. Crested hair-grass grassland	high	740
12. Sweet vernal - Yorkshire fog grassland	"	739
13. Meadow-grass - bent grassland	"	710
14. Rich bent - fescue grassland	"	660
15. Upland bent - fescue grassland	"	650
16. Rich sharp-flowered rush pasture	"	639
17. Acid bent - fescue grassland	"	570
18. Acid sharp-flowered rush pasture	"	549
19. Bent-fescue grassland with bracken	"	545
20. Heath-grass - White bent grassland	"	540
21. Soft rush pasture	Moderate	480
22. Rock-rose - fescue grassland	"	480
23. White bent grassland	"	460
24. Meadow-grass - bent grassland with bracken	"	444
25. Tussock-grass - white bent grassland	"	414
26. Flying bent grassland	"	390
27. Tussock-grass pasture	"	370
28. Star sedge mire with sharp-flowered rush	"	353
29. Carnation sedge pasture	"	343
30. Silverweed pasture	"	336
31. Flying bent - bracken grassland	"	290
32. Flea sedge mire	"	261
33. Star sedge mire	"	212
34. Star sedge mire with bog myrtle	low	184
35. Bog-moss water track	"	165
36. Few flowered spike-rush mire	"	81

37. Bog-rush mire	low	80
MOORLAND		
38. Sea plantain - crowberry heath	moderate	317
39. Sea plantain - bell heather moor	"	287
40. Herb-rich Atlantic heather moor	"	250
41. Common cotton-grass bog	"	236
42. Flying bent bog	"	223
43. Herb-rich Boreal heather moor	"	215
44. Blaeberry heath	low	175
45. Flying bent - bog myrtle bog	"	172
46. Maritime Atlantic heather moor	"	157
47. Dry Atlantic heather moor	"	145
48. Moist Atlantic heather moor	"	145
49. Northern Atlantic heather moor	"	140
50. Deer grass & northern deer grass bog	"	108
51. Upland blanket bog	"	108
52. Northern bog heather moor	"	105
53. Northern blanket bog	"	105
54. Lowland blanket bog	"	95
55. Dry Boreal heather moor	"	90
56. Bog heather moor	"	90
57. Mountain blanket bog	"	90
58. Cotton-grass bog	"	87
59. Moist Boreal heather moor	"	85
60. Lichen-rich Boreal heather moor	"	85
61. Blanket bog - terminal phase	"	50
MOUNTAIN		
62. Viviparous fescue grassland	moderate	370
63. Mountain white bent grassland	"	350
64. Stiff sedge grassland	"	315
65. Mountain heath-rush grassland	"	260
66. Alpine club-moss snow-bed	low	195
67. Bog whortleberry heath	"	163
68. Fescue-fringe-moss heath	"	113
69. Alpine lichen heath	"	90
SCRUB & WOODLAND		
70. Alderwood	Moderate	365
71. Bracken scrub	"	355
72. Dry grassy birchwood	"	267
73. Hazelwood	"	266
74. Grassy oakwood	"	239

75. Ashwood	moderate	239
76. Dry heathy birchwood	"	228
77. Juniper scrub	"	200
78. Bog myrtle scrub	low	172
79. Wet birchwood	"	172
80. Heathy oakwood	"	163
81. Native pinewood and old plantations	"	122
82. Oak-elmwood	"	53

Appendix 5  
Additional Communities

	<u>Grazing Category</u>	<u>RCV</u>
Tufted hair grass - white bent grassland	moderate	414
Alderwood	"	365
Marsh marigold swamp	"	360
Meadow-sweet meadow	"	330
Dry grassy birchwood	"	267
Hazelwood	"	266
Grassy oakwood	"	239
Ashwood	"	239
Dry heathy birchwood	"	228
Flying bent bog	"	223
Maritime grassland	good	578
Sea POA salt marsh	"	534
Mud-rush salt marsh	"	515
Flying bent - bog myrtle bog	poor	172
Wet birchwood	"	172
Heathy oakwood	"	163
Yellow flag swamp	"	149
Native pinewood and old plantations	"	122
Deer grass and northern deer grass bog	"	108
Cotton-grass bog	"	87
Oak-elmwood	"	53

Keele Meeting - LCC Recording

Classification of land use: actual cropping.

To be applied at farm level, about 50 ha.

1. Very intensive arable or horticultural
  - a) >20% roots, horticultural or soft fruit (remainder cereals)
  - b) Top-Fruit, >40% (remainder unspecified).
2. Intensive arable or horticultural  
Mainly cereals, some roots, hort. or fruit
3. a) Cereals (>50%) and temporary grass  
b) Cereals (>50%) and permanent grass  
c) Mainly grass, with dairy herd.
4. Mainly grass, no dairy herd.
5. Mainly grass, some rough.
6. Mainly rough grazing.
7. Heath, moor or mountain.

2. low to low

2. low to low, but 30

LCC

Wetness class

1

I#II

2

II better

3

III or better

4

$W_{40} > 140d$  after suitable dr. treatment.

Suggested Conventions.

sw

3 or 4 for all stagnogleys in large areas with  $> 100 MD$  . ? 50-100 MD.

w

Humose gleys in areas  $< 100 MD$ .

w

medium or coarse lowland soils with flood risk.

ws.

for all pseudo-annual gleys in dry lowlands with or without flood risk.

Workability, Reaching Feasibility

2, 3, 4 sw.

$> 150 MD$ . Stagnogleys  $\in$  FL-F2/C 3

Stagnogleys  $\geq$  FL-F2/C 2?

ex. Whimble, Flint, Ashley Satecombe

$> 175 MD$ . Pelosols.

Hard slope

possible for 2

$< 150 MD$ . Jans (1999). 2-3 for II-III alt.

ex. Whimble in 3 Hodnet FL-F2/FL 2.

$< 100 MD$  ( $> 240 Fc$  days) all gleys and most

stagnogleys <sup>soils</sup>. C, FC or F2  $\rightarrow$  class 4.