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Wicklesham Quarry, Faringdon, Oxfordshire Statement of Physical Characteristics April 1994

STATEMENT OF PHYSICAL CHARACTERISTICS

WICKLESHAM QUARRY, FARINGDON, OXFORDSHIRE

1. INTRODUCTION

1.1 In March 1994, 2.4 hectares of land at Wicklesham Quarry to the east of Faringdon in Oxfordshire was surveyed in connection with proposals for mineral extraction and restoration to agriculture. ADAS was commissioned by MAFF's Land Use Planning Unit to determine the land quality and site physical characteristics of the land affected by the proposals.

1.2 The survey was conducted by members of the Resource Planning Team, Guildford Statutory Group, at an observation density of approximately two borings per hectare. A total of 5 borings and one soil inspection pit were described in accordance with MAFF's revised guidelines and criteria for grading the quality of agricultural land, (MAFF, 1988). These guidelines provide a framework for classifying land according to the extent to which its physical or chemical characteristics impose long term limitations on its use for agriculture.

At the time of survey, the site was in winter cereals. A small strip of woodland is mapped adjoining the track to the north of the site.

1.3 The distribution of the grades, subgrades and land-use categories is shown on the attached Agricultural Land Classification (ALC) map and the areas and extent are given in the table below. The map has been drawn at a scale of 1:2,500. It is accurate at this scale, but any enlargement may be misleading. This map supersedes any previous survey information for the site.

Table 1 : Distribution of Grades and Subgrades

Grade	Area (ha)	% of Agricultural Land
1	1.3	59.1
2	0.4	18.2
3b	0.5	22.7
Woodland	0.2	100 (2.2 ha)
Total area of site	2.4 ha	

1.4 A general description of the grades and land-use categories identified in this survey is provided as an appendix. The grades are described in terms of the type of limitation that can occur, the typical cropping range and the expected level and consistency of yield.

2 CLIMATE

2.1 Climatic criteria are considered first when classifying land since climate can be overriding in the sense that severe limitations will restrict land to low grades irrespective of favourable site or soil conditions.

2.2 Estimates of climatic variables relevant to the assessment of land quality were obtained by interpolation from a 5 km grid point dataset, (Met Office, 1989) for a representative location in the survey area.

Table 2 : Climatic Interpolation

Grid Reference	SU292940
Altitude, (m, AOD)	125
Accumulated Temperature (°days, Jan-June)	1381
Average Annual Rainfall	691
Field Capacity Days	143
Moisture deficit, wheat (mm)	103
Moisture deficit, potatoes (mm)	93

2.3 The main parameters used in the assessment of an overall climatic limitation are, average annual rainfall, a measure of overall wetness, and accumulated temperature, as a measure of the relative warmth of a locality. In this instance, climate does not represent an overall limitation to agricultural land quality. In addition, no local climatic factors such as exposure or frost risk are significant.

2.4 However, climatic factors, specifically field capacity days and soil moisture deficits, do interact with soil factors to influence soil wetness and droughtiness limitations. At this locality, the climate is relatively dry in regional terms.

3. RELIEF

3.1 The site lies at an altitude of 120-125 m AOD with the land falling gently towards the east. Nowhere on the site do relief or gradient affect agricultural land quality.

4. GEOLOGY AND SOILS

4.1 British Geological Survey, (1971), Sheet 253, Abingdon shows the site to be underlain with Ferruginous Sands of the Cretaceous period, with a small outcrop of Sandstone of the same age on higher land at the south of the site.

4.2 Soil Survey of England and Wales, (1983), Sheet 6, Soils of South-East England shows the entire site to comprise soils of the Fyfield 4 association. These soils are described as, 'brown, coarse loamy typical argillic brown earths passing to sand or sandstone', (SSEW, 1984).

4.3 Detailed field examination of the site indicates the presence of soils somewhat dissimilar to those described by the Soil Survey across much of the site, although loamy and sandy soils were found towards the east of the survey area, coincident with land mapped as Subgrade 3b. Across the remainder of the site, soil profiles comprising variable textures occur which may be imperfectly drained.

5. AGRICULTURAL LAND CLASSIFICATION

5.1 Where land has not been graded 1, the ALC grading of the site is primarily determined by the interaction between soil and climatic factors giving rise to a soil droughtiness limitation

5.2 Table 1 provides the details of the area and extent of each grade. The distribution of grades is shown on the attached ALC map.

5.3 The location of the soil observation points is shown on the attached auger boring map.

5.4 Grade 1

The majority of the land surveyed has been classified as excellent quality agricultural land with no or very minor limitations to its agricultural use. Profiles typically comprise non-calcareous medium sandy loam topsoils which are free of stones. These overlie similar or slightly heavier textures, ie, sandy clay loam, in the upper subsoil and pass to clay at variable depths between about 50 and 100 cm. Profiles may contain thin horizons of loamy medium sand and tend to become more sandy with depth, passing to sandy clay loam or medium sandy loam once more, below 80-100 cm. Occasional profiles contain 2-10% total flints in the subsoil. In general, soils are well drained (Wetness Class I) although gleying may be evident below about 70 cm as a result of a fluctuating groundwater table. These deep, freely draining soils have good reserves of available water for crop growth. The land therefore has no or only very minor limitations to agricultural use and is capable of supporting a wide range of arable and horticultural crops which may be expected to achieve consistently high yields.

5.5 Grade 2

A small unit of very good quality agricultural land has been mapped where slightly heavier soils occur which impart a slight droughtiness limitation on the land. These soils also show signs of wetness, but due to light topsoil textures, this is not limiting in terms of agricultural land quality. Profiles comprise non-calcareous medium sandy loam topsoils, overlying sandy clay loam upper subsoils and passing to gleyed clay around 50 cm depth. Gleying provides evidence of impeded drainage through the clay which is slowly permeable at 60 cm. Given these drainage characteristics, Wetness Class II is appropriate. However, the land is limited by slight soil droughtiness arising through the interaction of poorly structured water retentive clay horizons and the climatic regime. The resulting profile available water may not be sufficient to meet the needs of the crop throughout the year.

5.6 Subgrade 3b

Land assigned to this subgrade represents an area of very sandy soils which are prone to severe soil droughtiness. Soils are very similar to those identified in a survey of adjacent land during 1990, (ADAS Ref: 3304/003/90), which has subsequently been worked for sand. Profiles comprise loamy medium sand topsoils which are non-calcareous and free of stones, passing directly to medium sand in the subsoil and extending to at least 120 cm. Due to the coarse textured, sandy nature of these soils they drain excessively (Wetness

Class I), retaining little soil water available for plant growth. As a result, plants may experience severe drought stress, for part or all of the growing season. The land is classified as only moderate quality to reflect this limitation to its agricultural use.

6. SOIL RESOURCES

Soil Units : Consideration for Restoration

6.1 The following section and the accompanying soil resource maps describe the pattern of topsoil and subsoil resources on the site. It should be emphasised that the maps are not soil stripping maps, but merely an illustration of the soil resources available for restoration on the site. Due to the natural variability of soils the depths and volumes of topsoil and subsoil units given below should be treated with caution. In general terms, all the available existing topsoil and subsoil resources should be retained for restoration purposes. When considering these details it is important to remember that soils were sampled to a maximum depth of 120 cm during survey work. In some cases soil resources will extend below this depth.

6.2 Topsoils

One topsoil unit was identified. It comprises an average 29.5 cm (range = 25-30 cm) of dark greyish brown or brown, (10YR 4/2 or 10YR 4/3) medium sandy loam or loamy medium sand. These topsoils were found to be non-calcareous and stonefree.

6.3 Subsoils

Two subsoil units were identified.

Unit 1 : This unit represents an average 90.5 cm (range = 90-95 cm) of subsoil resource extending across 1.7 ha of the site. Subsoils comprise a variety of textures, including sandy clay loam, medium sandy loam and clay, generally becoming heavier with depth, but passing to lighter textures again beyond 80-100 cm. Typically dark yellowish brown, (10YR 4/4) or pale brown, (10YR 6/3) sandy clay loam or medium sandy loam horizons overlie gleyed clay in the lower subsoil which tends to be paler and greyer in colour, (ie, 10YR 5/3, 10YR 6/2, or 10YR 7/1) with common ochreous mottles, (10YR 5/8, or 7.5YR 6/8). These subsoils were non-calcareous throughout, and they occasionally contained 2-10% total flints.

These moderately structured subsoils have varying structual composition depending on texture. Sandy clay loam horizons comprise coarse sub-angular blocky peds of friable consistence, whilst sandy loams have coarse angular blocky peds which are very friable. Clay horizons have coarse sub-angular blocky peds which are of firm consistence.

Unit 2 : This unit comprises an average 90.5 cm (range = 90-95 cm) of dark yellowish brown, (10YR 4/4), medium sand which is non-calcareous and free of stones.

The unit comprises a moderate structure of weakly developed medium to coarse sub-angular blocky peds passing to single grain or loose structures at depth. (ADAS Ref: 3304/003/90).

ADAS Ref: 3304/62/94
MAFF Ref: EL33/794

Resource Planning Team
Guildford Statutory Group
ADAS Reading

SOURCES OF REFERENCE

British Geological Survey (1971), Sheet 253, Abingdon.

MAFF (1988) Agricultural Land Classification of England and Wales : Revised guidelines and criteria for grading the quality of agricultural land.

MAFF (1990) Wicklesham Quarry, Faringdon, Oxon : Statement of Physical Characteristics (Ref: 3304/003/90)

Meteorological Office (1989) Climatic datasets for Agricultural Land Classification.

Soil Survey of England and Wales (1983) Sheet 6, Soils of South-East England.

Soil Survey of England and Wales (1984) Bulletin 15, Soils and their use in South-East England.

APPENDIX I

DESCRIPTION OF THE GRADES AND SUBGRADES

Grade 1 : Excellent Quality Agricultural Land

Land with no or very minor limitations to agricultural use. A very wide range of agricultural and horticultural crops can be grown and commonly includes top fruit, soft fruit, salad crops and winter harvested vegetables. Yields are high and less variable than on land of lower quality.

Grade 2 : Very Good Quality Agricultural Land

Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural or horticultural crops can usually be grown but on some land of this grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable root crops. The level of yield is generally high but may be lower or more variable than Grade 1 land.

Grade 3 : Good to Moderate Quality Land

Land with moderate limitations which affect the choice of crops, the timing and type of cultivation, harvesting or the level of yield. When more demanding crops are grown, yields are generally lower or more variable than on land in Grades 1 and 2.

Subgrade 3a : Good Quality Agricultural Land

Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape, potatoes, sugar beet and the less demanding horticultural crops.

Subgrade 3b : Moderate Quality Agricultural Land

Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass, or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.

Grade 4 : Poor Quality Agricultural Land

Land with severe limitations which significantly restrict the range of crops and/or the level of yields. It is mainly suited to grass with occasional arable crops (eg. cereals and forage crops) the yields of which are variable. In moist climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land.

Grade 5 : Very Poor Quality Agricultural Land

Land with severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

Urban

Built-up' or 'hard' uses with relatively little potential for a return to agriculture including: housing, industry, commerce, education, transport, religous buildings, cemetries. Also, hard-surfaced sports facilities, permanent caravan sites and vacant land; all types of derelict land, including mineral workings which are only likely to be reclaimed using derelict land grants.

Non-agricultural

'Soft' uses where most of the land could be returned relatively easily to agriculture, including: private parkland, public open spaces, sports fields, allotments and soft-surfaced areas on airports. Also active mineral workings and refuse tips where restoration conditions to 'soft' after-uses may apply.

Woodland

Includes commercial and non-commercial woodland. A distinction may be made as necessary between farm and non-farm woodland.

Agricultural Buildings

Includes the normal range of agricultural buildings as well as other relatively permanent structures such as glasshouses. Temporary structures (eg. polythene tunnels erected for lambing) may be ignored.

Open Water

Includes lakes, ponds and rivers as map scale permits.

Land Not Surveyed

Agricultural land which has not been surveyed.

Where the land use includes more than one of the above, eg. buildings in large grounds, and where map scale permits, the cover types may be shown separately. Otherwise, the most extensive cover type will be shown.

APPENDIX II

FIELD ASSESSMENT OF SOIL WETNESS CLASS

SOIL WETNESS CLASSIFICATION

Soil wetness is classified according to the depth and duration of waterlogging in the soil profile. Six soil wetness classes are identified and are defined in the table below.

Definition of Soil Wetness Classes

Wetness Class	Duration of Waterlogging[1]
I	The soil profile is not wet within 70 cm depth for more than 30 days in most years.[2]
II	The soil profile is wet within 70 cm depth for 31-90 days in most years **or**, if there is no slowly permeable layer within 80 cm depth, it is wet within 70 cm for more than 90 days, but only wet within 40 cm depth for 30 days in most years.
III	The soil profile is wet within 70 cm depth for 91-180 days in most years **or**, if there is no slowly permeable layer present within 80 cm depth, it is wet within 70 cm for more than 180 days, but only wet within 40 cm depth for between 31-90 days in most years.
IV	The soil profile is wet within 70 cm depth for more than 180 days but not wet within 40 cm depth for more than 210 days in most years **or**, if there is no slowly permeable layer present within 80 cm depth, it is wet within 40 cm depth for 91-210 days in most years.
V	The soil profile is wet within 40 cm depth for 211-335 days in most years.
VI	The soil profile is wet within 40 cm depth for more than 335 days in most years.

Soils can be allocated to a wetness class on the basis of quantitative data recorded over a period of many years or by the interpretation of soil profile characteristics, site and climatic factors. Adequate quantitative data will rarely be available for ALC surveys and therefore the interpretative method of field assessment is used to identify soil wetness class in the field. The method adopted here is common to ADAS and the SSLRC.

[1]The number of days specified is not necessarily a continuous period.
[2]'In most years' is defined as more than 10 out of 20 years.

APPENDIX III

SOIL PIT AND SOIL BORING DESCRIPTIONS

Contents :

Soil Abbreviations - Explanatory Note

Soil Pit Descriptions

Database Printout - Boring Level Information

Database Printout - Horizon Level Information

SOIL PROFILE DESCRIPTIONS : EXPLANATORY NOTE

Soil pit and auger boring information collected during ALC fieldwork is held on a computer database. This uses notations and abbreviations as set out below.

Boring Header Information

1. **GRID REF** : national 100 km grid square and 8 figure grid reference.

2. **USE** : Land use at the time of survey. The following abbreviations are used.

ARA : Arable	**WHT** : Wheat	**BAR** : Barley
CER : Cereals	**OAT** : Oats	**MZE** : Maize
OSR : Oilseed rape	**BEN** : Field Beans	**BRA** : Brassicae
POT : Potatoes	**SBT** : Sugar Beet	**FCD** : Fodder Crops
LIN : Linseed	**FRT** : Soft and Top Fruit	**FLW** : Fallow
PGR : Permanent Pasture	**LEY** : Ley Grass	**RGR** : Rough Grazing
SCR : Scrub	**CFW** : Coniferous Woodland	**DCW** : Deciduous Wood
HTH : Heathland	**BOG** : Bog or Marsh	**FLW** : Fallow
PLO : Ploughed	**SAS** : Set aside	**OTH** : Other
HRT : Horticultural Crops		

3. **GRDNT** : Gradient as estimated or measured by a hand-held optical clinometer.

4. **GLEY/SPL** : Depth in centimetres (cm) to gleying and/or slowly permeable layers.

5. **AP (WHEAT/POTS)** : Crop-adjusted available water capacity.

6. **MB (WHEAT/POTS)** : Moisture Balance. (Crop adjusted AP - crop adjusted MD)

7. **DRT** : Best grade according to soil droughtiness.

8. If any of the following factors are considered significant, 'Y' will be entered in the relevant column.

MREL : Microrelief limitation	**FLOOD** : Flood risk	**EROSN** : Soil erosion risk
EXP : Exposure limitation	**FROST** : Frost prone	**DIST** : Disturbed land
CHEM : Chemical limitation		

9. **LIMIT** : The main limitation to land quality. The following abbreviations are used.

OC : Overall Climate	**AE** : Aspect	**EX** : Exposure
FR : Frost Risk	**GR** : Gradient	**MR** : Microrelief
FL : Flood Risk	**TX** : Topsoil Texture	**DP** : Soil Depth
CH : Chemical	**WE** : Wetness	**WK** : Workability
DR : Drought	**ER** : Erosion Risk	**WD** : Soil Wetness/Droughtiness
ST : Topsoil Stoniness		

Soil Pits and Auger Borings

1. **TEXTURE** : soil texture classes are denoted by the following abbreviations.

S :	Sand	**LS** :	Loamy Sand	**SL** :	Sandy Loam
SZL :	Sandy Silt Loam	**CL** :	Clay Loam	**ZCL** :	Silty Clay Loam
ZL :	Silt Loam	**SCL** :	Sandy Clay Loam	**C** :	Clay
SC :	Sandy Clay	**ZC** :	Silty Clay	**OL** :	Organic Loam
P :	Peat	**SP** :	Sandy Peat	**LP** :	Loamy Peat
PL :	Peaty Loam	**PS** :	Peaty Sand	**MZ** :	Marine Light Silts

For the sand, loamy sand, sandy loam and sandy silt loam classes, the predominant size of sand fraction will be indicated by the use of the following prefixes:

F : Fine (more than 66% of the sand less than 0.2mm)
M : Medium (less than 66% fine sand and less than 33% coarse sand)
C : Coarse (more than 33% of the sand larger than 0.6mm)

The clay loam and silty clay loam classes will be sub-divided according to the clay content: **M** : Medium (<27% clay) **H** : Heavy (27-35% clay)

2. **MOTTLE COL** : Mottle colour using Munsell notation.

3. **MOTTLE ABUN** : Mottle abundance, expressed as a percentage of the matrix or surface described.

F : few <2% **C** : common 2-20% **M** : many 20-40% **VM** : very many 40% +

4. **MOTTLE CONT** : Mottle contrast

F : faint - indistinct mottles, evident only on close inspection
D : distinct - mottles are readily seen
P : prominent - mottling is conspicuous and one of the outstanding features of the horizon

5. **PED. COL** : Ped face colour using Munsell notation.

6. **GLEY** : If the soil horizon is gleyed a 'Y' will appear in this column. If slightly gleyed, an 'S' will appear.

7. **STONE LITH** : Stone Lithology - One of the following is used.

HR :	all hard rocks and stones	**SLST** :	soft oolitic or dolimitic limestone
CH :	chalk	**FSST** :	soft, fine grained sandstone
ZR :	soft, argillaceous, or silty rocks	**GH** :	gravel with non-porous (hard) stones
MSST :	soft, medium grained sandstone	**GS** :	gravel with porous (soft) stones
SI :	soft weathered igneous/metamorphic rock		

Stone contents (>2cm, >6cm and total) are given in percentages (by volume).

8. **STRUCT** : the degree of development, size and shape of soil peds are described using the following notation:

degree of development	**WK** : weakly developed **ST** : strongly developed	**MD** : moderately developed
ped size	**F** : fine **C** : coarse	**M** : medium **VC** : very coarse
ped shape	**S** : single grain **GR** : granular **SAB** : sub-angular blocky **PL** : platy	**M** : massive **AB** : angular blocky **PR** : prismatic

9. **CONSIST** : Soil consistence is described using the following notation:

L : loose **VF** : very friable **FR** : friable **FM** : firm **VM** : very firm
EM : extremely firm **EH** : extremely hard

10. **SUBS STR** : Subsoil structural condition recorded for the purpose of calculating profile droughtiness : **G** : good **M** : moderate **P** : poor

11. **POR** : Soil porosity. If a soil horizon has less than 0.5% biopores >0.5 mm, a 'Y' will appear in this column.

12. **IMP** : If the profile is impenetrable to rooting a 'Y' will appear in this column at the appropiate horizon.

13. **SPL** : Slowly permeable layer. If the soil horizon is slowly permeable a 'Y' will appear in this column.

14. **CALC** : If the soil horizon is calcareous, a 'Y' will appear in this column.

15. Other notations
APW : available water capacity (in mm) adjusted for wheat
APP : available water capacity (in mm) adjusted for potatoes
MBW : moisture balance, wheat
MBP : moisture balance, potatoes

SOIL PIT DESCRIPTION

Site Name : WICKLESHAM QUARRY, OXON Pit Number : 1P

Grid Reference: SU29039394
Average Annual Rainfall : 691 mm
Accumulated Temperature : 1387 degree days
Field Capacity Level : 143 days
Land Use : Cereals
Slope and Aspect : 02 degrees W

HORIZON	TEXTURE	COLOUR	STONES >2	TOT.STONE	MOTTLES	STRUCTURE
0- 30	MSL	10YR43 00	0	0		
30- 57	SCL	10YR44 00	0	0		MDCSAB
57- 70	MSL	10YR63 00	0	0		MDCAB
70-120	C	10YR53 00	0	0	C	MDCSAB

Wetness Grade : 1
Wetness Class : I
Gleying :070 cm
SPL : No SPL

Drought Grade : 1
APW : 142mm MBW : 39 mm
APP : 111mm MBP : 17 mm

FINAL ALC GRADE : 1
MAIN LIMITATION :

SAMPLE NO.	GRID REF	USE	ASPECT	GRDNT	GLEY	SPL	--WETNESS-- CLASS	GRADE	-WHEAT- AP	MB	-POTS- AP	MB	M.REL DRT	FLOOD	EROSN EXP	FROST DIST	CHEM LIMIT	ALC	COMMENTS
1	SU29039394	CER	W	01	068		1	1	144	41	110	16	1					1	
1P	SU29039394	CER	W	02	070		1	1	142	39	111	17	1					1	SL.GLEY 57+
2	SU29129397	CER	W	03	088		1	1	147	44	111	17	1					1	
3	SU29239398	CER	E	02	050	060	2	1	130	27	109	15	2				DR	2	
4	SU29279403	CER	E	02			1	1	70	-33	54	-40	3B				DR	3B	
5	SU29159399	CER	W	02			1	1	140	37	110	16	1					1	SL.GLEY 62+

SAMPLE	DEPTH	TEXTURE	COLOUR	MOTTLES COL	MOTTLES ABUN	MOTTLES CONT	PED COL.	GLEY	STONES >2	STONES >6	STONES LITH	STONES TOT	STRUCT/ CONSIST	SUBS STR	SUBS POR	SUBS IMP	SUBS SPL	SUBS CALC
1	0-26	msl	10YR43 00						0	0		0						
	26-45	scl	10YR44 00						0	0		0		M				
	45-68	msl	10YR63 00						0	0		0		M				
	68-110	c	10YR53 00	10YR58 00	C			Y	0	0		0		M				
	110-120	scl	25Y 62 00	10YR58 00	C			Y	0	0		0		M				
1P	0-30	msl	10YR43 00						0	0		0						
	30-57	scl	10YR44 00						0	0		0	MDCSAB	FR M				
	57-70	msl	10YR63 00					S	0	0		0	MDCAB	VF M				
	70-120	c	10YR53 00	10YR78 68	C		10YR61 00	Y	0	0		0	MDCSAB	FM M				
2	0-30	msl	10YR43 00						0	0		0						
	30-80	msl	10YR44 00						0	0		0		M				
	80-88	lms	10YR44 54						0	0		0		M				
	88-105	scl	10YR62 00	10YR58 00	C			Y	0	0		0		M				
	105-120	c	10YR71 00	75YR68 00	M			Y	0	0		0		M				
3	0-30	msl	10YR43 00						0	0		0						
	30-50	scl	10YR44 00						0	0	HR	2		M				
	50-60	c	10YR62 00	75YR68 00	M			Y	0	0		0		M				
	60-120	c	10YR71 00	75YR68 00	M			Y	0	0		0		P			Y	
4	0-30	lms	10YR43 00						0	0		0						
	30-120	ms	10YR44 00						0	0		0		M				
5	0-25	msl	10YR42 00						0	0		0						
	25-40	msl	10YR44 00						0	0	HR	2		M				
	40-48	scl	10YR44 00						0	0	HR	2		M				
	48-62	c	75YR58 00						0	0	HR	5		M				
	62-82	c	75YR58 00	75YR68 00	C		10YR71 00	S	0	0	HR	5		M				
	82-98	scl	10YR44 00						0	0	HR	10		M				
	98-120	msl	10YR44 00						0	0	HR	10		M				