ADS SUPPLEMENT

SUMMARY

This report contains data, archival material and subsequent specialist reports from fieldwork undertaken at two Sussex Early Neolithic mining sites, Long Down, Eartham during 1984 and Harrow Hill, Patching during 1986. Both of the small sample excavations were commissioned by English Heritage and directed by Robin Holgate and the Field Archaeology Unit, with additional funding provide by the Margary Fund of the Sussex Archaeological Society and the David Thomson Charitable Trust. The data contained within the report support the journal article, Breaking Chalk; the archaeological investigation of Early Neolithic flint mining-sites at Long Down and Harrow Hill, West Sussex, 1985-86, as published in the Sussex Archaeological Collections (2016).

Complied by Jon Baczkowski and Robin Holgate, with contributions from Chris Bergman, Chris Butler, Miranda Armour-Chelou, Sue Hamilton, Andy Merion Jones, Rory Mortimore and Andrew J. Smith.

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1.0 Geological background

By Rory Mortimore

1.1 *Stratigraphic distribution of the sites*

Neolithic flint mines tend to occupy two types of terrain on the Sussex Chalk downland that, superficially, seem to be related to particular flint-bearing levels in the Chalk.

1.2 The best-known group of mines is associated with the Secondary Escarpment in the central part of the Downs, west of the River Adur in the Newhaven and basal Culver Chalk members at Cissbury, Church Hill, Blackpatch and Harrow Hill. Another group of mines includes Long Down, near Eartham, Chichester in the Culver Chalk. The Long Down site is around the level of the Charmandean Flint. Potentially the best quality flint for producing flint artefacts in Sussex can be found along the crest of the Primary Escarpment, at sites such as Windover Hill, Newtimber Hill and Chanctonbury Ring, in the lower part of the Lewes Chalk, which contain well-developed courses of flint at or close to the high Turonian flint-maximum (Mortimore and Wood 1986), a stratigraphic position comparable with Grime's Graves at Brandon, Norfolk.

1.3 Stratigraphic information from the various sites is limited to a few echinoids collected during recent shallow excavations, by walking the sites and by inference from known horizons in the Chalk below and above the flint mine sites.

1.4 *Detail of individual mines*

<u>Cissbury</u>

Evidence for the stratigraphic position of the Cissbury Flint Mines is derived from the excavations in Curwen (1937), from the zonal maps of Gastor and local scrapes yielding poorly preserved fossils (Mortimore, 1986). This evidence indicates levels within the Offaster Pilula Zone from the Peacehaven to the Bastion Steps beds of the Newhaven Chalk.

1.5 Church Hill

The stratigraphic position of the Church Hill Mines, on the opposite side of the Findon Valley from Cissbury, has had to be inferred from the presence of the Marsupites Zone Chalk present in recent road cuttings to the northwest. On the basis of the southerly dip of the strata and the thickness of the overlying beds levels within the Offaster Pilula Zone are indicated possibly within the same beds as inferred for Cissbury.

1.6 Blackpatch Hill

The evidence for the stratigraphy of the chalk at Blackpatch is very thin but taking account of the southerly dip of the strata and the position of the Marsupites Zone in the road cuttings and the presence of sheet flints in the track adjacent to the mines it is probable that the Blackpatch Mines are excavated in the upper Old Nore Beds within the lower part of the Offaster Pilula Zone.

1.7 Harrow Hill

The recent fieldwork at Harrow Hill has added two further fossils, the echinoid Echinocorys cf cincta (Brydone), to the two obtained during the Sieveking excavations (Mortimore 1986). These were found in the rabbit scrapings and on the surface on the southerly back of the hill. E cincta ss is characteristic of the Meeching Beds but small forms related to E. cincta are present in the Castle Beds. On present evidence the Harrow Hill specimens are closer to forms from the Meeching Beds which supports the earlier interpretations that the deeper mines at this site which, because of the strata dip are stratigraphically lower towards the north, are located in the Peacehaven Beds.

1.8 West Stoke

The clump of trees at West Stoke is close to the famous phosphatic chalk in the Peacehaven Beds of the Newhaven Chalk which yielded abundant Echinocorys truncata (Brydone). It is probable that the West Stoke Mines are probably just above this phosphatic chalk in the Bastion Steps to Castle Hill Beds.

1.9 Long Down

The mines at Long Down are probably in the geologically youngest chalk within the Sompting Beds of the Culver Chalk Member. The evidence for this is provided by one Echinocorys collected from the surface plough and one from rubble in Trench A. These forms are related to the E. cf Marginata group in the lower part of the Gonioteuthis Quadrata zone.

2.0 Flint Work: Long Down

By Robin Holgate

2.1 *Surface collection survey*

In October 1984 the density of artifacts lying on the ploughed field surface on the eastern part of the site was recorded by walking transects spaced at 20m. Intervals and noting the humanly-struck flints and pottery occurring within each 20m. section of these transects. A well-defined dense concentration of axe roughouts and axe-thinning flakes c. 25m in diameter was recorded (Fig. 2), along with a widespread low-density scatter of abraded Iron Age and Romano-British potsherds. The flint concentration represents a large flint working area, whilst the pottery probably results from agricultural activities in the 1st millennium BC and 1st-4th centuries AD.

Table 1. Flintwork from the surface collection/recording surveys

	Long Down	Harrow Hill	Church Hill, Findon
Flakes/blades	301	2033	1199
Axe-thinning flakes	96	198	433
Chips	14		9
Tested nodules		3	42
Cores	3	49	39
Roughouts/preforms	4	76	50
Hammerstones			2
Scrapers	2	27	2
Knives		3	
Piercers		1	
Cutting blades/flakes	1	1	
Notches flakes		2	
Miscellaneous retouched flakes		8	1
Total	421	2401	1777

Table 2. Flint roughouts and preforms from the surface collection/recording surveys

	Long Down	Harrow Hill	Church Hill, Findon
Roughouts:			
Axe	2	72	42
Adze	1		
Chisel		1	
Sickle		1	
Discoidal knife			2
Ovate			2
Preforms:			
Axe	1		2
Miniature axe			1
Chisel			1
Total	4	76	50

Table 3. The excavated flintwork from Long Down

	Trenches				
Type	A	B	C	D	*Total*
With cortex: hard-hammer	396	418	69	7	890
soft-hammer	431	936	90	3	1460
Without cortex: hard-hammer	189	13	3	3	208
Soft hammer	194	27	4	2	227
Flakes total	1021	1394	166	15	2785
Blades					
With cortex: hard-hammer	-	-	-	-	-
soft-hammer	10	13	10	-	33
With cortex: hard-hammer	1	-	-	1	2
soft-hammer	4	20	12	-	36
Blades total	15	33	22	1	71
Axe thinning flakes					
With cortex: hard-hammer	260	1841	566	-	2667
soft-hammer	2004	9173	1247	-	12424
Axe thinning flakes total	2264	11014	1813	-	15091
Axe finishing flakes					
With cortex: soft-hammer	-	-	-	-	-
Without cortex: soft-hammer	1433	8509	45	-	9987
Axe finishing flakes total	1433	8509	45		9987
Other axe waste					
Chips	406	561	-	-	967
Shattered pieces	341	58	17	-	416
Quartered pieces	43	2	-	-	45
Tested nodules	23	4	-	-	27
Cores	17	9	4	-	30
Roughouts	6	9	1	-	18
Hammerstones	4	1	-	-	5
Other axe waste total	840	644	22		1506
Flake tools					
End scraper	-	1	-	-	1
Side scraper	-	-	1	-	1
Knife	?1	1	-	-	2
Ovate knife	-	-	1	-	1
Misc. retouched piece	-	1	-	-	1
Flake tools total	1	3	2	-	6
Total	5574	21564	2070	16	29240
Fire-fractured flint	19	48	15	-	82

Table 4. Small finds from Long Down

S.F No:	Category	Trench	Context
1	Flint cluster	A1	(8)
2	Flint cluster (nest)	A1	(15)
3	Axe roughout	A1	(15)
4	Axe roughout	A1	(15)
5	Antler	A1	(15)
6	Large flint point	A1	(15)
7	Nest of flakes	A1	(15)
8	Scapula (shovel?)	A1	(15)
9	Nest of flakes	A1	(15)
10	Charcoal sample	A1	(16)
11	Pottery	A1	(17)
12	Nest of flakes	A1	(17)
13	Axe roughout	A2	(26)
14	Axe roughout	A2	(26)
15	Axe roughout	A2	(26)
16	Large core	A2	(26)
17	Large core	A2	(26)
18	Large core	A2	(26)
19	Large core	A2	(26)
20	Large core	A2	(26)
21	Large core	A2	(26)
22	Large core	A2	(26)
23	Large core	A2	(26)
24	Large core	A2	(26)
25	Large core	A2	(26)
26	Large core	A2	(26)
27	Large core	A2	(26)
28	Pottery	A2	17
29	Antler tool (tine tip)	A2	17
30	Charcoal	A2	17

3.0 Long Down: pottery assessment

Table 5. Non-Neolithic pottery

Context	***Find no/ context***	***No of sherds***	***Description***
EIA			
C1/103	Sq A	1	Medium-sized flint inclusions; brown outer and inner surface; black core.
C1/102	Sq C	1	Medium-sized flint inclusions; brown outer and inner surface; black core.
C1/103	Sq B	1	Base 'sherd. Medium-sized flint inclusions; brown outer and inner surface; black core.
C1/104	Sq B	1	Medium-sized flint inclusions; brown outer and inner surface; black core.
IA			
D1/116		2	Medium-sized flint inclusions; black outer and inner surface. Medium-sized flint inclusions; brown outer surface; black inner surface brown core.
LIA			
B9/52	Base of ploughsoil	2	Medium-sized flint inclusions; brown outer surface; black inner surface. Medium-sized flint inclusions; brown surface and inner core.
B9/52-53	S	1	Medium-sized flint inclusions; black inner surface fragment
R-B			
B13/52		1	
B17/55		1	
C1/102	Sq A	1	
C1/103	Sq A	2	
D1/114		1	

Fieldwalking:

General	MIA
20/32	medieval
24/29	IA
24/31	EIA

3.1 *Comments*

All pieces, with the exception of one EIA basesherd (C1/103), are bodysherds.

The Iron Age and Romano-British, or medieval pottery, was dated by Sue Hamilton and David Rudling.

3.2 *The Early Neolithic Pottery*

By Andy Merion Jones.

3.3 The sherds of pottery from Long Down appear to exhibit evidence of being derived from early Neolithic pottery forms. They are from fine walled vessels, tempered with calcite or possibly burnt flint. Several of the more complete sherds have an obvious curvature suggesting they are from bowl forms (typical of the early Neolithic). In the case of the two sherds marked 7008/B9/54 Pottery A there is sufficient of the sherd remaining to tell that these sherds derive from neutral bowl forms of probable Carinated Bowl, as defined by Cleal (1992, 291-92). On the scant evidence available we are probably looking at vessels of Cleal's neutral inflected form. There were no rim forms recovered to confirm this tentative analysis.

3.4 On the basis of fabric, sherd thickness and firing profiles it may be that there are two or three groups of pottery, possibly representing different vessels. Group 1 includes: 7008/ B9/54; 7008/B9/52 P.2; 7008/B9/54 5; 7008/B9/52 'Mesolithic core'; 7008/B9/52 P. 5; 7008/B9/52 P.4 distinguished mainly by their differential firing profile Group 2 includes: 7008/B9/54 Pottery A, differentiated by the surface smoothing on these sherds. Group 3 includes: 7008/A1/6 find. No. 11; 7008/A2/17 Find no. 28; possibly 7008/B9/52-53; possibly 7008/B9/52 P. 3 differentiated by the dense fabric, and firing in a reduced atmosphere. Given the commonality in fabric across the group of sherds (all sherds are tempered by calcite or possibly burnt flint), and the variability of firing in prehistoric pottery in general we may be only looking at two or conceivably a single vessel represented here.

3.5 *Catalogue*

7008/B9/54

4 sherds from the same pot. Total Weight: 16g. Wall thickness: 7.39mm. Largest sherd length: 29.30mm. Clear evidence of differential firing- exterior oxidation, interior reduction. Evidence of exterior surface smoothing. Fabric: Numerous well-crushed inclusions of calcite (?).

7008/B9/54 5

1 sherd. Weight: 6g. Wall thickness: 6.81mm. Length: 30.44mm. Clear evidence of differential firing. Evidence of smoothing on interior surface. Fabric: sparse inclusions of calcite (?).

7008/B9/52 P1

1 sherd. Weight: 2g. Wall thickness: 6.55mm. Length: 27.16mm. Firing looks to have been in an oxidizing atmosphere. Rough smoothing of interior and exterior surfaces. Fabric: numerous well-crushed inclusions of calcite (?).

7008/B9/52 P. 2

1 sherd. Weight: 3g. Wall thickness: 7.48mm. Sherd length: 20.71mm. Clear evidence of differential firing – exterior oxidation, interior reduction. Probable smoothing of exterior surface. Fabric: Numerous inclusions of calcite (?) of variable size (largest visible inclusion 3.38mm in diam.). Probably from same vessel as 54.

7008/B9/52 P. 3

2 sherds. Total weight: less than 0g. Wall thickness: 4.44mm Length of largest sherd; 13.57mm. Look as if fired in reducing atmosphere. Fabric: sparse inclusions of calcite (?).

7008/B9/52 P.4

1 sherd. Weight: less than 0g. Wall thickness: 5.81mm. Length: 10.34mm. Clear evidence of differential firing. Fabric: sparse inclusions of calcite (?).

7008/B9/52 P. 5

9 sherds. Total weight; 8g. Wall thickness; 5.54mm Length of largest sherd: 14.74mm. Clear evidence of differential firing. Fabric: sparse inclusions of calcite (?)

7008/B9/52 'Mesolithic core'

Two small sherds. Total weight: 2g. Wall thickness: 5.53mm. Length of largest sherd: 12.91mm. Clear evidence of differential firing. Fabric: sparse inclusions of calcite (?).

7008/B9/52-53.

Three crumbs of pottery. Total Weight: less than 0g. Wall thickness: cannot be determined. Looks as if fired in reducing atmosphere. Fabric: sparse inclusions of calcite (?).

7008/B9/54 Pottery A

Two large sherds. Total weight: 27g. Wall thickness: 6.99mm Largest sherd length: 50.45mm. Rough smoothing of exterior and interior surfaces. Fabric: numerous (approx. 10-15%) inclusions of calcite (?). Both sherds clearly come from bowl forms (based on curvature). One sherd (the larger) is probably the lower part of the body of a neutral or inflected early Neolithic bowl form (after Cleal 1992).

7008/A1/6 Small Find. No. 11

1 sherd. Weight: 9g. Wall thickness: 8.47mm. length: 36.31mm. Interior exhibits evidence of coil building (smoothed coils visible on surface). Exterior surface abraded. Firing looks to be in a reduced atmosphere, but only interior surface remains. Fabric: dense, sparse inclusions of calcite (?). Curvature of sherd suggests this is a wall from a Neolithic bowl.

7008/A2/17 Small Find no. 28

1 sherd. Weight: 9g. Wall thickness: 6.73mm Length: 41.97mm . Exterior surface abraded. Firing looks to be in a reduced atmosphere, but only interior surface remains. Fabric: dense, sparse inclusions of calcite (?). Curvature of sherd suggests this is from wall from a Neolithic bowl.

4.0 Other artefacts: Long Down

4.1 *Notes on the Scapula and pick from Long Down*

By Miranda Armour-Chelu

1) Domestic ox scapula – weight 356grams - from right hand side of animal. The spine of the scapula has been roughly detached which may have facilitated ts use as a shovel, however there is little evidence that it was ever used as such. There is very little abrasion where one expect, eg along the proximal edge of the scapula.

2) Red deer antler – weight 180grams – worked each end. It is worked at each end and originally formed part of pick, before breaking during in use.

5.0 Environmental reports: Long Down

By Caroline Cartwright

5.1 As there is such a small amount of charcoal present, it is inappropriate to suggest any environmental or economic interpretations of the material (Table 6). All the charcoal fragments represent twig material with a maximum stem diameter of 3mm.

Table 6. Environmental finds: Long Down

Marine molluscs	1 top valve oyster shell (Ostrea edulis), appears to have peg-hole. Possibly medieval.
Stone - Field survey Nov. 198	Fragment of greensand quernstone 315g.
Charcoal	
7008/A1/13	1g. Fraxinus sp. (ash) charcoal
7008/A1/16 - associated with S.F 5	1g. Quercus sp. (oak) charcoal
7008/A1/16 - S.F 10	5g. Corylus sp. (hazel) charcoal
7008/A1/17 – S.F 30	1.3g. Corylus sp. charcoal

6.0 Radiocarbon carbon dates for Long Down

By the Oxford University Radiocarbon Accelerator Unit, 1987

Table 7. Uncalibrated Radiocarbon dates: charcoal, 12th February 1987

OxA – 1063	Charcoal	3110 ± 80
OxA - 1088	Hazel Charcoal (Corylus sp) 7008/A1/16,10	3130 ± 60

Table 8. Calibrated BP dates, using Pearson and Stuvier (1986)

OxA – 1063 Mean	= 1410 BC
1sd range (68% confidence)	=1410 BC
2sd range (95% confidence)	= 1490-1310 BC
OxA – 1088 Mean	= 1420 BC
1sd range (68% confidence)	= 1490-1320 BC
2sd range (95% confidence)	= 1520-1260 BC

Table 9. Uncalibrated Radiocarbon dates: bone and antler; 6th August 1987

OxA-1151 antler implement	4900+/-100
OxA – 1152 ox scapula	5050+/-100

Table 10. Calibrated BP dates, using Reimer and Stuvier (1986)

OxA-1151 4900+/-100 BP	
Intercepts: one sigma 3790-3543 BC	
two sigma 3960-3383 BC	
Probabilities: two sigma	3960-3840 BC 15% probability
	3830-3500 BC 83%
	3409-3383 BC 2%
OxA-1152 5050+/-100 BP	
Intercepts: one sigma 3980-3708 BC	
two sigma 4040-3640 BC	

6.1 *Radiocarbon dates report*
By Robin Holgate

6.2 The antler and bone artefacts, along with the charcoal, early Neolithic pottery and Neolithic flintwork, were recovered from layers of dumped chalk rubble over 1m. below the present ground surface. The antler and bone dates are consistent with the pottery and flintwork, but the charcoal dates seem too late. There are three possible interpretations. The Neolithic material could be residual; the charcoal could be intrusive; or the charcoal dates could be spurious. I do not think the Neolithic material is residual; the flintwork includes three clusters of *in situ* flint-knapping debris and all the Neolithic material is in fresh condition. The charcoal could be intrusive, but I do not know of any natural process which can inject charcoal 1m. below the ground surface. However, I see no reason why the two charcoal dates should be spurious.

6.3 If the incompatibility of the charcoal dates can be explained, then the antler and bone dates provide the first reliable C-14 dates for mining tools from flint mines on the South Downs found in association with other Neolithic artefactual material. These dates confirm the earlier date for the start of flint-mining in this region.

7.0 Flint work: Harrow Hill

By Robin Holgate

7.1 *Surface collection survey*

The surface artifact density in the area of the site under plough was recorded in October-November 1984 by walking transects spaced at 20m. Intervals and collecting the humanly-struck flints and pottery lying within each 20m. section of these transects. One part of the area surveyed produced a dense concentration of axe roughouts and axe-thinning flakes c. 50m. in diameter. The north-west part of the surveyed area, which overlay Clay-with-Flints, yielded a low density scatter of late Bronze Age-Iron Age potsherds and hard hammer-struck flint debitage.

Table 11. The excavated flintwork from Harrow Hill

Trenches

Type	*Drift Mines*	*Working Floor*	*Total*
Flakes			
With cortex: hard-hammer	201	582	783
soft-hammer	343	1215	1558
Without cortex: hard-hammer	10	63	73
Soft hammer	15	163	178
Flakes total	569	2023	2592
Blades			
With cortex: hard-hammer	2	5	7
soft-hammer	21	76	97
With cortex: hard-hammer	2	5	7
soft-hammer	9	63	72
Blades total	34	149	183
Axe thinning flakes			
With cortex: soft hard-hammer	278	556	834
Without cortex: soft-hammer	175	586	761
Axe thinning flakes total	453	1142	1595
Finishing flakes			
With cortex: soft-hammer	-	15	15
Without cortex: soft-hammer	14	70	84
Axe finishing flakes total	14	85	99
Other axe waste			
Chips	46	288	334
Quartered pieces	1	1	2
Tested nodules	3	6	9
Cores	1	5	6
Roughouts	5	14	19
Pre-forms	-	3	3
Other axe waste total	56	317	373
Flake tools			
Knife	1	3	4
Piercer	-	1	1
Misc. retouched piece	1	1	2
Flake tools total	2	5	
Total	1128	3721	4849
Fire-fractured flint	1	13	14

Table 12. Small finds from Harrow Hill

S.F No:	Category	Trench	Context
1	Flint cluster	A1	(8)
2	Flint cluster (nest)	A1	(15)
3	Axe roughout	A1	(15)
4	Axe roughout	A1	(15)
5	Antler	A1	(15)
6	Large flint point	A1	(15)
7	Nest of flakes	A1	(15)
8	Scapula (shovel?)	A1	(15)
9	Nest of flakes	A1	(15)
10	Charcoal sample	A1	(16)
11	Pottery	A1	(17)
12	Nest of flakes	A1	(17)
13	Axe roughout	A2	(26)
14	Axe roughout	A2	(26)
15	Axe roughout	A2	(26)
16	Large core	A2	(26)
17	Large core	A2	(26)
18	Large core	A2	(26)
19	Large core	A2	(26)
20	Large core	A2	(26)
21	Large core	A2	(26)
22	Large core	A2	(26)
23	Large core	A2	(26)
24	Large core	A2	(26)
25	Large core	A2	(26)
26	Large core	A2	(26)
27	Large core	A2	(26)
28	Pottery	A2	17
29	Antler tool (tine tip)	A2	17
30	Charcoal	A2	17

8.0 The Pottery, Harrow Hill

By Sue Hamilton

8.1 The surface collection survey produced 32 fragments of Bronze and Iron Age pottery; a further 35 sherds were recovered by excavation, although none came from undisturbed later prehistoric contexts. With the exception of one basesherd, all were bodysherds (Table 13 and 14). Five were represented:

Fabric 1

Very coarse, medium abundant flint-tempered ware with thick walls, oxidised surfaces and reduced core. Middle to Late Bronze Age fabric type. One sherd from the surface collection.

Fabric 2

Grog-tempered ware with oxidised surfaces. Probably Deverel-Rimbury fabric. Two sherds from the excavation.

Fabric 3

Medium to coarse, medium abundant flint-tempered ware with more reduced than oxidised surfaces and cores. Late Bronze to Early Iron Age. Twenty six sherds from the survey; twenty seven from the excavations.

Fabric 4

Fine to medium grade quartz tempering with medium abundant flint tempering. Some surfaces are burnished. Late Bronze to Early Iron Age. Six sherds from the survey

Fabric 5

Medium abundant grog and medium abundant fine quartz sand-tempered ware. One flat slightly out-turned basesherd was recovered. One flat, slightly out-tuned basesherd was recovered. Probably slightly out-tuned basesherd was recovered. Probably cooking jar fabric (Hamilton 1977, 94). Late Iron Age. Five sherds from the survey.

Table 13. Sherd numbers according to fabric type from the excavations

Fabrics	1	2	3	4	5	Total
Contexts						
Unstratified			1			1
B/1			2	1		3
C/1			1			1
K/1		1				1
K/12			1			1
K/12 S/F 6			1	4		5
W1/1			3			3
W3/1			2			2
W22/1			3			3
W25/1			2			2
W26/1			1			2
W28/1			1			1
W34/1			2			2
W35/1			5			5
W38/41			1			1
W40/1			1			1
W41/1			1			1
TOTAL		2	28	5		35

Table 14. Sherd numbers according to fabric surface collection survey

Fabrics	1	2	3	4	5	Total
Collection units						
20/15			1			1
20/22			12			12
21/21			4			4
21/22			1			1
22/16					3	3
22/19					1	1
24/14	1					1
24/18			2			2
25/14			3			3
30/20					1 base	1
35/19			3			3
TOTAL	1		26			32

9.0 The working properties of the flint at the mining sites in Sussex

By Chris Bergman

9.1 Three pieces of nodular and sheet flint from Long Down and Harrow Hill were given to the author for the purposes of testing their flaking quality. At both sites. Nodular flint was almost always selected for axe manufacture. The experimental work attempted to replicate bifacial Neolithic-type axes on both types of flint and the flaking tools used included a Red deer (Cervus Elaphus) antler hammer and a quartzite hammerstone.

9.2 Long Down

A single piece of nodular flint from Long Down, West Sussex, was given to the author for the purpose of testing its flaking quality. At this site nodular flint was always selected for axe manufacture. In general, the nodular proved to be of good quality and relatively free of inclusions and internal fractures which can cause difficulties during flaking. It has been suggested that the flint available in this part of Sussex is of poor quality and generally unsuitable for knapping. The nodule selected for this experiment would certainly have provided adequate material upon which any competent knapper could produce a finished tool.

9.3 Harrow Hill

For the purposes of the second experiment a single piece of tabular flint was collected from Harrow Hill, West Sussex. Although nodular flint was the preferred material for axe manufacture at the site there are a small number of roughouts in tabular flint. The flaking tools used in the experiment were the same as those mentioned previously. The flint, on initial examination, seemed to be free of internal fractures and at first flaked well. However, a flaw soon became visible and the axe roughout eventually broke in half.

9.4 *Discussion*

It seems clear that the flint from both sites does suffer, to a certain extent, from the internal cracks and flaws. The Neolithic knappers were undoubtedly aware of this fact and carefully selected their raw material. One good reason for roughing out axes close to their source is to avoid carrying heavy flint nodules over long distances only to discover they are flawed. It seems certain that enough good flint was available at both sites to make the sources worthy of exploitation.

10.0 Geophysical Investigation of Ancient Flint Mines, Harrow Hill, Sussex

By Andrew J. Smith

10.1 This investigation was one of a preliminary nature in an attempt to discover whether changes in substructure, due to ancient flint mines, could be located using electromagnetic, geophysical techniques.

10.2 Harrow Hill is located in the heart of the South Downs, not far from Arundel. It lies in the Duke of Norfolk's estate and permission had to be obtained from him to allow the survey to be carried out.

10.3 The area is well known for its flint mines and several investigations have been carried out in the past. The previous studies have been mainly excavations and geophysical techniques have not yet been used.

10.4 The previous investigators were;

1. Carmen 1924-1925
2. Holleyman 1936
3. Sieveking 1982 and 1984

10.5 Figure 1 shows the outline of the most likely places for ancient flint mines and also the areas in which the above investigators undertook their work.

10.6 *The survey*

The EM 31 was used for this survey and an area 250x60m was covered. Six traverse lines were set out as shown on the attached Harrow Hill plan and readings were taken at 5m intervals on each traverse line.

10.7 As a check the instrument was pivoted through 90 degrees at various places over the site to see if any changes in readings would result. No difference was observed ands so only one reading was taken per station.

10.8 *Results*

The results were processed by computer and isometric and contour plots were obtained. It can be seen from both of these that some marked disturbance in the readings is detected as the instrument passes over the area known to contain flint mines.

10.9 No other cause could be attributed to these disturbances and it can be stated that the electromagnetic device used was able to detect the presence of flint mines.

Fig 1. Map of Harrow Hill, showing surveyed area

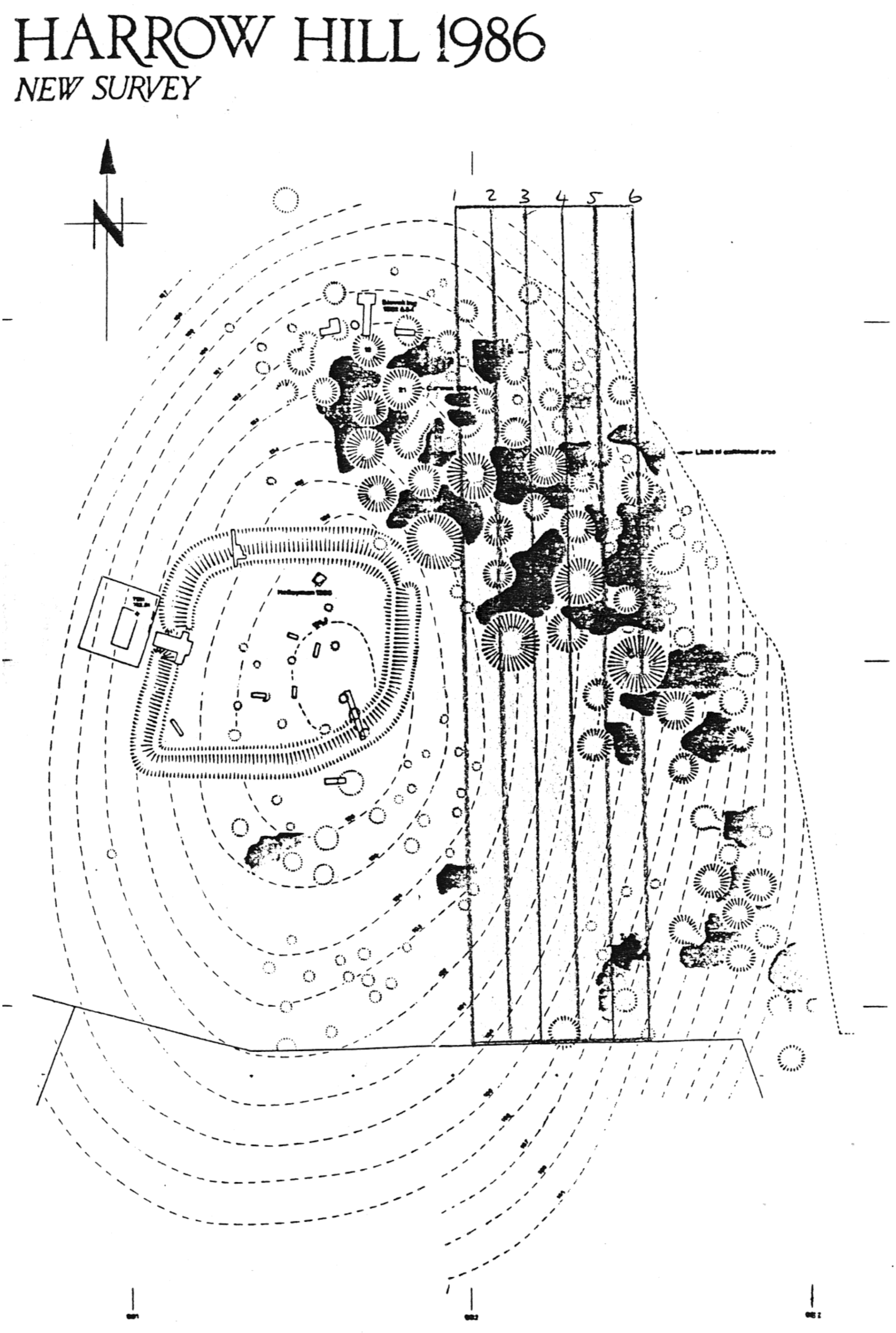


Fig 2. Harrow Hill, EM31 survey results, contour plot

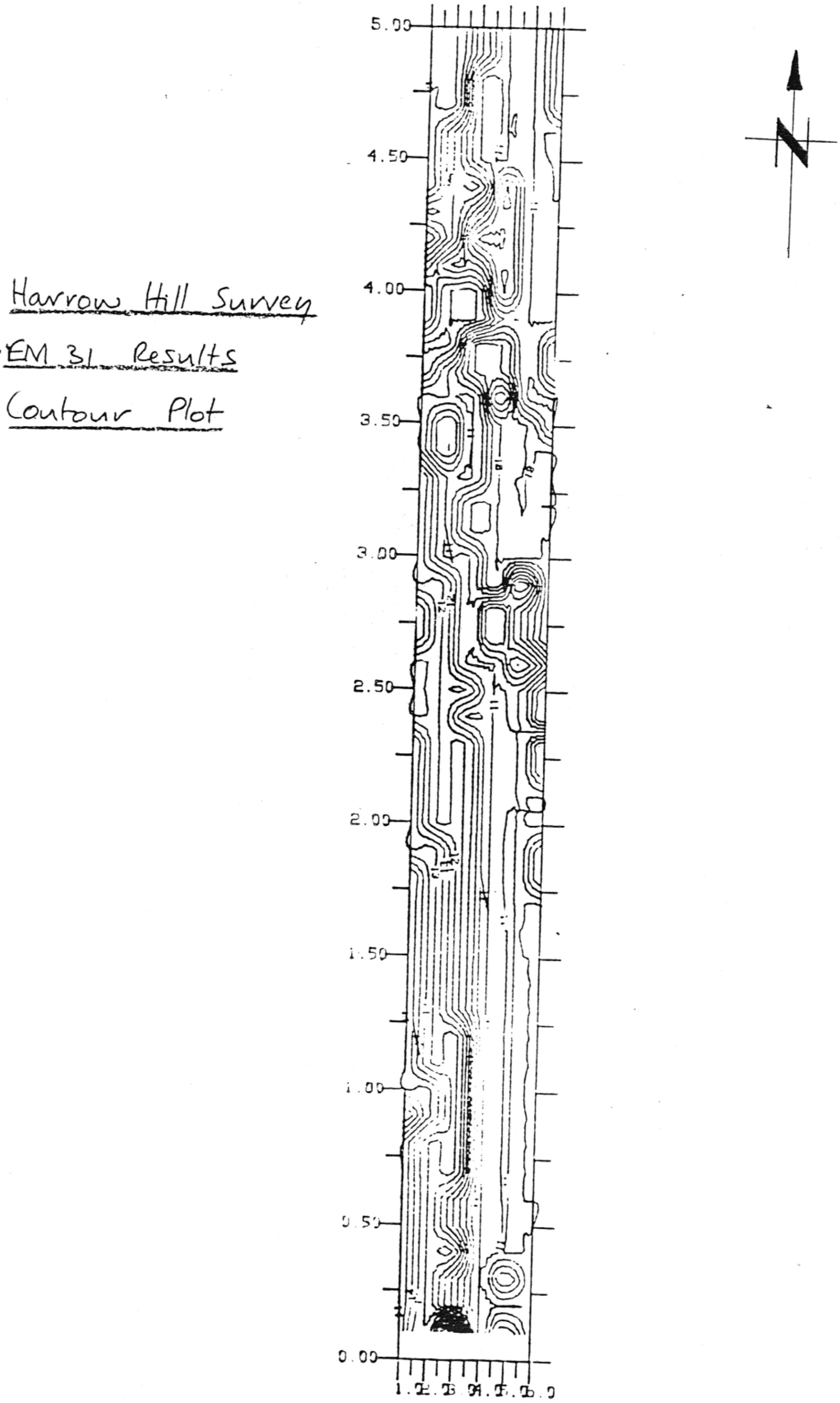
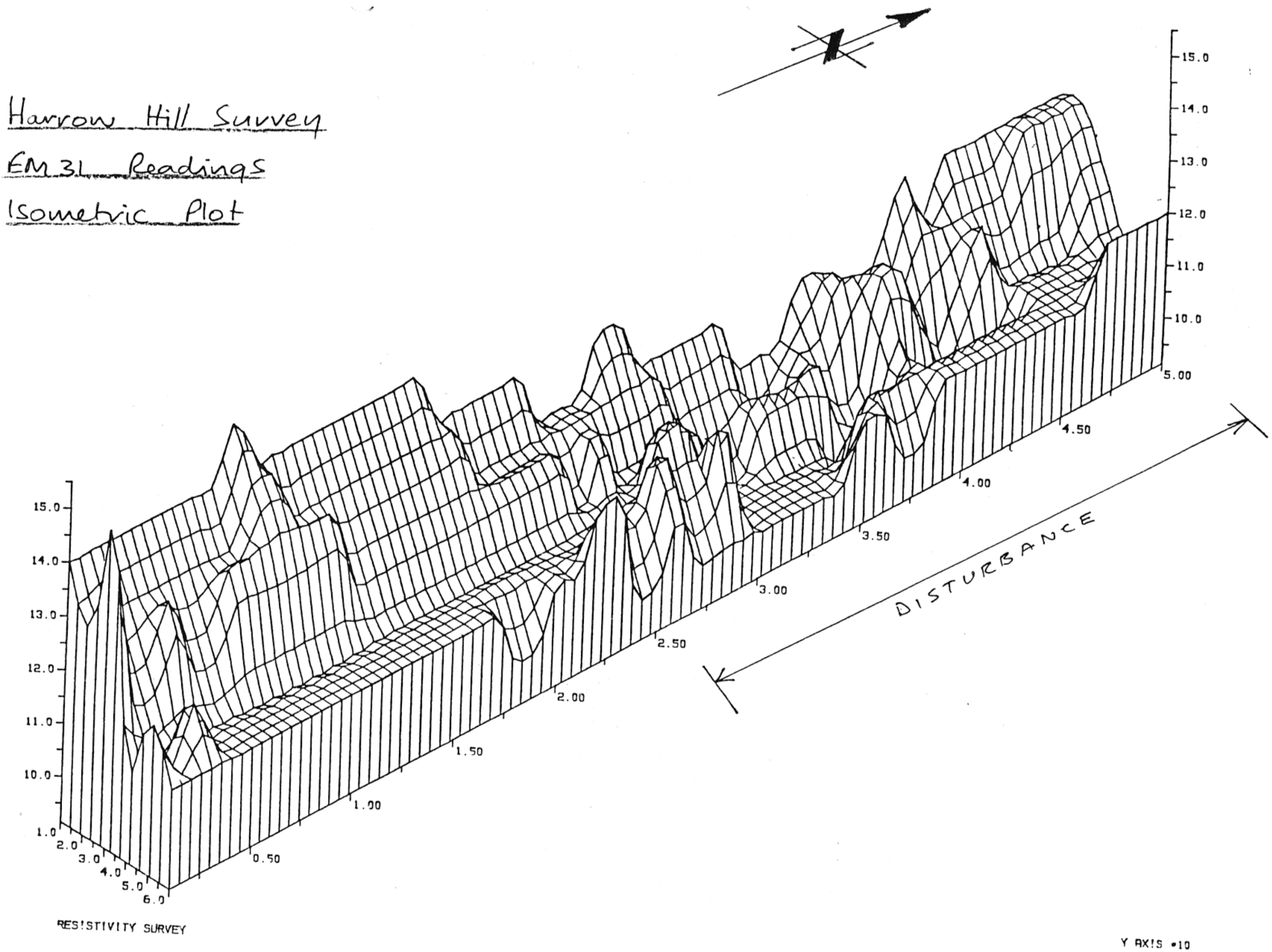


Fig 5. Harrow Hill, EM 31 survey results, readings isometric plot



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