Archaeology South-East

ASE

Enhanced Geoarchaeological Desktop Assessment and Sedimentary Modelling for Midhurst Academy, Midhurst, West Sussex

Site code: MAM 10

NGR: 48865 12215
ASE Project No: 4377

ASE Report No: 2010211

Dr Matthew Pope

November 2010

Enhanced Geoarchaeological Desktop Assessment and Sedimentary Modelling for Midhurst Academy, Midhurst, West Sussex

Site code: MAM 10

NGR: 48865 12215
ASE Project No: 4377

ASE Report No: 2010211

Dr Matthew Pope

November 2010

Archaeology South-East
Units 1 & 2
2 Chapel Place
Portslade
East Sussex
BN41 1DR

Tel: 01273 426830
Fax: 01273 420866
Email: fau@ucl.ac.uk

Abstract

An archaeological and geoarchaeological watching brief was undertaken on geotechnical trial pits and boreholes by Archaeology South-East at Midhurst Rother College, Midhurst, West Sussex during late May/early June 2010. The work was commissioned by Gifford on behalf of their client, and was intended to support a forthcoming planning application for the site.

In July 2010 a desktop assessment of these results and likely potential for Quaternary environmental and archaeology was produced. Further to this, Gifford commissioned an enhancement of the desk-top assessment based on 3D modelling of the geotechnical observations in order to develop a zoned characterisation of the site.

The modelling indicates relatively shallow Made Ground depths across the site, overlying a deposits of sandy Head Deposits which relates to slope processes. Below this, the site divides into three broad zones. A Lower Slope Zone where no indication of sedimentation is known below 1.5m but which has the potential to hold Holocene fluvial sedimentation. A Mid-Slope Zone under the current school where extensive fluvial deposits are present as part of a terrace sequence and locally found at depths of 1m below the modern landsurface. The third zone the Upper Slope Zone, again only investigated to depths of 1.5m but containing a localised deposit of rooted clay below apparent Holocene Head Deposits.

CONTENTS

LIST OF FIGURES

1.0 INTRODUCTION

1.1 Archaeology South-East (ASE), the contracting division of the Centre for Applied Archaeology at the UCL Institute of Archaeology, were commissioned by Gifford on behalf of their client, to produce an enhanced desk top assessment of geoarchaeological potential at the site based on first order modelling of the geotechnical data from investigations at Midhurst Rother College, Midhurst, West Sussex (centred NGR 48865 12215, Figure 1).

1.2 Two phases of geotechnical investigations were carried out at the site: an archaeological watching brief during geotechnical trail works and a geoarchaeological watching brief during boreholes. This desk top assessment combines all observations to determine the likely significance, archaeological potential and a suggested zoned approach to further mitigation.

2.0 LANDSCAPE CONTEXT

2.1 The Midhurst Academy site falls within the drainage of the Arun and Western Rother Rivers, the catchment of which lies largely within West Sussex and a small part of Eastern Hampshire. The valleys cut through the varying Cretaceous and Quaternary Geologies of the West Sussex Coastal Plain, Chalk Downlands and the low lying Sussex Weald. The northern boundary falls along the line of Tunbridge Wells Sandstone outcrops lying at the western end of the High Weald, while the southern boundary is set by the present day coastline. The Arun and Western Rother together make up one single, indivisible river system, the Rother having its confluence with the Arun some 15km inland from the modern coast. While the Rother is considered to be a subordinate system to the Arun, it has an extensive drainage area comparable to that of the pre-confluence Arun. The combined system drains the Western Weald and Chalklands from the flanks of the Surrey Hills, to the watersheds of the Adur, Lavant and Wey Rivers.

2.2 The lower reaches of the Western Rother cut a relatively straight and restricted valley through Lower Greensand and Gault geologies between the respective cretaceous escarpments of the South Downs, Folkstone Beds and Hythe Beds. To the north, the dip slope of the Lower Greensand (Hythe Beds) rises steeply to a 100m escarpment and preserves a number of well-defined and productive terrace gravel deposits. These have produced good collection of Palaeolithic flint work and, at Duncton, faunal remains.

2.3 The Midhurst academy site is situated on the south bank of the River Rother between 35 and 20m OD. It occupies a topographic position at the foot of the Lower Greensand (Folkstone Beds) escarpment straddling a break in slope (at 25m OD.) between the steep flank of the escarpment and more level ground flanking the floodplain of the main river valley. It also occupies the effective confluence between a tributary dry valley of Rother, entering the flood plain from the south where it can be traced back to a major gap in the chalk which carries through to Singleton and the Lavant Valley and yet is separated from this system by a watershed to the north of Singleton near Cocking. The tributary valley will from here on be referred to as the Cocking Valley.

2.4 This dry valley system would have been last active at the end of the last glacial period c.100,000 years ago when it would have discharged meltwater from snow fields on the South Downs. It may have continued to be active during the early

Holocene as a spring fed channel but today in devoid of active drainage and is currently occupied to the south of the site by the main settlement of Midhurst.

3.0 THE GEOLOGICAL CONTEXT OF THE MIDHURST ACADEMY

3.1 Solid Geology

3.1.1 According to BGS mapping, the site is underlain by a solid geology comprising elements of the cretaceous Lower Greensand Formation (LGS). At the site this comprises almost entirely the Selham Ironshot Sand Member (SIS) although the Rogate Member (RGTB) and Upper Fittleworth Member (UFIB) also outcrop close to the site. These solid geologies comprise glauconitic sands and sandy clays containing beds of both phosphatic nodules and calcareous sand stones (Gallois 1965).

3.2 Superficial (Pleistocene and Holocene) Geology

3.2.1 The immediate subsurface geology, as mapped by the BGS, comprises fluvial sands and gravels of the 1st Terrace of the Rother. The outcrop at the site forms part of a more extensive surface deposits of river terrace gravels appearing to cover a crescentic landform indicative on an original Pleistocene meander curve, the ancient floodplain of the river swinging south here against the escarpment of the Folkstone Beds. The low position of this gravel spread in the terrace sequence suggests a Late Pleistocene date, however, no specific dating programme has yet been carried out in the Rother Valley to provide an accurate guide to exact ages. An MIS 7-6-5 (250K-125K BP.) age is forwarded here as a possible date range for the deposits on the basis of altitude.

3.2.2 Further outcrops of river gravel to the south of this meander curve may relate to earlier terraces of the River Rother, however it is also possible these relate directly to the drainage of the Cocking Valley during periods of meltwater discharge. It is possible that some of the terrace gravels underlying the site also relate to drainage of this valley system during the Late Pleistocene and not exclusively to the River Rother itself. Detailed consideration of topography, fluvial structures and clast composition may help to disentangle the degrees to which both fluvial systems were contributing to gravel aggradations at the site during the Late Pleistocene.

3.2.3 No deposits relating to Head or Colluvium were mapped by the BGS at the site, but proximity to the steep escarpment of the Folkstone Beds suggested from the start of the investigation that the presence of these deposits was likely. To the immediate east and north of the site are the alluvial deposits of the current Rother floodplain. These outcrop at lower altitudes than the school site (c.20m OD.) and it is not thought, on the basis of current mapping that the proposed development would impact on these deposits. However, due to their close proximity this should be confirmed through further consideration of both geotechnical reports and topographic survey.

4.0 POTENTIAL FOR EARLY PREHISTORIC ARCHAEOLOGY IN THE ROTHER VALLEY

4.1 The Arun-Rother valley system came to the awareness of the archaeological community from the mid-nineteenth century onwards (Prestwich 1859) and has continued, to produce artefactual material, usually associated with aggregate extraction or development to the present day. By the turn of the 20th century the Rother was established as an area with good potential for the preservation of Palaeolithic finds, potential which has yet to be followed up by direct research prospection for sites. (Garraway-Rice 1905; Roe 1968; Woodcock 1981, Roberts and Pope 2004). A general review of past work in the area is given in the Woodcock volume (Woodcock 1981) with an update of recent finds covered by the Boxgrove Project (Pope 2004). A review of all known find-spots and relevant outcrops of terrace deposits within the area was undertaken by Wymer as part of the Southern Rivers Project (Wessex Archaeology 1993; Wymer 1999).

4.2 Previous survey work by the Boxgrove Project/ASE in the vicinity of the Coates and Horncroft Common aggregate pits near Fittleworth have begun to determine precise rock-head heights for the major mapped terraces. This work is now being expanded by the UCL research team to establish the complete sequence of deposits and provide contextual information for previously recovered material. At Selham, exposures of terrace gravel in the railway cutting revealed patinated debitage within the body of sands and gravels. Two bifaces have been recovered from deposits above the Rother valley at Midhurst (SU887207, SU885215). At Chithurst (SU 842239) Fowler records an abraded ovate biface from fields above the Rother Valley. This may well indicate the continued presence of Lower Palaeolithic material from the terraces of the Rother far into the western Weald and in the vicinity of the site.

4.3 Little previous work has been undertaken to the west of Midhurst. Palaeolithic finds are rare and terrace deposits poorly mapped. Midhurst is therefore an area of interest for understanding the relationship of the upper reaches of the Rother system with the better known eastern parts of the valley. By establishing the true range of terrace deposits in this region, it can be both tied in with the mapped sequences of the Lower Rother and work can then proceed to make a direct correlation between the Rother sequence and the better-known and archaeologically important stair case sequence of the Wey valley, which shares a water-shed with the Rother in this area. The Farnham terrace sequence has produced abundant artefacts from 150ft terrace deposits (Farnham Terrace A). These artefacts are crude and contrast with finer, soft-hammer finished tools from the lower 120ft Terrace B (Roe 1968; Wymer 1999). These artefact bearing deposits should have equivalents within the Western Rother, given the shared watershed. Both the high level plateaus and lower valley flanks of the valley should be considered areas of archaeological potential given the demonstrable presence of artefacts across all terraces in the Rother-Arun systems.

5.0 GEOTECHNICAL INVESTIGATIONS AT THE SITE

5.1 Geotechnical investigations

5.1.1 Two phases of geotechnical investigations have been carried out at the site. The records here provide a more detailed overview of deposits likely to be impacted upon by development from which some indication can be suggested for likely geoarchaeological potential.

5.2 Geotechnical test-pits

5.2.1 The first phase, (carried out on the 10/5/2010) comprised 12 geotechnical test pits excavated to depth of between 1.5 and 2.5m (Figure 2). All test pits showed sequences capped by between 0.3 and 1.1m of Made Ground resting on underlying sands. It would appear likely that the original Holocene landsurface here has been truncated, presumably in an attempt to create a flat, stable and dry playing field.

5.2.2 Sands and gravel deposits make up the rest of the observable sequences. Generally, to depths of around 1.2- 1.5m these comprise Yellowish Brown to Orange Brown fine to medium sands with fine to coarse medium flint and siltstone gravels. Below 1.5m, in TP212, TP207 and TP205 gravels become more prevalent, perhaps indicating a general coarsening on the bed-load reflecting initial high-velocity flow. Of note is the clay with sand bed recorded at 1.2 in TP208 which contained rootlets despite being sealed by sands. The possibility of surviving palaeoenvironmental evidence from this location should be considered.

5.2.3 None of these test pits made contact with the underlying Folkstone Beds Solid, water strikes were encountered at between 2 and 2.5m in TP212, TP210, TP211 and TP201.

5.3 Geotechnical boreholes

5.3.1 A second phase of geotechnical work was carried out on the 2/06/10. This compromised five boreholes, BH201 – 205 (Figure 2) taken to depths of in excess of 20m. These provide an indication of basal depths for the river terrace deposits, interpreted here as being the maximum depth of gravel elements in the lithological make up of the sediments and consequently the platform height of the terrace itself. Caution should be taken accepting this interpretation as it rests on the assumption that the earliest phase of fluvial aggradations of the terrace was high energy and consequently will contain the coarse clast components. Discerning the difference between reported sands which may comprise basal parts of the fluvial sequence and the upper, weathered parts of the solid Folkstone Beds is difficult in the field and impossible to call on the basis of examination of sediment log records alone.

5.3.2 In all boreholes the indisputable solid (Folkstone Beds) is encountered at between 4m and 7.5m depth. In BH202 and BH205 the fluvial gravels are underlain by 3m of stiff dark glauconitic clay, these may be a facies of the Lower Greensand Formation but should development impact impinge on these deposits, this assumption should be tested.

6.0 MODELLING OF GEOTECHNICAL RESULTS

6.1 Methodology

6.1.1 In order to further understand the likely significance and origin of deposits encountered at the site, and to develop an appropriate mitigation strategy, construction of a first-order geological model was commissioned.

6.1.2 Stratigraphic and lithological data from all observed boreholes and test pits was entered into a geological data manager (Logplot) and then imported into a modelling application (Rockworks). The data was then analysed to test a series of potential stratigraphic relationships and modelled using both nearest neighbour and krigging algorithms to produce a sensible and coherent first order model. The models editable and further, enhanced models can be produced should further data become valuable. However, given the size of the site there was broadly enough data to develop a reasonably detailed 3-dminesional framework.

6.2 The model

6.2.1 The model is presented here in three different ways. Two images (of logs within a 3d matrix are shown from slightly varying angles to give an impression of the overall lay-out of the site Figures 3 and 4). This model will also be made available online as a rotating movie clip. A single cross site transect is then presented providing the most coherent sectional slice through the site's principle sedimentary horizons (Figure 5). Finally two cross sectional models based on two slightly divergent transects are presented which model and interpolate wider stratigraphic relationships. Each are discussed in turn below.

6.2.2 Inspection of the 3d log models (Figures 3 and 4) as well as the representative west-east transect (Figure 5) demonstrates the following observable facts for each of the modelled stratigraphic units.

1. **Made Ground:** This unit covers the entire site and was recorded to some extent as the first encountered deposits at each observed location. However modelling shows it to be largely superficial in nature, never attaining depth grater than 0.6m and more usually only 0.1 -0.3m deep.
2. **Orange Sands:** Whilst originally interpreted as comprising an alluvial deposit, possibly relating to terrace deposits, modelling has now clearly resolved this deposit as a colluvial Head sediment. Below Made Ground, it covers the entire site and has a basal underlying contact which cuts across a number of underlying sedimentary units suggesting a degree of unconformity which most probably relates to erosional slope processes. The fine grained, sandy nature of the deposits and the occasional presence of fine flint most probably reflect simply the erosion of the local solid geology and remnant flint gravels which cap most low hills in the vicinity of the site.
3. **Clay with sand:** At two locations TP208 and TP211 mottled clays were encountered underneath the Orange Cover sands. The modelling confirmed that the deposits at the two locations were probably unrelated except in terms of their stratigraphic position. Given that each occur at the base of short sequences, their relationship to either underlying fluvial gravels or the solid geology is impossible to determine. The observed rooting at TP 208, given its modelled position underlying slope deposits should however be considered potentially significant.
4. **Sands and Gravels:** Medium to Coarse flint and sandstone gravels in a grey sand matrix were observed at depths between 1m and 4m below ground surface in all the

borehole sequences and at two of the mid-slope test pits (TP205 and TP212). The model shows this deposit to be consistent with a fluvial terrace deposits as previously suspected, with neither the upper or lower surface of these gravels respecting the ground surface slope geometry and having a contact in the majority of cases with the underlying solid.

5. **Glauconic Clay:** In two Boreholes BH205 and BH202 a stiff, dark green Glauconic clay was encountered between the fluvial sands and gravels and the surface of the Solid Geology. At BH202 this occurred between 3.1m and 6.1m while at BH205 it was between 4.75m and 6.2m. In BH204 a thin seam of Glauconic Clay was found at the same stratigraphic position but was too thin to properly model. The modelling process cannot alone determine whether this deposit is likely to be part of the basal fluvial sequence or a facies of the Lower Greensand Formation which is currently unmapped.
6. **Lower Greensand:** The Interpretation of basal sandstones as being the solid Lower Greensand geology is upheld by the model which shows its occurrence at a regular depth and with consistent Lithology encountered at depths varying between 4m -7m and around 18m-20m O.D. However observations were only available for the mid slope part of the site as none of the test pits excavated deep enough to reach the solid geology. In order to develop the model further it is necessary to have solid rock heights for the lower and upper parts of the slope. Only in this way can the true shape of the terrace be properly modelled.

6.4 Two summary, modelled cross sections are provided in Figures 6a and 7a (Figures 6b and 7b provide schematic maps showing the position of boreholes and test pits from which the model was generated). They provide a model which in summary suggest the site is situated on a terrace of the River Rother system, possibly relating to the subsidiary Cocking Stream, with a platform heights of 20m O.D. The fluvial sequence is covered by Head Deposits which derive from the local Folkstone Beds geology.

7.0 CONCLUSIONS: POTENTIAL, ZONING AND SUGGESTED MITIGATIONS.

7.1 The site holds moderate potential for the recovery of Pleistocene archaeology in the form of stone artefacts and palaeoenvironmental data in the form of faunal remains, and environmental indicators such as molluscs, pollen and microfauna. It can be firmly stated that deposits known to preserve Palaeolithic artefacts and fauna elsewhere in the valley are substantially preserved at relatively shallow depths below the ground at the Midhurst Academy site.

7.2 Consideration should be given to the Head Deposits (Orange Sands) which cover the entire site. They reach significant depths of up to 3m in places and for much of the site their lower contact has yet to be determined. The relatively shallow depths of Made Ground may not always indicate significant disturbance, although levelling on the playing fields is highly likely. Consideration should be given to the possibility that the upper part of these deposits could contained marginally truncated archaeological features and human activity signatures associated with Holocene colluviation of the valley.

7.3 In summary, on the basis of geological modelling three broad zones can be identified at the site each with specific aspects of interest which will require different approaches and levels of consideration, depending on the likely nature of development impact.

Zone 1: Lower Slope (TP 201, 202, 203, 204, 206) (Figure 2).
Situated largely on playing fields to the east, this area occupies the lowest part of the site. It was sparsely investigated during the geotechnical works and so we have only limited data for it. No deep boreholes were site here and so only the top 1.5m of subsurface geology was investigated. This unfortunately means that it cannot be determined if Pleistocene terrace deposits continue under Head Deposits here or if deeper alluvial sediments relating to the Holocene drainage of the valley exists at the lower reaches of the site. Any groundworks here which impact below 1.5m have the potential to encounter either Pleistocene Gravels or Holocene alluvium. Targeted test pitting could resolve this uncertainty.

Zone 2: Mid Slope (TP205, 212, 211 BH201-205) (Figure 2).
This zone, covering the area currently occupied by the school was the most intensely investigated. Here boreholes established the presence of fluvial sand at gravels at depths as shallow as 1.2m (BH201 and 202). At other locations (BH 203-205) Head Deposits extended to depths of between 3m to 4m so this contact can be considered highly variable within the area. This zone should be considered the highest for Palaeolithic potential as the gravels are clearly of Pleistocene origin. It is also the dating and characterisation of these gravels which is of most immediate palaeogeographic significance. Determining the true nature and origins of the Glauconic clay should also be considered as an objective here, but could be resolved through inspection and analysis of retained cores.

Zone 3: Upper Slope (TP 208, 209, 207, 210) (Figure 2).
As with Zone 1, this area was only investigated through test pit excavation to depths of 1.5m and so no detail is known as to whether significant deposits lie below this horizon. Apart from Head Deposits, discussed above, the only deposit of significance was the rooted clay found at the base of TP208. The character and significance of this deposits requires further investigate if development is proposed in the vicinity of TP208

7.4 The details outlined above should be considered a first order model based on observed Lithology and cross-site distribution. The precise origin of each sedimentary horizon has not been tested through sedimentary, particle or mineralogy. No assessment has yet been undertaken for palaeoenvironmental potential. However, we can be confident of the general character of the sedimentation and gaps in our knowledge critical to a full assessment of the site have been clearly identified. Moving forward the first order model now exists as an editable, augmentable project file to which further data can be added and the stratigraphic relationships refined as further data become available.

REFERENCES

Gallois, R.W. (ed.) (1965). British Regional Geology: The Wealden District. London: Her Majesty's Stationery Office. ISBN 0-11-884078-9

Garraway-Rice, R. 1905. Implements from the terrace gravels of the River Arun and Western Rother. *Proceedings of the Society of Antiquities 10, 197 – 207.*

Prestwich, J. 1859. On the Occurrence of Flint-implements, associated with the Remains of Extinct Mammalia, in Undisturbed Beds of a late Geological Period [Abstract]. *Proceedings of the Royal Society of London 10:50-59*

Pope, M.I. 2003. The Earliest occupation of Sussex: Recent research and future objectives. In Rudling, D. (ed) The archaeology of Sussex to A.D. 2000. Heritage Marketing and Publication Ltd. 17-29.

Pope, M.I. and Roberts M.B. 2004. Geoarchaeological Investigations at Coates Common. Unpublished Evaluation Report for Wessex Archaeology.

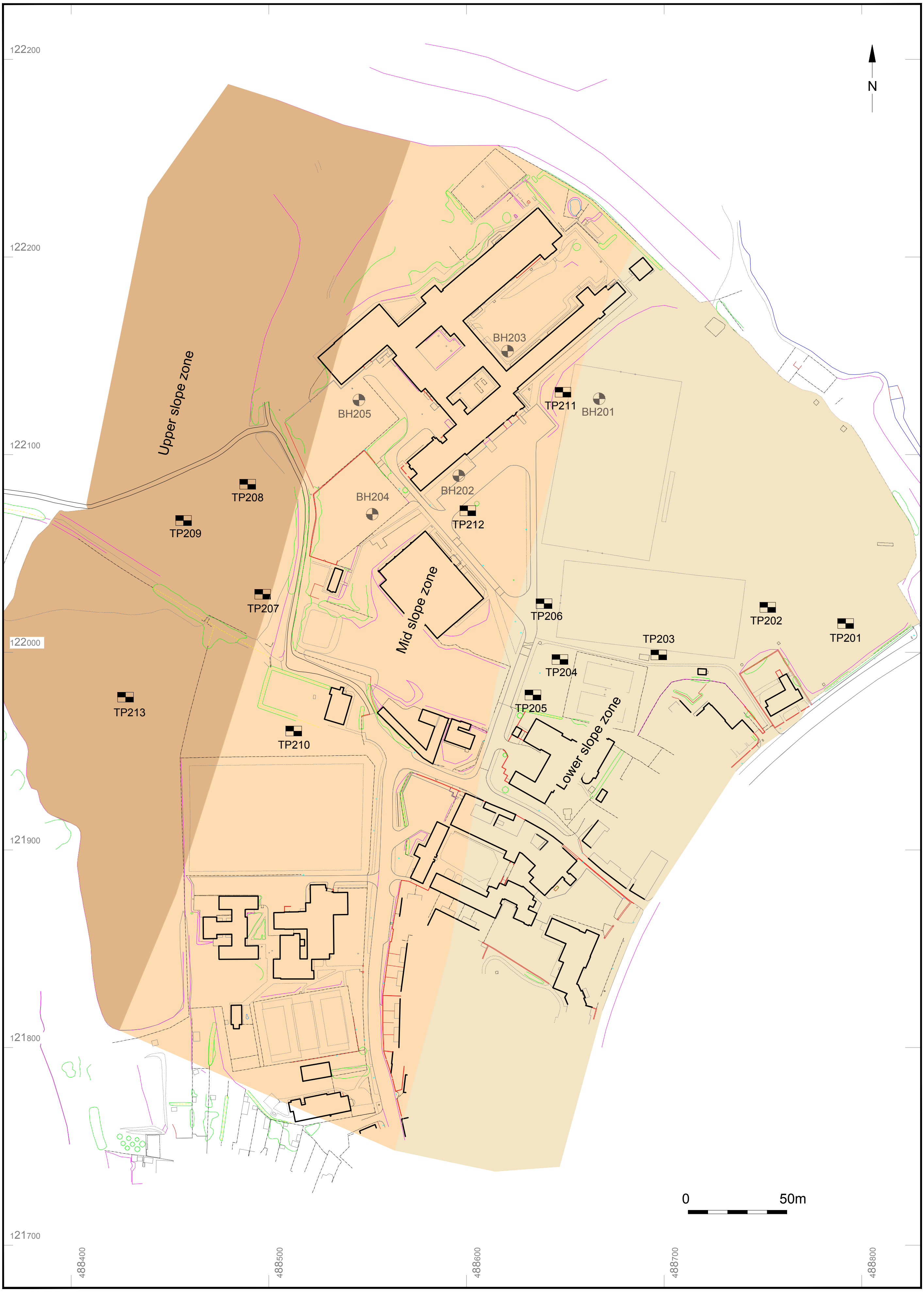
Roe, D.A. 1968. A Gazetteer of the British Lower and Middle Palaeolithic Sites, London.

Wessex Archaeology. 1993. The Southern Rivers Palaeolithic Project: Report No. 2. Salisbury: Wessex Archaeology

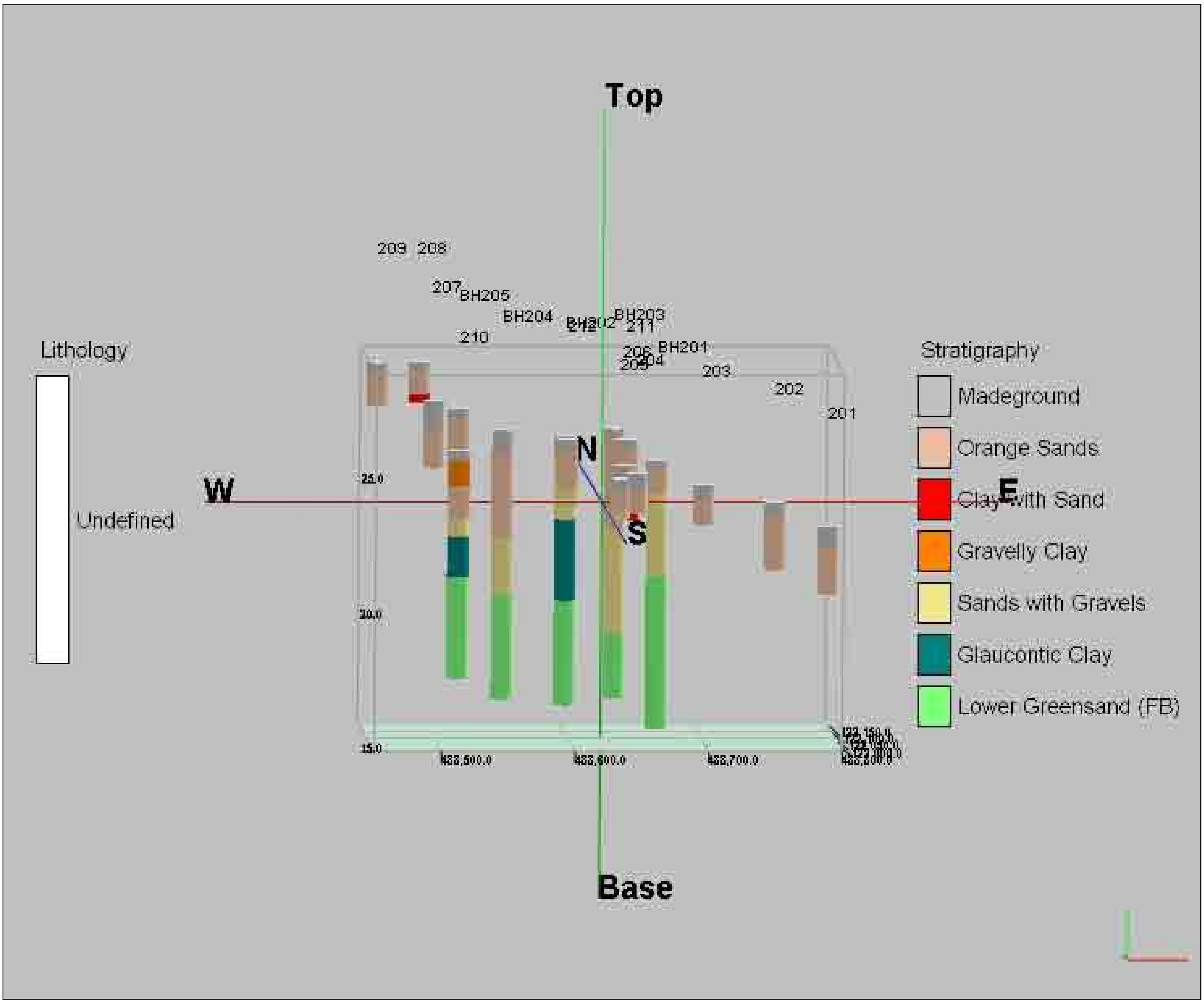
Woodcock, A. *1981 The Lower and Middle Palaeolithic periods in Sussex. BAR British Series 94..*

Wymer, J. 1999. The Lower Palaeolithic Occupation of Britain. Wessex Archaeology and English Heritage.

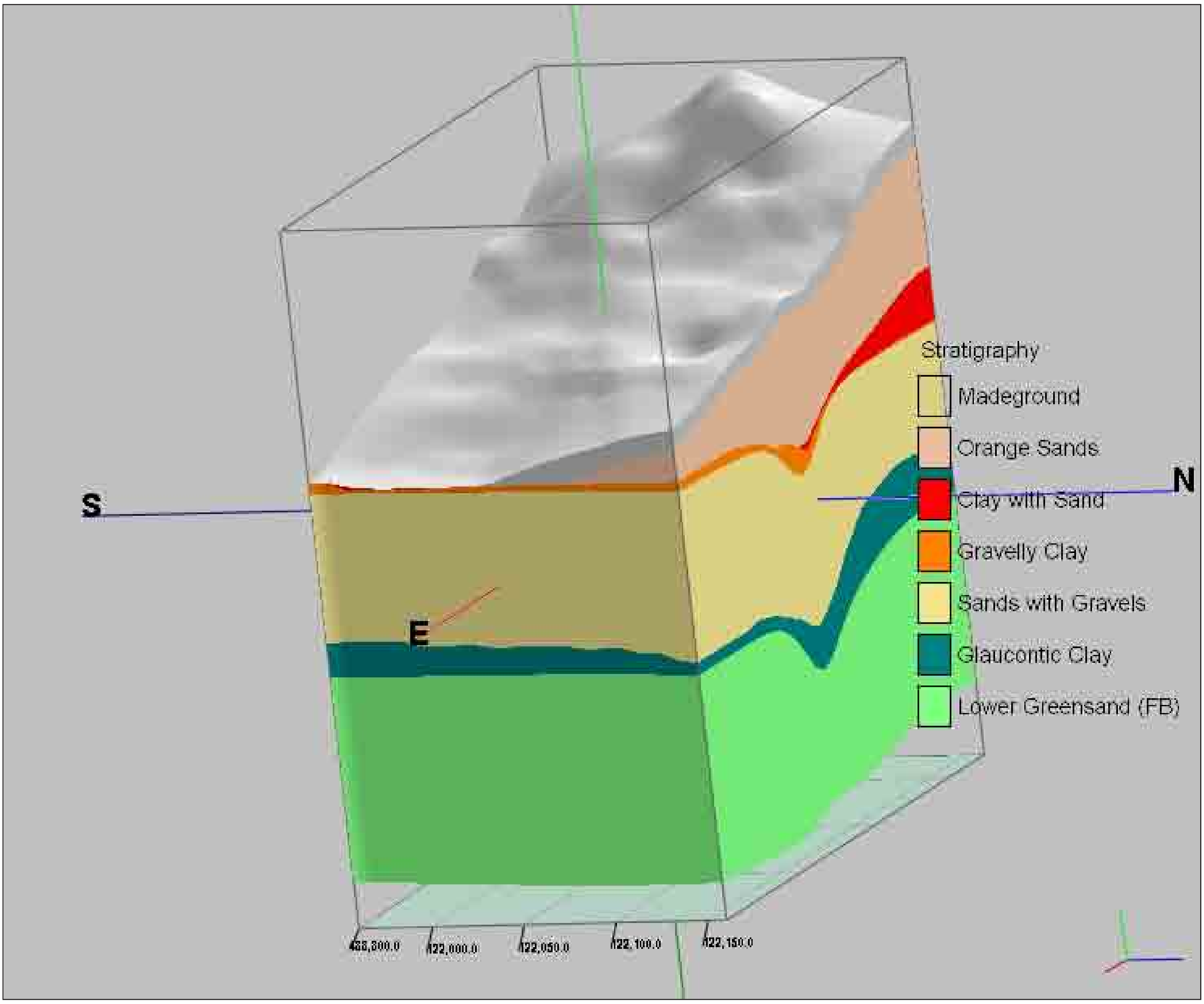
© Archaeology South-East		Midhurst Academy, Midhurst	Fig. 1
Project Ref: 4377	Nov 2010	Site location	
Report Ref:	Drawn by: JLR		



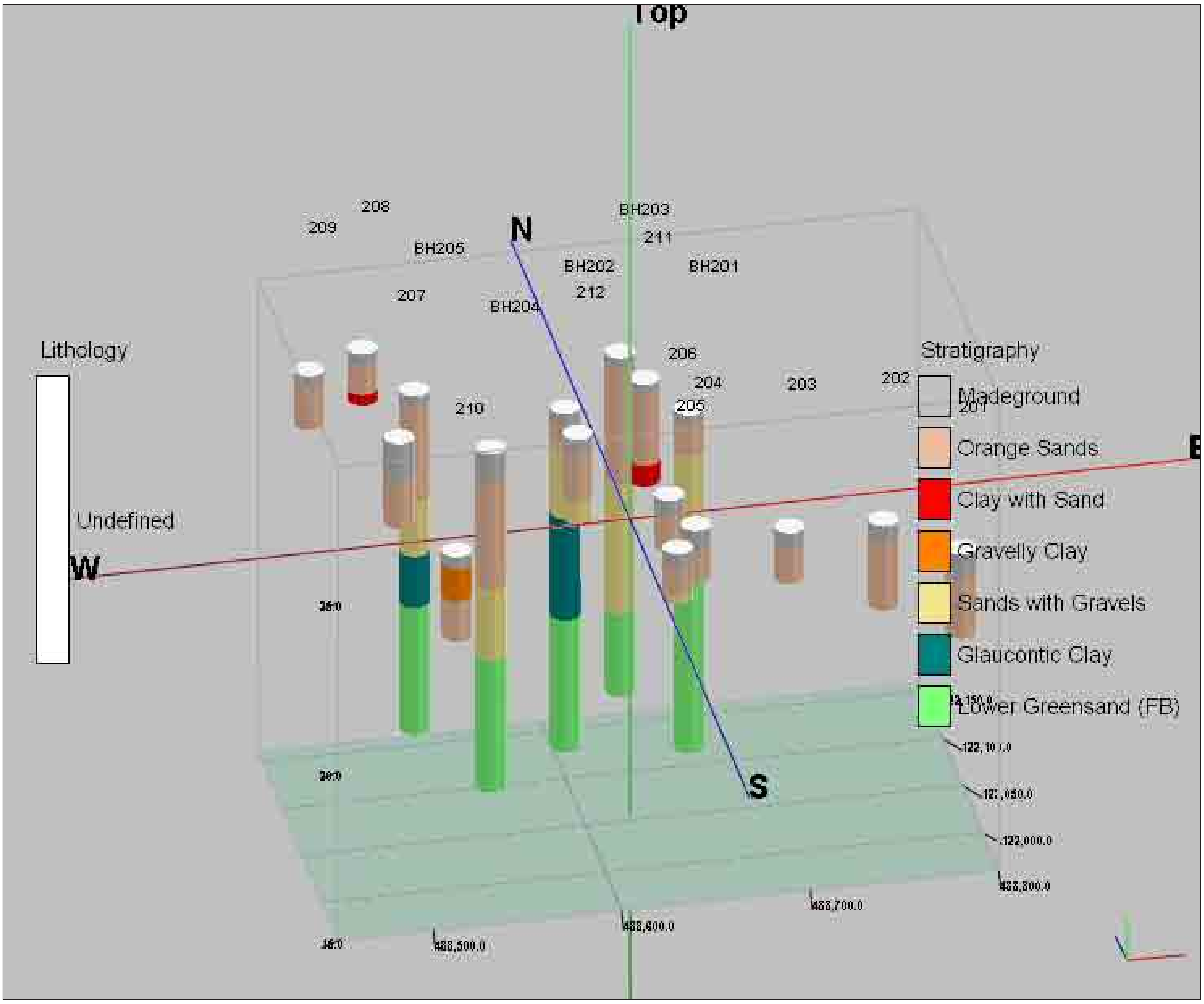
© Archaeology South-East		Midhurst Academy, Midhurst	Fig. 2
Project Ref: 4377	Nov 2010	Trial pit and borehole location plan	
Report Ref:	Drawn by: JLR		



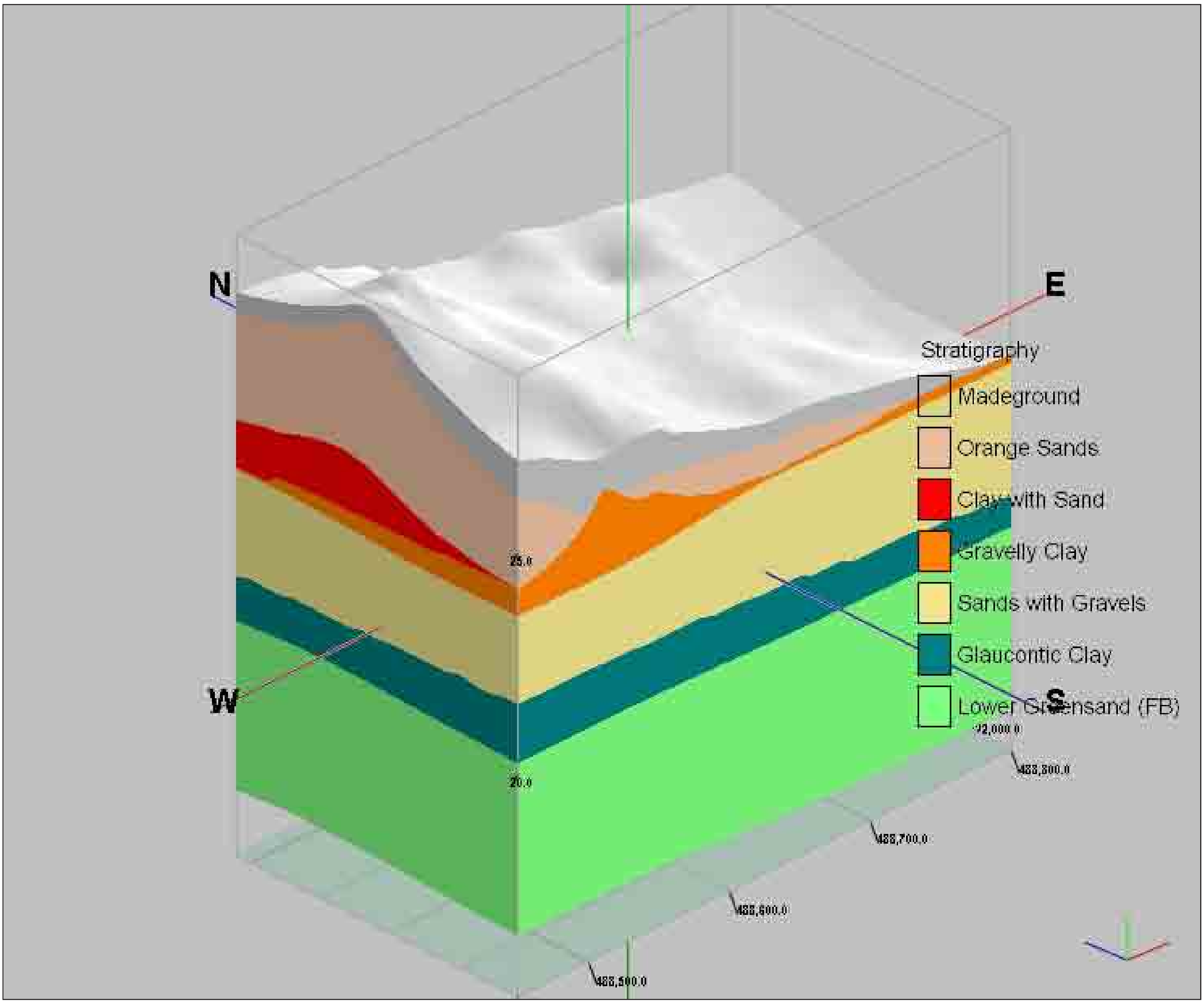
© **Archaeology South-East**		Midhurst Academy, Midhurst	Fig. 3a
Project Ref: 4377	Nov 2010	3D well log model 1	
Report Ref:	Drawn by: MP		



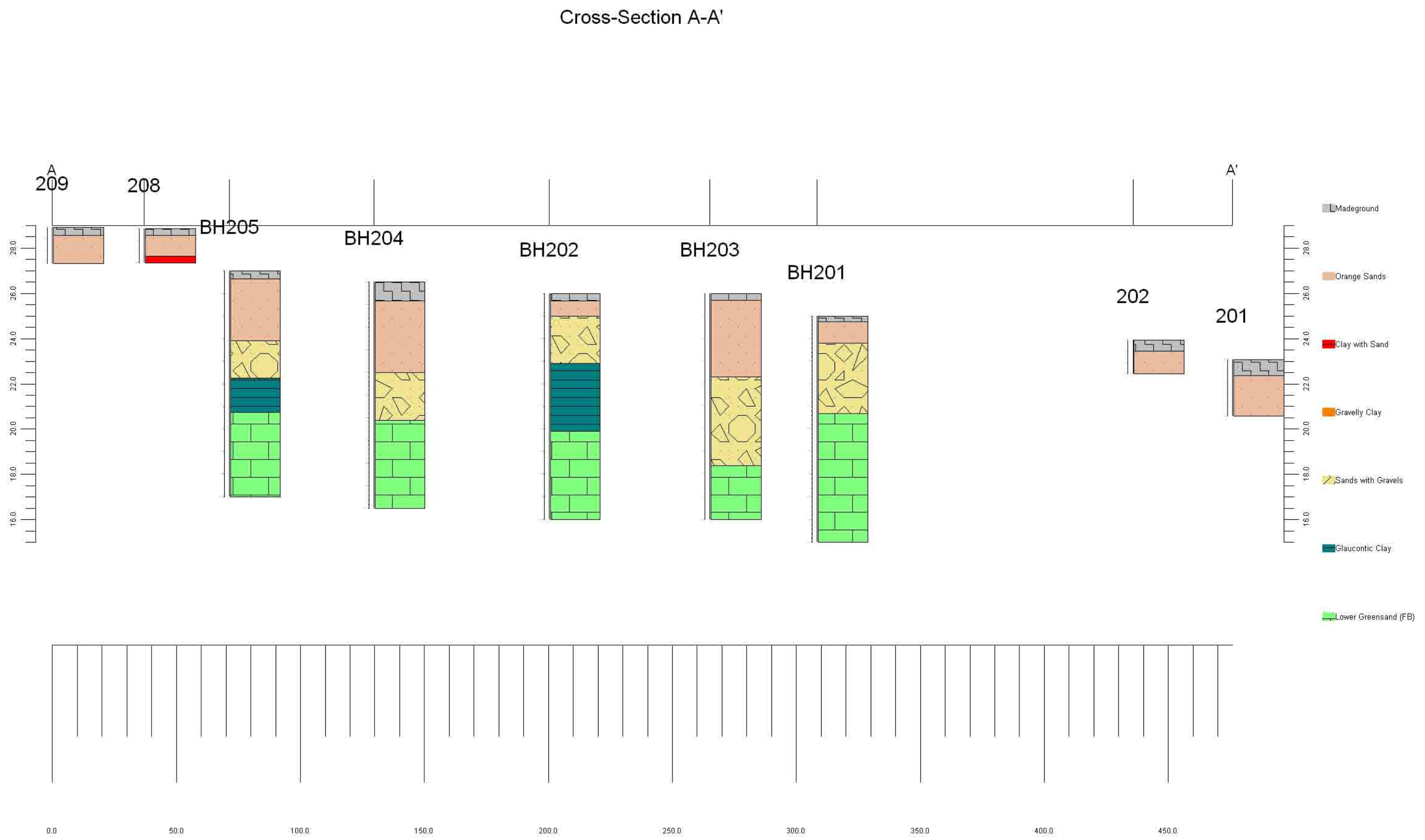
© **Archaeology South-East**		Midhurst Academy, Midhurst	Fig. 3b
Project Ref: 4377	Nov 2010	3D well log model 1 (Solid)	
Report Ref:	Drawn by: MP		



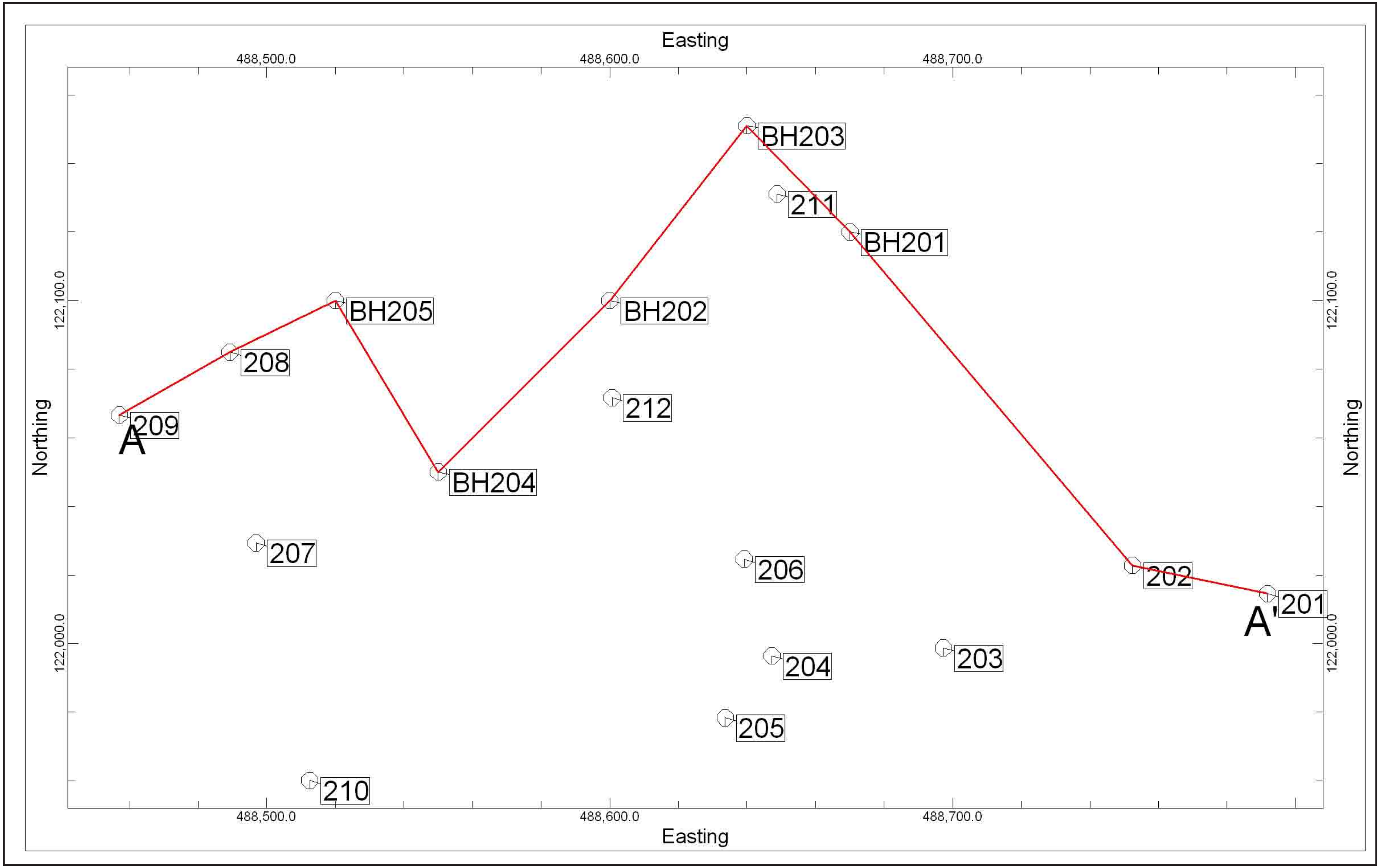
© **Archaeology South-East**		Midhurst Academy, Midhurst	Fig. 4a
Project Ref: 4377	Nov 2010	3D well log model 2	
Report Ref:	Drawn by: MP		



© **Archaeology South-East**		Midhurst Academy, Midhurst	Fig. 4b
Project Ref: 4377	Nov 2010	3D well log model 2 (Solid)	
Report Ref:	Drawn by: MP		

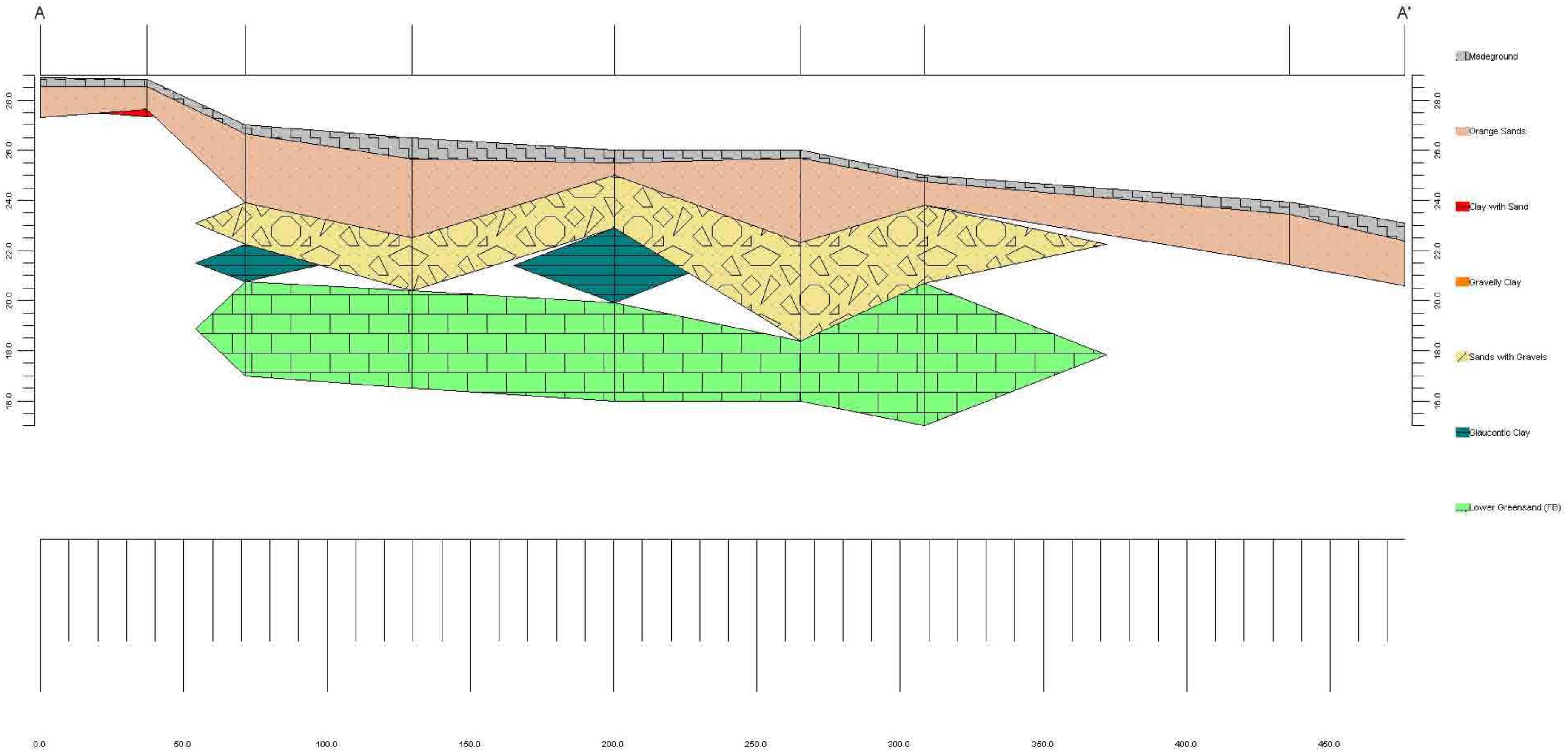


© Archaeology South-East		Midhurst Academy, Midhurst	Fig. 5a
Project Ref: 4377	Nov 2010	West East log transect	
Report Ref:	Drawn by: MP		

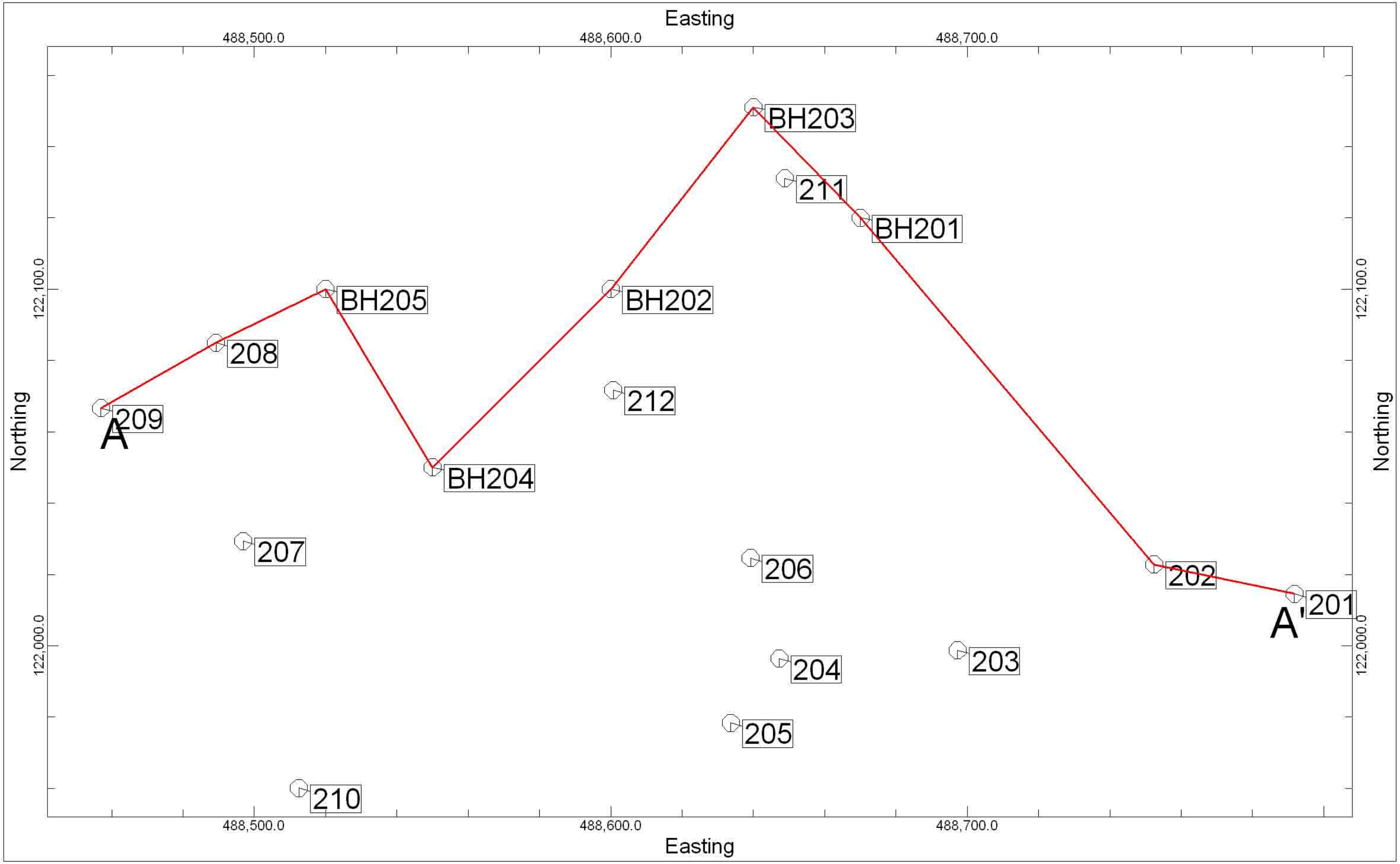


© **Archaeology South-East**		Midhurst Academy, Midhurst	Fig. 5b
Project Ref: 4377	Nov 2010	Schematic map for locations of logs in transect	
Report Ref:	Drawn by: MP		

Cross-Section A-A'

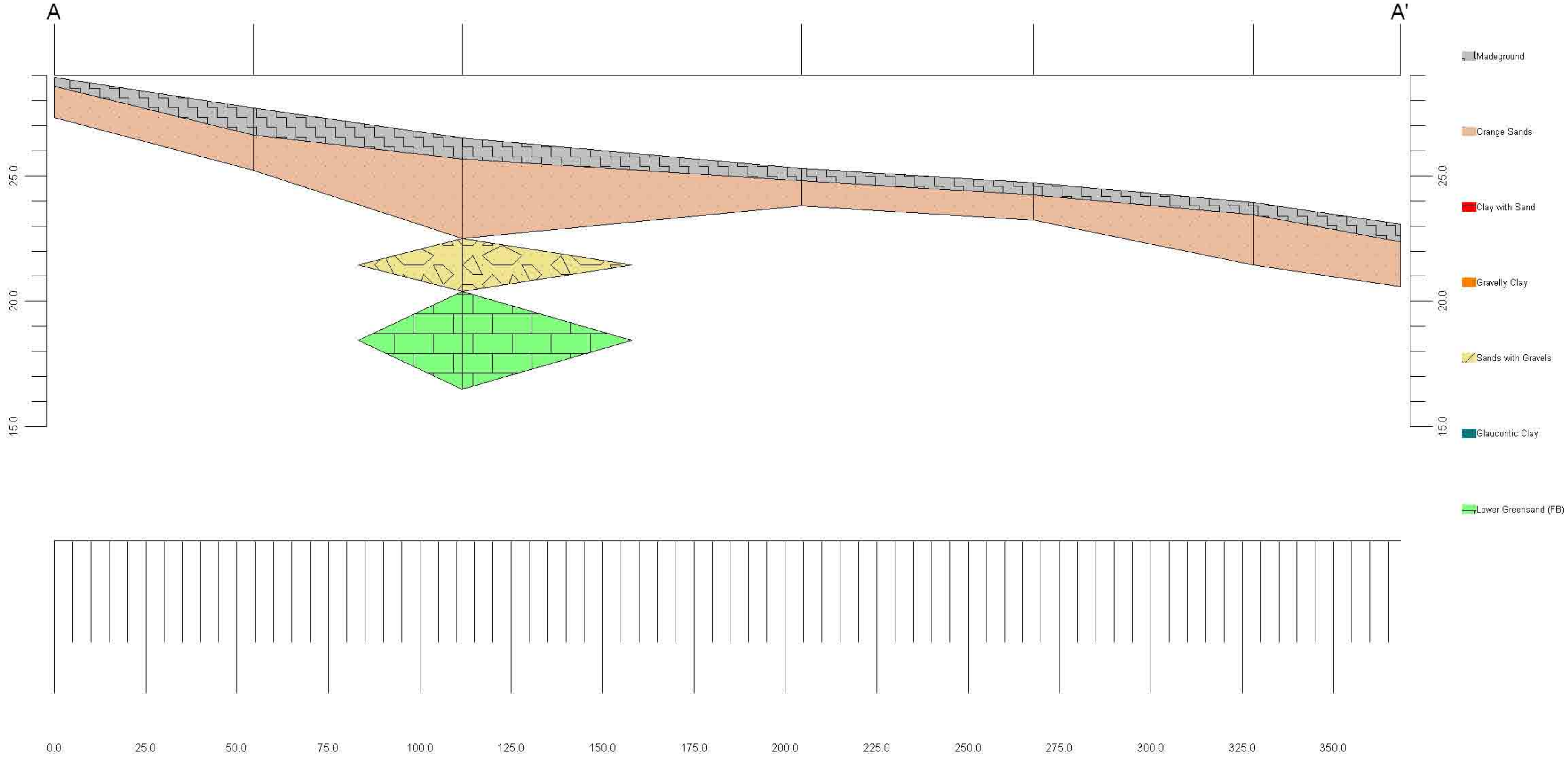


© Archaeology South-East		Midhurst Academy, Midhurst	Fig. 6a
Project Ref: 4377	Nov 2010	West-East modelled and correlated Transect 1	
Report Ref:	Drawn by: MP		

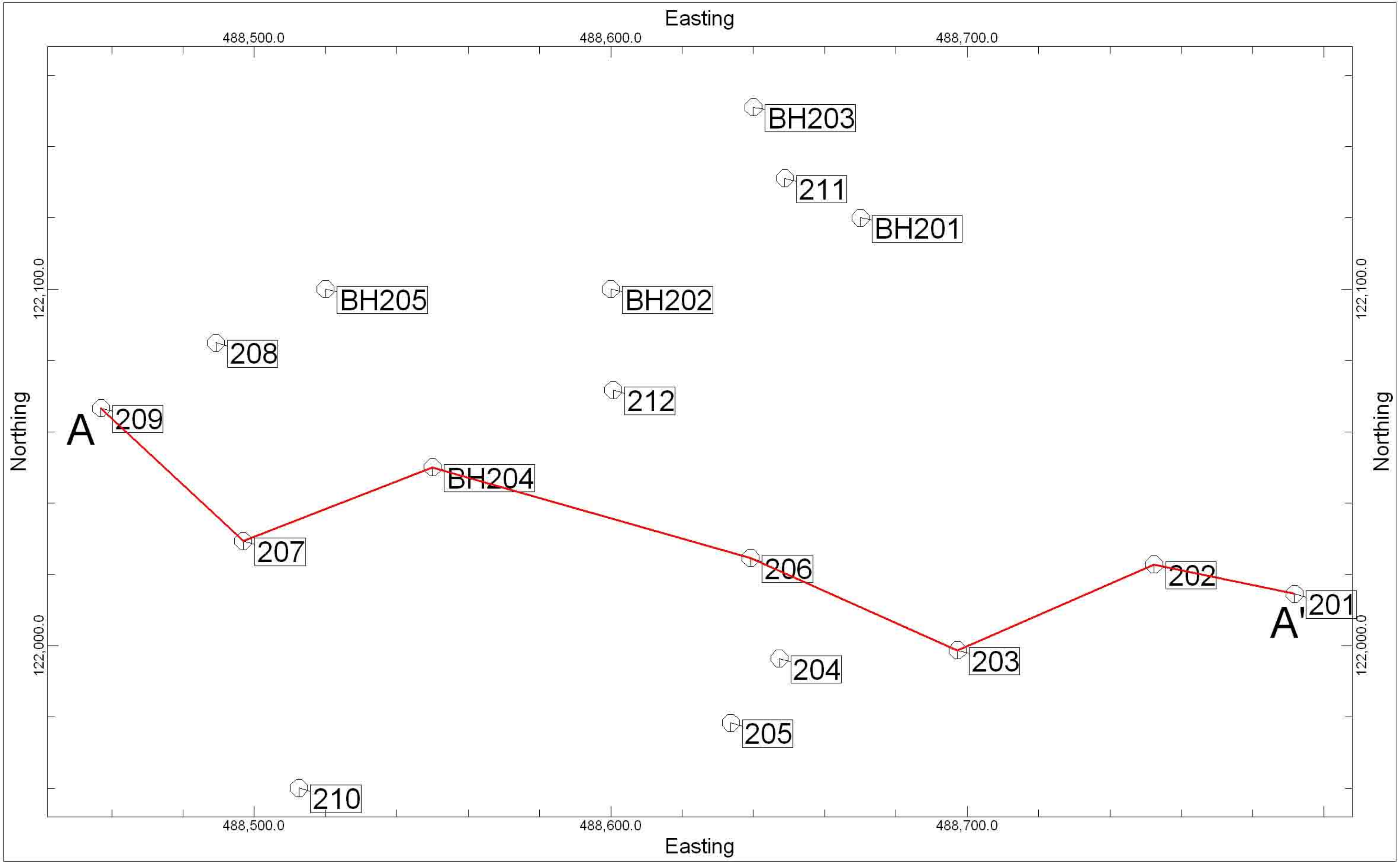


© **Archaeology South-East**		Midhurst Academy, Midhurst	Fig. 6b
Project Ref: 4377	Nov 2010	Schematic map for locations of logs in transect	
Report Ref:	Drawn by: MP		

Cross-Section A-A'



© **Archaeology South-East**		Midhurst Academy, Midhurst	Fig. 7a
Project Ref: 4377	Nov 2010	West-East modelled and correlated Transect 1	
Report Ref:	Drawn by: MP		



© **Archaeology South-East**		Midhurst Academy, Midhurst	Fig. 7b
Project Ref: 4377	Nov 2010	Schematic map for locations of logs in transect	
Report Ref:	Drawn by: MP		

Head Office
Units 1 & 2
2 Chapel Place
Portslade
East Sussex BN41 1DR
Tel: +44(0)1273 426830 Fax:+44(0)1273 420866
email: fau@ucl.ac.uk
Web: www.archaeologyse.co.uk

London Office
Centre for Applied Archaeology
Institute of Archaeology
University College London
31-34 Gordon Square, London, WC1 0PY
Tel: +44(0)20 7679 4778 Fax:+44(0)20 7383 2572
Web: www.ucl.ac.uk/caa