Farndon Fields, Newark, Nottinghamshire: Windermere Interstadial deposits with potential for Late Upper Palaeolithic human activity

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Abstract. Late Upper Palaeolithic (LUP) artefacts collected from ploughsoil on the flattish interfluve between the rivers Trent and Devon have been shown by excavation to derive from alluvial sediments attributed to the Windermere Interstadial. The recorded distribution of artefacts from ploughsoils lies almost exclusively to the north of coversands of potentially later date (Loch Lomond Stadial). Hand-augering and test-pitting, by a team working under the banner 'Ice Age Journeys', set out to investigate the extent of these coversands, and to see if contexts surviving beneath them provide potential for Palaeolithic activity. In the southern part of Farndon Fields, the studied sections show that the basal Dimlington Stadial sands and gravels are overlain by laminated sediments on which a weak soil developed before burial by coversands. Two new OSL dates bracket this soil horizon, one above (in coversands, 11.76 ± 0.79 ka) and one below (in laminated sediments, 14.8 ± 1.4 ka), demonstrating its Windermere Interstadial age. This locally high (c. 11.0–11.7 m OD) and dry ground overlooked the alluvial floodplain with proven, *in situ*, LUP occupation at c. 10.6 m OD. A ridge to the north (c. 11.3–11.7 m OD) has also produced LUP artefacts. Though lacking context because from ploughsoils, they confirm that both landscape settings were occupied by Palaeolithic groups. As the higher ground to the south was subsequently buried by coversands, it lies below the current ploughzone, having therefore great potential for the preservation of intact LUP archaeology.

Introduction and background

Late Upper Palaeolithic (LUP) flints, typical of the Windermere Interstadial (GI-1, 14,700–12,900 BP: Rasmussen et al, 2014), have been found over some 18 ha at Farndon Fields on the interfluve between the Rivers Devon and Trent (Fig. 1). The flints were initially discovered by systematic collection from the fields' surface prior to a re-routing of the A46, Fosse Way, just to the south-west of Newark-on-Trent (centred at NGR SK 7852; Garton and Jacobi, 2009). Between 1991 and 2009, when a new route of the A46 was constructed, the key question was to identify the deposits from which the flints were being ploughed. The flints were mostly in good condition, and had not been damaged by ploughing, so it was clear that they had only been recently disturbed. Work conducted on behalf of the Highways Agency, mainly by Cotswold Wessex Archaeology, partly answered that question, but also recognised the possibility of other late glacial sediments that could be important in containing archaeological artefacts (the archaeology of the new A46 corridor is reported by Harding et al, 2014). Since the A46 construction, a community group involving archaeologists and geologists working under the banner 'Ice Age Journeys', has been working to understand the stratigraphy and genesis of the superficial geology at Farndon Fields, so as to locate preserved LUP assemblages out of range of recent ploughing. This paper reports on the results of one element of that work.

During the Dimlington Stadial (GS-2, 23,300–14,700 BP) Farndon was ~50 km south of the maximal ice limit of the British and Irish ice sheet (Bateman et al, 2015) in a periglacial landscape. The braided channels of the River Trent, with huge seasonal variation in flows due to the periglacial climate, provided extensive exposed sediment susceptible to wind erosion leading to coversand being deposited along the Trent and into north Lincolnshire in both the last part of the Dimlington and the later Loch Lomond stadials (GS-2 and GS-1: Bateman, 1998; Bateman et al, 2000; Baker et al, 2013, pp 108–9). These are periods for which little archaeology is known. In the intervening Windermere Interstadial (GI-1), rapid warming allowed human groups to recolonize Britain; their artefacts are well known from excavations in caves conducted from the 18th century onwards, but more recent work is starting to recover sites out in the open like Farndon Fields. In caves at Creswell Crags, some 35 km distant (and the type-site for the British LUP Creswellian industry), humanly-modified hare-bones and horse-teeth are dated to the earlier part of the Interstadial (GI-1e, 14,700–14,100, Jacobi and Higham, 2011, fig. 12.13). The LUP tool styles changed over the course of the Interstadial and, at both Creswell and Farndon, slightly later forms (called Federmesser after similar industries in Northern Europe), have also been found. It is very rare that Creswellian and Federmesser artefacts are reported from single locations and rarer still that they occur in stratigraphic association. Exceptional examples are known from caves in the Torbryan Valley, Devon (Barton and Roberts, 1996) but Farndon Fields is the first open-air site where this was reported in excavations (Harding et al, 2014). Hence, Farndon Fields is recognised as of National Importance and the 'new' A46 was routed to avoid known artefact concentrations (Public Enquiry: Highways Agency, 2007, pp 7–104), and this recognition has been subsequently endorsed by Historic England (2018) for both this sequence and

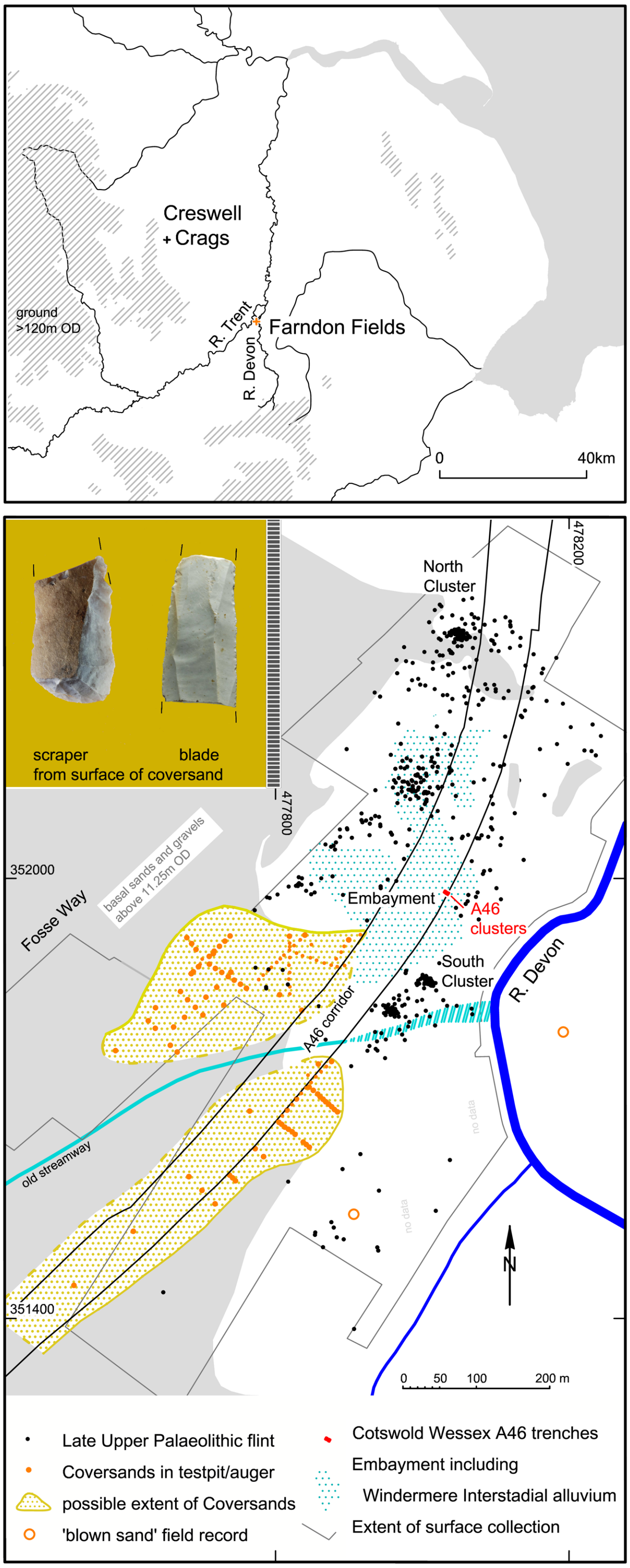

Figure 1*. Farndon Fields, located on the interfluve between the Rivers Devon and Trent, showing location of flints collected from surface of ploughsoils and the superficial deposits discussed in the text. Orange/yellow shading represents coversands; blue represents estimated minimum extent of 'embayment' i.e. silty/alluvial deposits that contain Later Upper Palaeolithic artefacts where basal sands and gravels dip below 10.75 m OD; grey represents surface of basal sands and gravels above 11.25 m OD (nb 'no data' in south-eastern part below streamway). Break-lines indicated on flints are ancient. (Based on OS open-data © Crown copyright and database right 2010)*

the widespread extent of LUP archaeology. Currently, Farndon Fields ranks with Hengistbury Head, Dorset (Barton, 1992) as one of the most prolific occurrences of open-air finds from anywhere in the British Isles.

Farndon Fields lies on the largely undeveloped parts of the interfluve between the Trent and Devon mapped as Holme Pierrepont Sand and Gravel (British Geological Survey, 1996; Howard et al, 2011). The interfluve rises to a little over 12 m OD, whilst the very narrow floodplain of the modern Devon stands just below 11 m OD (LiDAR images of the area are shown in Garton et al, 2015; Tapete et al, 2017); the underlying gravel topography ranges from 9.6–12.5 m OD. British Geological Survey (BGS) mapping (1996) shows alluvium along the Devon and in a west-projecting tongue – described as an 'embayment' by the A46 team (Harding et al, 2014, fig. 2.3). In the BGS map these deposits are labelled as Holocene but the A46 work has shown that they start earlier and include both Holocene and late glacial deposits. It is these deposits, in many places thinner than 1 m (and therefore outside the threshold of BGS mapping: Smith, 2009), that have been investigated by the Ice Age Journeys team. It is not yet clear if there will be an easily recognised sedimentary difference between older and younger deposits but, where *pristine* LUP flint artefacts are incorporated, it is a good indication of sediments that formed in the late glacial landscape. Fig. 1 shows the gross spatial pattern of flints collected from the surface between 1991 and 2017; this pattern has been tested by small-scale excavations to investigate the context of more concentrated areas of finds.

In the northern part of the study area, flints have been recovered from a thicker patch of bioturbated subsoil on a slight ridge of the gravels (11.3–11.7 m OD, 'North Cluster' in Fig. 1). The flints, including tools indicative of butchery and hide-processing, are now mostly incorporated into ploughsoils (Garton et al, 2015, fig. 7). To the south, the gravel surface dips into the embayment where two adjacent trenches for the A46 recovered demonstrably *in situ* (primary context) LUP artefacts within alluvial sediments interpreted as wetland margins with overbank flooding (Harding et al, 2014, p 69) closer to the likely line(s) of the Devon (Fig. 1). Here, two flint-clusters were identified: one with a Creswellian-type technology, the other of Federmesser-type. The Creswellian consisted of an intact knapping scatter (covering some 5 m^2), where the pattern of refitting pieces and copious micro-debitage is interpreted as having lain contained between the knapper's legs (ibid, fig. 2.35; Grant and Harding, 2014). The Federmesser, made up of diagnostically different artefacts (covering some 10 m^2), was also marked by burnt flints and 'burned mineral material' in micromorphological samples, perhaps indicating scattered hearth debris (Harding et al, 2014, p 36). The excavations demonstrated that these scatters were in stratigraphic sequence (though with some vertical migration, ibid, p 66); most of the larger items from the Creswellian cluster plot at 10.60–10.67 m OD, and most of the Federmesser cluster plot at 10.66–10.70 m OD (as archived: ADS, 2017). These *in situ* deposits at Farndon Fields lay just 2–3 cm below the plough-level; had they been disturbed this rare evidence of discrete knapping events would have been lost. Further artefact clusters have been located in testpits within bioturbated silty, probable alluvial deposits lying midway between the high ground of the 'North Cluster' and the A46 clusters; they lay immediately below the plough-level and had been disturbed by linear scores from mechanical subsoiling (Garton, 2015, p 121, fig. 12). Some flints from these testpits refit along ancient breaks, so were essentially *in situ*, suggesting that these sediments were probably part of the same alluvial spread as the embayment deposits but, as they were only a maximum of 0.7 m thick, were not mapped by BGS. Further clusters along the SE edge of the embayment are known only from surface collections; monitoring of these fields shows that most had been brought into the ploughsoil since 2005 (the 'South Cluster' in Fig. 1).

There are no known clusters, and virtually no flints, along the edge of the embayment where it abuts coversands (first recognised by the A46 team: Harding et al, 2014, p 17). These coversands were sampled by the A46 team for OSL dating (ibid, table 1: FF2063B-C located in Fig. 3), yielding two Holocene dates, and two Loch Lomond Stadial (GS-1) dates comparable with coversands in north Lincolnshire and Girton, Nottinghamshire (Bateman, 1998; Baker et al, 2013). A palaeosol beneath coversands to the south of these trenches was not dated by OSL but was 'stratigraphically placed between the LGM [Last Glacial Maximum] and Loch Lomond Stadial, and is therefore most likely to be attributable to the Windermere Interstadial... (GI-1)', (Harding et al, 2014, p 29). A further two OSL measurements, taken from laminated sediments below coversands in a different place (FF6091 located in Fig. 3), gave dates said to be 'broadly contemporary, albeit slightly later' than the overlying coversands (ibid, p 30). Bioturbation issues were noted throughout this report. Burnt sand grains and a 'blackened humic soil clast (400 μm) with embedded charcoal' were also recorded within micromorphological samples from the laminated sediments (ibid, p 29), though whether this related to wildfires, or the actions of people, is unknown. The significant observation that some parts of the coversands buried a palaeosol, coupled with the almost mutually exclusive geographical occurrence of ploughsoil LUP artefacts and coversands (Fig. 1), led the Ice Age Journeys team, in 2014–16, to investigate the extent of the coversand body to see if contexts survived beneath it of relevance to the LUP activity but out of reach of the plough.

Methods employed

Farndon Archaeological Research Investigations, a local society combining amateurs and professionals, had become interested in the LUP material throughout the A46 works and, drawing in specialist archaeological and palaeoenvironmental support, constituted 'Ice Age Journeys' (IAJ) in 2012 (with a Heritage Lottery Fund grant) with the express purpose of continuing the study of the Upper Palaeolithic loci in the vicinity of Farndon Fields (studied fields are outlined in Fig. 1). IAJ work has involved further systematic collection of artefacts from field surfaces, augering (mostly manual Dutch-head augering with a head of 35 mm diameter but also some power-augering with the help of the British Geological Survey) and hand-dug test-pitting. Earlier results concerning various aspects of this project have been reported by Garton et al (2015) and Tapete et al (2017).

In 2013–15 hand-augering (58 cores) was conducted on the south-eastern side of the new A46. In 2014–16 IAJ investigated the potential coversand deposits to the west of the A46 and adjacent to the flint scatter within and around the embayment. Hand-augering led by Will Mills in 2014 was followed in 2015 and 2016 by further augering (131 cores) and hand-dug testpits in Field 373A led by Nick Barton and Daryl Garton, and is the work reported here (Figs 2, 3). At that time Richard Macphail was consulted and produced a report

***Figure 2**. Farndon Fields: excavation and recording in action (photo: Daryl Garton)*

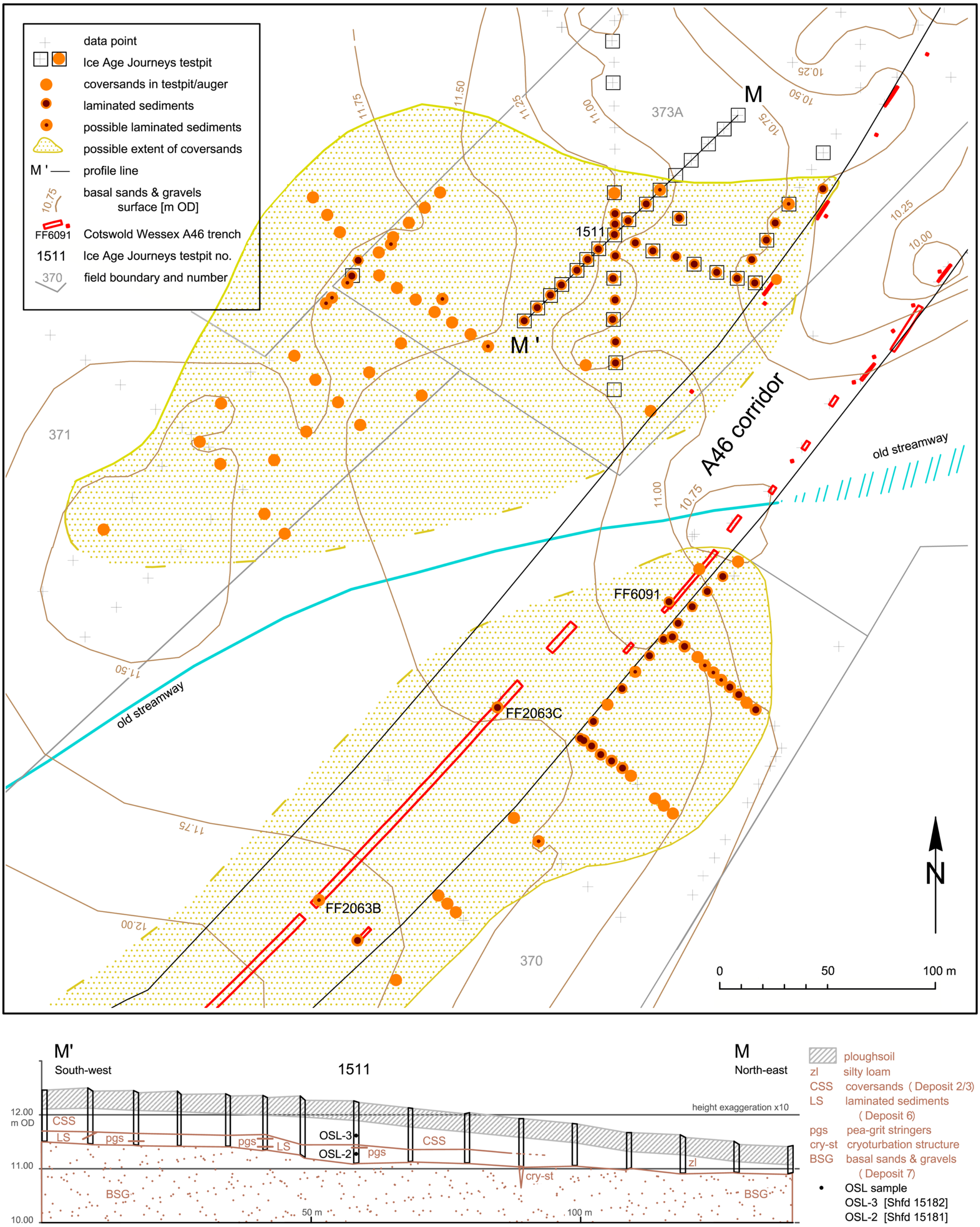

***Figure 3**. Farndon Fields: location of testpits and auger-cores showing recovery of coversands and laminated sediments. Surface contours of basal sands and gravels reconstructed from data points using triangulation interpolation using QGIS. Profile M'– M shows location of OSL samples (nb vertical exaggeration x10) (based on OS open-data © Crown copyright and database right 2010)*

on micromorphological sections of the lower deposits (Macphail, 2017), and Mark Bateman analysed samples for Optically Stimulated Luminescence (OSL, reported here). Samples for particle-size were taken by Deodato Tapete; they are reported elsewhere together with BGS analysis of LiDAR records of testpit sections (Tapete et al, 2017). In all 34 1x1 m testpits, dug just into the top of the basal sands and gravels, were hand-excavated with their location, heights above OD and deposit sequences logged and recorded by photography. The ploughsoils were removed by spade, with underlying deposits removed in 10 cm spits by trowel/small hand-tools with 25% dry-sieved through a c. 8 mm mesh to check for flints.

In order to establish a chronology for the deposits two luminescence dating samples were collected from testpit 1511 (Fig. 4, OSL-2 and OSL-3; note: OSL-1 came from a different testpit and was not analysed). Determination of dose rates was undertaken through elemental analysis of the samples using ICP-MS, combined with a calculated cosmogenic dose-rate (Prescott and Hutton, 1994) and attenuated for palaeomoisture values based on those of the present day (Table 2). Samples were prepared to extract and clean quartz as per Bateman and Catt (1996). Initially prepared aliquots 5 mm in diameter taken from within a maximum size range of 125–180 µm underwent measurement using a Risø TL DA-20 luminescence reader with stimulation provided by blue/green LEDs and luminescence detection through a Hoya U-340 filter. To obtain the palaeodose (De), samples were analysed using the single aliquot regenerative (SAR) approach (Murray and Wintle, 2000). As samples were found to have some persistent feldspar contamination an infrared wash was performed prior to each OSL measurement. Within the SAR protocol an experimentally derived (from a dose recovery preheat test on sample OSL-2) preheat of 240 °C for 10 seconds was applied. All aliquots where the ratio of first and last dose point exceeded ±10% of unity were excluded from further analysis. Both samples had good OSL characteristics with fast OSL signal depletion with stimulation, well constrained SAR growth curves and good recycling. No samples contained saturated aliquots indicative of sediment whose antiquity is beyond the limits of the SAR OSL technique. Multiple De replicates per sample were measured to better understand sample variability.

Results

A description of the deposits in testpit 1511 from which the OSL samples were taken (Fig. 4), is given in Table 1, along with their interpretations.

The data from these investigations, together with that archived from the A46 trenches (ADS, 2017), has allowed an estimate of the current extent and stratigraphy of two areas of coversands (Fig. 3), though lack of access has meant that their southern and south-western limits remain to be investigated. Dashed lines around the limits of the coversand patches depicted in Fig. 3 represent a lack of data points and also coincides with a 'streamway', mapped from the 1830s (Sanderson, 1835) and subsequently mostly incorporated into field-boundaries (OS mapping).

Records of 'blown sand' on BGS unpublished fieldslips (1987–93) are noted to the east and south-west of the area we studied; on the BGS 1996 map they are grouped with other superficial deposits. In an enquiry to A. S. Howard (BGS resurvey team) he commented that the banked deposits of Head and blown sand against mudstone scarps were likely places for buried late glacial sediments to be preserved. Colin Baker has drawn attention to samples from pits dug for development purposes in this location (Environmental Scientifics Group, 2013: ESG-TP01 at 478461/351563 and ESG-TP02 at 478565/351549); their grain-size distributions are similar to those from our testpits (Tapete et al, 2017, fig.7).

The surface topography of the basal sands and gravels has also been reconstructed using triangulation interpolation (using QGIS: data points and contours shown in Fig. 3). The wider view of Fig. 1, with basal gravels above 11.25 m OD in grey, highlights the position of the embayment, with a ridge to the north (on which the 'North Cluster' sits), and locally high ground to the west and south, overlain by coversands along its southern margin.

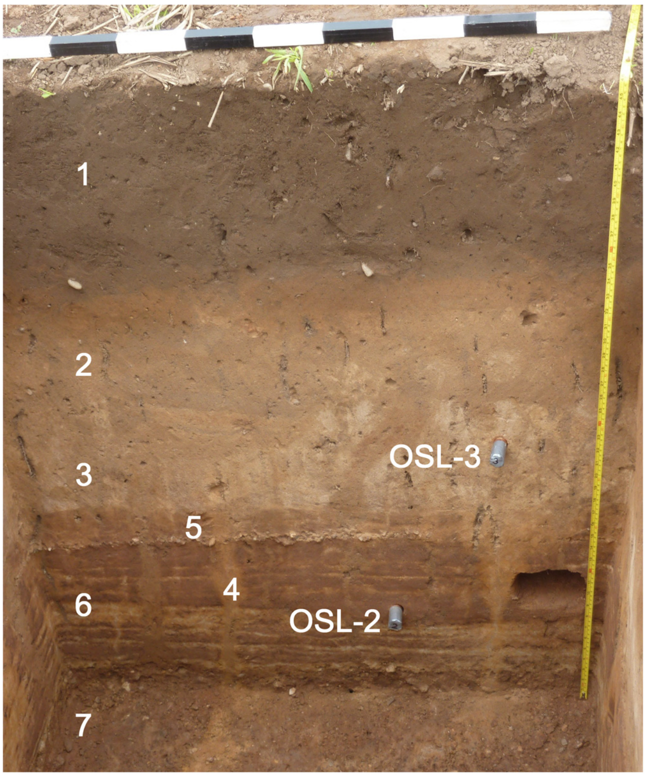

Figure 4*. Farndon Fields: NE face of testpit 1511 showing location of OSL samples. OSL-2 is at 11.62 m OD and OSL-3 at 11.27 m OD. Numbered Deposits/Events are described in Table 1. Black and white scale units are 0.10 m; testpit is 1.20 m deep. (Photo: David Budge, slightly rectified)*

Deposits/Events – as numbered in Fig. 4	Field description of typical sequence	Boundary to deposit below	Interpretation	Heights above OD
Deposit 1	Topsoil – ploughed.	sharp	Ploughsoil.	
Deposit 2	Fine sand with pedogenic overprinting (strong root channels, Fe/Mn/clay on some partings, even clayey lensing in small patches).	diffuse	Coversands with heavy subsequent (Holocene) bioturbation.	Reaching over 12.0 m OD and sometimes (e.g. just outside study area mapped in BGS field slips as 'blown sand') over 1 m thick (draped over higher topography); distinguishable down to 10.5 m OD (but note possibility of reworking onto lower slopes).
Deposit 3	Cleaner, fine sand, drier, lighter-coloured than above; restricted patches of apparently primary aeolian planar bedding visible under LiDAR (Tapete et al, 2017, figs. 13, 14). Their fig. 7 shows grain-size distribution curves that are negatively skewed, i.e. with fine-grained tail. OSL-3 [Shfd15182] at 11.62 m OD.	sharp, slightly irregular	Coversands (aeolian sheet sands) with less frequent bioturbation from above; some traces of original sheetwash (niveo-aeolian); possible erosive base, increasingly so on slopes.	
Event 4	Vertical pipes/dykes with fine sand infill, sometimes with localised clay skins; observed to continue from vertical section into polygons (some 0.30 m across) in floor of testpit affecting the whole sediment interval between the basal part of Deposit 3 into the upper part of Deposit 7; also some convolution, especially higher in the suite of structures.		Polygonal network of sand veins; water-escape structures and convolutions, all interpreted as related to ground-ice in at least one phase, this main activity dating from early in Deposit 3 period.	
Event 5	Weak, possible B-horizon (Fe and clay, possible cutan structure) survival, but still quite strongly overprinted by activity from above. Structure shows well in LiDAR-record of section in Tapete et al, 2017, fig. 13.	gradational	Pedogenesis active from the top of Deposit 6; weak intraformational (i.e. between Deposits 3 and 6) emergence features/weak soil formation, overprinted by Holocene activity.	
Deposit 6	Laminated well-sorted rust red fine to medium sands inter-bedded with light grey pale silt (well-sorted); occasional and often discontinuous pea-grit [5-10 mm] stringers at various levels (in this testpit at or near top of Deposit 6). Two stones (one large, one medium) recovered from different testpits. The hole across many laminae in Fig. 4 is sample-position 10 for grain-size distribution curves reported by Tapete et al, 2017, fig. 8. OSL-2 [Shfd15181] at 11.27 m OD.	sharp	Series of mostly low energy waterlain deposits; intersected by polygonal network of Event 4.	c. 11.1–11.7 m OD, base dropping slightly locally in north-easterly direction.
Deposit 7	Clast supported fine to medium sand and pebbles (5–50 mm).		Basal fluvial sands and gravels, mapped by BGS as Holme Pierrepont Sands and Gravels; some slight steps (e.g. to SW of testpit 1511 – Fig. 3 profile), but generally lacking buried bar topography (i.e. implying some erosion at top). Penetrated by polygonal network of Event 4.	Up to 12.5 m OD.

Table 1. *Description, sample locations in testpit 1511 and interpretation of sequence of sediments.*

Method	Sample code	Depth (m)	Water content (%)	K (%)	U (ppm)	Th (ppm)	Cosmic dose rate (Gy a^{-1})	Total dose rate (Gy a^{-1})	D_e* (Gy)	OD (%)	Prop (%)	Age (ka)
Aliquot	OSL-3 [Shfd15182]	0.63	1.0	1.2	1.62	5.0	0.19±0.01	2.14±0.11	8.84±0.75	35	47	4.14±0.41
									18.46±1.42		53	8.65±0.79
Aliquot	OSL-2 [Shfd15181]	0.97	3.4	1.3	1.77	5.0	0.19±0.01	2.20±0.11	15.14±2.29	45	24	6.9±1.1
									27.93±1.86		76	12.7±1.1
Grain	OSL-3 [Shfd15182]	0.63	1.0	1.2	1.62	5.0	0.19±0.01	2.14±0.11	25.1±1.14	121	54	11.76±0.79
Grain	OSL-2 [Shfd15181]	0.97	3.4	1.3	1.77	5.0	0.19±0.01	2.20±0.11	32.47±2.68	74	63	14.8±1.4

*extracted using Finite Mixture Model (FMM). Components exceeding 10% of data shown.

***Table 2**. OSL related data for Farndon Fields OSL samples.*

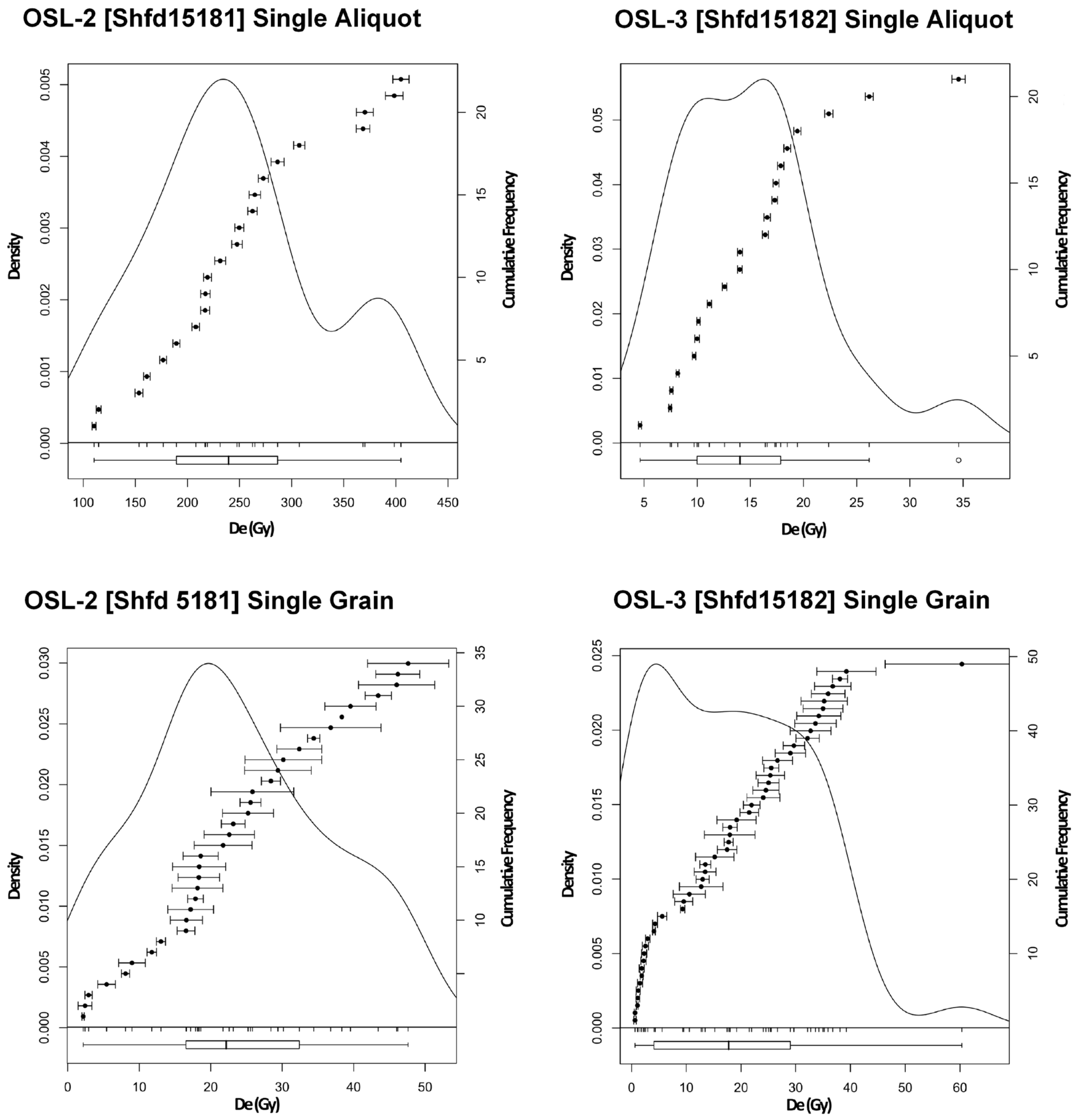

***Figure 5**. Kernel Density plots of the De replicate data from the two samples from Farndon Fields testpit 1511 showing both single aliquot (upper) and single grain (lower) data.*

Luminescence dating

Results of the single aliquot luminescence dating showed that in both cases the replicate De measurements had high over-dispersion and non-normal multimodal distributions taken to be indicative of a disturbed sediment which had been insufficiently exposed (bleached) to sunlight prior to burial (Fig. 5). As a result, the Finite Mixture Model (FMM) of Galbraith and Green (1990) was applied to the data. For both samples two De components were extracted. If poor bleaching is assumed for the samples then the samples give ages of 6.9 ± 1.1 and 4.14 ± 0.41 ka (Table 2). If however the poor De reproducibility was due to post-depositional disturbance then ages of 12.7 ± 1.1 and 8.65 ± 0.79 ka were calculated. As measurements of multi-grain aliquots (~ 1000 grains) masks the true De distribution (due to averaging effects) further measurements at the single grain level were undertaken. The same SAR protocol as described above was used and of the large number of grains measured, between 42 and 61 grains with sufficient signal, good SAR growth and recycling within 20% of unity were used to calculate De values (Fig. 5). Using the dominant component from the single grain De values the ages of the samples were 14.8 ± 1.4 and 11.76 ± 0.79 ka for OSL-2 and OSL-3 respectively. These components represent 54% and 63% of the single grain data.

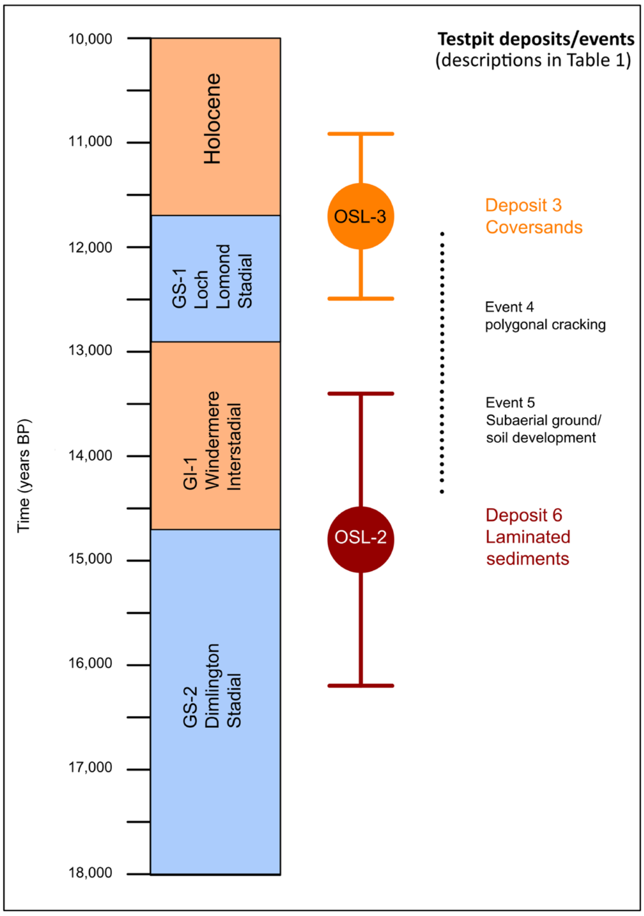

***Figure 6**. Diagram to illustrate the OSL dates at 1 σ (68%) probability (time in years BP with chronology as defined by Rasmussen et al, 2014)*

Discussion

Despite being obtained from coversand and low-energy waterlain sediments the OSL replicate De data of neither sample behaved like a well-bleached sediment. Looking at the single aliquot De distributions of the luminescence and proportions of data in FMM components the upper sample OSL-3 appears more affected (Table 2). Single grain measurements (particularly in the uppermost sample) also revealed zero-dose grains indicative of recent exhumation and burial of grain (Bateman et al, 2007). In light of this, the samples are interpreted as having been well bleached prior to burial but disturbed by post-depositional mixing introducing younger grains during the Late Holocene. Such a mechanism has been demonstrated at Farndon Fields by micromorphological analyses and artefact taphonomy (cf. Harding et al, 2014, pp 29, 66). Elsewhere Barton et al (2009) attributed similar variations at the LUP site at Nea Farm, Hampshire to the introduction of younger quartz grains into the samples from above through bioturbation. By using the single grain ages and only the dominant De component (which is assumed to have been unaffected by later bioturbation) the ages of 14.8 ± 1.4 and 11.76 ± 0.79 ka for OSL-2 and OSL-3 respectively probably represent the true burial age for these sediments. This dates the laminated series to the Windermere Interstadial and the coversands to within the Loch Lomond Stadial (Fig. 6); the latter coinciding well with the timing of coversand deposition further north (Bateman, 1998; Baker et al, 2013). This also allows for an interval when the laminated sediments (Deposit 6) were exposed to pedogenesis (Event 5), followed by ground-ice penetration and burial by coversands (Event 4 and Deposit 3: Table 1). Hence, the OSL dates bracket the potential archaeological horizon. This work demonstrates the added information that can be gained from making single grain OSL measurements. Although more time-consuming it shows that it is essential for the study of sediments for archaeological purposes when bioturbation is evident.

Concluding remarks

Our work set out to define the geometry and date of the coversands so as to learn if they formed a continuous sediment body sealing context relevant to LUP activity. Although we successfully mapped well-stratified late glacial deposits, our efforts to discover stratified flint in testpits have so far gone unrewarded, even though six LUP flints were recovered on nearby ploughed surfaces (plotted in Fig. 1). The pristine condition of five of these flints suggests they came from undisturbed contexts, perhaps brought into the ploughzone by tree-throw or animal-burrowing. Within the study area in Field 373A, only 34 m^2 out of an estimated 2.5 ha of coversands have been examined by test-pitting, representing less than 0.14% of the total survey area. Only 25 of the 34 testpits exposed the layers of laminated sediments and palaeosol with the greatest potential for archaeological finds. It is therefore unsurprising that

LUP artefacts have not yet been recovered from below the coversands, or that no *in situ* clusters of flint of the dimensions recorded in the A46 excavations (5 m^2 for the Creswellian and 10 m^2 for the Federmesser) have so far been encountered. It should be added that much of the work in the adjacent fields has involved coring by Dutch-auger, with a head of only 35 mm diameter. Retrieval of artefacts visible to the naked eye using such a method is highly unlikely, and smaller pieces (<5 mm, such as tiny lithic chips, charcoal fragments or burnt sand particles) could be recovered only by systematic fine sieving and microscopic scanning beyond the scope of the present project.

In summary, the new data show that coversands of Loch Lomond Stadial age and underlying laminated sediments extend more widely than previously published, probably reaching significantly beyond the area that it has yet been possible to study. Between those two deposits, both stratigraphy and OSL measurements provide solid evidence for an interval when soils of Windermere Interstadial age formed in the southern part of Farndon Fields (Event 5 in Table 1 and Fig. 6). Hence, this locally high ground, overlooking the floodplain in the embayment, was available for occupation by visiting hunter-gatherer groups as supported by the recovery of a few pristine artefacts, possibly also by burnt materials in micromorphological samples, from this location. In contrast with the transient activities evidenced so far in the embayment, where periodic deposition of alluvium was evident (Harding et al, 2014, pp 35, 65), the higher, drier and reasonably stable ground should include zones in which thin artefact-horizons could develop (allowing for trampling and/or weak soil formation). Subsequently, these zones may have been disrupted by ground-ice and wind-erosion, though burial by coversands, to depths sufficient to attenuate Holocene bioturbation to a considerable degree, could have permitted survival of near-primary contexts with *in situ* clusters of artefacts and other structural evidence such as hearths.

This suggests a high-quality potential for recovery of significant additional material from within the nationally important Late Upper Palaeolithic resource around Farndon Fields.

Acknowledgements

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