M25 DBFO Widening Section 4

Post-excavation Assessment and Project Design

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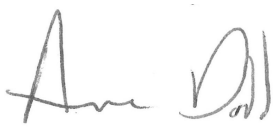
1	Edward Biddulph Senior Project Manager (PX)	Steve Lawrence Senior Project Manager (Field)	Anne Dodd Head of Post-Excavation and Publications, OAS	

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M25 DBFO Widening Section 4

Post-excavation assessment and project design

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Summary

Oxford Archaeology carried out a programme of archaeological strip, map and sample recording (SMS) on behalf of Skanska Balfour Beatty on land to either side of the M25 carriageway between Junctions 27 and 29 as part of the M25 Widening Scheme (Section 4). A total of 29 sites were investigated.

Principal sites were identified at Hobbs Hole (Junction 29) and Passingford Bridge, although significant archaeological remains were also uncovered at Upminster Bund and Codham Hall Bund. In addition, potentially important, though apparently isolated, cremation burials and charcoal-filled pits were recorded at ponds 1609, 1615, 1605, 1683, 1824 and 1835.

At Hobbs Hole, prehistoric features relating to land clearance and possible field boundaries were uncovered. Formal land division relating to the Roman period was recorded, as well as associated waterholes and possible clay quarries. A number of cremation burials may also belong to this period. Early Saxon sherds were collected from the upper fills of features across the site, though the character of any Saxon occupation is difficult to define.

Passingford Bridge contained a late Neolithic/early Bronze Age ring ditch on the flood plain of the River Roding. A later post avenue, possibly of Bronze Age date, was aligned upon it and extended across the centre of the monument. A late Iron Age settlement of four or five circular structures was recorded, associated with curvilinear enclosures, pits, waterholes and quarries. There was continued occupation into the early Roman period and more limited late Roman remains.

Significant archaeological remains recorded at Upminster Bund included a pit alignment provisionally dated to the Bronze Age. This may have formed a boundary. Sequences of Roman-period and medieval ditches and boundaries were uncovered at Codham Hall Bund.

Widening of the M25 through the Belhus Cutting between J29 and J30 cut through the Corbets Tey Pleistocene Formation, revealing an interglacial channel filled with organic-rich sands and silts, rich in a range of palaeo-environmental remains, namely plant macro remains, pollen, insects, molluscs, small vertebrates and ostracods. A lithic artefact indicative of contemporary hominin occupation in the vicinity was found in one of the lower beds of the channel. There have been previous finds of lithic artefacts (including two handaxes) from gravel deposits capping the channel. The channel is thought to represent the interglacial of MIS 9, dating to between c 350,000 and 300,000 BP (years Before Present).

This assessment presents the preliminary findings of the fieldwork, and specifies what further post-excavation recording and analysis is required. It assesses the potential of the results to address research questions and contribute to a better understanding of the region's prehistoric, Roman and post-Roman landscapes.

1 DESCRIPTION OF THE PROJECT

1.1 Scope of report

1.1.1 This document is a MoRPHE-style (succeeding MAP2 – English Heritage 2006) post-excavation report, which presents the preliminary findings of the excavations and a proposal for further analysis, reporting and publication.

1.2 Background

Location, project organisation and scope of work

1.2.1 Oxford Archaeology (OA) was commissioned by Skanska Balfour Beatty (SBB) to undertake an evaluation and subsequent programme of archaeological strip, map and sample recording (SMS) on land to either side of the existing carriageways between Junctions 27 and 30 of the M25 (between NGRs TQ 4701 9999 to TQ 5757 8006). This route of the M25 passes through the county of Essex and the London Borough of Havering. The archaeological investigations formed part of a mitigation strategy implemented alongside the construction programme for the M25 Section 4 Widening Scheme (Fig. 1). The scheme was split into three subsections; Section 4a, 4b and 4c identified within the project chainage as 159100-168500, 168500 to 176600 and 176600 to 185200 respectively. The fieldwork was completed between December 2008 and December 2011.

1.2.2 At the instigation of the construction project Gifford, acting as Skanska's archaeologist, produced an outline specification for the evaluation of five identified sites (Gifford 2008). This was based upon relatively scant design information for the impact areas beyond the Highways Agency (road corridor) boundary as locations and land purchases for many pond and bund sites had not been agreed at that point. This included the first area to be investigated ahead of the project compound construction at Junction 29. OA produced a Written Scheme of Investigation (WSI) detailing how it would implement and complete the evaluation of these areas in accordance with the specification (OA 2008). The evaluation of Hobbs Hole subsequently produced archaeological remains and it became clear that the construction timetable would not easily accommodate a stand down period whilst a full evaluation report was produced. Therefore, through agreement of all parties, an interim statement of the results was rapidly produced and agreed with the planning archaeologist from Essex County Council (ECC) and areas for detailed excavation were identified and excavation commenced. At the same time OA produced a detailed WSI for excavation specific to this site (OA 2009a).

1.2.3 Following the experiences at Hobbs Hole, the existing evaluation specification was discarded through agreement with ECC and the Greater London Archaeological Advisory Service (GLAAS) in favour of a SMS methodology from outset for all areas. OA subsequently produced an amendment WSI document to reflect the change in methodology required for the SMS recording (OA 2009b). This method and document subsequently applied to all areas of investigation. A Section 4a specific Final Archaeological Design was subsequently produced by Gifford (2009).

1.2.4 Route section-specific Final Archaeological Designs were subsequently produced identifying the locations for SMS investigation (Gifford 2010a and 2010b). The existing WSI agreements and amendments issued by OA applied to these documents although a collated WSI was also produced at the end of the fieldwork to clarify the project history, agreements and methods applied (OA 2012). During the course of the project

OA also produced an assessment of the geoarchaeological potential of Pleistocene Geology along the route (OA 2009c). The results and proposals from this document were incorporated into the Final Archaeological Designs.

1.2.5 A total of 29 sites were investigated (Fig. 2a, b and c). The only site subject to evaluation prior to implementing SMS recording was the very first area to be investigated, the Junction 29 Compound at Hobbs Hole. Thereafter, through agreement with the planning archaeologists from ECC and GLAAS, each site was investigated under the SMS methodology outlined in more detail below.

1.2.6 The sites are presented below by site name and in geographical order from the north (Junction 27) to the south (Junction 30). Scheme chainages are included along with the relevant side of the carriageway (clockwise CW and/or anti-clockwise ACW). The accompanying national grid reference (NGR) is an approximate centre point at each site or, where these comprise multiple areas, a centre point in relation to the group of areas. Site codes are listed and were generated in a numerical sequence according to the order that each site was first investigated. The sequence starts at 001 with each code preceded by M25 and followed by the year that the code was generated separated by a full stop (eg .09 for 2009). Where the site falls within the collecting authority of the Museum of London (MoL), this institution issues an accession code as the site code. Although this was in a similar form to the above this did vary slightly and has been included alongside the standard site code where relevant.

Site name	Scheme chainage	NGR	OA project code	Site code	MoL site code
Pond 1605	ACW 160400-160800	TQ 4762 9972	TMTM25EX	M25006.09	-
Pond 1609	ACW 160840-160920	TQ 4794 9951	THEM25EX	M25003.09	-
Pond 1615	ACW 160840-161440	TQ 4834 9915	MOUM25EX	M25004.09	-
Skinners Bridge Strip Widening and Bush Grove Pond	ACW 162160-162380	TQ 4910 9882	TMKM25EX	M25009.10	-
Tank 1632	ACW 163180-163250	TQ 4986 9820	THTA1632EX	M25029.11	-
Passingford Bridge Bund	CW 164150-164450	TQ 5078 9762	STTPBREX	M25002.09	-
Passingford Bridge Widening and Flood Alleviation Area	CW 164860-165190	TQ 5150 9746	STTPBREX	M25002.09	-
Pond 1656	ACW 165450-165710	TQ 5182 9706	NAVM25EX	M25005.09	-
Pond 1683 Strip Widening, Topsoil Storage, Recovery Compound and Tank installation	CW 168000-168500	TQ 5385 9516	NATM25EX	M25010.10	-
Pond 1683	CW 168250-168360	TQ 5388 9515	NAKM25EX	M25007.09	-
Benskin's Cutting Palaeolithic Watching Brief	CW 169000-169500	TQ 5441 9444	NBNM25EX	M25016.10	M25-016 10

Site name	Scheme chainage	NGR	OA project code	Site code	MoL site code
Pond 1698 and Strip Widening	ACW 169640-169870	TQ 5486 9403	NOPM25EX	M25013.10	M25-013 10
Tank 1706 and Strip Widening	CW and ACW 169960-170600	TQ 5537 9373	HATM25EX	M25011.10	M25-011 10
Tank 1714 and Strip Widening	CW and ACW 170670-171500	TQ 5615 9316	HAHM25EX	M25017.10	M25-017 10
Pond 1727	ACW 172490-172710	TQ 5687 9212	BPDM25EX	M25019.10	-
Tank 1740 and Strip Widening	CW and ACW 173940-174530	TQ 5724 9076	TK1740EX	M25015.10	M25-015 10
Warley Road to Bereden's Lane Strip Widening	ACW 174790-174880	TQ 5743 9006	WRBM25EX	M25014.10	M25-014 10
Folkes Lane Strip Widening	ACW 175710-176290	TQ 5812 8910	FOLM25EX	M25012.10	M25-012 10
Codham Hall Bund, Tank 1762 and Strip Widening	CW 175580-176350	TQ 5831 8895	BCBM25EX	M25018.10	-
Junction 29, Hobbs Hole Evaluation	CW 176850-177250	TQ 5881 8841	M25HOBEV	M25001.08	-
Junction 29, Hobbs Hole Excavation	CW 176850-177250	TQ 5881 8841	M25HOBEX	M25001.09	-
Upminster Bund	ACW 177050-177680	TQ 5860 8785	HAVM25EX	M25008. 09	M25-008 09
Pond 1776	CW 177600-177690	TQ 5885 8762	GWPONDEX	M25021.11	-
Pond 1787 and Strip Widening	CW and ACW 178280-178720	TQ 5890 8666	CTHM25EX	M25020.11	M25-020 11
Pond 1791 and Strip Widening	CW and ACW 178720-179350	TQ 5869 8620	CLATEX2	M25023.11	M25-023 11
Ockendon Cutting Palaeolithic Watching Brief	CW and ACW 179400-180500	TQ 5846 8558	NOCKYWB	M25026.11	M25-026 11
Pond 1812 and Strip Widening	CW and ACW 180490-181260	TQ 5827 8412	SOCKEX	M25024.11	M25-024 11
Dennis Road Turnaround and Strip Widening Chainages 181300-181700	CW and ACW 181300-181370	TQ 5813 8388	DENNISEX	M25022.11	-
Pond 1824 and Strip Widening	ACW 181750-182800	TQ 5793 8325	SOPONDEX	M25025.11	-
Pond 1835 and Strip Widening	CW and ACW 183270-183560	TQ 5756 8192	SO1835EX	M25028.11	-
Belhus Cutting Palaeolithic Watching Brief	CW and ACW 183700-185200	TQ 5750 8100	SOBELWB	M25027.11	-

Topography and geology

1.2.7 The topography and geology section below is repeated from the description presented as part of the Environmental Statement Technical Report, Part 7: Cultural Heritage (Highways Agency 2007).

Topography - general

1.2.8 Section 4 of the M25 lies within the Epping Forest, Brentwood and Thurrock (B) districts of Essex and the London Borough of Havering. Within these districts the M25 passes through the ancient parishes of Epping, Theydon Garnon, Theydon Mount, Stapleford Tawney, Navestock, South Weald, Great Warley, Upminster, Cranham, South Ockendon and Aveley.

1.2.9 Between Junctions 27 and 30, the M25 corridor passes through six Landscape Characterisation Areas as defined by Essex County Council (Essex and Southend on Sea Replacement Structure Plan) and Thurrock Borough Council (Thurrock Borough Council UDP). These comprise Epping Forest and Ridges, Roding Valley, Brentwood Hills, Bulphan/Orsett Fen, South Ockendon and Aveley.

1.2.10 Immediately east of Junction 27 the M25 passes from the Epping Forest and Ridges into the Roding Valley. The Epping Forest and Ridges is characterised by heavily wooded ridge lines fringed by generally small to medium thick-hedged fields. The Roding Valley is a broad, gentle sloped valley with low rounded hills between its tributary interfluves. The Roding Valley comprises a fairly open landscape with tree-hedged fields of varying size on the valley slopes and smaller meadows in the valley bottom and is sparsely settled by dispersed farmsteads.

1.2.11 Between Curtismill Green and Junction 28 the M25 passes over Navestock Common, exploiting the valley of the Weald Brook to descend into Junction 28. Between Junctions 28 and 29 the M25 passes over two ridges, forming part of the Brentwood Hills. These have a varied topography of ridge lines and rounded hills dominated by woodland. Parts of the Brentwood Hills, notably around Navestock and Curtismill Green, feature un-enclosed greens and common land with numerous ponds.

1.2.12 Between Junction 29 and North Ockendon the M25 passes across Orsett/ Bulphan Fen and South Ockendon. The change in topography is sharply defined as the M25 exits the Brentwood Hills and descends onto the Thames Terraces towards the Dartford Crossings. The Orsett/Bulphan Fen and South Ockendon is characterised by a relatively flat, open landscape of large fields.

Geology – general

1.2.13 The underlying solid geology of the M25 Section 4 consists predominantly of Eocene London Clay. Between Junctions 28 and 29 the London Clay is in part overlain by the silts and sands of the Claygate Beds.

1.2.14 The solid geology beneath Section 4 is masked by a succession of Quaternary drift deposits comprising Alluvium, Terrace Gravel, Brickearth, Head, Glacial Gravel, Boulder Clay and Pebble Gravel.

1.2.15 Alluvium is associated with a number of rivers that traverse Section 4 between Junctions 27 and 28 and Junctions 29 and 30. From Junction 27 to 28 the Alluvium is primarily associated with the Roding Valley and Weald Brook. Terrace Gravel (Taplow Gravel) is indicated at Junction 30. Brickearth is the dominant drift deposit between Junctions 29 and 30, masking much of the solid geology along this section of the route. Head deposits are present to the immediate east of Junction 27.

1.2.16 Glacial deposits consisting of Boulder Clay cap the higher ground traversed by the M25 between Junctions 27 to 28 at Navestock Common. Pebble Gravel and Claygate Beds form ridgelines north of Junction 29. Extensive quarrying for mineral extraction has taken place in the Thurrock, Aveley and Ockendon areas.

Archaeological background

1.2.17 The route was subject to a detailed assessment of the cultural heritage and is discussed in detail in the Environmental Statement (Highways Agency 2007). The ES defines much of the route as crossing a relatively undeveloped rural landscape and, therefore, containing only a limited number of known excavated sites of archaeological interest, the majority of which are located within the more developed belt on the Thames terraces to the south of Junction 29.

1.2.18 The initial specification for evaluation and subsequently the section-specific Final Archaeological Designs identified the reasons for archaeological investigation at each site. Subsequently a Pleistocene period specific background was also presented as part of an assessment produced by OA (2009c). Detailed backgrounds are not reproduced here and the original documents that form part of the project archive should be referred to.

1.2.19 A detailed period and site specific background for Belhus Cutting Palaeolithic Watching Brief has been produced by the specialist author and is included as part of that site description in Section 1.4 below.

1.3 Fieldwork methodology

Evaluation

1.3.1 As outlined above, the only area subject to trial trench evaluation was limited to Junction 29 Compound at Hobbs Hole. Here trenches were arranged within the compound boundary to provide an evenly distributed 4% sample of the site by area. These were excavated under archaeological supervision using a mechanical excavator fitted with a toothless bucket to the first archaeological horizon or the surface level of undisturbed geology (drift or solid) depending upon which was encountered first. The exposed archaeological deposits were investigated by hand excavation and the results were presented as a summary interim document that included spot dates to the planning archaeologist at ECC to facilitate a rapid decision with regard to further mitigation requirements. This led to areas of excavation defined within the compound for which a detailed excavation WSI was produced. This outlined a two-stage approach to the detailed investigation at this site; in the first instance this was limited to stripping, mapping and characterisation, followed by detailed excavation. This method formed the basis for all further archaeological works along the route following the agreement to remove the evaluation stage in favour of stripping the full area of each identified potential site (effectively 100% evaluation). The method employed is outlined below.

SMS and Excavation

1.3.2 Sites subject to SMS investigation were stripped under close archaeological supervision using a mechanical excavator fitted with a toothless bucket for the removal of the topsoil. Each machine stripping topsoil and underlying deposits to the archaeological horizon was supervised by an individual archaeologist. Machine excavation ceased on exposing archaeologically significant deposits or the surface level of undisturbed geology (drift or solid) depending upon which was encountered first. Machine excavation generally produced a clean surface that did not require substantial hand cleaning. However, where archaeological deposits were encountered these were hand cleaned as necessary prior to excavation to define the extent of the feature/deposit and inform an interpretation.

1.3.3 The recording methodology followed a two-stage approach. The initial investigation was limited to the production of a plan and characterisation excavation to produce data to inform a second phase of more detailed excavation. The scope of the second phase detailed excavation works at each site was agreed by means of on site meetings with the relevant planning archaeologist.

Palaeolithic Watching Brief Areas

1.3.4 The areas identified for assessment and investigation of the Pleistocene deposits were each within cuttings where the M25 passed through elevated contours. These allowed the exposure of deep sections into the sediment sequence. Each was investigated in a similar manner. Firstly, the lower parts of the existing shallow sloped cutting sides were steepened by machine excavation to approximately 65º from the horizontal plane. A combination of toothed and toothless buckets were used for this due to the ability of the machines to cut into the slopes at the correct angle within the varying types of sediment. Also both the Benskin's and Ockendon Cuttings were only observed after machine excavation had been undertaken. Machine excavation at Belhus was completed under archaeological observation. Following machine excavation, the exposed sequence was assessed by a geoarchaeologist and, where deemed

necessary following a primary assessment, a Palaeolithic sediment specialist (Francis Wenban-Smith) prior to photographic and written recording. Detailed recording was completed at specific locations along the cuttings and was located according to the construction chainage markers and associated to the scheme OS basemap in .dwg format. Sediment descriptions included information about depth, texture, composition, colour, clast orientation, structure, and contacts between deposits.

1.3.5 A more detailed sampling and recording methodology for Belhus cutting is included below as part of that site description produced by the specialist author.

1.4 Archaeological description

Pond 1605 – M25006.09 (Fig. 3)

1.4.1 Pond 1605 was located in the saddle of a wide valley. The natural geology was a deposit of Thames group clay. Pond 1605 was located to the south of the M25 at *c* 40m aOD and covered an area of 0.81ha that included an access route to the pond. The area was stripped of topsoil and a buried soil horizon to a combined depth of 0.4-0.6m.

1.4.2 A small, shallow, charcoal-filled pit (6) within the eastern part of the pond area was excavated and measured 0.4m in diameter and 0.2m deep. There was no evidence of *in situ* burning and the natural clay was not scorched, suggesting that the charcoal had not been deposited when cooled. No finds or other dating evidence was present. A 1.4m wide and 0.27m deep ditch (4) aligned NE-SW across the site was excavated and is recorded on the first edition OS map. The excavation of this did not produce any dating material to establish an origin although a medieval or, more likely, a post-medieval date for this field boundary seems probable. No other archaeological remains were encountered.

Pond 1609 – M25003.09 (Fig. 4)

1.4.3 Pond 1609 was located on relatively flat land at *c* 40m aOD within a valley bottom to the south of the M25 and extended to the east of a road referred to on OS maps as 'Roman Road'. The site enclosed an area of 0.42ha. The existing ploughsoil and an underlying buried ploughsoil horizon with a combined depth of 0.5m were removed across the site revealing the natural deposit of Thames clay.

1.4.4 In total, 24 features were located along the western side of the site parallel and adjacent to Roman Road. Nineteen of these were small charcoal-filled pits measuring from 0.4m in diameter and 0.04m deep to only 0.2m in diameter and 5mm deep. When first revealed, the features were thought to be the remains of cremation burials due to their appearance and proximity to a road with possible Roman associations. No cremated remains were found, and so it seems unlikely that these had a funerary function. However, the features were very heavily truncated by ploughing and so all human remains may have been ploughed out. The degree of truncation was demonstrated by five linear features, which when excavated proved to be deep ruts or plough scars which had truncated other possible pits. No other archaeological deposits were encountered.

Pond 1615 and Haul Road – M25004.09 (Fig. 5)

1.4.5 Pond 1615 and the associated access road were to the east of Pond 1609 within the same large, flat valley bottom at an average height of 40m aOD, rising gently towards the east to 50m aOD. Prior to excavation, the site was in use as agricultural land. Across the whole site a deposit of modern ploughsoil and a buried ploughsoil were both removed to a combined depth of 0.6m. The natural geology comprised Thames clay.

1.4.6 The combined areas were excavated in three phases. The initial area comprised the pond, which covered 0.45ha. This was followed by a strip for a haul road between ponds 1615 and 1609 which was subsequently widened. The combined area covered 1.1ha to the south of the M25.

1.4.7 In the area for the haul road, a shallow pit (4) measuring 0.65m in diameter and 0.2m deep was excavated. This contained 55 body sherds of Bronze Age pottery overlain by a dark, charcoal fill. The purpose of the pit was unclear but it was similar in form and

size to one excavated in Pond 1605 to the west. A post-medieval field boundary ditch (7) was located, but not excavated, as it was visible on the OS first edition map. A further ditch (8 not illustrated) of similar appearance was also recorded to the west and parallel to ditch 7. This does not appear on the same edition map but is most likely to derive from the same period and arrangement of field boundaries. No other archaeological deposits were encountered.

Skinners Bridge Strip Widening and Bush Grove Pond – M25009.09 (Fig. 6)

1.4.8 Skinners Bridge Strip Widening was located on a south-western facing slope with elevations from 55m aOD to 50m aOD on the south (ACW) side of the M25. The natural geology was London Clay Formation, clay, silt and gravel along the south-western side of the stripped area with made ground along the north-eastern extent associated with the original construction of the M25. The stripped area totalled 0.05ha.

1.4.9 Bush Grove Pond was located to the immediate east of the strip widening area on a gently sloping valley side at a height of *c* 60m aOD. The removal of *c* 0.2m of modern topsoil across the 0.33ha area revealed a deposit of compacted made ground. Two test pits were dug to the southern extent of the site to establish the depth of made ground. Both were abandoned at 1.2m with made ground continuing. Due to the impact of the works it was not necessary to remove the made ground and it was agreed that it would remain *in situ*. The made ground is very likely to have originated from the primary construction of the M25 and Skinners Bridge.

Tank 1632 – M25029.11 (Fig. 7)

1.4.10 Tank 1632 was located south (ACW) of the M25 and east of Skinners Bridge on the western side of a steep, north-south, valley of a small tributary of the River Roding. The site had elevations from 38.15m to 34.57m aOD. The natural deposit comprised glacio-fluvial sand and gravel which was exposed across the 0.22ha site area following the removal of the 0.25m thick existing ploughsoil.

1.4.11 No archaeological remains were encountered.

Passingford Bridge Bund, Widening and Flood Alleviation Area – M25002.09 (Figs 8-11)

Passingford Bridge Bund

1.4.12 The excavation at Passingford Bridge bund covered an area of 1.3ha north (CW) of the M25 carriageway. Within this a clear focus of activity was identified at the eastern end of the excavation area. However, the earliest remains comprised a single pit of possible mid-late Iron Age date just within the western limit of the site. Pit 1020 contained four small sherds of mid-late Iron Age pottery. The pit had a rounded base and measured 1.4m in diameter and 0.46m deep. No evidence was identified as to its purpose.

1.4.13 A group of early Roman boundary ditches were partly exposed at the eastern edge of the excavation area and presumably represent the western limit of a complex of boundaries that extended to the east. Two ditches (1124, 1125) that lay on converging ENE-WSW alignments extended into the excavation area for 40m before terminating, and a third ditch (1122) lay on a similar alignment *c* 15m further south. Parts of three other ditches that are likely to be of similar date were exposed, and included a small subsidiary ditch that extended northward from the middle ditch and was cut by middle Roman curving ditch 1123 and a ditch near the north-eastern corner of the excavation that was cut by late Roman hollow-way 1126.

1.4.14 Most of the curving ditch lay beyond the limit of the excavation, and only approximately a quarter of the circumference was within the area of the investigation. It is unclear if this is a complete enclosed ring or a penannular ditch. The gully had a projected diameter of *c* 12m and was V-shaped in profile, measuring 1.2m wide and 0.45m deep. The fill contained a modest assemblage of pottery that included a large, well-preserved sherd from a mortarium imported from Soller in Germany.

1.4.15 In the late Roman period, a somewhat sinuous hollow-way (1126) extended past the western side of gully 1123 on a N-S alignment. The hollow-way was 2.5-3.5m wide and 0.25-0.3m deep and had a gravelly lower fill that may represent deliberate metalling. It extended for at least 35m, petering out at the southern end and continuing to the north beyond the edge of the excavation area.

1.4.16 An isolated Roman boundary ditch (1127) was encountered along the western edge of the site. This was parallel to the existing historic London Road and between the road and the Iron Age pit. The ditch was not closely dated although it produced numerous sherds from a single early/middle Roman vessel.

1.4.17 A post-medieval former field boundary ditch (1052) extended across the excavation area west of the main concentration of Roman ditches. This corresponds to a field boundary depicted on late 19th century OS maps.

Passingford Flood Alleviation Area

1.4.18 The Passingford Flood Alleviation Area was located 420m to the east of the bund site. This excavation encompassed a 4.5ha area and included the valley floor of the River Roding at *c* 29m aOD rising to *c* 33m aOD on the high ground of the gravel terrace.

1.4.19 Evidence for activity dating from the late Mesolithic/early Neolithic period comprised a relatively small quantity of chronologically diagnostic worked flint, most of which was either unstratified or recovered from the fills of later features. The only piece that was recovered from a possibly contemporary feature was a single blade from tree throw hole 2281, although the dating of the feature is not certain and rests solely on its association with the flint. The tree throw hole was situated *c* 12m south-east of ring ditch 2100, which also produced a concentration of late Mesolithic/early Neolithic lithic material, perhaps indicating a focus of activity in this part of the flood plain. The other find spots were located on the gravel terrace, where they were distributed across a distance of *c* 175m, providing evidence for widespread activity with no definitive concentrations.

1.4.20 Ring ditch 2100 was situated on the flood plain in the southern part of the excavation area where the River Roding arcs around from a north-south course to an east-west flow. No pottery was recovered from the feature but it has been tentatively attributed to the late Neolithic/early Bronze Age on the basis of worked flint recovered from its fill and the earlier stratigraphic relationship of the ditch to the post avenue described below. The ring ditch was annular in form with an internal diameter of *c* 7.8m. The ditch was not substantial, measuring 1m wide and only 0.10-0.16m deep, and had a flat base and a fill of pale grey silt. No central burial, or indeed any other contemporary features, was identified within the ring ditch and it is not certain whether the feature represents a plough-levelled barrow or some other form of ritual monument.

1.4.21 Bronze Age activity was represented by an avenue of postholes situated on the flood plain, and apparently associated with ring ditch 2100, and a scatter of pits and postholes on the gravel terrace. The avenue was defined by at least 14 pairs of postholes. Ten of these pairs formed a straight alignment measuring *c* 30m long and 2.5-3.0m wide that extended on a NE-SW alignment, with its north-eastern end aligned

across the centre of the ring ditch. Where the avenue crossed the ring ditch its orientation changed slightly, with the alignment of the final four pairs of postholes being closer to NNE-SSW. The postholes at the south-western end of the avenue were deepest, with some measuring up to 0.2m deep, and became progressively shallower toward the north-eastern end, where several measured less than 0.1m deep, and it is therefore possible that further postholes at the north-eastern end may have been destroyed by medieval and modern ploughing.

1.4.22 At the south-western end of the avenue lay a group of four postholes that were arranged in a square that was slightly off-set from the alignment of the avenue. It is uncertain whether they formed part of the avenue or represented a separate structure. The arrangement measured *c* 3.5m square and was composed of the most substantial postholes in this complex of features, the two that were excavated measuring 0.24m and 0.3m deep. The greater size of the postholes compared with those of the avenue may strengthen the case for this group representing a structure that was linked to the ring ditch by the avenue. The eastern posthole of this group (2152) was the only one of these features that yielded any artefactual material, in the form of a body sherd from a vessel of probable Bronze Age date. A second possible structure was represented by a similar group of four postholes situated c 12m west of the first. Only one of the postholes was excavated. It produced no artefactual material.

1.4.23 A total of 15 other features produced Bronze Age pottery, all of which were located on the gravel terrace, although they were widely distributed and did not form any specific concentrations. Most of the features were small and may have represented either postholes or small pits. The only more substantial example was pit 2650, which measured 1.6 x 1.2m and 0.5m deep.

1.4.24 The late Iron Age phase comprised an open settlement and associated field system. The settlement was situated on the gravel terrace in the north-eastern part of the excavation area and comprised the remains of at least five roundhouses (3360, 4016, 4020, 4095, 4377), as well as part of two larger curvilinear enclosure ditches (4310, 4251) and a curving ditch or gully of uncertain function (4269). The roundhouses were represented principally by complete or partial drip gullies, although pairs of postholes that supported the doorway survived in structures 3360 and 4020 and a single such posthole was identified in structure 4016. Only in roundhouse 4020 did a small part of the footings of the wall survive. A rectangular building or enclosure (4431) composed of two square elements of similar size was situated at the south-eastern edge of the settlement and a gully that defined three sides of a small rectangular enclosure (4141) lay a further 17m to the south. Numerous postholes were scattered around the settlement but the only group that could be resolved into a definite structure comprised a four-post structure (4315). Most of the buildings intersected with their immediate neighbours, indicating that they were not in contemporaneous use, and it is likely that they represent a settlement of 2-4 structures that were each replaced on at least one occasion.

1.4.25 Adjacent to the area of settlement lay a group of conjoined rectilinear fields. At least five fields were identified, varying in size from 23 x 18m to 68 x 30m. Most of the fields were situated on the gravel terrace, but insubstantial and only partially surviving ditches at the southern end of the complex indicated that two fields extended onto the flood plain. An area of quarrying measuring *c* 10m in diameter was situated within the south-eastern corner of one of the fields and the largest contained a large number of postholes, although only six of these features could definitely be attributed to the late Iron Age. Some 100m west of these fields a group of ditches exposed in the western

part of the excavation area are likely to have enclosed a further group of fields with more irregular shapes. However, preservation of these features was less complete and the form of the fields less well understood.

1.4.26 A single cremation burial (2009) comprising the remains of an adult of undetermined sex interred in an urn and accompanied by an accessory vessel was located on the floodplain in an otherwise isolated position near ring ditch 2100.

1.4.27 A lengthy and somewhat sinuous ditch (2799) extended across the excavation for a distance of at least 275m, continuing to the west beyond the edge of the site. It cut across the boundary ditches of the late Iron Age field system, and for most of its length extended along the boundary between the flood plain and gravel terrace, presumably defining a boundary that divided these two topographic areas and their respective landuse. The feature has been dated to the late Iron Age/early Roman period.

1.4.28 The early Roman period was represented by a ditched boundary and three pits. The boundary 3671 was located at the western end of the site and extended on a N-S alignment. The absence of other ditches of similar date indicates that it did not form part of a field system and is more likely to represent a boundary that divided the gravel terrace into areas of different use or in different ownership. The ditch had been re-defined on at least three occasions, indicating its significance and longevity.

1.4.29 Two small, isolated oval pits of uncertain function contained small quantities of early Roman pottery, but the most substantial feature attributed to this phase was a large waterhole or quarry pit (4151) situated in the eastern part of the excavation area.

1.4.30 An extensive system of rectilinear fields defined by boundary ditches was laid out during the 2nd or early 3rd century. The most substantial field occupied the south-central part of the excavation area and measured 155m from east to west, extending to the south beyond the edge of the site. It was bounded on its western side by a smaller field that measured 65m from east to west and may have been sub-divided by an internal boundary represented by an insubstantial and intermittent ditch, and was adjoined on its northern side by a similar field. A trackway 4.5-5.0m wide defined by a pair of parallel ditches extended along the western side of these two fields. An L-shaped ditch (2423) defined a smaller enclosure against the northern side of the large central field that measured 28m x 18m, and a ditch (4465) near the north-eastern corner of the excavation and a linear ditch at the south-eastern limit provided evidence that the complex of boundaries continued to the east of the excavated area. Three discrete pits and a waterhole (3609) were also attributed to the middle Roman period.

1.4.31 The features that were attributed to the late Roman period on ceramic grounds generally respected the boundaries that had been established during the middle Roman phase, suggesting that these boundaries were still in use and defined by surface features even though the corresponding ditches had silted up. The only alterations to the existing boundaries comprised the creation of a boundary ditch (2297) that roughly corresponded with the western side of the large central field, and a rectilinear enclosure (2432) in the central part of the site. The latter enclosure was defined by ditches on only three sides, although either of two E-W ditches that produced no dating evidence could have enclosed its northern side. The enclosure was accessed by an entrance through its eastern side, which was associated with an alignment of six postholes that extended alongside the interior of the enclosure ditch. Despite this elaboration, the artefactual assemblage recovered from the enclosure was not sufficient to indicate domestic occupation. A series of quarry pits that extended along the western and southern sides of middle Roman ditch 4465 in the north-eastern part of the excavation

area were attributed to the late Roman period, as were four pits that cut the ditch defining the northern side of the large central field and a further pit that was located a short distance within the field. Waterhole 3652 cut middle Roman waterhole 3609 for which it was presumably a direct replacement. The waterhole measured 7.6m wide and 1.5m deep and had lower fills of waterlogged silty clay in which organic remains were preserved, including pieces of wood.

1.4.32 The excavation area was crossed on N-S and E-W alignments by ditches that corresponded with boundaries recorded on late 19th century OS maps and which produced modern artefacts that indicated that they had been backfilled during the late 20th century.

1.4.33 A large number of postholes were recorded and distributed mainly across the gravel terrace to the west of the late Iron Age settlement. Very few of these features contained any datable artefactual material, and although some distinct concentrations could be identified the only group that could be resolved into a coherent structure formed an oval structure (3119) that was situated within the south-eastern corner of the largest of the late Iron Age fields. In contrast, very few postholes were identified on the floodplain other than those of the Bronze Age avenue. A small number of undated postholes were situated around ring ditch 2100, and a discrete group of six postholes was identified at the south-eastern edge of the excavation that may represent a small rectilinear structure of unknown date and function.

Pond 1656 – M25005.09 (Fig. 12)

1.4.34 Pond 1656 was situated to the south of the M25 on the low-lying floodplain of the River Roding at 35m aOD. The natural deposit was identified as Taplow Gravel Formation. The site covered a total area of 0.12ha within which a deposit of topsoil and a buried ploughsoil were removed to a combined depth of 0.5m across the entire.

1.4.35 A ditch (103) aligned NW-SE across the site was excavated and recorded although this did not produce any datable finds. However the ditch is likely to have a post-medieval origin as it corresponds to a field boundary visible on the 1880 OS map. No other archaeology was encountered.

Pond 1683 Strip Widening, Topsoil Storage, Recovery Compound and Tank installation – M25010.10 (Fig. 13)

1.4.36 The sites followed the natural contour of a shallow valley and drain that eventually leads into the Weald Brook to the south-west. The highest point of the site was at *c* 70m aOD and the lowest *c* 65m aOD. The main areas were split either side of the drain. The natural deposit of Thames Clay was encountered throughout the combined excavation area of 0.59ha.

1.4.37 The strip widening areas were excavated parallel to the CW carriageway of the motorway, to the south-east and north-west of pond 1683, and close to an additional topsoil bund to the south of the drain. The modern ploughsoil and a buried ploughsoil were excavated to a combined depth of 0.4m.

1.4.38 A ditch (1) was excavated and recorded within the north-western extent of the strip widening area. This did not produce any artefacts although it corresponds to a field boundary seen on the OS map of 1873. The ditch contained five struck flints, but these are likely to be residual.

1.4.39 A small area measuring 0.02ha was also excavated for the installation of a drainage tank. The area was located *c* 220m upslope of pond 1683 at 80m a OD. The site was in

use as a temporary compound for the M25 construction and so a protective layer of terram and hardcore was laid prior to use. This deposit, along with the 0.4m of topsoil and subsoil, was removed to the underlying Thames clay. No archaeology was encountered at this location.

Pond 1683 – M25007.09 (Fig. 13)

1.4.40 Pond 1683 was situated on a gentle, south-east facing slope of a valley, at 75m aOD at the highest point and 70m aOD at the foot of the hill, where the field met the drain into the Weald Brook. The buried ploughsoil was excavated to reveal a deposit of Thames Clay. Due to the wet conditions and poor traction at the site, this was stripped using only a tracked excavator with the spoil bunded around and within the pond area. The stripped extent of the pond was 0.88ha. Due to the relatively limited results and through agreement with the relevant planning archaeologist, the areas below the spoil heaps within the pond boundary were not investigated.

1.4.41 Three pits, all containing a charcoal-rich fill, were identified and excavated. The natural clay beneath all the pits showed evidence of scorching, suggesting that the charcoal was burnt *in situ*. The pits each measured around 0.6m in diameter and 0.1m deep. Two (1005 and 1007) were to the north-east of the site and in close proximity to each other; the other (1012) was further to the south. There was no obvious use or dating for the pits, although one of the pits contained small fragments of slag and burnt flint.

1.4.42 Two ditches extended NE-SW and NW-SE and were machine excavated (Ditch group 1014). The ditches were *c* 2m wide with evidence of root-disturbance around both sides. The ditches appear on the first edition OS map forming part of the field boundary arrangement with ditch 1 described above. This map shows trees flanking the sides of both ditches consistent with the root disturbance recorded on site. No other archaeology was found.

Benskin's Cutting Palaeolithic watching brief – M25016.10 (Figs 14-16)

1.4.43 The cutting lies to the east of the Pond 1683 between Junctions 27-28 of the M25 The carriageway cuts into the elevated contours of the north-east facing slope of Noak Hill between 50m to 80m OD. This is at the end of a roughly north-south aligned undulating ridge with the Weald Brook in the base of the valley to the east.

1.4.44 The local geology exposed in the cutting is Anglian till of the Lowestoft Formation, overlying London Clay. These deposits date from the middle Pleistocene, or Anglian glaciation (MIS 12) that occurred between 500,000 and 425,000 years ago.

1.4.45 The general sequence revealed by the reshaping of the cutting was a series of brownish red gravelly sands and silts overlying London Clay on the crest of the hill at approximately 80m OD. The London Clay was encountered at a depth of 8m below ground level towards the east of the cutting. It was also encountered at a depth of 2.5m within the recorded sections 4 and 5, where its upper surface showed signs of weathering. Closer examination revealed a stratified sequence of brownish red gravelly sand and silts, overlying weathered London Clay. In places, these deposits exhibited more inter-stratified detail of laminated silt and sand with pale greyish mottling. The base of the London Clay was not encountered at the crest of the hill, where the cutting only reached a depth of between 4-5 metres.

1.4.46 This sequence of gravelly sand was capped by sandy sub-rounded gravel deposits located near to the top of the cutting underneath the topsoil. These deposits were matrix supported sandy gravel, with sub-rounded to sub-angular clasts and varied in

thickness from 0.80m on the crest of the hill to a maximum of 2m to the east, as the deposits started to dip down into the valley.

1.4.47 No deposits of pre-Anglian age were identified within the cutting and no signs of palaeolithic flints were recovered. The sediments conform in nature and character to fluvial-glacial deposits of the Anglian glaciation as mapped by the British Geological Society. No fossiliferous or low-energy deposits were identified within the sequence that could have archaeological potential or further geological importance.

Pond 1698 and Strip Widening – M25013.10 (Fig. 17)

1.4.48 Pond 1698 was situated on the lower slope of the Weald Brook valley east of Noak Hill. The site sloped to the south-east from a height of 48m aOD to 42m aOD. A total of 1ha was stripped revealing a natural deposit of London Clay, silt and sand below the existing topsoil

1.4.49 No archaeological remains were encountered.

Tank 1706 and Strip Widening – M25011.10 (Fig. 18)

1.4.50 This area comprised a drainage tank installation and a collection of strip widening sites to the north (CW) and south (ACW) of the M25. The natural geology was London clay overlain by Head clay, silt, sand and gravel. On the northern side of the motorway, due to the low impact level of the construction work, only the topsoil was removed and the subsoil left *in situ*. No archaeology was encountered at this level.

1.4.51 To the south of the M25 the narrow strip widening area spanned the low contours of the Weald Brook valley at the north-western and south-eastern extents of the excavation. The valley rises from at *c* 40m aOD at the base to *c* 50m aOD at the high point of a shallow cutting through which the M25 runs. Tank 1706 was located at the south-eastern end of the strip widening area. The combined area was 0.58ha with the overlying topsoil and a buried topsoil removed to a combined depth of between 0.2m on the high ground to 0.4m across the valley floor.

1.4.52 Two ditches (6 and 8) were excavated. These were both found to be backfilled, post-medieval field boundaries, one of which (6) terminated within the site limits. Ditch 8 was clearly depicted as a field boundary on the 1881 OS map. A large modern pit (4) containing construction waste was also recorded but not excavated.

Tank 1714 and Strip Widening – M25017.10 (Fig. 19)

1.4.53 Tank 1714 and the adjacent strip widening areas were located in close proximity to the Weald Brook valley floor and lay at heights of between *c* 40m to 45m aOD. The underlying natural deposit was London clay formation with an overlying superficial deposit of Head clay, silt, sand and gravel.

1.4.54 The areas were excavated in a number of phases and comprised strips both to the north (CW) and south (ACW) of the M25. Combined, these covered an area of 0.54ha. Prior to the commencement of works the land had various uses. Some had been used for agriculture, other areas for grazing, and one area was covered in trees. The areas were each stripped of topsoil, and in places an underlying buried ploughsoil, to an average depth of 0.4m.

1.4.55 All of the features encountered were focused upon a small area at the northern end of the Tank 1714 location and the adjacent strip widening area. These two areas were separated by a drain into the Weald Brook created as part of the original M25 construction. Here at least five ditches were encountered. The largest of these (118)

was aligned north to south and correlates to a large curving boundary depicted on the 1881 OS map. The other smaller ditches were aligned NE-SW parallel to the modern drain. These may have a more recent origin than that of the larger ditch. The larger ditch and one of the smaller gullies were also truncated by two large rectangular pits (122 and 124). These contained small amounts of modern brick debris and may have been associated with a possible pylon removal/replacement for the overhead power lines during the original construction of the M25. No other archaeology was encountered.

Pond 1727 – M25019.10 (Fig. 20)

1.4.56 Pond 1727 comprised the excavation of both the pond area and an access track to the south (ACW) of the M25. The site sloped gently from 40m aOD within the southern part of the site to 35m aOD to the north with a low-lying dip at the junction of the access track and pond area. The low-lying contour contained a drain running to the south-west into the Ingrebourne River west of the pond. The Ingrebourne River continues the course of the Weald Brook.

1.4.57 The excavation area of 0.5ha revealed a natural deposit of London clay formation, clay, silt, and sand below the current topsoil and buried ploughsoil. No archaeological remains were encountered on the site

Tank 1740 and Strip Widening – M25015.10 (Fig. 21)

1.4.58 Tank 1740 and the adjacent strip widening areas were situated in an undulating landscape with the topography very broadly sloping from the high ground at *c* 75m aOD east of the M25, to *c* 55m aOD to the west of the carriageway (ACW). Within the lower contour areas it can clearly be seen that the level for the motorway has been significantly built up perhaps by up to 10m although the extent of this was uncertain due to the degree of landscaping undertaken as part of the original construction.

1.4.59 A combined area of 1.1ha was stripped revealing made ground across each area. This was investigated at various locations and proved to be 1m deep and was left *in situ*. No archaeological remains were encountered.

Warley Road to Bereden's Lane Strip Widening – M25014.10 (Fig. 22)

1.4.60 This small area of strip widening was located within the lower contours of a narrow, north-south dry valley within the undulating landscape and to the west of the M25 (ACW). The excavation covered an area of 0.1ha with the ground sloping gradually to the north from 70m aOD in the base of the dry valley to 75m aOD at the northern limit of the excavation. The existing topsoil was removed to a depth of 0.3m exposing a colluvial deposit beneath. Due to the low impact of the construction works the colluvial deposit remained *in situ*, as it would protect any archaeological remains beneath. Imported material was then built up above it.

1.4.61 No archaeological remains were encountered.

Folkes Lane Strip Widening – M25012.10 (Fig. 23)

1.4.62 The narrow and long strip widening site sloped gently from the north-west to south-east from 51m aOD to 40m aOD. Excavation was completed in two phases; a northern and a southern part. Within both a natural deposit of London clay was encountered.

1.4.63 Prior to excavation the majority of the site had been covered in dense immature woodland and scrub. A modern topsoil, which included a high quantity of tree stumps

and rooting, was removed across the entire length of the excavation revealing two post-medieval ditches, orientated N-S and NE-SW. One ditch (102) was still in use as excavation commenced, while the other (104) had been recently backfilled, possibly during the original construction of the M25. No other archaeology was encountered.

Codham Hall Bund, Tank 1762 and Strip Widening – M25018.10 (Fig. 23)

1.4.64 The Codham Hall excavation encompassed strip widening, a bund and a drainage tank. The site covered an area of 2.6ha and comprised a broad area *c* 150m by 80m to the south, which extended northwards in a narrow strip alongside the M25 (CW).

1.4.65 The earliest activity identified was represented by a single piece of flint, a horseshoe-shaped end scraper dating to the late Neolithic or early Bronze Age. It was found in isolation on the horizon between the natural geology and the modern ploughsoil.

1.4.66 The first evidence for occupation appears in the south-west corner of the excavation and dates to the late Iron Age or early Roman period, up to *c* AD 70. Here a series of ditches appear to have enclosed an area of activity which is likely to have extended beyond the western edge of the excavation area under the existing M25. Although no production-related features were found during the excavation, the presence of fired clay and a possible metalwork mould in the backfill of the ditches suggests nearby manufacture. This is reinforced by a series of pits which, while containing high quantities of charcoal, displayed no evidence for *in-situ* burning. Pottery recovered from these pits could be as early as the middle Iron Age, while pottery from the ditches may date to as late as AD 70, suggesting that the area was utilised for an extended period of time and spanned the Iron Age to Roman transition.

1.4.67 Occupation of the site appears to have ceased at the end of the 1st century AD. Between this date and the early 11th century the only activity was the deposition of what may have originally been a complete Roman grey ware jar in a small pit (274) more than 100m to the north of the Iron Age activity area. The vessel dated to between the 2nd and 4th centuries. Often such a deposit would be associated with a cremation burial, although no cremated remains were present within this small pit.

1.4.68 Evidence for activity during the early medieval period (from the late 11th to the early 13th centuries) was seen in the form of a sequence of east-west aligned ditches and at least one pit (340). Unfortunately these features lie at the periphery of an area which has been heavily truncated by an extensive area of modern quarrying and this may have removed more extensive evidence.

1.4.69 Two narrow gullies crossing the site on an east-west axis were seen to be on the same alignment as a track shown on the OS Map of 1920 and may represent ruts caused by cartwheels. A number of pits were excavated in the narrow northern portion of the site but these were very dispersed and mainly undated. No further activity was identified on the site and it seems likely that for most of its history this area has been retained for agricultural use.

Hobbs Hole evaluation and excavation – M25001.08/09 (Figs 24-26)

1.4.70 The site was located to the south-east of Junction 29 of the M25 (CW) and occupied a broad, shallow valley through which a stream flows from east to west. The base of the valley lies at *c* 25m OD, from which the ground rises gradually to the north and a little more steeply to the south to a maximum height of *c* 30m OD. The underlying geology comprised London Clay.

1.4.71 Following an evaluation that comprised a total of 48 trenches and encompassed an area of 14.5ha, a 3.1ha part of the northern slope of the valley and a smaller 0.59ha area at the top of the southern slope were targeted for excavation.

Northern Area

1.4.72 Bronze Age pottery was recovered from a wide, shallow hollow (5112/5131) located at the north-eastern tip of the eastern area, at the top of the north slope of the valley. It is likely that this was a natural drainage feature. The hollow measured 4m wide and at least 25m long, continuing to the north beyond the edge of the excavation area. To the south the feature appeared to bifurcate before becoming more diffuse and petering out beyond the break of slope, where it may have been destroyed by modern ploughing.

1.4.73 Seven pieces of struck flint were recovered from later features. The only datable piece was a large, thick tertiary flake of Bronze Age date that was recovered from the topsoil during machining.

1.4.74 The early and middle Roman periods were characterised by the establishment of rectilinear enclosures and other boundaries. A significant boundary was defined by a particularly long, though very shallow ditch (6039) that extended down the valley side. A pair of rectilinear enclosures were constructed to the west of this boundary, defined by shallow ditches. The northern enclosure measured at least 25m x 25m. Its western side appeared to be defined by a series of inter-cutting pits rather than a continuous ditch, and the enclosure may have been open on its northern side, although it is possible that this part had simply been destroyed by more recent ploughing. The southern enclosure was represented by an L-shaped ditch that enclosed two sides of an area measuring at least 35m x 25m. The only contemporary feature located within these enclosures was a large quarry pit (7043/7123) within the south-western corner of the southern enclosure. A group of ditches (5024, 5058, 6063) that were exposed at the top of the slope on the eastern side of ditch 6039 may have represented the remains of similar enclosures, and an L-shaped ditch (5007) located 45m further east may have been the surviving part of a further example. No evidence for domestic occupation was found and it is likely that the enclosures were associated with agriculture or the management of livestock.

1.4.75 A total of five cremation burials were uncovered during the excavation, in addition to a single example (4303) that had been recorded during the evaluation. Four of the burials (5035, 5069, 6092, 6094) were located at the top of the valley side and the other (6096) lay on the lower part of the slope, 75m from the main group. Cremation burials 6092 and 6094 lay within the enclosure represented by ditch 5007, although it is not certain whether the features were contemporary. In burials 5035 and 6096 the cremated remains had been interred within an urn, the latter also including two accessory vessels, but the other burials were extremely truncated, and comprised only the bases of apparently un-urned burials, the remains having been inserted directly into a shallow pit.

1.4.76 At least five large quarry pits (5083, 6006, 7012=7020, 7043=7123, 7160) measuring up to 12m across were dug during this period, presumably for the large-scale extraction of clay. Excavation of each of these pits was terminated at a depth of 1.2m for reasons of health and safety and the limited and temporary impacts that the site would experience before returning to agricultural land. At this depth it was clearly evident that the pits themselves were much deeper than this. A full depth was established only for pit 6006, which was augered to a total depth of 2.4m from the surface of the clay geology. The sequence of ceramic material that was recovered from the fills of quarry pit 7012=7020 indicates that it was dug during the 2nd century but did not finally silt up

until the 3rd-4th century, and it is likely that a similarly long period of silting occurred at each of the other pits.

1.4.77 A curving, somewhat discontinuous ditch (6000) extended diagonally across the valley side. The ditch was quite substantial compared with other ditches on this site. It measured up to 0.5m deep, and extended for a distance of *c* 100m. The feature was attributed to the late Roman period on the basis of pottery, although it resembles the alignment of irregular pits and ditches from Upminster Bund that was dated to the Bronze Age or early Iron Age. A wide, shallow linear feature (7027) situated at the base of the valley side also produced late Roman pottery, but the irregular shape of this feature may indicate that it was a natural hollow created by rain-water draining off the slope rather than a deliberately dug feature.

1.4.78 Three large quarry pits (5096, 5161, 6071) were dug during the late Roman period. They were similar to the earlier examples, with dimensions of up to 7.5m, and all were more than 1.2m deep. Augering of pit 6071 indicated that it had a depth of 2.2m. Pit 5174 was only 0.4m deep but may be a shallower example of such a feature.

1.4.79 A swathe of irregularly-shaped features located up-slope of quarry pit 6071 in the Eastern Area produced pottery of late Roman date. Most of these features were not excavated, the pottery being recovered from their surfaces, and their precise nature is uncertain.

1.4.80 A number of features produced assemblages of Roman pottery that were not sufficiently diagnostic to enable them to be attributed specifically to the earlier or later part of the period. These features included four large quarry pits (5158, 7070, 7135, 7190). Pit 7190 was the largest quarry pit within the excavation area and measured 17m x 11m. Pit 7135 was 1.1m deep, but depths could not be established for the other three features, each of which was excavated to a depth of 1.2m without reaching the base. Pit 7146, which cut one of the early-middle Roman enclosures, was only 0.65m deep and may also be a quarry pit, albeit less substantial than the others.

1.4.81 Anglo-Saxon pottery was recovered from a number of features at the top of the north slope of the valley. The pottery mostly came from the upper fills of ditches that originated during the Roman period, and indicates that this area was occupied during the 5th century, when the final silting of these features occurred. Little evidence was found to elucidate the character of this occupation, however, either because it lay beyond the northern edge of the excavation area or because any associated features were very shallow and had been completely truncated by more recent ploughing. The only feature that appeared to have originated during this period was pit 5071, which had Anglo-Saxon pottery in its lower fill. The pit was sub-circular and measured 5.8m x 4.2m, with a depth of 0.7m, and appeared to be a large quarry pit similar to those dating from the Roman period.

1.4.82 Two ditches that were exposed in the western and northern areas extending up the northern slope of the valley corresponded with field boundaries depicted on the 1st Edition Ordnance Survey map of 1881 and are likely to be modern in origin. Several ditches identified within the evaluation trenches to the east of the northern area also correspond to boundaries shown on the 1881 map.

Southern Area

1.4.83 During the early-middle Roman period a single enclosure measuring at least 25m x 18m was created at the top of the southern slope of the valley, and two ditches that extended beyond the southern edge of the excavation area may indicate the presence of further enclosures or associated boundaries in this area.

1.4.84 A single boundary ditch (5962) extended for a little over 20m on a N-S alignment. It was not obviously associated with any other features, although it is possible that its alignment was derived from that of the early-middle Roman enclosure that lay *c* 60m to the east.

1.4.85 Two substantial quarry pits (5905, 5911) were located in this area. Pit 5905 measured a little over 1m deep. Excavation of pit 5911 was terminated at a depth of 1.2m without reaching the base.

1.4.86 A large concentration of pits was situated in and around the early-middle Roman enclosure in the Southern Area. A sample of these was excavated and revealed that they were rather different in character from the quarry pits. They were considerably less substantial, with depths rarely more than 0.3m, and some were irregular in form, leading to the interpretation that at least some of these features were tree holes. These may indicate that the area was cleared of trees specifically for the creation of the small enclosure.

Evaluation Trench 43

1.4.87 A cremation burial (4303) was uncovered in Evaluation Trench 43, which was situated *c* 45m north-east of the southern excavation area on the valley's southern slope. Like most of the burials on the northern side of the valley it had been substantially truncated, and only the base of the feature survived.

Upminster Bund – M25008.09 (Fig. 27)

1.4.88 Upminster Bund was located to the west (ACW) of the M25 at Junction 29. The site sloped gently from the north at 25m aOD towards the south-east to *c* 17m aOD. Prior to excavation, the site was in use as agricultural arable land. The natural deposit was revealed as London Clay, and silt and sand with an overlying superficial deposit of Head formation.

1.4.89 The site covered 6.8ha and deposits of topsoil and a buried ploughsoil were removed to a combined depth of 0.5m. The main focus of the archaeology at Upminster Bund was within a smaller portion of the site (0.72ha) at the southern end. Here a 'pit' alignment was identified extending more than 100m on a NW-SE orientation before turning 90º and returning over 22m towards the south-west. The width of the alignment varied between 2.5m and 15m. Unfortunately the turn in the alignment was within an area not subject to investigation, and so the character of this part of the alignment is not certain.

1.4.90 The 'pit' alignment comprised a large number of irregular shaped features that can only loosely be described as purposeful pits. In places these were elongated to form short lengths of irregular ditches. The pits measured between 0.6m and 1.65m in width and length and were between 0.1m and 0.3m deep. They contained generally small fragments of pottery dating to the Bronze Age or early Iron Age. A sample of the pits was excavated along the length of the alignment, as the features were generally similar in shape, size, and date. The alignment is interpreted as a prehistoric boundary.

1.4.91 A single cremation burial (1166) was excavated *c* 5m to the east of the pit alignment. The burial was in very poor condition due to plough damage, and contained no dating evidence. It is possible that the burial is of a similar date to the alignment, although there is little evidence other than spatial association to substantiate this.

1.4.92 No other significant archaeological remains were encountered. Medieval or post-medieval ridge and furrow was seen extending east-west across the site, both over the

Bronze Age boundary and in the area to the north. Post-medieval field boundaries were also recorded and these were visible on all OS mapping until 1961.

Pond 1776 – M25021.11 (Fig. 28)

1.4.93 Pond 1776 was situated on flat, low-lying ground at a height of *c* 12m aOD. The underlying natural geology was recorded as London Clay with a superficial deposit of Head clay, silt, sand and gravel. The excavation comprised an area of 0.72ha located to the east of the M25 within an arable field. Topsoil and subsoil were removed to a depth of 0.37m to expose the natural clay.

1.4.94 A ditch (1013) was recorded aligned NW-SE across the site. This was interpreted as a post-medieval boundary ditch and contained six small fragments of ceramic building material. Other features excavated on the site comprised a modern posthole and natural features. A single struck flint was recovered from the subsoil. No other archaeology was encountered.

Pond 1787 and Strip Widening – M25020.11 (Fig. 29)

1.4.95 The pond and strip widening areas were excavated in several phases and included areas to both the east and west of the M25. The combined pond and strip widening areas east (CW) of the M25 covered an area of 0.95ha within fields formerly used as grazing pasture. Here a natural deposit of gravel was exposed below a 0.3m thick layer of topsoil. No archaeology was present within the strip widening area north of the pond.

1.4.96 Within the pond and adjacent strip widening area, six linear ditches were recorded each, with the exception of one, arranged parallel on a ENE-WSW alignment. Ditch 102, the northernmost of these, was the remains of the existing field boundary hedge and ditch. Aligned NNW off this was another boundary ditch likely to have been infilled when the M25 was originally constructed.

1.4.97 Two postholes were also excavated, one to either side of the northernmost ditch. Their use could not be determined, but they may relate to the field boundary. No dating was recovered from the features but it seems most likely that they are post-medieval and modern in date origin.

1.4.98 The final area was a 0.39ha strip widening excavation on the western side (ACW) of the motorway. This area offered little potential with significant modern earthwork disturbance and drainage present at the outset. No archaeology was encountered following the removal of the 0.3m thick topsoil layer.

Pond 1791 and Strip Widening – M25023.11 (Fig. 30)

1.4.99 Pond 1791 was located to the east (CW) of the M25 within a series of low lying fields at a height of 11m aOD. The pond excavation encompassed an area of 0.73ha and included an area of strip widening extending to the north. The natural deposit was Head clay, silt, sand and gravel. Topsoil and subsoil was removed to a depth of 0.3m.

1.4.100 Prior to excavation the site had been covered in dense, young woodland and scrub growth. As a result the exposed surface of the excavation area exhibited considerable root disturbance. A linear ditch or hedgerow (111) aligned north to south was recorded at the southern end of the site. No dating evidence was present within the ditch. A former field boundary ditch (107) of clear post-medieval or modern origin was also identified within the strip widening area to the north of the pond. A single cremation burial was also recorded. This measured *c* 0.9m in diameter and contained charcoal and cremated bone. It was, however, undated.

1.4.101 The second phase of works comprised the strip widening to the west (ACW) of the carriageway. This covered a total of 0.63ha and, following the removal of the modern topsoil 0.25m thick to the underlying natural horizon, it was clear that the majority of the area had been truncated by the excavation of the existing M25 drainage ditch. No archaeological remains were encountered within this area.

Ockendon Cutting Palaeolithic watching brief – M25026.11 (Figs 31-33)

1.4.102 A watching brief was undertaken along the Ockenden Cutting. A detailed inspection of the exposed deposits following regrading of the CW cutting was undertaken by OA geoarchaeoloists and a Palaeolithic specialist. This recorded the Boyn Hill Gravel sand and gravel deposits without other significant interglacial deposits present. No artefacts or deposits likely to contain significant artefacts were encountered. A similar observation was made along the ACW cutting following this exposure.

Pond 1812 and Strip Widening – M25024.11 (Fig. 34)

1.4.103 Pond 1812 was situated to the east (CW) of the M25, directly north of Dennis Road. The pond excavation covered a total of 0.44ha and occupied a level arable field at *c* 18m aOD. The strip widening extended across a combined area of 0.73ha to the east and west of the motorway and north of the pond excavation. Here the ground level gently rises to *c* 20m aOD. Before the investigation, the land encompassed part of the motorway verge and agricultural land beyond. The natural deposit was Lynch Hill gravel to the south of a railway line and Head clay, silt, sand and gravel to the north.

1.4.104 The topsoil was relatively thick being up to 1m in depth largely as a result of the deep ploughing of the fine soils undertaken within the field.

1.4.105 Stripping of the pond site revealed a number of features. A single urned cremation burial (219), dating to the Bronze Age, was excavated towards the south of the site. The cremation was housed within a single vessel which had been significantly truncated to both the top and side by ploughing and a field drain. No other Bronze Age features were identified across the site.

1.4.106 A series of early medieval ditches, aligned NE-SW and NW-SE, were excavated. The pottery recovered from these comprised local wares dating to the 11th-13th century. The ditches form a number of small enclosures and possibly a trackway, and show evidence of modern truncation through ploughing.

1.4.107 Four post-medieval ditches were excavated – two (107 and 110) within the strip widening area immediately north of the pond site and two to the south. All the ditches were either visible on the OS 1866 map or followed the alignment of the ditches shown. These also repeat the alignments of the medieval ditches. One of the ditches (298) follows the alignment of the current borough division and is probably an earlier definition of this administrative boundary. To the far south of the site an area of bioturbation, 17m by 7m, was excavated. This proved to be the remains of a post-medieval woodland or coppice.

1.4.108 The strip widening areas north of ditches 107 and 110 revealed no archaeology. This may in part be due to truncation caused by the construction of the M25.

Dennis Road Turnaround and Strip Widening – M25022.11 (Fig. 35)

1.4.109 The strip widening areas were within a flat landscape at a height of *c* 20m aOD located to either side of the M25 (CW and ACW), covering a total of 0.41ha. The

underlying natural geology was recorded as a superficial deposit of Head clay, silt, sand and gravel.

1.4.110 On both sides of the motorway the areas excavated were *c* 5m lower than the height of the motorway. The current topsoil and subsoil were removed to a depth of 0.4m. The exposed surface of the natural clay exhibited considerable disturbance caused by the original construction of the M25.

1.4.111 No archaeological features were found.

Pond 1824 and Strip Widening – M25025.11 (Fig. 36)

1.4.112 Pond 1824 was situated on flat grazed pasture at *c* 18m aOD west of the M25 (ACW). The natural deposit exposed across the 0.63ha site was Lynch Hill gravel. Topsoil and subsoil was removed to a depth of 0.4m revealing the natural deposit and several small pits and ditches. Evidence of natural features and disturbance was also recorded.

1.4.113 The pits were located around the western part of the excavation area and appeared to form a broad arcing NW-SE alignment extending for *c* 100m. The pits measured between 0.5m and 1.1m in diameter and *c* 0.25m deep. All contained flint, dating from the late Neolithic to early Bronze Age, and pottery of Bronze Age date.

1.4.114 The ditches were aligned either NE-SW or NE-SW to form enclosures in the northern part of the site. The ditches were dated to the post-medieval period by finds and map regression, although only one ditch was visible on the 1862 OS map. Some of the ditches were also clearly visible as extant earthworks within the pasture fields to the north and west. One ditch contained a single sherd of flint, a Mesolithic microlith, which is clearly residual.

1.4.115 Following the excavation of the pond area, the strip widening was undertaken to the immediate north and south and adjacent to the ACW carriageway. The excavation area of the strip widening was 1ha within which was encountered the same general sequence of soils. However, these had witnessed considerable disturbance likely to have been caused during the original construction of the M25. No archaeological remains were encountered within this area.

Pond 1835 and Strip Widening – M25028.11 (Fig. 37)

1.4.116 The Pond 1835 excavation was located to the east of the M25 (CW) and north west of South Ockendon. The pond was situated within a low flat clearing within woodland at *c* 12m aOD and encompassed a total stripped area of 0.24ha. The underlying geology was recorded as London clay no with superficial deposits.

1.4.117 Deposits of topsoil and subsoil were removed to a combined depth of 0.35m to reveal the top of the natural clay. An unstratified struck flint was recovered during machining from the subsoil. The natural clay was cut by three features, a ditch or hedgeline (103), a pit (107) and a treehole (105). The ditch or hedgeline had a irregular profile to its base and was aligned NE-SW across the site. Although no finds were recovered it was thought to be a post-medieval field boundary. The treehole measured 1.9m by 0.9m and may be the result of the deliberate uprooting of a tree. The pit contained a quantity of burnt flint, charcoal waste and a piece of worked flint of Mesolithic or early Neolithic date. The pit may also be a treehole where the root was deliberately burnt out.

1.4.118 Although the archaeological remains were sparse at pond 1835, the presence of struck and burnt flint potentially suggests prehistoric activity.

1.4.119 In addition to Pond 1835 a strip widening area was also excavated apposite along the western side of the M25 (ACW). This encompassed a total area of 0.49ha where only deposits of topsoil and subsoil were encountered overlying the natural London clay. The natural clay showed a high level of truncation from the dense scrub and immature trees that covered the site prior to excavation. No archaeology was encountered.

Belhus Cutting Palaeolithic watching brief – M25027.11 (Figs 38-45)

by Francis Wenban-Smith

Background

1.4.120 A Pleistocene interglacial channel with organic-rich sediments was noted in the Belhus Cutting when the M25 was first built (Ward 1984; Wymer 1985; Gibbard 1994). The fine-grained organic-rich channel sediments occurred over a stretch of *c* 50-100m at *c* TQ 575 811, and were noted in both the west and east sides of the motorway cutting. The organic-rich channel was sandwiched between gravels of the much more extensive Corbets Tey Formation, generally now agreed (Bridgland 1994; Schreve *et al.* 2002) to represent a meander loop – the Ockendon Loop – of an ancient course of the Thames laid down in the Middle Pleistocene climatic cycle covered by Marine Isotope Stages (MIS) 10-9-8, between *c* 350,000 and 300,000 BP (years Before Present).

1.4.121 The lower Thames region contains a particularly important fluvial archive of the different interglacial cycles from MIS 12-11-10, 10-9-8, 8-7-6 and 6-5-4-3-2 that post-date the Anglian glaciation of c. 450,000 BP and the associated diversion of the lower Thames into its current drainage basin. Of these interglacials, that of MIS 10-9-8 is perhaps the least well understood, with detailed investigations having been only carried out at a few localities, the dating and correlation of which have often been disputed; the best investigated and most widely accepted localities are Purfleet (Schreve *et al.* 2002; Bridgland *et al.* 2012) and the Nightingale Estate, Hackney (Green *et al.* 2006). At Purfleet, which has been proposed as the stratotype for the MIS 9 "Purfleet interglacial", there is a record of an initial rising sea level and estuarine conditions associated with interglacial warmth, followed by a transition to freshwater fluvial conditions, with continuing interglacial warmth. The sequence at Purfleet is thought to be equivalent to the earliest part of the multi-phase MIS 9, i.e. sub-stage 9e (of Siddall *et al.* 2003) or 9.3 (of Bassinot *et al.* 1994).

1.4.122 When the interglacial channel at Belhus Cutting was first investigated, pollen evidence confirmed its interglacial nature (Gibbard 1994), although there was dispute about how it related to the lower Thames Middle Pleistocene terrace framework and the global MIS framework (Bridgland 1994). It is now, however, almost universally accepted that the Corbets Tey Formation, and its contained Belhus organic channel, are Thames deposits associated with MIS 9, from basic geomorphological geometry, clast lithological analysis and amino acid determinations (Bridgland 1994; Bridgland *et al.* 2012). However, what remains very uncertain is exactly how the deposits of the Belhus Channel relate to those of Purfleet and Hackney. It is also as yet quite uncertain how the history of hominin occupation in the Lower Thames region relates to the record of changing climate and environment through the cycle of MIS 10-9-8.

1.4.123 At the Belhus Cutting, when initially investigated in the late 1970s and early 1980s, various lithic remains in mint condition, and so thought to represent minimally disturbed evidence of contemporary occupation, were recovered from the clayey gravel overlying the organic beds (Ward 1984; Wymer 1985). Therefore, if the Belhus channel can be

more reliably integrated into the wider framework of MIS 9, then this would contribute to understanding the pattern of hominin settlement and cultural variability of the time in Britain. This contributes to two of the four primary research themes — "Hominin environments" and "Hominin demographies" — in the most recent strategic research framework for the British Palaeolithic (English Heritage/Prehistoric Society 2008), as well as to the East England Palaeolithic/Pleistocene research objective of "understanding the chronological framework of Quaternary geology" (Medlycott 2011) as a vital context for the understanding of Palaeolithic cultural remains. Finally, within the context of the site's location in the Thames Estuary/Thames Gateway region, and the archaeological research framework for this region (Williams and Brown 1999) the evidence from the Belhus channel directly addresses the specific objective of "developing the framework of Pleistocene environmental and climatic change" (under the framework objective of "increasing understanding of the physical evolution of the Thames Estuary during the Pleistocene, and of the social/cultural strategies of early hominin populations in relation to changing environment and climate" (Williams and Brown 1999, 27).

Excavation, Recording and Sampling Method

1.4.124 Excavation of the cutting followed that for each investigated Pleistocene sediment sequence as outlined above (1.3.4). At Belhus Cutting the presence of the fine-grained interglacial channel was noted on the east side of the motorway, between chainage *c* 184-200 and 184-500 and this was hand cleaned, recorded and sampled. The detailed investigations were undertaken on the CW carriageway in the first instance. The ACW carriageway cutting was exposed in the same manner and assessed. This proved to repeat the sequences of the CW side and, in places, was less well preserved. Therefore further detailed sampling was not undertaken here.

1.4.125 An initial survey of the main deposit boundaries was carried out using a Total Station, and where appropriate a portable GPS system, along the length of the cutting between chainage 184-020 and 184-430, where a pedestrian footbridge crossed the motorway – incidentally, the same footbridge as where Gibbard took samples through the channel sequence for pollen analysis in the original cutting on its west side (Gibbard 1994). After this, three locations where the best representative set of samples could be taken through the channel sequence were selected, sample locations 1, 2 and 3 (Figs 44 and 45). The organic-rich channel-fill deposits dipped northwards in the cutting (described in more detail below), and the most northerly sampling location (No. 2) was nearest the centre of the channel, where the deepest exposure of the upper organic-rich clayey/silty facies (phase 4a) of the channel-fill was present. A series of overlapping sediment monoliths of length *c* 50 cm was taken through the sequence, supplemented by a vertical series of 14 small samples of *c* 200g, and a series of three bulk samples of 100 litres from each of the three main contexts recognised.

1.4.126 The central sampling location (No. 1) was *c* 18 m further to the south. At this location, the upper part of the phase 4 sediments was affected by oxidisation and denaturing, but the lower parts were in good condition, potentially providing a tie-in for any palaeo-environmental remains with the sequence of location 1. In addition, there was a good exposure of deposits of the underlying phases 3 and 2. A similar approach to sampling was taken, with a combination of monoliths, smaller samples and bulk samples through the deposits of phases 4, 3 and 2 (Fig. 45).

1.4.127 The third and most southerly sampling location (No. 3) was towards the southern edge of the channel, where the lower organic-rich sediments of phases 2 and 3 thinned and wedged out against the rising surface of the underlying gravel of phase 1. The

phase 4 sediments were also present here, and continued further to the south, but they were thinner and more affected by oxidisation and denaturing, and predominantly consisted of the upper part (facies 4b) of phase 4, with the lower facies (phase 4a) reduced to a thin bed *c* 10-20cm thick. As for the other locations, a sequence of monoliths, a vertical series of spot samples and a vertical series of 100 litre bulk samples were taken through the sequence.

Results

1.4.128 Five main phases of deposit were recognised in the cutting. It could clearly be seen that the organic-rich interglacial channel-fill (phases 2-4) had its southern bank at *c* chain 184-325, and then dipped northward, with the upper surface of the phase 4 deposits disappearing beneath the ground *c* 100m to the north at chain 184-230, and then reappearing briefly at chain 184-160, a further 70m north. A north bank of the channel was never seen, and it is entirely uncertain where/how these deposits develop/terminate northwards.

1.4.129 A medium size flint flake *c* 50mm long was recovered from context 307 (phase 2) at Location 3. It was technologically undiagnostic, but was in quite fresh condition, suggesting not too much reworking and transportation. It is therefore quite likely that it represents contemporary hominin occupation on the bank of the organic-rich channel, which would transform the importance of investigating the Quaternary palaeo-environmental evidence at the site from of general Quaternary science to specific Palaeolithic archaeological importance.

1.4.130 A selection of the samples taken from Locations 1, 2 and 3 were assessed for a range of palaeo-environmental remains, namely insects, ostracods, pollen, molluscs and plant macro-remains. No specific assessment was carried out for small vertebrate remains, although several were noted in the course of the other assessments, and their presence (and the potential for further recovery and investigation) is therefore taken account of in this report. The more detailed specialist reports of these assessments are presented as an appendix (Appendix D) and the results are summarised here.

Phase	Name & summary description	Comments & interpretation	Distribution
5c	UPPER GRAVEL Beds of gravelly sand, interspersed with contorted beds of much more solid sandy/gravelly clay; no internal bedding structures, in contrast to facies 5a and 5b	Possibly continuing fluvial deposition with overbank colluvial/slopewash input; possibly reduction in fluvial energy with clayey deposition during more sustained episodes of quiet water; possibly all a slopewash (or even solifluction) deposit rather than a fluvial one	Capping sequence in northern part of investigated sequence, chain 184020-184120
5b	UPPER GRAVEL Medium coarse, sub-horizontally bedded sandy gravel, moderately well-sorted, with sandy beds and occasional clay-silty lenses; generally brownish-yellow with reddish sub-horizontal staining in places.	Fluvial sands/gravels, mostly high energy with quieter phases represented by sand/clayey-silt deposition.	Capping sequence in central part of investigated sequence, chain 184120-184250; cut out by 5c to north

Phase	Name & summary description	Comments & interpretation	Distribution
5a	UPPER GRAVEL Ditto above, but predominantly medium-coarse sand, with occasional more gravelly beds	Fluvial sands, mostly moderate energy with quieter phases represented by sand/clayey-silt deposition, and episodes of higher energy deposition represented by more gravelly beds	Capping sequence in southern part of investigated sequence, chain 184250-184430; overlain by 5b/5c further north
4b	SILTY ORGANIC CLAY Firm, often slightly brecciated grey/brown clay, sometimes with slight sand/gravel content, and intermittent sandy/silty/gravelly lenses.	Upper part of organic-rich channel-fill sequence, often affected by oxidisation and denaturing; dips/thins to north, grading diffusely into underlying phase 4a; thickens/rises to south, overlapping phase 4a; quiet fluvial/alluvial deposition possibly drying at top	Chain 184230 to footbridge at 184430, where probably equivalent to most of the sequence sampled by Gibbard (1994: 75 and 146-149); surface dips underground at chain 184230, then briefly reappears further north at chain 184160
4a	CLAYEY ORGANIC SILT Moderately soft, cohesive clayey silt, often with fine clayey/silty laminations, greyish-brown and smells peaty due to organic content.	Dips and thickens northwards, grading diffusely into overlying phase 4b; thins to south, reducing to thin layer 10-20 cm thick at sampling location 3, chain 184325, then wedges out further to south; quiet fluvial/alluvial deposition.	Chain 184235-184360
3	CORBICULA SAND/GRAVEL Moderately poorly sorted, matrix-supported, F-VC flint gravel in greyish-brown sand/silt matrix with common shells of *Corbicula fluminalis* and with visible pieces of ancient wood and plant macro-remains.	Wedges out to south, against rising surface of phase 1 gravel; dips and thickens north, with its basal junction grading down into the phase 2 deposits; moderately high energy fluvial deposition with quieter phases.	Chain 184270-184345
2	LOWER SILT/SAND/GRAVEL Greyish-brown silty sand, becoming more gravelly downwards, although also with distinct clayey beds.	Upper junction grades diffusely into base of phase 3 deposits; deposit wedges out southwards against rising surface of phase 1 gravel, and dips and thickens northwards, seen down to *c.* 11.20 m OD in manhole chamber opposite location 1, although lower parts not sampled; moderately high energy fluvial deposition with quieter phases.	Chain 184285-184335, between sampling location 1 and 3

Phase	Name & summary description	Comments & interpretation	Distribution
1	BASAL GRAVEL Moderately poorly sorted fine to very coarse flint gravel in slightly clay-silty VF-M sand matrix; generally brownish-yellow, yellowish-brown with reddish sub-horizontal staining or strong brown.	High energy fluvial deposition; part of mapped Corbets Tey formation	Surface rises to south and then continues for at least several hundred metres between chain 184-300 and chain184-800; probably has its base along this stretch at *c.* 9-10 m OD, and reaches a maximum surface elevation of *c.* 14-15 m OD; distribution to north uncertain as buried; it may outcrop between chain 184-070 and 184-100

1.4.131 In summary, a rich variety of palaeo-environmental remains were present in the phase 4 deposits at Location 2, nearest the centre of the channel, becoming increasingly varied and well-preserved downwards. Pollen, plant macro remains, insects and ostracods were all present, and with potential for further analysis. Small vertebrates were not noted in any of the molluscan, ostracod or plant macro remains samples, so are unlikely to be common, although may still be present in the larger, and as-yet-unassessed small vertebrate samples. Molluscs were absent in the only horizon assessed, context 205 from the base of the phase 4 sequence at this location.

1.4.132 At Location 1, a little closer to the southern channel edge, the upper part of the phase 4 deposits was less rich in remains, but the lower part was also rich, as were the underlying phase 3 and phase 2 deposits. In the lower phase 4 deposits, both molluscs and small vertebrates were present, as well as pollen, plant macro remains and ostracods. The presence (and quality of preservation) of insects was uncertain, as they were not assessed at this location. In the underlying phase 3 deposits (context 104), all categories of environmental remains were present, and with good potential for more detailed analysis, namely all of pollen, plant macro remains, molluscs, insects, small vertebrates and ostracods. Below this in the phase 2 deposits (context 105), pollen and insects were not preserved, although the other categories of evidence were present.

1.4.133 At Location 3, nearer the southern edge of the channel — within 20m of the southern channel bank for the phase 2 and 3 deposits — the phase 3 deposits were also rich in a range of environmental remains, although the evidence from the phase 2 and phase 4 deposits was not so diverse or abundant. A particular point about the results from phase 3 at Location 3 is that, although stratigraphically equivalent to phase 3 at Location 1, its position closer to the edge of the channel meant that it had an enhanced representation of terrestrial faunal elements from the ground above the channel bank, thus its results complement rather than duplicate those from the same horizon at Location 1. In particular, the molluscan and small vertebrate remains have the potential to provide an increased representation of terrestrial elements. Ostracods and pollen were not assessed for phase 3 or 4 at this location, so their presence/potential is unknown.

1.5 Research aims and objectives

Aims of Fieldwork

1.5.1 The general aims of the fieldwork were:

- to establish the presence/absence, extent, date, nature, function, and phasing of the archaeological remains present within the bund boundary and to preserve these by detailed archaeological records.
- to characterise the overall nature of any archaeological remains encountered and to understand the process of their formation.
- to identify priorities within any areas of exposed archaeological remains that may warrant more detailed investigation.
- to establish the relative archaeological value of any remains encountered and implement an appropriate archaeological recording response to these through agreement with the Contractor's Archaeologist and the relevant Local Planning Archaeological Service.
- to recover evidence for the ecofactual and environmental potential of any archaeological deposits and features where this is considered appropriate to investigate.
- to make available the results of the investigation through appropriate publication.

Regional Research Aims

1.5.2 The written scheme of investigation for Hobbs Hole (OA 2009) highlighted several research objectives identified in the Eastern Counties Research Agenda and Strategy (Brown and Glazebrook 2000) that had the potential to be addressed through the excavations at that site. These related to:

- Food: consumption and production, including atypical crop assemblages, rural site crop production levels, rural site faunal assemblages, complex economic links beyond the region, and the impact of the Roman conquest on production levels.
- Agricultural production
- Landscape, including the date of relict field systems, the detailed distribution of woodland in the Roman landscape, woodland regeneration/clearance in the late Roman and post-Roman periods, and the road network.
- Rural settlement
- The late Roman/Anglo-Saxon transition, and early Saxon occupation

1.5.3 Further detailed site specific aims were not recorded by document during the course of the excavations. Specific areas of potential and interest were addressed individually through site meetings and discussions were held in relation to the regional research aims.

Statement of Potential

Stratigraphy

1.5.4 This assessment has provided a good understanding of the chronological and stratigraphic sequences of sites along M25 Widening Section 4. Sites that contained no

archaeological remains (Skinner's Bridge and Bush Grove Pond, Tank 1632, Pond 1698, Warley Road, Tank 1740, Warley Road to Bereden's Lane and Pond 1727) require no further work. Sites containing medieval and post-medieval field boundaries only (Pond 1656, Pond 1683 strip widening, Tank 1706, Tank 1714, Folkes Lane Strip Widening, Pond 1776, Pond 1787, and Dennis Road Turnaround) also have no potential for further work, although it will be necessary to consider their place within the wider landscape as part of the discussion of changing land use and organisation.

1.5.5 Further stratigraphic work will be focused on major sites and smaller sites that contain evidence for multi-period occupation. There is potential to refine the phasing of Hobbs Hole with examination of key stratigraphic relationships and final spot dates obtained from detailed pottery recording. This will potentially allow features currently broadly dated or undated to be assigned to a narrower date range, and may provide confirmation of the date of ditch 6000, tentatively dated to the late Roman period. Cremation burials, currently identified as Roman, may be dated more precisely with radiocarbon dating. In general, a detailed description of archaeological features is required. A number of interventions through Roman-period ditches are not currently shown on the GIS plan; these need to be located.

1.5.6 A more detailed archaeological description of Passingford Bridge Bund and Flood Alleviation Area, incorporating any revisions to ceramic spot dates and the stratigraphic sequence, is also required. Greater understanding of the chronology and associations of the prehistoric posthole avenue and ring ditch may be possible with radiocarbon dating and further stratigraphic analysis. There is also the potential to examine the sequence and function of structures belonging to the late Iron Age settlement. Can a gradual shift in the focus of settlement be detected? How was the settlement organised and used? The nature of late Roman occupation also merits further examination.

1.5.7 Ponds 1609, 1615, 1605 and 1683 are characterised by charcoal-filled pits. Where dated, a prehistoric date is indicated, although a Roman date for some has been suggested, while others are undated. Apparently isolated or in small groups away from obvious settlement, the features raise questions about function (comparison of charcoal assemblages will be important in this regard) and contemporaneity (through radiocarbon and pottery dating). Are they part of the same cultural phenomenon?

1.5.8 Radiocarbon dating provides a chance for the undated cremation burials at Upminster Bund and Pond 1791 to be phased. Further stratigraphic analysis of the pit and ditch alignment at Upminster Bund may help to confirm function. Regional parallels will be sought.

Pleistocene

1.5.9 The rich variety of palaeo-environmental remains from the organic-rich channel-fill sequence of the Belhus Cutting makes it a nationally important Quaternary site, with the potential to directly address a number of current research framework priorities established for Palaeolithic archaeology in the East of England (Medlycott 2011) and the Thames Estuary (Williams and Brown 1999), as well as national framework priorities (English Heritage/Prehistoric Society 2008). More detailed investigation and analysis of the remains has the potential to significantly enhance our understanding of the MIS 9 interglacial in the Lower Thames region, relating rising sea level to date, climatic change, local environment and physical evolution of the Lower Thames Estuary. Besides generally providing a framework to contextualize the known records of hominin occupation of southeast England during this period, the recovery of a flake representing contemporary hominin occupation provides an additional direct indicator of archaeological importance for carrying out more detailed analysis. On current evidence,

it seems that the newly discovered Belhus deposits cover a greater span through MIS 9 than those previously investigated by Gibbard (1994) at the same location, representing an earlier period of deposition associated with rising sea-level and an increasingly brackish influence. As such, they also seem to provide a slightly different record to the sequence at Purfleet, which has been proposed as a definitive stratotype for the MIS 9 interglacial (Bridgland *et al.* 2012).

The pottery

1.5.10 The prehistoric pottery has been rapidly scanned to characterise the assemblage in terms of chronology and function. It is necessary to record the pottery in more detail in order to confirm or refine the dating, and to identify forms and fabrics to a greater resolution. Assessing the place of the assemblage with reference to important assemblages in the region, notably that from Mucking (Barrett and Bond 1988), will be crucial.

1.5.11 The later Iron Age and Roman pottery will potentially make a useful contribution to the understanding of ceramic supply and use in the region. The most significant assemblages are from Hobbs Hole and Passingford Bridge Bund, and together the pottery gives an unbroken sequence from the middle Iron Age to the late Roman period. Detailed recording will allow the dating of context groups and the site sequence to be refined. It will provide data with which questions of the introduction and survival of forms and fabrics, as well as their origin and relative importance at the sites, can be addressed. The pottery can contribute to questions of site status and function through key measures, such as the ratio of dishes and bowls against jars (cf. Evans 2001) and decorated samian ware as a proportion of the samian assemblage (Willis 1997). The data will be enhanced with comparison with contemporaneous assemblages from sites in Essex and east London.

1.5.12 Though a small assemblage and limited in its potential, the post-Roman pottery will be more fully recorded to refine the dating and identify the full range of pottery present. Comparison with other assemblages in the region will help place the groups from Section 4 in their local and regional context.

Ceramic building material

1.5.13 The existence of tegulae and imbrices, often recorded as large, relatively fresh pieces, indicates that structures with tiled roofs were located in the vicinity of Hobbs Hole and Passingford Bridge. In addition, box-flue tiles suggest that residents of a structure near Hobbs Hole enjoyed the use of a hypocausted room. Some of the plain, flat tiles, consistent in thickness with *pedalis*, *bessalis* and *lydion* tiles, may also have been used in a hypocaust, for instance as *pilae*, although flat tiles could have been used in smaller structures, such as kilns.

1.5.14 Inevitably the range of ceramic building material at Hobbs Hole and Passingford Bridge brings to mind high-status, villa-like buildings. At Chignall St James, near Chelmsford, fields south of a known villa, otherwise characterised by ditches and timber-post structures, produced a comprehensive quantity and range of roofing and hypocaust tiles (Clarke 1998). However, the evidence from Great Holts Farm, Boreham (Major and Tyrell 2003) reminds us that basic aisled buildings could also have tiled roofs and incorporate a bathhouse. Building material can, though, be reused and recycled. For instance, tegulae were modified and reused in a salt-evaporating kiln at Stanford Wharf Nature Reserve (Shaffrey forthcoming).

1.5.15 With reference to comparative material, there is good potential to determine the likelihood that the material from Hobbs Hole and Passingford Bridge derived from villa-

like buildings, or represented re-use of roofing and heating tiles in smaller structures, such as kilns. The differences between the two sites – notably the absence of box-flue tile from Passingford Bridge and the site's narrower range of fabrics – are also of interest, potentially pointing to differences of status, site-function or supply patterns.

1.5.16 The cbm from the remaining sites has little potential for further work. However, it should be recorded in more detail to better identify form and fabric.

Fired clay

1.5.17 The material from Hobbs Hole and Passingford Bridge Bund has the greatest potential for further work. The general character of the assemblages is consistent with a range of domestic features – hearths, ovens and structures – that point to nearby settlement of later prehistoric and Roman date. In addition, a number of fired clay objects from Passingford Bridge were tentatively identified as oven or kiln furniture. The objects were from late Iron Age or early Roman contexts and recall evidence – including clay oven plate, triangular perforated bricks, block and rectangular pedestals – from Mucking and the Beam valley, Dagenham (Jones and Rodwell 1973, 18; Biddulph *et al.* forthcoming a) that is characteristic of pottery kilns. The kilns would have been shallow, probably little more than surface structures, and the clay objects served as flooring or supports for the walls and dome of the oven, which would have been enclosed by turf. Kilns of this type are characteristic of pottery production in the late Iron Age and earliest Roman period in south Essex.

1.5.18 The assemblage from Passingford has the potential to contribute to our understanding of the pottery or other industry of this period and the spread of regional traditions. Further recording of this assemblage and that from Hobbs Hole will also better identify hearth and structural material, which will provide a clearer view on the domestic occupation at or near the sites. The fired clay from the other sites will be further recorded to confirm identifications.

Flint

1.5.19 The lithic assemblages have been quantified and characterised typologically. During the initial analysis additional information on condition (rolled, abraded, fresh and degree of cortication), and state of the artefact (burnt, broken, or visibly utilised) was also recorded. Retouched pieces were classified according to standard morphological descriptions (eg Bamford 1985, 72-77; Healy 1988, 48-9; Bradley 1999). The assemblages do not merit further detailed metric analysis.

Worked stone

1.5.20 *Hobbs Hole*: The querns are reused and do not indicate domestic activity at Hobbs Hole itself although they are unlikely to have been brought far and thus do indicate settlement nearby. They add to the bigger picture of what is happening in the general area, even if not to our interpretation of the site. The possible structural stones are enigmatic and may have some potential to add to our understanding of what was occurring on site – what were they doing that required large blocks to be imported?

1.5.21 *Passingford Bridge Bund*: The worked stone has some limited potential to add to our understanding of what was occurring in the area. All of it is indicative or typical of activities that would have occurred in a domestic occupation setting - i.e. food and other processing, so it does not make any contribution to wider research aims other than to contribute to our understanding that lava querns were ubiquitous during the Roman period.

1.5.22 *Codham Hall Bund*: The stone has no potential to add to our understanding of the site.

Glass

1.5.23 All four glass assemblages are of limited or no group value, and have no potential for further analysis. The glass has been fully recorded and no further work is required.

Metal finds

1.5.24 The metal assemblages from Pond 1683, Pond 1609, Folkes Lane, Codham Bund and Pond 1812 are very small and have no group value, and no potential for further analysis. The finds have been fully recorded and no further work is required.

1.5.25 The assemblage from Passingford Bridge Bund is larger, but of limited group value and with limited potential for further analysis. The assemblage has been fully recorded. However, four objects could be illustrated.

Slag

1.5.26 Significant quantities of metalworking debris were recovered from Hobbs Hole, Passingford Bridge, Pond 1609 and Upminster Bund. The assemblage has the potential to inform on the character of metalworking processes, for example smithing or smelting, and enhance our picture of industrial and economic activity at the sites. Notably, some of the slag from Passingford Bridge and Upminster Bund was recovered from features provisionally dated to the Bronze Age.

1.5.27 The assemblage needs to be recorded in greater detail to identify the type of material represented (for instance, Lynne Keys has noted that fuel ash slag, a slag-like residue, can result from any high temperature activity, such as domestic hearths and accidental fires, and on its own does not represent metalworking activity). The material should be analysed in conjunction with the site phasing (taking into account revisions resulting from radiocarbon dating or improved ceramic spot dates) to establish the chronology of the activity.

Wood

1.5.28 The wood from waterhole 3652, Passingford Bridge, offers little potential for further analysis, although it is recommended that the single worked piece (context 3662, SF2012) be examined by wood specialist Damian Goodburn.

Animal Bone

1.5.29 The animal bone data has some potential to facilitate future research, but is unlikely to add significantly to our understanding of Roman animal husbandry in the region.

Human Bone

1.5.30 Most of the burnt and unburnt bone from M25 Section 4 has limited osteological potential owing to the small volumes of bone recovered from each context and, in the case of the burnt bone, the small sizes of the fragments. Exceptions are the burnt remains from group 6104 at Hobbs Hole , and group 2009 at Passingford Bridge, which comprise good sized deposits with identifiable bone fragments and thus have high potential to provide valuable information on cremation burial practices.

Charred plant remains and charcoal

Hobbs Hole

1.5.31 The assessment results from Hobbs Hill showed that almost 75% of the samples contained identifiable charred plant remains comprising charred cereal grains, cereal chaff and wild plant/weed seeds. Only five of the 32 productive samples, however, produced rich botanical assemblages, from early/mid Roman quarry pit fills (samples 109, 118), late Roman quarry pit fills (samples 107, 108), and pit fill (sample 124) while six other flots contained moderate sized assemblages, from early/middle Roman ditch

fill (sample 147) and pit fill (sample 132), late Roman quarry pit fills (samples 114, 143, 144) and undated ditch fill (sample 110). The remaining 21 productive samples only produced occasional or very small amounts of often poorly preserved charred plant material. Collectively, however, the botanical remains may provide information on some aspects of crop husbandry and processing activities at the site. The presence of rich assemblages in both early/middle Roman and late Roman samples may allow an examination of potential changes in crop husbandry during this period.

1.5.32 The identifiable charcoal may provide information on the range of woodland taxa available during the Roman period and contribute towards environmental reconstruction with initial results showing the presence of *Quercus* sp. (oak), *Quercus/Fraxinius* sp. (oak/ash) and *Pomoideae* (hawthorn, apple, pear etc.) charcoal. It will probably not be possible, however, to establish the specific uses of the different woods (other than as fuel) given the nature of the features from which the large amounts of identifiable charcoal was recovered. With regard to the selection of wood as fuel for ritual purposes, only five of the ten cremation fills produced potentially identifiable charcoal and then only occasional fragments in flots with a volume of less than 5ml. Thus there is the potential likelihood that this material may be intrusive although an examination of the stratigraphic integrity of these deposits may be able to resolve this issue.

1.5.33 The un-charred plant remains (seeds and fruits) in 33 of the flots are probably intrusive, given their presence in generally only very small amounts and the presence of roots/rootlets in many of the samples. Thus, no further work is recommended on these remains although as noted above it is possible that the large amounts of *Lemna* (duckweed) seeds in six samples may point to the presence of temporary bodies of water in some of the ditch and pit fills at some time in the past.

1.5.34 The poorly preserved very fragmented (including burnt) bone in 24 flots is probably unidentifiable while the few insect (including beetle) fragments in 13 samples are likely to be intrusive. The occasional molluscs in 11 flots can provide little environmental information and in any event may also be intrusive.

1.5.35 Collectively, the botanical data (charred plant remains and charcoal) may provide information on the following:

- the range of plant foods used on the site
- crop husbandry and potential changes over the Roman period
- areas of crop-processing activity and food preparation during the early/middle and late Roman periods
- the range of woodland species used for fuel
- local woodland environmental reconstruction

Passingford Bridge Bund

1.5.36 Palaeoenvironmental data from early Bronze Age sites in south-east England are extremely rare and analysis and dating of charred crops from Bronze Age features, especially hut platforms/roundhouses and associated postholes, should be a priority (Cambell and Straker in prep). Similarly, sites with both Late Iron Age and Roman material should be investigated in order to understand continuity in local practices.

Pond 1609

1.5.37 The assessment has provided fairly detailed information about the charred material recovered from the pits. Further work would not add significantly to the present study, therefore no further analysis is warranted.

Pond 1615

1.5.38 The charcoal-rich fill from pit 4 may represent dumped hearth or bonfire waste, perhaps from land clearance or hedgerow clipping. In which case the pit may have acted as a refuse pit. Further work would not add significantly to the study, and therefore no further analysis is warranted. Charcoal from the short-lived wood would provide suitable material for radiocarbon dating.

Pond 1683

1.5.39 Oak wood or oak charcoal is often the preferred fuel wood for metalworking (Edlin 1949), and therefore its abundance in these pits alongside the fragments of slag may suggest the pits are repositories for industrial waste. Given their isolated context, however, this interpretation remains tentative. Further work would not add significantly to the present study, therefore no further analysis is warranted.

Upminster Bund

1.5.40 The assessment of the samples taken during the excavations at Upminster Bund demonstrates the presence of common charred plant remains in only one of the features, pit 1168. Charcoal was highly fragmented and therefore no identification to wood species was possible.

1.5.41 The nature of the charred assemblage in pit 1168 is unlikely to be consistent with a Bronze Age or Early Iron Age date. Although a few examples of bread/club wheat have been found in deposits dated to the Neolithic period in Britain, it is not thought to have become a crop in its own right until the Late Iron Age or Late Roman/Anglo-Saxon period (van der Veen 1992, 1994). Similarly, corncockle is generally considered to be a weed of Roman cultivation, and rye more commonly associated with medieval cereal assemblages (Greig 1991). Given the abundant modern roots in the sample, there are grounds to suggest that the charred material in pit 1168 represents later, possibly reworked, material. However the antiquity of the cereals can only be established through radiocarbon dating. If any of the dated bread/club wheat grains returned a Bronze Age date then the results would be worth reporting on. Further analyses, however, would not add significantly to the current study.

Codham Hall Bund

1.5.42 Further CPR/charcoal analysis would not add significantly to the results from this assessment. Therefore no further palaeoenvironmental work is warranted from this site.

Pond 1791

1.5.43 The paucity of the plant remains other than charcoal from the cremation burial means that no further CPR analysis is warranted. The abundant charcoal in the sample suggests that oak was the main wood used to construct the cremation pyre. Oak dominated assemblages are commonly found in Iron Age and Roman cremation deposits in south-east Britain (eg Challinor 2007; Druce forthcoming a; Druce forthcoming b). Further charcoal analysis to confirm the dominance of oak in the cremation deposit at this site is of limited value unless the feature is dated.

Pond 1812

1.5.44 Additional palaeoenvironmental work would not add significantly to the present study; therefore no further analysis is warranted.

Pond 1824

1.5.45 The paucity and poor preservation of the plant remains from the site means that no further CPR analysis is warranted. Further charcoal work may be considered should the

features prove to be cremation pits. The cereal grains and charcoal from short-lived wood taxa would provide suitable material for radiocarbon dating.

Waterlogged plant remains

1.5.46 Eight samples from Passingford Bridge Bund have a good potential for further analysis of the waterlogged plant remains (some samples were increments from a single context) and two each have a moderate or low potential. Thirteen samples have some potential for radiocarbon dating if required. The assessment of the waterlogged plant remains suggests that eleven samples have some potential for analysis, and analysis of insect remains.

Pollen

1.5.47 Further work is not recommended as the potential for further analysis is poor, due to a combination of generally mixed/poor preservation of pollen coupled with only moderate pollen recovery.

Scientific dating

1.5.48 At Hobbs Hole, four cremation burials remain undated. A Roman date is suspected, but this needs to be confirmed. It will also be necessary to scientifically date currently undated cremation graves at Passingford Bridge, Upminster Bund and Pond 1791.

1.5.49 An intriguing type of archaeological feature found on various sites across the Section 4 route is the charcoal-filled pits. Many are undated, although the little dating evidence that has been recovered has pointed to a prehistoric date. This can potentially be confirmed through radiocarbon dating.

1.5.50 The prehistoric ring-ditch and posthole avenue from Passingford Bridge Bund is tentatively dated through stratigraphical associations and small amounts of finds. Our understanding of these features would be enhanced by scientific dating.

1.5.51 Amino acid dating is required of selected *Bithynia opercula* remains from Belhus Cutting to confirm which MIS is relevant to the recorded sequence.

Potential to address revised regional research aims

1.5.52 Fieldwork results across the Section 4 route, preliminary artefactual and environmental analyses, and the updating of the Eastern Counties Research Agenda and Strategy (Medlycott 2011) permit the original research objectives to be revised and augmented.

Pleistocene (Belhus Cutting)

1.5.53 The aims of analysis should be:

- to reconstruct climatic and local environmental conditions through the sequence, with particular attention to varying brackish/estuarine influence
- to relate the sequence to those from the other important MIS 9 localities of Purfleet and Hackney
- to relate the sequence to the global Marine Isotope Stage (MIS) framework and to the Lower Thames fluvial terrace archive
- to date the sequence by suitable chronometric means (i.e. amino acid dating on *Bithynia opercula*) and any biostratigraphic indicators.

Neolithic/Bronze Age

1.5.54 The revised framework stresses that “the small and inconspicuous must not be overlooked as this is where the ‘variation markers’ are likely to lie hidden” (Medlycott

2011, 13). The evidence of Neolithic and Bronze Age pits from ponds 1835 and 1824 and Upminster Bund (with more potentially emerging with radiocarbon dating) and their assemblages of flint, pottery and plant remains, is a case in point, and can contribute to the understanding of variation in land use and occupation during these periods.

1.5.55 The framework also suggests that the relationship of Neolithic and Bronze Age funerary landscapes to settlements needs to be explored in more detail, and calls for examination of the interrelationship between Bronze Age settlements and monuments (Medlycott 2011, 13, 20). The cremation burial from Pond 1812 offers a small amount of evidence with which to address this, but the focus will be on the posthole avenue and ring ditch from Passingford Bridge Bund. What do their assemblages reveal of their function? Can we suggest a relationship with settlement evidence? To what extent was their location on the floodplain of the river Roding significant? Radiocarbon dating will be crucial in establishing a firmer chronology for these groups of features.

1.5.56 There are similar concerns expressed in the *Research Framework for London Archaeology* (Nixon *et al.* 2002, 23). In particular, it highlights the paucity of good botanical and faunal assemblages in the region, which has been detrimental to our understanding of the subsistence economy. This can be redressed to some extent with the good assemblage of charred plant remains from Passingford Bund.

Iron Age

1.5.57 It is acknowledged in the revised framework (Medlycott 2011, 31) that the distribution, density and dynamics of Iron Age settlement need further study. In addition, there is potential for investigating the relationships between field systems and long-distance trackways, and settlements, enclosures and funerary sites. Detailed study of the late Iron Age settlement and field systems at Passingford Bridge can make a useful contribution to these objectives.

Roman

1.5.58 Given the number of sites that have been excavated in recent years, the Roman rural landscape in Essex is reasonably well understood. However, questions remain about chronological, regional, and morphological variations in settlement location, density and type. The revised framework (Medlycott 2011, 47) raises the posibility that some of this variation shows tribal distinctions and sub-regional groupings. Evidence for this is already emerging at Stanford Wharf Nature Reserve in south Essex (Biddulph *et al.* forthcoming b), where pottery, worked stone and ceramic building material have pointed to stronger cultural links with north Kent than other parts of Essex. Material culture is a particularly good way of investigating wider cultural zones, and that from Hobbs Hole and Passingford Bridge has good potential for inter-site comparison, including M25 Section 1 sites.

1.5.59 The botanical evidence from Hobbs Hole and Passingford Bridge viewed in light of the field ditches can contribute to the question, posed in the revised framework (Medlycott 2011, 47), of how far the size and shape of fields can be related to agricultural regimes.

1.5.60 A London framework objective (Nixon *et al.* 2002, 41) calls for the investigation of the relationship between town and country in the production and supply of food. The evidence of plant remains and animal bone placed against the regional settlement pattern can contribute to this.

Anglo-Saxon

1.5.61 The Anglo-Saxon pottery and features from Hobbs Hole offer limited scope for further study, but their dating through detailed recording and stratigraphic analysis – and

examination of their association with Roman-period material – should add to our understanding of function and the nature of the deposition. Potentially the evidence can provide some insight into the period of Roman/Saxon transition (Medlycott 2011, 48).

Medieval and post-medieval

1.5.62 Little or no further stratigraphic and chronological analysis of the medieval and post-medieval field boundaries, ditches or hedges recorded along the Section 4 route is required. However, several boundaries were identified on Ordnance Survey maps, and there remains the chance to address questions of changing land use and organisation. As the revised framework states, 'There is huge potential for further research into topics such as field systems, enclosures, roads and trackways or parks and gardens, in particular utilising historic maps and documents' (Medlycott 2011, 79).

1.6 Project scope

1.6.1 The analysis and report writing will focus on the larger sites of Hobbs Hole and Passingford Bridge Bund, and key sequences and features of the smaller sites, such as Upminster Bund and Codham Hall Bund, and the burials and pits of Ponds 1609, 1615, 1683, 1791, 1812 and 1824. The remaining sites will not be analysed in detail, although medieval and post-medieval field boundaries will be discussed in terms of their wider significance in the development of the landscape.

1.6.2 With regard to Belhus Cutting, the scope of the project is focused on the material recovered during fieldwork in July 2011. It complements previous work at the locality by Gibbard (1994). It includes palaeo-environmental analyses, dating work and clast lithological analysis. The work needs to focus on complementary environmental and dating analyses through the deposits of phases 2, 3 and 4 at Locations 1, 2 and 3. In addition, clast lithological analyses need to be carried out on the gravels of phases 1 and 5, which sandwich the fine-grained interglacial channel sediments.

1.6.3 At location 2, nearest the centre of the channel and where the phase 4 deposits are thickest and contain the best-preserved remains of most types of evidence (curiously, molluscan remains were absent here), further samples through contexts 205A, 205B and 205C need to be analysed for: pollen; plant macro-remains; ostracods; insects and small vertebrates.

1.6.4 At Location 1, where the fossiliferous phase 4 deposits are directly underlain by deposits of phases 3 and 2, and also contain molluscs, further analyses need to be carried out for: pollen; plant macro-remains; molluscs; ostracods; insects and small vertebrates.

1.6.5 A selection of complementary analyses also needs to be carried out at the channel bank locality 3, through the bottom of phase 4, phase 3 and phase 2, for: plant macro remains, molluscs, ostracods, small vertebrates and insects.

1.6.6 Amino acid dating needs to be carried out on *Bithynia opercula* (n=12) from phase 3, context 104.

1.6.7 The clast lithology samples need to be analysed (n=3), and compared with other lithologies from Thames gravel members in the vicinity: Hackney Gravel, Little Thurrock Gravel, Botany Gravel and Corbets Tey.

1.7 Project review

1.7.1 Project progress will be monitored internally on a weekly basis by the post-excavation project manager (Edward Biddulph). This will be achieved through the checking of timesheet data and regular communication with project staff.

1.7.2 Each month, Edward Biddulph will review progress with overall project manager Steve Lawrence and OA's post-excavation manager, Anne Dodd.

1.7.3 A short statement of progress will be submitted to Skanska Balfour Beatty with regular interim invoices.

2 RESOURCES AND PROGRAMMING

2.1 Project team structure

2.1.1 The project team is set out in the table below.

Name	Organisation	Role
Leigh Allen	OA South	Finds manager
Enid Allison	External	Insects analysis
Edward Biddulph	OA South	Senior project manager: post-excavation management; pottery specialist
Sandra Bonsall	OA North	Waterlogged plant remains
Matt Bradley	OA South	Geomatics manager
Geraldine Crann	OA South	Finds supervisor
Anne Dodd	OA South	Project monitoring
Denise Druce	OA North	Charcoal specialist
Damian Goodburn	External	Worked wood specialist
John Giorgi	External	Charred plant remains
Leo Heatley	OA South	Supervisor: geomatics
Elizabeth Huckerby	OA North	Waterlogged plant remains
Lynne Keys	External	Slag specialist
Steve Lawrence	OA South	Senior project manager; Scheme-wide manager
Louise Loe	OA South	Burials manager
Rebecca Nicholson	OA South	Environmental manager and radiocarbon dating coordinator
Sylvia Peglar	External	Pollen
Susan Rawlings	OA South	Archives assistant
Ian Scott	OA South	Project officer: metalwork
Nicola Scott	OA South	Archives manager
Andy Simmonds	OA South	Project officer: stratigraphic narrative and analysis
David Smith	External	Insects
Magdalena Wachnik	OA South	Graphics office manager
Helen Webb	OA South	Project officer, human remains
Francis Wenban-Smith	External	Pleistocene
Tom White	External	Molluscs
John E Whittaker	External	Microfauna

2.2 Methods statement

Stratigraphy

2.2.1 The phasing of the Section 4 sites will be finalised. This will be achieved through integration of pottery and scientific dating with the stratigraphic record (aided by further ceramic identification where necessary), and comparison of feature profiles and depositional sequences. Full archaeological descriptions will be produced. This will be accompanied by completed CAD/GIS plans.

The pottery

2.2.2 The prehistoric pottery will be recorded with reference to established guidelines and standards (PCRG 2011). Pottery recorded as grave goods, as well as decorated pieces and other material of note, will be illustrated.

2.2.3 The Roman pottery will be fully recorded to OA standard (Booth, nd), and quantified by sherd count, weight and estimated vessel equivalents (EVE). Forms and fabrics will be correlated with regional series, notably Going's Chelmsford typology (Going 1987), the Essex County Council fabric series, and Museum of London form and fabric codes (Symonds and Tomber 1991; Marsh and Tyers 1978, 546-582). A representative selection of pottery, along with a few pieces of intrinsic interest, will be illustrated.

2.2.4 The post-Roman pottery will be recorded in accordance with Medieval Pottery Research Group standards (MPRG 2001). Forms and fabrics will be correlated with regional series (chiefly Cunningham 1985).

Ceramic building material

2.2.5 The assemblage will be recorded in full, allowing the records to be considered with material from other sites. Fabrics will be examined macroscopically, but also microscopically as required, to identify them in comparison with published material and permit an understanding of supply and source. Where possible, types will be referenced to Brodribb 1987.

Fired clay

2.2.6 The assemblage will be recorded in full. Fabrics will be examined macroscopically, but also microscopically as required. Reference will be made to relevant published material.

Flint

2.2.7 The flint assemblage has little potential for further study, however, the assessment report should be edited for full publication and a selection of flints should be illustrated.

Worked stone

2.2.8 It is recommended that a short report be prepared on the quern fragments; this will summarise the evidence that indicates they were reused or residual and investigate possible sources for domestic waste. It will also look at the function they may have served at Hobbs Hole itself. The report will also discuss the decorative piece of Millstone Grit, where it may have come from and its function at Hobbs Hole.

2.2.9 Further work will also need to include preparation of the project archive and database. Further investigation will include looking at where the blocks were recovered to see if

context records can shed any light on their purpose as well as searching the geological literature for possible sources of the stones.

Metal finds

2.2.10 The assessment report will be edited for publication. Additional work will entail the illustration of four objects from Passingford: the small spearhead from context 2904, and the leaf-shaped terminals from contexts 4382 (ditch fill) and 5038 (cremation), and possibly the rod with knob terminal from context 4415 (quarry pit fill).

Slag

2.2.11 The slag will be recorded and quantified, and the data entered onto a database or spreadsheet. The assemblage will be analysed in conjunction with stratigraphic and phasing information.

Wood

2.2.12 The single worked piece from waterhole 3652, Passingford Bridge, will be examined and a short report written.

Human bone

2.2.13 It is recommended that a full osteological report is compiled, but no further analysis of the human remains is required. The report should discuss the all of the human bone deposits and, for the cremated bone, should give reference to the colour, which is dependent on factors such as the quality of fuel, favourable weather conditions and the quality of the pyre construction. The weights of cremated bone present should also be considered, in order to explore further the nature of the deposits. For example, do the weights of bone present represent complete individuals, or are they token deposits? Full details of the skeletal elements identified in each of the deposits should also be examined, to explore whether there has been a selection process favouring certain skeletal parts over others. The report should also take into account the depositional context of both the burnt and unburnt bone. Full soil deposit descriptions should be given, including information on the presence of other burnt material within the cremation features (e.g. charcoal), and the levels of disturbance and truncation.

2.2.14 For group 6104 at Hobbs Hole, and group 2009 at Passingford Bridge it should be considered whether the bone recovered from the general fills of the pits may relate to the same individuals represented in the urned deposits. Likewise, the relationship between the urned cremation deposits in group 6104 (Hobbs Hole) should be considered. Are the deposits from the same or different individuals? Comparisons with assemblages similar in date and type should also be sought to further explore burial practice.

Animal bone

2.2.15 Roman settlements are very common in Essex and animal bones from a great variety of settlement types, both urban, rural, sacred and industrial, have been excavated and analysed (Johnstone and Albarella 2002, 46; Strid forthcoming). The smaller assemblages along the M25 Widening are therefore not likely to add significantly to our understanding of Romano-British animal husbandry in this region. The assemblage from Hobbs Hole (M25001.08), while too small to be analysed on its own, will provide useful data for synthesis at a regional level and it would therefore be worthwhile fully

recording and briefly reporting on the remainder of the Roman assemblage (including the sieved bone).

Charred plant remains and charcoal

Hobbs Hole

2.2.16 On the basis of the assessment, full analysis (including sorting and quantification) is recommended for the five rich and six moderately rich charred plant assemblages. The presence of occasional or small amounts of identifiable remains from the other 21 productive samples should be recorded by a rapid scan of the flots although some of these remains were sorted during the assessment. Identifiable charcoal fragments should be selected from the four charcoal rich assemblages (two of which, however, depends on dating the sampled features) together with a representative sample from the other ten moderately rich charcoal assemblages. The identification of the few charcoal fragments from cremations [6096] and [4303] should only be carried out following an examination of the stratigraphic integrity of these fills and establishing the likelihood as to whether or not the material is intrusive.

Passingford Bridge Bund

2.2.17 Analysis of the CPR from two of the Bronze Age postholes (fills 2153 and 2163) is recommended, alongside radiocarbon dating of the better preserved cereals. Much of the charred material from the late Iron Age and early Roman features at the site is likely to represent dumped crop processing waste, and, as such, should provide information on continuity in local agrarian practices. Full CPR analysis is recommended on those late Iron Age ditch and early Roman features with abundant cereal remains. In addition, a more detailed assessment of the cereal remains from a number of the others is recommended, for the purpose of maximising the data set. Any samples with common to abundant remains that are currently unphased are not recommended for further assessment/analysis unless they are assigned positive phasing. Any recommendations for further analysis of the WPR from waterholes 3652 and 2714 should be made with reference to the WPR report (E Huckerby below).

2.2.18 Full charcoal analysis is recommended on the two Late Iron Age cremation deposits in order to identify possible species selection for the construction of the pyre. More detailed analysis of selected samples containing the most diverse charcoal assemblages is recommended in order to provide information on possible changes in local woodland and/or wood selection over time. The further assessment of some of the Late Iron Age and Early Roman charcoal should also be considered in order to confirm the relative quantities of taxa per period. As with the CPR, further charcoal assessment/analysis is not recommended on any of the features currently unphased.

Scientific dating

2.2.19 Thirteen radiocarbon determinations will be sought from features in order to gain a better understanding of the chronology of features, types of activity, and excavated material, such as plant remains and pottery. A provisional selection of samples for dating is shown in Table 50.

2.3 Stages, products and tasks

Stages

2.3.1 The post-excavation analysis and reporting will be accommodated within a 14 month programme. It is anticipated that the programme will begin in Octopber 2012, and that a publication-ready report will be completed by December 2013.

2.3.2 For the publication proposal, see Section 2.4.

2.3.3 Before the start of post-excavation analysis and publication, a payment schedule will be drawn up and agreed by Oxford Archaeology and Skanska Balfour Beatty. The schedule will provide details of payment stages spread over the course of the analysis programme. It will include the value of each payment and any conditions required to trigger payment (eg the provision of progress reports, or the completion of certain tasks).

Products

2.3.4 The products of the stratigraphic analysis will comprise an updated context database, completed phasing based on stratigraphic associations, pottery dating and radiocarbon dating, a stratigraphic narrative, and a set of phase plans and interpretative figures.

2.3.5 Artefactual analysis will produce catalogues for each finds category, final reports, and where necessary illustrations showing a representative selection of material encountered.

2.3.6 The products of the environmental analyses will be datasets for all categories, data tables for publication, and final reports.

2.4 Publication

2.4.1 Following approval from Skanska Balfour Beatty, Richard Havis of the Historic Environment Management team for ECC and Adam Single of GLAAS, the illustrated final report will be submitted to Essex County Council in hard copy and digital format for entry onto the Essex and Greater London Historic Environment Records.

2.4.2 The publication report will be submitted to the county archaeological journal, *Essex Archaeology and History*. It should be noted that some of the minor sites are located within the Greater London Borough of Havering. However, this area lies within the historic county of Essex and is covered by the county journal.

2.4.3 For Belhus Cutting, an archive report will be produced and made available on the Archaeology Data Service, and an academic paper prepared for publication in *Quaternary Science Reviews*.

2.4.4 Minor sites not analysed in detail as part of the publication programme have already been fully described in this current assessment report. Permission will be sought to make this report available as a download from the OA digital library (http://library.thehumanjourney.net/).

2.4.5 Summaries of all sites within Essex have already been submitted to Essex Historic Environment Record for inclusion in its annual roundup of fieldwork published in *Essex Archaeology and History*. Summaries of all sites within the Greater London Borough of Havering have also been submitted annually for inclusion in the relevant London Fieldwork and Publication Round-up supplements to *London Archaeologist.*

2.5 Ownership and archive

2.5.1 Skanska Balfour Beatty retains ownership of the archive. However, finds ownership for the sites at Codham Hall, Hobbs Hole and Pasisngford Bridge currently lie with private landowners. Permission will be sought to transfer ownership, including finds, and deposit the archive to an appropriate museum in due course.

2.5.2 On completion and approval of the final report, an OASIS fieldwork summary form will be completed and submitted to the Archaeology Data Service.

2.5.3 The complete project archive will be prepared in accordance with current professional practice (Walker 1990). The archive, including the finds, will be deposited with the appropriate museums with their consent and in accordance with their guidelines.

Site	Site code	Receiving museum
Junction 29, Hobbs Hole Evaluation	M25001.08	Chelmsford Museum
Junction 29, Hobbs Hole Excavation	M25001.09	Chelmsford Museum
Passingford Bridge Bund, Widening and Flood Alleviation Areas SMS and Excavation	M25002.09	Epping Forest District Museum
Pond 1609 SMS	M25003.09	Epping Forest District Museum
Pond 1615 SMS	M25004.09	Epping Forest District Museum
Pond 1656 SMS	M25005.09	Chelmsford Museum
Pond 1605 SMS	M25006.09	Epping Forest District Museum
Pond 1683 SMS	M25007.09	Chelmsford Museum
Upminster Bund SMS	M25008. 09	Museum of London
Skinner's Bridge Widening and Bush Grove Pond SMS	M25009.10	Epping Forest District Museum
Pond 1683 Strip Widening, Topsoil Storage, Recovery Compound and Tank installation SMS	M25010.10	Chelmsford Museum
Tank 1706 SMS	M25011.10	Museum of London
Folkes Lane Strip Widening ch 175500-176300 SMS	M25012.10	Museum of London
Pond 1698 SMS	M25013.10	Museum of London
Warley Road to Bereden's Lane Strip Wideing ch 174790-174880 SMS	M25014.10	Museum of London
Tank 1740 SMS	M25015.10	Museum of London
Benskin's Cut Palaeolithic Watching Brief ACW Ch 168500-169700	M25016.10	Museum of London
Tank 1714 and adjacent Strip Widening	M25017.10	Museum of London
Codham Bund, Tank 1762 and Strip	M25018.10	Chelmsford Museum

Widening Ch 175530-176350		
Pond 1727 SMS	M25019.10	Chelmsford Museum
Pond 1787 SMS	M25020.11	Museum of London
Pond 1776 SMS	M25021.11	Chelmsford Museum
Dennis Road Turnaround and Strip Widening Ch 181300-181700	M25022.11	Thurrock Museum
Pond 1791 SMS	M25023.11	Museum of London
Pond 1812 SMS	M25024.11	Museum of London
Pond 1824 SMS	M25025.11	Thurrock Museum
Ockendon Cut Palaeolithic Watching Brief CW Ch 179300-180500	M25026.11	Museum of London
Belhus Cut Palaeolithic Watching Brief CW Ch 183700-185100	M25027.11	Thurrock Museum
Pond 1835 SMS	M25028.11	Thurrock Museum
Tank 1632 SMS	M25029.11	Epping Forest District Museum

2.6 Task list and programme

2.6.1 A task list is presented below. A programme is appended at the end of this project design.

Task no.	Description	Performed by	Days
	Management		
1001	Project management	E Biddulph	10
1002	Project management/liaison	S Lawrence	8
1003	Project monitoring	E Biddulph	2.5
1004	Finds management	L Allen	1.5
1005	Archive management	N Scott	2
1006	Environmental management	R Nicholson	1.5
1007	Graphics office management	M Wachnik	1
1008	Geomatics management	M Bradley	1
1009	Burials management	L Loe	0.5
1010	Palaeolithic management – Belhus	E Stafford	2.5
	Phasing and stratigraphy		
2001	C14 administration	R Nicholson	2
2002	C14 dating @ £350 per sample	External	13
2003	Database check	A Simmonds	5
2004	Phasing and stratigraphic analysis	A Simmonds	30
2005	Stratigraphic narrative	A Simmonds	20
2006	Prepare drawing brief for site figures	A Simmonds	5
2007	Update GIS/CAD plans	Geomatics	4
2008	Prepare site figures for publication	Graphics Office	22
2009	Stratigraphic narrative – Belhus	External Specialist	3
2010	Amino acid dating – Belhus	External	3
	Artefact analysis and reporting		
3001	Specialist liaison	A Simmonds	3
3002	Prehistoric pottery recording	L Brown	4
3003	Prehistoric pottery reporting and drawing brief	L Brown	4
3004	Prehistoric pottery illustration	Graphics Office	2
3005	Roman pottery recording	E Biddulph	20
3006	Roman pottery reporting and drawing brief	E Biddulph	16
3007	Roman pottery illustration	Graphics Office	15
3008	Post-Roman pottery recording	J Cotter	3

Task no.	Description	Performed by	Days
3009	Post-Roman pottery reporting and drawing brief	J Cotter	3
3010	Post-Roman pottery illustration	Graphics Office	1
3011	Ceramic building material	C Poole	22
3012	Ceramic building material – illustration	Graphics Office	2
3013	Fired clay	C Poole	10
3014	Fired clay illustration	Graphics Office	3
3015	Flint: review of report and drawing brief	M Donnelly	3
3016	Flint illustration	Graphics Office	3
3017	Worked stone	R Shaffrey	3
3018	Metal objects catalogue and drawing brief	I Scott	1
3019	Metal objects illustration	Graphics Office	1
3020	Slag recording and reporting	L Keys	4
3021	Worked wood	D Goodburn	1
3022	Human bone	H Webb	2
	Environmental analysis and reporting		
4001	Animal bone	L Strid	5
4002	Charred plant remains – Hobbs Hole	J Giorgi	7
4003	Charred plant remains – Passingford	Specialist	8
4004	Charred plant remains – Upminster Bund	Specialist	2
4005	Charcoal – Hobbs Hole	Specialist	10
4006	Charcoal – Passingford	Specialist	8
4007	Charcoal – Pond 1791	Specialist	1.5
4008	Waterlogged plant remains – sorting	Specialist	7
4009	Waterlogged plant remains – recording and reporting	Specialist	8
4010	Insects – processing additional samples	Technician	2
4011	Insects – analysis and reporting	E Allison	6
4012	Environmental reports edit for publication	R Nicholson	3.8
4013	Environmental specialist liaison - Belhus	E Stafford	3
4014	Prepare sample specification for specialist analysis – Belhus	External Specialist	1.5
4015	Monolith logging and subsampling – Belhus	C Champness	3
4016	Sample and information distribution – Belhus	C Champness	2
4017	Clast lithology – Belhus	External Specialist	2.5
4018	Molluscs – Belhus	External	4.5

Task no.	Description	Performed by	Days
		Specialist	
4019	Small vertebrates sample processing – Belhus	Technician	11
4020	Small vertebrates recording and reporting – Belhus	External Specialist	6
4021	Insects analysis and reporting – Belhus	External Specialist	3
4022	Pollen processing samples, analysis and reporting – Belhus	External Specialist	7
4023	Plant macro remains – Belhus	E Huckerby	10
4024	Ostracods – Belhus	External Specialist	3.5
	Publication production, editing and submission		
5001	Research	E Biddulph	5
5002	Write discussion	E Biddulph	12
5003	Check figures	A Simmonds	2
5004	Edit and assemble specialist reports	E Biddulph	7
5005	Copy edit	E Biddulph	5
5006	Incorporate editor's comments	A Simmonds	3
5007	Submit draft report to client/incorporate comments	A Simmonds	1
5008	Submit final report to client and journal	E Biddulph	1
5009	Journal publication	External	1
5010	Archive report production – Belhus	External Specialist	6
5011	Check figures – Belhus	C Champness	1
5012	Edit and assemble specialist reports – Belhus	C Champness	4
5013	Edit report – Belhus	E Stafford	3
5014	Journal publication – Belhus	External	1
5015	Assemble paper archive	S Rawlings	6
5016	Preparation of finds for deposition	L Allen	4
5017	Transport	Technician	1
5018	Microfilming	External	5

APPENDIX A. QUANTIFICATION OF SITE ARCHIVE

A.1 Quantification of the archive

Site Code	No. context records	No. Sections	No. Plans	No. Digital Images	No. Slide Films	No. B&W Films	No. Enviro Samples
M25001.08	255	41	32	154	5	8	4
M25001.09	706	164	132	710	16	17	44
M25002.09	3755	1590	1431	2388	60	60	134
M25003.09	54	11	3	51	3	2	10
M25004.09	11		2	25	1	1	1
M25005.09	5	1	2	2		1	
M25006.09	8	2		12	1	1	
M25007.09	15	5	7	13	1	1	3
M25008. 09	174	61	53	219	7	7	7
M25009.10	2		2				
M25010.10	15	3	4	10	1	1	
M25011.10	2			44		1	
M25012.10	6		3	36			
M25013.10	2		1	10			
M25014.10	4	4	5	3			
M25015.10	4	4	5	70		2	
M25016.10	N/A	N/A	N/A	N/A	N/A	N/A	N/A
M25017.10	42	10	6	34	1	1	
M25018.10	403	189	177	244	8	9	7
M25019.10	3	1		33		1	
M25020.11	21	6	7	91			

M25021.11	13		6	31			
M25022.11	3			27			
M25023.11	13	4	3	45			1
M25024.11	296	162	142	210	4	3	6
M25025.11	143	16	18	91			3
M25026.11	N/A	N/A	N/A	N/A	N/A	N/A	N/A
M25027.11	N/A	N/A	N/A	N/A	N/A	N/A	N/A
M25028.11	9	3	4	17			
M25029.11							

A.2 Quantification of artefacts by number of fragments

Site Code	Animal Bone	Burnt Flint Unworked	CBM	Charcoal	Clay Pipe	Copper Alloy	Human Bone	Fired Clay	Flint	Glass	Iron	Lead	Mortar	Plaster	Pottery	Shell	Slag	Stone	Wood
M25001.09	1728	1060	833	1		2	1107	1245	22	3	249	1	101		5934	116	284	88	
M25002.09	895	2757	845		1	2		1001	203	2	23				6508		3890	44	47
M25003.09	6							138		55	16					2	389		
M25004.09		1													1				
M25005.09																			
M25006.09																			
M25007.09		10	3					26	8		1				1		1		
M25008. 09	25	13						3	3						485				
M25009.10																			
M25010.10					1				6										
M25011.10			3		1										1				
M25012.10											1								
M25013.10																			
M25014.10																			
M25015.10																			
M25016.10	N/A	N/A	N/A	N/A		N/A		N/A	N/A	N/A	N/A	N/A			N/A		N/A	N/A	N/A
M25017.10			8						2										
M25018.10		28	1	7				84	2		2				776			40	
M25019.10																			
M25020.11																			
M25021.11		2	6					1	7						3				
M25022.11																			
M25023.11		1					126	2											

Site Code	Animal Bone	Burnt Flint Unworked	CBM	Charcoal	Clay Pipe	Copper Alloy	Human Bone	Fired Clay	Flint	Glass	Iron	Lead	Mortar	Plaster	Pottery	Shell	Slag	Stone	Wood
M25024.11	30	3	3					6	9	4	4				76			52	
M25025.11	17		4					1	22						33	1			
M25026.11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
M25027.11	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
M25028.11		6							1										
M25029.11																			

APPENDIX B. ASSESSMENT OF FINDS

B.1 Pottery

Edward Biddulph

Introduction

Over 12,500 sherds of pottery, weighing 119kg, were recovered from sites along Section 4 of the M25 Widening works (Table 1). Hobbs Hole (M25001.09) and Passingford Bridge Bund (M25002.09) contained the largest single assemblages. Medium-sized assemblages (relative to other Section 4 assemblages) were recovered from Upminster Bund (M25008.09), Codham Bund (M25018.10), and Pond 1812 (M25024.11). There were smaller assemblages at Pond 1615 (M25004.09), Pond 1683 (M25007.09), Tank 1706, Pond 1776 (M25021.11), and Pond 1824 (M25025.11).

Site	Sherds	Weight (g)
M25001.09	5301	56884
M25002.09	5867	54952
M25004.09	55	355
M25007.09	1	11
M25008.09	485	1784
M25011.10	1	10
M25018.10	745	3208
M25021.11	3	4
M25024.11	223	1655
M25025.11	35	268
Totals	12716	119131

Table 1: Quantities of pottery from M25 Section 4

The pottery was rapidly scanned to identify diagnostic forms and fabrics, provide spot-dates, and to assess the general character of the pottery in terms of chronology, supply patterns, and condition. Each context group was quantified by sherd count and group weight (g). Fabrics were assigned codes standard to OA (Booth, nd). Forms were identified using Going's Chelmsford typology for Roman-period material (Going 1987), with occasional reference made to the *Camulodunum* series (Hawkes and Hull 1947), samian typologies (Webster 1996), and Barrett and Bond's report on Bronze Age pottery from Mucking (Barrett and Bond 1988).

Hobbs Hole (M25001.09)

Pottery was recovered from 282 contexts. Almost all the pottery (96% by sherd count) belonged to groups assigned a Roman date. Of this, mid Roman (*c* AD 120/30-250/60) and late Roman (*c* AD 250/60-410) pottery dominated (Table 2). The mean sherd weight of the assemblage as a whole was 10g, which indicates relatively small sherds usually difficult to identify to form.

Phase	Sherds	% Sherds
Late Bronze Age/early Iron Age	34	1
Bronze Age or Iron Age	12	0
Early/middle Iron Age	24	0
Middle Iron Age	3	0
Middle/late Iron Age	13	0
Late Iron Age	83	2
Iron Age	3	0
Late Iron Age/early Roman	30	1
Early Roman	666	13
Early/mid Roman	275	5
Mid Roman	1513	29
Mid/late Roman	594	11
Late Roman	1585	30
Roman	375	7
Anglo-Saxon	84	2
Undated	7	0
Total	5301	-

Table 2: Hobbs Hole – Chronology of the pottery

Pottery from groups dated to the later Bronze Age or earlier Iron Age largely comprised undiagnostic body or base sherds in fine or coarse flint-tempered fabrics. Sandy and organic-tempered fabrics were also encountered. Forms were restricted to two probable slack-shouldered jars. Middle Iron Age pottery consisted of sand-tempered fabrics. One form was recognised, a slack-shouldered jar. A glauconitic fabric was also identified. An everted rim in this fabric is likely to belong to a type recorded at Little Waltham (Drury 1978, type F13). These wares of middle Iron Age tradition to some extent appear to have continued in use into the late Iron Age, as they were found alongside grog-tempered wares and shelly wares. Forms in grog-tempered and shelly fabrics were restricted to a storage jar and a barrel- or ovoid-shaped *Cam* 255 jar.

Thirteen per cent of the pottery by sherd count belonged to groups dated to the early Roman period (*c* AD 43-120/30). Of this, some 65% was recovered from groups dated to the mid 1st century (up to *c* AD 70/80) on the basis of their containing grog-tempered wares and, to a lesser extent, sandy fabrics of later Iron Age tradition. Reduced sand-tempered fabrics, however, were dominant, being present in 27 of the 31 groups assigned to the early Roman period. The fabrics were variable, but were generally sorted into medium sandy fabrics, fine fabrics, black-surfaced fabrics and coarse (usually storage jar) fabrics. Most sources are likely to have been local, although fine grey ware arrived from North Kent and Highgate Wood. Forms included bead-rimmed jars (G1/G3) , necked jars (G19, G23), a platter, and butt-beaker (H7). Reduced wares were joined by shelly fabrics, in which bead-rimmed jars (G1) and lid-seated (G5.1) jars were available. Oxidised wares were identified in 12 context-groups. Forms were limited to a necked jar, a globular beaker, and a flagon handle, although a sherd in London-Essex stamped ware almost certainly belonged to a bowl. The stamped-ware sherd has a probable Hadham origin (Going 1999, 297), and a number of fine oxidised ware sherds (including a B10 dish) are consistent with the Hadham fabric (cf. Tomber and Dore 1998, 151). A platter (A2) arrived from North Kent. White ware was recorded in two contexts. One was a Verulamium product; the

second may be from North Gaul. Other continental imports included South Gaulish samian (a Drag. 18 platter was recognised), and body sherds from South Spanish amphorae.

Pottery from groups dated to the mid Roman period accounted for 29% of the site assemblage. Again, reduced sandy wares dominated, being present in all 31 contexts assigned to the period. Much had been locally-produced, but grey ware was also arriving from North Kent and Hadham. Reduced fabrics were available largely as jars, which included necked types (G10, G24, G28), the lid-seated G5.5, and storage jar G44. The wide-mouthed jar or bowl-jar E2 was present, as were a number of dish forms – the straight-sided B1 and B3 types, and the bead-rimmed B2 and B4 types. Two types of beaker were recorded: the folded beaker H34/H35, and the globular or funnel-necked beaker H39/H41. Cremation burial 6096 contained two grey ware vessels. One (?the cinerary container) was a cooking-pot type (G9) in black-surfaced ware (SF110), and the other was a jar or bowl in North Kent grey ware (SF111). Oxidised fabrics were reasonably common. These included coarse storage jar fabrics, sandy oxidised ware and fine oxidised ware. Some sherds in the fine fabric were consistent with a Hadham source. No forms were identified. No white wares belonged to this phase, but white-slipped oxidised and reduced wares were present. Fine wares were represented by Colchester colour-coated ware, Hadham oxidised ware, and East Gaulish Rhenish ware. Decorated bowls were recorded in Central Gaulish and East Gaulish samian ware, and South Spanish amphorae continued to be deposited. In addition, a hammerhead mortarium (D11) in Colchester white ware was deposited in the later 2nd or early 3rd century.

Pottery from the 47 context-groups assigned a late Roman date took a 30% share of the site assemblage. As in the earlier Roman phases, reduced wares made the largest contribution. Most of the forms seen in mid Roman contexts were present in late Roman groups. These were joined by incipient bead-and-flange (B5) and dropped flange (B6) dishes, G42 storage jars, narrow-necked jars or flasks (G36 and G40), the large pedestal jar *Cam* 207, and bowl-jars E5 and E6. Reduced fabrics introduced in this phase included Alice Holt grey ware and Rettendon-type flint-tempered wares. North Kent grey ware was residual in this phase, but Hadham grey ware continued to be supplied. Shelly ware was reintroduced. The fabric, probably from Bedfordshire or Northamptonshire and available as a jar (G27), is one of the latest arrivals in Essex, attesting to deposition after *c* AD 350. Fourth-century deposition is supported by a bag-beaker (Young 1977, type O20) in Oxford oxidised ware, and body sherds in Portchester 'D' ware. Another late Roman form, the flanged bowl C8, was recorded in a sandy oxidised fabric. More Oxford products arrived as a parchment ware bowl (Young 1977, type P24), and mortaria in white-ware (Young 1977, type M22) and red colour-coated ware. The Nene Valley also provided white ware mortaria and bowls, though to a lesser extent. Hadham oxidised ware made the most significant contribution among British fine wares. Few rims were recorded, but a disc-necked flagon and bowls or bowl-jars were identified. Other fine wares included Nene Valley colour-coated ware (an H41 globular beaker was present), a bowl in Oxford red colour-coated ware, and Colchester colour-coated ware. Samian was now largely residual, but the forms included the latest types – Drag. 31, 32, and 79 dishes, and a Drag. 38 bowl – in both Central Gaulish and East Gaulish fabrics. A few sherds of residual South Spanish amphorae were recorded.

Two substantially complete, but fragmented, vessels (SF101) were recovered from mid to late Roman context 5036. One vessel was a sandy grey ware jar with a hooked rim (possibly G24); the other was a Hadham grey ware beaker.

Saxon, or potentially Saxon, pottery was recovered from seven contexts. Forms included slack-shouldered jars or bowls in sandy or other coarse fabrics. Organic tempering was also noted.

Passingford Bridge Bund (M25002.09)

A total of 5867 sherds, weighing 54952g, were recovered from the excavation. The pottery was collected from 349 contexts; on average, 16 sherds were collected from each. Only ten context groups contained over 100 sherds, while 223 groups contained ten or fewer sherds. The mean sherd weight is 9g. The generally small group size and average sherd size indicates that the condition of the assemblage is poor. Rims were often small and had broken at the neck, making forms difficult to identify. Generally, the assemblage is strongly weighted towards the late Iron Age (*c* 100/50 BC-AD 43/50).

Phase	Sherds	% Sherds
Bronze Age/Iron Age	36	1
Late Bronze Age/Early Iron Age	127	2
Iron Age	26	0
Middle Iron Age	164	3
Middle Iron Age/Late Iron Age	214	4
Late Iron Age	1623	28
Late Iron Age/Early Roman	2133	36
Early Roman	499	9
Early Roman/mid Roman	64	1
Mid Roman	102	2
Mid Roman/Late Roman	161	3
Late Roman	579	10
Roman	104	2
Post-medieval	2	0
Undated	33	1
Total	5867	-

Table 3: Passingford Bridge Bund – chronology of the pottery

Three per cent of the assemblage by sherd count is from context-groups that are tentatively attributed to the Bronze Age or Iron Age. The material consisted exclusively of coarse flint-tempered or flint-and-sand-tempered pottery. Just two forms were identified – a slack-shouldered jar and a bowl.

Pottery from groups dated to the middle Iron Age or middle to late Iron Age accounts for 7% of the assemblage by sherd count. The period was dominated by sandy fabrics (both fine and coarse). Slack-shouldered jars (including an example with a frilly or 'pie-crust' rim) and jars with everted rims, and to a lesser extent ovoid jars and globular jars, were recorded. The pottery was accompanied by a smaller amount of flint-tempered pottery, in which slack-shouldered jars were present. This material may include residual Bronze Age or earlier Iron Age sherds.

Some 65% of the assemblage by sherd count belonged to context-groups dated to the late Iron Age or the late Iron Age/early Roman period. This phase was dominated by grog-tempered wares. Jar forms identified included high-shouldered, necked jars (such as Going forms G19 and G20, and *Cam* 218), bead-rimmed jar G1 and *Cam* 229, bucket-shaped jar *Cam* 254, storage jars, and base fragments of pedestal jars. Carinated bowls (*Cam* 210 and *Cam* 212) were also recorded, as well as butt-beaker H7 and platter forms. Sandy fabrics continued to be deposited, but had become a minor component of the assemblage. Just one form – a *Cam* 21

platter – was recognised by rim, although many of the body sherds are likely to belong to jars or bowls. Shelly fabrics, which often incorporated sand and grog, contributed the second largest fabric group, and were available as G1 and G3 bead-rimmed jars, and the bucket-shaped *Cam* 254.

A number of near-complete vessels were recovered from the site and are dated to the late Iron Age. Context 2005 and 2006 each contained a grog-tempered vessel (SF2000, SF2001); no rims survived, although the fragments are likely to belong to jars. Context 3404 contained two vessels that were substantially complete: SF2008 was a vessel in a coarse sandy fabric; SF2010 was a vessel in a fine grog-tempered fabric. Context 4245 included the substantial proportion of a storage jar in a shelly fabric (SF 2013).

Pottery from context-groups dated to the early Roman period (*c* AD 43-120/30) contributed 9% to the entire assemblage by sherd count. The groups were characterised by the continued presence of late Iron Age-tradition sherds (principally grog-tempered and shelly fabrics) but with the addition of post-Conquest sand-tempered wares. The forms recorded in shelly and grog-tempered fabrics included those seen in the previous phase, but there were additional types, such as a grog-tempered high-shouldered necked jar (Going G20) and strainer. There were few forms identified in Roman-period reduced wares; a sandy grey ware jar and fine grey ware platter (Going A1) were among them. The early Roman period also saw the deposition of 'fine and specialist wares' (cf. Booth 2004). A flagon handle was recorded in a fine oxidised ware. White-slipped oxidised ware arrived from Hadham. A fine white-ware butt-beaker is a possible North Gaulish product, and South Gaulish samian is represented by a very abraded decorated sherd and a base sherd from a Drag. 36 dish.

Mid Roman context-groups contained some 2% of the assemblage by sherd count. Pottery characteristic of the period included bead-rimmed dishes (Going B2/B4) in black-surfaced or sandy grey wares, lid-seated (G5.5) and oval-bodied jars (G24) in sandy grey wares, and Central Gaulish samian (a Drag. 18/31 dish was recorded) and Colchester colour-coated ware.

Ten per cent of the assemblage belonged to groups dated to the late Roman period (*c* AD 250/60-410). This ceramic phase was the most diverse in terms of the range of forms and fabrics present. Grey wares dominated; the G24 oval-bodied jar, present in the mid Roman period, continued to be deposited in the late Roman period. It was joined, however, by the incipient bead-and-flange dish, B5, and the dropped flanged B6 dish, and necked bowl-jar form, E5. A body sherd with roller-stamped decoration in a fine grey ware may have derived from a vessel manufactured in south Essex (cf. Jones and Rodwell 1973, fig. 9). Grey wares also arrived from Hadham and Alice Holt. Of the fine wares present, Hadham oxidised ware made the most significant contribution. Forms included the E5 or E6 bowl-jar, and flanged bowl C8 (imitating samian form Drag. 38). The fabric was joined by Oxford red colour-coated ware (no forms were identified) and a plain-rimmed dish (B1) in Nene Valley colour-coated ware. The Oxford industry was also responsible for white ware mortaria (Young type M22 was identified) and a red colour-coated ware mortarium. A large and heavy Soller mortarium from Germany was recorded, as well as a white-slipped oxidised ware mortarium (D14). Harrold-type late Roman shelly ware was available in the form of an oval-bodied jar (G27), and suggests that pottery deposition continued into the second half of the 4th century AD.

Pond 1615 (M25004.09)

Coarse flint-tempered pottery (55 sherds, 355g) was recovered from context 5. The fragments are likely to belong to a single jar and date to the Bronze Age.

Pond 1683 (M25007.09)

Context 1000 contained a single sherd, weighing 11g, of a sandy oxidised ware. The fragment dated to the medieval period.

Upminster Bund (M25008.09)

Phase	Sherds	% Sherds
Bronze Age/Iron Age	222	46
Late Bronze Age/early Iron Age	212	44
Early Iron Age	6	1
Early Roman	45	9
Total	485	-

Table 4: Upminster Bund – chronology of the pottery

Almost 500 sherds of pottery were recovered from the site. Ninety per cent of it dates to the Bronze Age or earlier Iron Age. The mean sherd weight of the assemblage was just 4g, indicating that the assemblage generally comprised very small sherds. There were few diagnostic pieces, and the fabrics encountered were tempered with flint, which was used from the Neolithic to the Iron Age. Consequently, the pottery was not well dated, although on the whole a date commencing in the Bronze Age, rather than the Neolithic was preferred.

There were some differences between the fabrics which provide a tentative basis for separating the pottery. Pottery dated to the late Bronze Age/early Iron Age was available in fine and coarse flint-tempered pottery. Rim sherds were occasionally seen in these fabrics, and these conformed to jars with upright rims, recorded at, for example, Mucking (Barrett and Bond 1988, type 13 or 14). A number of body sherds in sandy and organic-tempered fabrics were present. These are consistent with later Bronze Age fabrics also recorded at Mucking (ibid. 26-7). The pottery dated more broadly to the Bronze Age/Iron Age comprised undiagnostic flint-tempered pottery only.

Six fragments of pottery, from context 1081, were provisionally assigned to the early Iron Age. These included sherds in a sand-and-shell-tempered fabric. Two context groups were given early Roman dates. Context 1121 contained a shelly ware bucket-shaped jar (*Cam* 254), sandy and fine grey ware, and sandy oxidised ware. Context 1060 contained North Kent oxidised ware, shelly ware and sandy grey ware. In addition, intrusive mid Roman pottery, including a B2 bead-rimmed dish and G5 lid-seated jar, was found in Bronze Age deposits 1013 and 1082.

Tank 1706 (M25011.10)

A single sherd of grog-tempered pottery, weighing 10g, was recovered from context 9. The pottery dates to the late Iron Age or early Roman period.

Codham Bund, Tank 1762 and Strip Widening Ch 175530-176350 (M25018.10)

Phase	Sherds	% Sherds
Bronze Age/Iron Age	7	1
Late Bronze Age	1	0
Iron Age	8	1
Middle Iron Age/Late Iron Age	4	0
Late Iron Age/Early Roman	160	21
Early Roman	35	5
Mid Roman	53	3
Mid Roman/Late Roman	12	2
Roman	142	19
Medieval	320	43
Post-medieval	1	0
Undated	2	0
Total	745	

Table 5: Codham Bund – chronology of the pottery

A total of 745 sherds, weighing 3208g, were recovered from the site. A small amount of flint-tempered pottery is likely to date to the Bronze Age or earlier Iron Age. Four sherds of sandy pottery, and one sherd of a shelly fabric, are likely to belong to the Iron Age.

The late Iron Age or early Roman period is better represented. This ceramic phase accounted for 21% of the assemblage by sherd count. Grog-tempered fabrics were present in most context-groups dated to the phase, although no forms were identified. Sandy fabrics were also seen. Forms were recognised in shelly fabrics. These included bead-rimmed jars (Going forms G1 and G3), barrel-shaped *Cam* 255, and bucket-shaped *Cam* 254.

Pottery from groups given an early Roman date included a Drag. 18 platter in South Gaulish samian ware, a fine grey ware (possibly from Hadham), and a bead-rimmed jar (G3) and lid-seated jar (G5.1) in a shelly fabric. More samian – a Drag. 33 cup in a Central Gaulish ware – was encountered in a group dated to the mid Roman period. This was accompanied by a G24 oval-bodied jar in a sandy oxidised fabric.

Pottery from groups broadly dated to the Roman period comprised forms and fabrics that could not be closely dated, but it included a near-complete jar (SF3, Going form G24) from context 275. A date after AD 100 is likely for this vessel.

Some 43% of the assemblage was from groups dated to the medieval period. This was dominated by shelly ware dating to the 11th to 14th century.

Pond 1776 (M25021.11)

Three very small fragments (weighing 4g) of flint-tempered pottery were recovered from context 1001. The pottery could not be closely dated, although the use of flint is likely to place the material into the Bronze Age or Iron Age.

Pond 1812 (M25024.11)

Some 223 sherds, weighing 1655g, were recovered from the site. Most context-groups were dated to the medieval period, although the assemblage as a whole is dominated by a single Bronze Age vessel from context 219.

Date	Sherds	% Sherds
Bronze Age	145	65
Iron Age/Medieval	2	1
Medieval	74	33
Post-medieval	1	0
Undated	1	0
Total	223	-

Table 6: Pond 1812 – chronology of the pottery

Context 219, a deposit within a cremation burial, contained the remains of a highly fragmented jar. This was flint-tempered and was decorated with a cordon. The vessel had been truncated at the top, but the base and body sherds survive. A Bronze Age date for the jar is likely.

The medieval pottery largely comprised shelly wares in which jars were available. Sandy fabrics were present to a lesser extent. Overall, the pottery falls within the earlier medieval period, *c* 11th-13th century.

The post-medieval sherd was a glazed white ware body sherd.

Pond 1824 (M25025.11)

Thirty-five sherds of pottery, weighing 268g, were recovered from the site. With the exception of a single sherd of Roman-period fine grey ware, all dates to the Bronze Age or early Iron Age. This material was flint-tempered. Pottery from context 131 included a body sherd with large fingertip impressions, and an upright rim, consistent with Mucking type 13 or 14 (Barrett and Bond 1988). A sherd from context 138 was decorated with a thin cordon.

B.2 Ceramic building material

Edward Biddulph

Introduction

A total of 1203 fragments of ceramic building material (cbm), weighing almost 76kg, was recovered from nine sites along the M25 Section 4 widening scheme (Table 7). The material was rapidly scanned within context groups to identify diagnostic forms that gave an indication of function and date. Most of the cbm was concentrated in two sites: Hobbs Hole (M25001.08) and Passingford Bridge Bund (M25002.09). Material recovered from sieved samples was not recorded.

Site	No. fragments	Weight (g)
M25001.08	559	27498
M25002.09	616	47672
M25007.09	3	252
M25011.10	3	52
M25017.10	8	235
M25018.10	1	16
M25021.11	6	15
M25024.11	3	53
M25025.11	4	107
Total	1203	75900

Table 7: Quantities of ceramic building material from M25 Section 4

Hobbs Hole (M25001.08/09)

Ceramic building material was recovered from 98, largely Roman-period, contexts. The material was present in a range of fabrics. The dominant fabrics were a coarse sandy fabric, moderately micaceous and usually including occasional flint, clay pellets and chalk fragments, and a relatively fine sandy fabric, also micaceous and tempered with calcareous fragments and clay pellets. Another fine fabric, which contained frequent chalk fragments to give it a speckled appearance on the surface and streaky appearance within the break, and a coarse shelly fabric were also recorded, though in minor quantities.

Of the forms, tegulae, imbrices, box-flue tiles, bricks, flat tiles with plain edges, and flat tiles of indeterminate type (probably mainly tegula fragments, but likely to include bricks) were recorded. Tegulae and imbrices were the commonest types, being recovered from at least 21 and 20 contexts respectively. Eight contexts contained bricks, while box-flue tiles were collected from four contexts. Other flat tiles, including flat tiles of indeterminate form, were collected from 23 contexts. Flat tiles with plain edges were often relatively thin, ranging from *c* 11mm to 25mm thick. The thicker flat tiles or bricks tended to measure between 30mm and 40mm thick. Tegulae and imbrices were available in the dominant sandy and fine sandy fabrics. Brick and box-flue tile were recorded in the sandy fabric. Curved fragments, probably imbrices, were seen in the fine chalky fabric.

Ninety-five contexts contained pottery in addition to the cbm. The dating given by the pottery places the emphasis for the deposition of cbm on the mid and late Roman periods. Some 10 contexts dated by pottery to the mid Roman period contained cbm, while 21 contexts were dated to the late Roman period. Five contexts that contained cbm were dated to the early Roman period; one of the early Roman context-groups included box-flue tile.

A signature mark was recorded on a flat tile with a plain edge. A trace of mortar survived on the edge. Combed or scored keying was seen on all fragments of box-flue tile; one box-flue tile included a vent hole. Although no complete tegulae, imbrices, flat tiles and box-flue tiles were present, relatively large pieces were recorded, suggesting that the material had been deposited close to the area of its use and the site of structures.

Passingford Bridge Bund (M25002.09)

Eighty-two contexts contained ceramic building material. Fabrics were largely confined to the sandy and fine sandy types seen at Hobbs Hole, and of these, the fine fabric was dominant. The fine chalky fabric did not appear to be present. As at Hobbs Hole, roofing tile was common. Twenty-three contexts contained tegula fragments, while imbrex fragments were collected from 19 contexts. Eight contexts contained brick fragments, while flat tiles (including of indeterminate form) were present in 27 contexts. Flat tiles ranged in thickness from 12mm to 35mm. A brick fragment had a thickness of 64mm. No box-flue tile fragments were recorded.

Fifty-three contexts that contained cbm also contained pottery. This gives a mid and late Roman emphasis for deposition, although there was slight mismatch between the chronological distribution of tegulae and imbrices; five contexts containing imbrices were dated by pottery to the early or early/mid Roman period, compared with just one early Roman context that contained a tegula fragment.

A signature mark was seen on a fragment of a flat tile of indeterminate form. A possible paw print (?dog) was seen on the underside of a tegula fragment from context 2455. The condition of the cbm from the site was mixed, but large pieces were recorded, suggesting that structures were located nearby.

M25007.09 (Pond 1683)

Three fragments from a medieval peg-tile were recovered from context 1000.

M25011.10 (Tank 1706)

Ceramic building material was recovered from three contexts. Context 13 contained a fragment from a medieval peg-tile. Fragments from contexts 7 and 9 were undiagnostic, but are probably of medieval date, based on fabric.

M25017.10 (Tank 1714)

Five contexts contained ceramic building material. The small assemblage comprised flat fragments of uncertain form, although a medieval date can be suggested on the ground of fabric.

M25018.10 (Codham Bund)

A single fragment of indeterminate form, though in a medieval sandy fabric, was recovered from context 111.

M25021.11 (Pond 1776)

Six pieces of indeterminate form were recovered from context 1012. A medieval date can be suggested based on fabric.

M25024.11 (Pond 1812)

Indeterminate fragments were recovered from contexts 242 and 249. A medieval date is likely on fabric grounds.

M25025.11 (Pond 1824)

A fragment in a fine sandy fabric was recovered from context 101. A flat piece in a coarser sandy fabric was collected from context 108. The fabrics are consistent with those seen at Hobbs Hole and Passingford Bridge, and a Roman date can be suggested.

B.3 Fired clay

Edward Biddulph

Introduction

A total of 1210 fragments of fired clay, weighing almost 13.5kg, were recovered from sites along the M25 Section 4 widening scheme. The material was rapidly scanned within context groups to identify diagnostic forms that gave an indication of function. Most of the fired clay was concentrated in two sites: Hobbs Hole (M25001.08) and Passingford Bridge Bund (M25002.09). Material recovered from sieved samples was not recorded.

Site	No. fragments	Weight (g)
M25001.08	300	4497
M25002.09	812	7178
M25018.10	76	1410
M25021.11	1	6
M25024.11	20	283
M25025.11	1	20

Table 8: Quantities of fired clay from M25 Section 4

Hobbs Hole (M25001.08/09)

Fired clay was recovered from 66 context groups. The fabrics encountered were variable, but included very fine or silty fabrics, shelly and organic fabrics, and mixed fabrics that contained sand, along with smaller proportions of clay pellets, flint or shell. Some pieces of fired clay were sufficiently diagnostic to suggest function. At least eighteen contexts contained material likely to have derived from hearths or ovens. Typically the fragments are characterised by a single flat surface (often scorched or burnt or purplish in colour) and irregular underside. The pieces probably formed part of the hearth or oven floor. A corner from a block from context 5951 may be a fragment from an oven plate or part of a kiln structure. Structural fired clay, pieces potentially applied to the walls of structures or ovens, was recovered from at least nine contexts. This comprised rounded fragments of daub and larger pieces with wattle impressions. Fired clay from another 38 contexts were of indeterminate form, although it is likely that most fragments from hearths or structures.

In 60 contexts the fired clay was found alongside pottery. In lieu of finalised phasing, this provides an indication of the chronological spread of the material. Some 10% of fired clay from these contexts by fragment count was recovered from contexts dated by pottery to the Iron Age. The proportion was marginally higher in the early Roman period (12%). The middle Roman period accounted for 19% of fired clay, and the proportion was higher still in the late Roman period (28%). This gives a later Roman emphasis to the site's structures and hearths.

Passingford Bridge Bund (M25002.09)

Eighty-nine contexts contained fired clay. Fragments certainly or potentially deriving from hearths or ovens were recovered from 22 contexts. As with Hobbs Hole, fired clay identified as

hearth lining was characterised by amorphous burnt pieces or fragments flat on one side and undulating on the other. A possible plate was collected from context 3656. Objects mainly in sandy fabrics and potentially associated with kilns were recovered from six contexts. These included a fragment possibly from a trapezoidal-shaped block pedestal from context 3111. Fragments from three perforated objects, found in contexts 3508, 4342 and 4369, are also potentially identified as kiln (or oven) furniture. Fired clay with a structural function was recovered from at least 11 contexts. The material included amorphous fragments of daub and pieces with wattle impressions. Forty-nine contexts contained material categorised as indeterminate, although it is possible that on more detailed examination, a proportion of this will be attributable to function.

Forty-eight contexts that contained fired clay also contained pottery. The dating provided by the pottery suggests places the emphasis for deposition on the Iron Age and early Roman period. Of the material from these dated contexts, some 21% by fragment count (largely indeterminate, but also including pieces of structural origin) was recovered from contexts dated to the Iron Age. Sixty-nine per cent of fired clay was found alongside late Iron Age or early Roman contexts. The fragments included hearth or oven lining and a smaller proportion of structural material, but also all the pieces potentially identified as kiln or oven furniture. There were no middle Roman groups, and fired clay found in association with late Roman pottery accounted for less than 1% of the assemblage from dated contexts.

Codham Bund (M25018.10)

Twelve contexts contained fired clay. Potential hearth material in the form of burnt amorphous fragments was recovered from two contexts. Structural fired clay, identified from wattle impressions, was collected from four contexts, although an edge or corner piece (SF4) from context 295 may belong to an oven or kiln. The remaining material was indeterminate.

Fired clay from four contexts was found in association with pottery. This dated three contexts to the late Iron Age or early Roman period, and gave the fourth a broad Roman date. Structural material was recovered from the late Iron Age/early Roman contexts.

Pond 1776 (M25021.11)

A single amorphous fragment of uncertain function was recovered from Bronze Age or Iron Age context 1007.

Pond 1812 (M25024.11)

Two contexts (205 and 236), dated by pottery to the medieval period, contained fired clay of indeterminate function.

Pond 1824 (M25025.11)

A single fragment of fired clay was recovered from undated context 126.

B.4 Flint

Mike Donnelly

Hobbs Hole (M25001.09)

A very small assemblage of 23 flints was recovered from this site. However, this included ten natural pieces and three pieces of burnt unworked material. These flints originated from ten separate contexts, widely spread across the site. Two of the pieces were retouched and include some very fine work on a complex tool on an elongated distal trimming flake. This piece is backed down its left edge, has a retouched and centrally notched right side and has two piercer projections at either side of its distal terminus. The other retouched form is a fairly crude denticulate. Both could belong to a range of periods, but a Neolithic date is most likely. The remaining pieces are unspectacular and include one or two flakes typical of later prehistoric knapping strategies. However, given the small assemblage size, little should be made of this as they could just as easily represent less adept early prehistoric knapping. Another flake displays a heavily faceted platform most commonly associated with assemblages dating to the Upper Palaeolithic or middle to late Neolithic periods. Given the rarity of the former, the later date is far more likely. The assemblage suggests very limited activity at this site dispersed across a broad span of early and later prehistory.

Category type	Number
Flake	5
Blade-like	1
Irregular waste	2
Denticulate	1
Other retouch	1
Total	10
Burnt unworked flint No./g	3/36g
No. burnt (exc. chips) (%)	1/10 (10%)
No. broken (exc. chips) (%)	1/10 (10%)
No. retouched (exc. chips) (%)	2/10 (20%)

Table 9: Flint from Hobbs Hole

Passingford Bridge Bund (M25002.09)

Assemblage composition

A total of 252 struck flints, eight natural flints and 4672 pieces of burnt unworked flint (weighing 34.67kg) were recovered from excavations at Passingford Bridge. A small number of diagnostic artefacts were recovered, including two arrowheads. The technological characteristics of the remaining flake and blade debitage confirm activity during the Neolithic and early Bronze Age,

albeit with a slight possibility of residual earlier material. Later prehistoric knapping is almost entirely absent and may only be represented here by a few squat flakes. The flint assemblage from the site is shown in Table 10.

Category type	Grand Total
Flake	114
Blade	10
Bladelet	8
Blade-like	10
Irregular waste	15
Sieved Chips 10-4mm	26
Sieved Chips 4-2mm	46
Tested nodule/bashed lump	2
Single platform blade core	1
Multi platform flake core	2
Core on a flake	1
Scraper end	3
Scraper end of blade	1
Arrowhead leaf-shaped	1
Arrowhead barbed-and-tanged	1
Awl	1
Knife other	1
Microdenticulate	1
Retouched blade	2
Retouched flake	6
Grand Total	252
Burnt unworked flint No./g	4762 (34666g)
No. burnt (exc. chips) (%)	5/180 (2.78%)
No. broken (exc. chips) (%)	22/180 (12.22%)
No. retouched (exc. chips) (%)	17/180 (9.44%)

Table 10: Flint from Passingford Bridge Bund

Flintwork was recovered from 68 contexts. Although the distribution of flints was far from uniform, many contexts only produced single examples (34/68, 50%) and nearly every context had less than five examples (58/68, 85.29%). Only four had between five and 10 (5.88%) and five had more than 10 (7.35%). These larger assemblages accounted for 121 flints or around half the total assemblage (48.02%). However, three of these larger groups were known only from sieved material, usually microdebitage.

The largest assemblage of 41 pieces originated from context 2455, a fill in ditch group 2460, a probable extension to rectilinear ditch group 2432 (Table 11). Thirty-four of these pieces were chips of less than 10mm in length, a single piece of large irregular waste, four flakes and two blade-like flakes. Fill 2446 originated from ditch group 2432 and had a very similar assemblage to 2455, as was the assemblage from posthole fill 2896. Context 2105 differed from these chip dominated assemblages in that it mainly contained waste flakes. However, context 2103 from the same ring ditch feature 2100 had another chip dominated assemblage. None of these larger groups contained any retouched forms despite retouch being common in the overall assemblage. One blade-like flake from context 2105 had been utilised.

Category type	2103	2105	2446	2455	2896
Flake	7	21	5	4	4
Blade		1			
Bladelet	1	1			2
Blade-like		3	1	2	
Irregular waste	5		1	1	2
Sieved Chips 10-4mm	8	1	5	6	
Sieved Chips 4-2mm			3	28	8
Tested nodule/bashed lump	1				
Sieved %	72.72	70.37	100	100	100
Grand Total	22	27	15	41	16
No. burnt (exc. chips) (%)	1/22 (4.54%)	0	0	0	4/16 (25%)
No. broken (exc. chips) (%)	2/22 (9.09%)	4/27 (14.81%)	1/15 (0.67%)	1/41 (2.44%)	2/16 (12.5%)
No. retouched (exc. chips) (%)	0	0	0	0	0

Table 11: The flint assemblage from the Passingford Bridge site by specific context

Other interventions and samples from ring ditch 2100 yielded another 25 flints giving it 74 in total (Table 12). This assemblage was dominated by flakes (44/74, 59.46%) but blades were also well represented (13/74, 17.57%) giving a blade component to the removal assemblage of 22.8%(13/57), slightly low for Mesolithic material but indicative of earlier Neolithic knapping. Ditch group 2432 produced flints from one other intervention, giving it 23 in total, while group 2460 was only represented by fill 2455. However, both these ditch groups appeared to belong

to the same overall enclosure and represent 64 pieces or 35.56% of the assemblage total. This combined assemblage is dominated by small chips, clearly genuine knapping waste. However, the assemblage also contained 10 flakes and four blade forms, again indicating a Neolithic or possibly even Mesolithic element to the assemblage (4/14, 28.6%). These flints were found over 50m north-west of ring ditch 2100 and the intervening archaeology did not yield any significant flint assemblages, so it is quite probable that these two small scatters may be unrelated and of different dates.

Category type	Ring Ditch 2100	Rectilinear groups 2432	2446
Flake	44	6	4
Blade	4	1	
Bladelet	3		
Blade-like	6	1	2
Irregular waste	5	1	1
Sieved Chips 10-4mm	10	7	6
Sieved Chips 4-2mm		7	28
Tested nodule/bashed lump	1		
Core multi platform flake	1		
Sieved %	66.22	95.65	100
Grand Total	74	23	41
No. burnt (exc. chips) (%)	1/74 (1.35%)	0	0
No. broken (exc. chips) (%)	7/74 (9.46%)	1/23 (4.35%)	1/41 (2.44%)
No. retouched (exc. chips) (%)	0	0	0

Table 12: The flint assemblage from the Passingford Bridge site by key groups

Raw material and condition

The raw materials exploited at Passingford Bridge consist entirely of flint, predominantly from secondary gravel sources that could be found on or near the site. The flint displays a range of colours and conditions, mostly translucent greys and browns. The material is fairly fresh, much of the fine knapping debitage is fresh or slightly edge-damaged, while some of the larger pieces are moderately edge-damaged. Many of the pieces recovered in the ring ditch may be close to *in situ*, while the major groups from ditches 2432 and 2460 may have truncated an area of *in situ* knapping activity. There are a few rolled and glossed pieces indicating lengthy exposure and considerable reworking. The distinctive Bullhead beds flint, commonly found in south-eastern assemblages is absent here. The flint displays a very light to moderate patina; very few

pieces are heavily patianted/corticated and these are either in poorer condition or are idiosyncratic to the assemblage as a whole (e.g. double backed blade 80 from pit 4541).

Storage and curation

The struck flints are bagged individually and boxed in a size 3 storage box; this is adequate for long-term storage and curation. The burnt unworked flint is bagged by context. It is not recommended that the burnt unworked flint is retained for long-term storage.

Discussion

Of most obvious note with regard to the Passingford Bridge assemblage is the high instance of blade forms (blades, bladelets and blade-like flakes) in the assemblage at 19.7% of all removals (28/142). This is raised to 22.8% for ring ditch 2100 and 28.6% for the assemblages recovered from ditch groups 2432/2460. All these figures imply an assemblage in which blades are important (Ford 1987) but are not as high as expected for blade-dominated Mesolithic assemblages (40%). Many of the flakes and some of the cores recovered highlight this importance with parallel blade negative scars present. However, caution needs to be observed when tying core reduction preferences to their final states, as it is often the case, especially with exhausted cores, that they may have a shift in emphasis from blade to flake production as they near exhaustion or that they may fail in a manner that obliterates many of the earlier blade scars.

Other factors regarding the assemblage indicate an early date, and many of the pieces display platform edge abrasion/preparation to varying degrees. This has been noted on 59 of 141 pieces with intact butt ends or 41.84% of the assemblage and this figure clearly indicates the importance of this technique here. Soft hammer reduction is also present and was observed on 47 of 143 recorded examples (32.87%); 46 were hard-hammer struck (32.17%) and 50 were indeterminate (34.96%). Many of the initial stages of reduction in any period will be conducted with a hard hammer but the high instance of soft hammers, coupled with the extensive use of abrasion/preparation and the incidence of blade technology all indicate a Mesolithic or Neolithic focus to the assemblage.

Some of the tools recovered support this view. A fine microdenticulate on a blade was recovered from a cremation deposit 5037 along with a bladelet and snapped blade. Given the absence of certain Neolithic pottery, it is likely that these finds are residual in later material and may indicate another smaller foci of Neolithic activity. A partially flaked or more likely unfinished leaf-shaped arrowhead of Green's type 3C was recovered from hillwash horizon 3245. Other tools of early date include an end scraper on a partially crested blade from ditch group 3308 and an end of flake scraper from Iron Age pit 2903. While end of flake scrapers are not diagnostic in general, the form of the blank and the parallel blade-like negative scars on its dorsal surface indicate an early date.

Perhaps the most striking find is, however, of later date. A fine, fancy, barbed and tanged arrowhead of probable Conygar Hill type (BF, Green 1980) was recovered from ditch group 3668, fill 3404. This piece is clearly of early Bronze Age date but arrowheads are, given their very nature, often found as stray finds in later features and the intervention in question was not associated with significant quantities of flint debitage but was only loosely associated with a small retouched flake.

Another striking find is a fine blade, more heavily patinated than any other piece from the assemblage found in pit 4541. This piece is double backed/trimmed and each end is obliquely

truncated. It is in form and style more indicative of the early Mesolithic or even the upper Palaeolithic periods

The assemblage from Passingford Bridge represents a small yet significant focus of early prehistoric activity. It is very difficult to be certain which periods are represented. However, the debitage studies strongly indicate a focus in the earlier Neolithic, albeit with some stray artefacts dated to the early Bronze Age and possibly the Mesolithic period. The lack of associated features could imply that much of the material originated from hillwash or other forms of buried soils. The flint assemblage is most probably the result of a mix of *in situ* knapping, middening of material and possibly its later incorporation into pits or pit groups.

Category type	Pond 1683	Pond 1683	Upminster Bund	Codham Bund	Tank 1714	Pond 1812	Pond 1776	Pond 1835	Total
Flake	3	2	1	1	1	4	1		13
Blade								1	1
Blade-like flake						1			1
Sieved Chips 4-2mm		3							3
Other blade core					1				1
Core fragment			1						1
Scraper end of flake				1					1
Awl	1								1
Other retouch	1		1						2
Retouched flake	1								1
Grand Total	6	5	3	2	2	5	1	1	25
Burnt unworked flint No./g	0	11 (31g)	13 (162g)	35 (478g)	0	0	2 (7g)	6 (47g)	67 (725g)
No. burnt (exc. chips) (%)	0 / 6 (0%)	0 / 2 (0%)	0 / 3 (0%)	0 / 2 (0%)	0 / 2 (0%)	0 / 5 (0%)	0 / 1 (0%)	0 / 1 (0%)	0 / 22 (0%)
No. broken (exc. chips) (%)	1 / 6 (16.7%)	0 / 2 (0%)	2 / 3 (66.7%)	1 / 2 (50%)	0 / 2 (0%)	0 / 5 (0%)	0 / 1 (0%)	0 / 1 (0%)	4 / 22 (18.2%)
No. retouched (exc. chips) (%)	3 / 6 (50%)	0 / 2 (0%)	1 / 3 (33.3%)	1 / 2 (50%)	0 / 2 (0%)	0 / 5 (0%)	0 / 1 (0%)	0 / 1 (0%)	5 / 22 (22.7%)

Table 13: Flint assemblage by excavation area

Pond 1683 (M25007.09)

Pond 1683 produced just five flints, two flakes from the topsoil and three chips and 13 pieces of fragmentary burnt flint from sieved residues. The flakes are generally undiagnostic and both are plough damaged. One does display parallel negative scars more typical of early prehistoric knapping.

Upminster Bund (M25008.09)

Only three pieces of genuine struck flint were recovered from this site. The assemblage consists of a preparation flake, a plough-damaged core fragment and a complex tool with crude denticulate and scraper retouch on its alternate sides alongside a piercer projection at its distal end. Such combination tools feature in assemblages of many dates but a later Neolithic date is probably the most likely. This site also yielded very small amounts of burnt flint from eight contexts amounting to 13 pieces weighing 162g.

Tank 1714 (M25017.10)

Tank 1714 yielded two flints, a flake and a atypical bladelet and flake core, worked almost in a similar fashion to a 'levallois' discoidal core. Both pieces displayed moderate patination and were either lightly or moderately edge damaged. The flake is undiagnostic, while the core is of early prehistoric date, most likely early Neolithic or possibly late Mesolithic.

Codham Bund (M25018.10)

Codham Bund yielded only two flints. One is an end scraper on an elongated blade-like flake blank while the other is a fairly squat hard-hammer flake typical of later prehistoric knapping. The scraper displays well executed retouch and has parallel blade-like negative scars on its dorsal surface and most likely belongs to the Neolithic to early Bronze Age. This site also yielded 35 pieces of burnt unworked flint weighing 478g from six separate contexts.

Pond 1776 SMS (M25021.11)

A single struck flint was recovered from context 1001 along with six pieces of natural unworked flint and two pieces of unworked burnt flint. The flake recovered represents a double ventral removal, possibly some form of tool blank. It may have been crudely worked but the considerable edge damage it has suffered prevents certainty.

Pond 1812 SMS (M25024.11)

This site yielded 10 pieces of flint. However, five were found to be natural fragments. The remaining five consist of four flakes and a blade-like flake. The pieces are in varying condition from fresh to quite heavily rolled/plough damaged. A distal trimming flake from context 129 is very fresh and has characteristics typical of later prehistoric knapping while the blade-like flake from context 149 is in very poor condition and has a heavily abraded platform margin indicative of early prehistoric flintwork. Another flake from context 102 may have been used as a burin, but it is not in fresh condition and burin spalls can occur accidentally (*burin de fortune*).

Pond 1824 (M25025.11)

A very small assemblage of 24 flints was recovered from this site and included three natural pieces which will not be discussed further. These flints originated from five contexts, mostly clustered at the eastern end of the site where three pits/tree-throws yielded 10 (138/cut 137), nine (131/cut 130?) and two flints (133/cut 132?). Two flints were recovered from a ditch (104/cut 103?) in the identified field system but are certainly residual finds.

The assemblage can be broken into two main components. The first and earliest part dates from the early Mesolithic and is represented by a broken obliquely blunted microlith recovered from ditch fill 104. Several blades from the pits identified in the eastern part of the site may also date to this period, although they could equally belong to the later Mesolithic or early Neolithic.

The blades were discovered as residual material in features containing later prehistoric struck flint. Each of the blades appears slightly more edge damaged and patinated than the later material which is generally fresh. The blades and the bladelet display soft hammer struck butt ends, with edge abrasion and all appear to have been removed from single platform blade cores.

The later prehistoric component of the assemblage includes two cores and several flakes but lacks fine knapping waste. The flakes are typical of later prehistoric knapping, and display hard hammer bulbs with plain or cortical platforms and a lack of preparation. They often also display noticeable spurs and are squat and thick. One of the two cores was a crude, tested nodule with one or two flake removals while the other was a more complex, multi-platform flake core, possibly even a discoidal example. Such a piece could date to the late Neolithic-early Bronze Age but the remainder of the assemblage is probably later in date and it would seem logical to suggest that same date for this group of similarly conditioned material. One of the flakes appears to have been heavily utilised along its distal end but retouch is absent. Another flake has been calcined.

Category type	Number
Flake	13
Blade	3
Bladelet	1
Microlith	1
Irregular waste	1
Tested nodule	1
Multiplatform, discoidal core	1
Total	21
No. burnt (exc. chips) (%)	1/21 (4.76%)
No. broken (exc. chips) (%)	3/21 (14.29%)
No. retouched (exc. chips) (%)	1/21 (4.76%)

Table 14: Flint from Pond 1824

Pond 1835 SMS (M25028.11)

This site produced a single blade of flint and six pieces of burnt unworked material. The blade was found in the subsoil and represents a fairly regular piece displaying heavy platform abrasion. It appears to have been truck from a thermally fractured nodule, has a hard hammer bulb of percussion and has a distinct hinge termination. It almost certainly dates to the Mesolithic or early Neolithic periods.

B.5 Worked stone

Ruth Shaffrey

Hobbs Hole (M25001.09)

A total of eight records of quern fragments were entered into the database; small fragments of a single lithology from one context were entered together but multiple material types or context numbers were recorded separately. These include 18 fragments of lava from five contexts weighing a total of less than 500g. Two fragments of Millstone Grit are both likely to be from querns although one is a small fragment (7233) and the other has been reused (5909). The remaining quern fragment has been extensively reused for rubbing and sharpening so that it cannot be distinguished as either a saddle or rotary quern (5910). It is also heavily blackened due to burning.

Without exception, the quern fragments have been either reused or are extremely fragmentary. This indicates that a significant amount of time had elapsed between their use as querns and their eventual deposition at Hobbs Hole and it is possible that they were never used as querns on that site. That interpretation would be in keeping with the lack of occupation evidence from the site generally.

Context	Description	Notes	Wt (g)	Lithology
5098	Probable rotary quern	Small fragment	9	Lava
5099	Probable rotary quern	Small fragment	39	Lava
5909	Possible quern fragment,	One concave worn face and one worn probable edge, flat plus a groove on the edge and some shaping on the side opposing the concave face. Function is unclear but could be a reused quern	1189	Possible Millstone Grit (MG)
5909	Probable rotary quern	Small fragment	35	Lava
5908	Lava querns	Six fragments of rounded lava with original edge	188	Lava
6016	Quern fragments	9 rounded and small fragments	210	lava
5910	Quern fragment, rotary or saddle	No edges survive and the quern has been heavily reused so that it is worn smooth and concave on both faces. It is also blackened from burning on multiple faces, including broken edges	1263	ORS
7233	Quern fragment	Small fragment with two adjoining worked faces, one more worn is probably the grinding surface	31	Probable Millstone Grit

Table 15: Worked stone from Hobbs Hole

In addition to the querns there are a number of curious materials, including some lumps of chalk, which are possibly worked but have no clear facets or function (7131). There is also a lump of ochre (6084). A large piece of gritty sandstone, possibly Old Red Sandstone or Millstone Grit, has one square corner with part of a curved moulding (5909). Its function is unclear but it seems likely to be decorative and structural and how it ended up at Hobbs Hole is puzzling.

Four other large blocks of stone also appear to be structural (two from 7053, fill of pit 7052 and two from 813, fill of ditch 812). The blocks from pit 7052 are accompanied by seven smaller but still substantial blocks. A single block of tufa was also found in the fill of pit 5905 (5939). None of the blocks retain any obvious signs of working, such as tool marks, but must have been imported to the site as there are no sources of Greensand nearby. They presumably served a purpose that required heavy blocks, although as no remains of structures were uncovered, their exact function is unclear.

Context	Description	Notes	Wt (g)	Lithology
7131	Unknown	6 lumps of chalk, some with possible worked edges but none are facetted or clearly objects. Said to be imported to the site, so need to check that	409	Chalk
6084	Ochre	Yellowish orange soft stone, possible ochre		
6060	Unworked mudstone		10	Mudstone
5909	Possible structural stone	Has one square corner with part of a curved moulding. Function unclear but possibly decorative structural bit	636	Possible ORS/MG / other
7053	Possible structural block	Large lump with one possible flat worked face	>2000	medium grained grey sandstone, possibly Greensand
7053	Possible structural block	Large and unworked but same stone as ST 04 and presumably used structurally	>2000	medium grained grey sandstone, possibly Greensand
813	Possible structural block	Large and unworked but same stone as ST 04 and presumably used structurally	>2000	medium grained grey sandstone, possibly Greensand
813	Possible structural block	Reasonably well squared although no tooling is evident	2998	Sandstone, well cemented
7053	Unworked sarsen	Four large blocks, not worked but possibly used structurally		
5939	Block, not tooled but possibly structural	Tufa	2224g	
7053	Unworked	Three large lumps of Greensand, not worked, presumably structural	5951g	

Table 16: Other worked or possibly utilised stone from Hobbs Hole

Passingford Bridge Bund (M25002.09)

Lava quern fragments were recovered from two contexts (4415 and 2786) but comprise only small weathered fragments totalling approximately 900g. Two pebbles appear to have been used as rubbers. One of these has clear facets and areas of polishing (2622); the other has a noticeably flat face that may be natural or have resulted from use (2369). If caused by use,

wear on both would have resulted from rubbing, perhaps grinding grain or other substances. The polish could have resulted from pot burnishing or perhaps rubbing materials such as leather. A small slab of stone is worn on one side (4290); wear such as this could have resulted from use as a grinding slab or use in a floor surface.

Context	Description	Notes	Size	Wt	Lithology
4415	Probable quern fragments	Two very worn fragments	Measurements are indeterminate	816	Lava
2786	Probable quern fragments	Approx. 20 very tiny rounded fragments	Measures	38	Lava
2369	Possible rubber	Pebble with naturally flat face that may have been used. But not definite	Measures >72 x 35 x 30mm	112	
2622	Rubber / polisher	Pebble with two utilised flat worn facets, one of which is polished. One end broken	Measures 90 x 80 x 70mm	676	Quartzitic sandstone
4290	Worn stone	Small slab of stone, worn on one side. Purpose unclear	Measures 80 x 80 x 18	264	

Table 17: Worked stone from Passingford Bridge Bund

Codham Hall Bund (M25018.10)

A total of 41 fragments, almost certainly from rotary querns, were recovered from two contexts (289, 313) and totalling 399g. They are all small undiagnostic fragments and although they indicate food processing, it is by no means certain where they were used for grinding. In addition to the worked stone, heat cracked stones used for cooking, were recovered from four contexts (126, 253, 261, 378).

Context	Description	Notes	Wt (g)	Lithology
289	Probable rotary quern	weathered fragments x 12	185	Lava
313	Probable rotary quern	weathered fragments x 28	210	Lava
289	Probable rotary quern	single tiny weathered fragment	4	Lava

Table 18: Worked stone from Codham Hall Bund

B.6 Glass

Ian Scott

Introduction and methodology

The glass assemblages from the Section 4 sites are very small and only four sites produced glass (Table 19). The glass has been fully recorded onto an Excel spreadsheet. Provenance is recorded together with identification and description of the glass, and where appropriate measurements.

Site/Code	Context	bottle	wine bottle	vessel	undiagnostic	window	Total
Hobbs Hole (M25001.08)	1105			1			1
	1706	1					1
	3905		1				1
	Total	1	1	1			3
Passingford Bridge Bund M25002.09	3132		1				1
	4460					1	1
	Total		1			1	2
Pond 1609 M25003.09	1007					1	1
	1027				6		6
	Total				6	1	7
Pond 1812 M25024.11	131	1		1			2
	133	1					1
	149		1				1
	Total	2	1	1			4
Total		3	3	2	6	2	16

Table 19: Summary quantification of glass finds from M25 Section 4 by Site, Context and glass type (sherd count)

Hobbs Hole

The glass from Hobbs Hole comprises three sherds:

- A sherd from the kick, or push up, of a thick-walled free-blown early 18th-century wine bottle in dark olive green metal (context 3905).
- The neck and finish from a machine moulded bottle of late 19th- or early 20th-century date with an applied tooled finish. The bottle in green metal has a screw cork closure (context 1706).
- An undiagnostic sherd of vessel glass in green metal (context 1105).

Passingford Bridge Bund

There are just two sherds of glass from this site:

- A weathered sherd of early thick-walled free blown wine bottle in green metal. The sherd is not more closely datable than early 18th-century (context 3132).
- Sherd of hand made window glass with slightly irregular surfaces in light green metal. Post medieval, but not more closely datable (context 4460).

Pond 1609

There are seven sherds of glass from Pond 1609:

- A small sherd of colourless window glass, that is not closely datable (context 1007)
- Seven small chips of glass, 6 brightly coloured, and 1 colourless. Undiagnostic and undated (context 1027).

Pond 1812

There are four sherds of glass from Pond 1812:

- A small body sherd probably from a cylindrical bottle, in light green metal, not closely dated but probably 19th-century or later in date (context 131)
- A small opaque white or off-white sherd possibly from the rim of a vessel or dish. Not closely dated but probably later 19th-century or later (context 131).
- Body sherd from a cylindrical bottle in light green metal. Not closely dated but probably later 19th-century or later (context 133).
- Small body sherd from an early thick-walled free-blown wine bottle. Dates no later than the late 18th-century. Olive green metal (context 149).

B.7 Metal finds

Ian Scott

Introduction and methodology

The metal assemblages from the Section 4 sites are very small and only six sites produced finds (Table 20). The metal finds are all iron. The finds have been fully recorded onto an Excel spreadsheet. The finds are quantified by object and fragment count. Undiagnostic finds, usually small unidentified fragments and lumps are quantified only by fragment count and their presence noted in tables. Provenance is recorded together with identification and description of the finds, which have been assigned to functional categories and where appropriate have been measured.

Code/Site	Ctxt	Arms	Transport	Nails	Misc	Query	Waste	Undiag.	Total
Pond 1683	1000					1			1
(M25007.09)	Total					1			1
	1039			§		1			1
	2029			1					1
	2208							*	*
	2301							*	*
	2603			1					1
	2635				1				1
	2904	1							1
	3131					3			3
Passingford	3132					2			2
Bridge Bund	3134					1			1
(M25002.09)	3135					1			1
	3195			1					1
	4077							*	*
	4273							*	*
	4287							*	*
	4382					1			1
	4415					1			1
	4532		1						1
	5038					1			1
	Total	1	1	3	1	11		*	17
Pond 1609	1015			1				*	1
(M25003.09)	Total			1				*	1
Folkes Lane	105		1						1
(M25012.10)	Total		1						1
Codham	356			2				*	2
Bund	359							*	
(M25018.10)	Total			2					2
	193				1				1
Pond 1812	225						1		1
(M25024.11)	236							*	
	Total				1		1		2
Total		1	2	6	2	12	1	*	24

Table 20: Summary quantification of metal finds from M25 Section 4 by Site, Context and Functional category (object count)

Pond 1683

The single piece of metalwork from Pond 1683 is an iron circular swivel ring, flattened a pierced on one side. It is probably a cart or harness fitting. It is not closely datable (context 1000).

Passingford Bridge Bund

There are 17 iron objects (22 fragments). In addition there are in excess of 175 iron crumbs recovered from soil samples (Table 21). The metal finds include a small broad leaf-shaped spearhead, broken and heavily encrusted (context 2904) and a post-medieval horseshoe (context 4532). There are just three nails (six fragments). There are three possible bar or rod fragments, two with leaf-shaped points or terminals (context 4382 and 5038), one with a knob terminal. These are not closely datable.

Context	Sample No	Count
2208	2010	25+
2301	2009	25+
4077	2062	25+
4273	2124	25+
4287	2125	100+

Table 21: Passingford Bridge Bund: Summary of metal fragments from soil samples

The most numerous finds are seven flat irregular fragments or blocks ranging in size from 152mm x 75mm x 30mm to 125mm x 80mm x 40mm from the fills of a post-medieval pit (3130) (Table 22).

Context	Count	Measurements (mm)	Description
3131	3	150 x 107 x 30 130 x 93 x 40 144 x 75 x 30	3 x dense blocks
3132	2	152 x 75 x 30 125 x 80 x 40	2 x dense blocks
3134	1	70 x 70 x 35	fragment of dense block
3135	1	105 x 61 x 35	Dense block

Table 22: Passingford Bridge Bund: Summary of dense irregular iron blocks or fragments

Pond 1609

There is a single metal object and 15 undiagnostic small fragments from Pond 1609. The nail with a small solid domed head and the fragments are from context 1015.

Folkes Lane

The only metal find was a narrow modern horseshoe with fullering (context 105).

Codham Bund

This site produced two nails (eight fragments) (context 356), two small irregular undiagnostic lumps (context 356), and 20 crumbs of irregular sizes (context 359). The crumbs from context 359 and irregular lumps from context 356 are not quantified in Table 20, but their presence is noted.

Pond 1812

There are a fragment of thick bar (context 193), and small piece of probable (context 225) and two small undiagnostic fragments (context 236). The latter are not quantified in Table 1.

B.8 Slag

Edward Biddulph

A total of 5075 pieces of slag, with a total weight of 10.6kg, were recovered from six sites along the Section 4 works. The largest assemblage came from Passingford Bridge (M25002.09); notable groups were also collected from Hobbs Hole (M25001.08), Pond 1609 (M25003.09) and Upminster Bund (M25008.09). In addition, Denise Druce noted fragments of burnt slag in environmental samples from Pond 1683.

At Hobbs Hole, the metalworking evidence is almost exclusively from Roman-period features. A single fragment (2g) was recovered from a hollow-way assigned to the Bronze Age, but this is likely to be intrusive. Otherwise, the assemblage was concentrated in mid and late Roman pits and ditches. The assemblage from Passingford Bridge had an earlier emphasis: slag was recovered from the pits, ditches and roundhouse gullies of the late Iron Age settlement, although some material also came from a late Roman waterhole and a mid Roman ditch. Intriguingly, slag was extracted from samples collected from postholes provisionally dated as Bronze Age; one of the postholes was close to the posthole avenue. Similarly, at Upminster Bund, slag was recovered from pits belonging to the Bronze Age/early Iron Age pit and ditch alignment or boundary.

Overall, the assemblage consisted of bulk slag, such as fragments of smithing hearth bottom, and hammerscale or micro-slag, which consists of fish-scale like fragments of iron dislodged during working, or spheroidal droplets of liquid slag expelled during hot working. It is important in interpretation of activity on sites, because it is highly diagnostic of smithing and tends to build up in the immediate vicinity of the smithing hearth and anvil. Hammerscale may therefore give a more precise location of smithing than the bulk slags, which can be deposited away from activity areas.

Site	Fragment count	Weight (g)	Comments
M25001.08	284	1483	Hammerscale, bulk slag
M25002.09	3888	8940	Hammerscale, occasional bulk slag
M25003.09	389	67	Hammerscale
M25007.09	1	1	Hammerscale
M25008.09	512	73	Hammerscale
M25024.11	1	1	Hammerscale
TOTAL	5075	10565	

Table 23: Quantities of slag by site

B.9 Wood

Edward Biddulph

Forty-seven fragments of wood were recovered from late Roman waterhole 3652, Passingford Bridge. Pieces from 3662 included small branches or twigs, and a larger piece (SF2012) had cut marks. Unworked branch-like pieces were recovered from contexts 3653 and 3654.

B.10 Human bone

Helen Webb

Introduction

Cremation deposits were recovered from four of the Section 4 sites: Hobbs Hole (M25001.08), Passingford Bridge (M25002.09), Pond 1791 (M25023.11) and Upminster Bund (M25008.09). A small quantity of unburnt human bone was recovered from Hobbs Hole (M25001.08).

At Hobbs Hole cremated bone was recovered from a Roman feature (group 6104), which comprised two urned deposits (6100, in urn SF 110 and 6102 in urn SF 113) within pit 6096. The pit also contained a grave good vessel (SF 111). This contained a small amount of bone but the field records suggest the fill of the pot comprised naturally accumulated clay, thus the bone within it probably came from the surrounding fills. Indeed, loose cremated bone was present in the upper (6097) and lower (6103) fills of the pit.

Unurned cremation deposits from Hobbs Hole were recovered from earth-cut pits 5069 (deposit 5070), 6094 (deposit 6095), 6092 (deposit 6093) and 4303 (deposit 4304). The field records for deposits 4304 and 5070 state that the features were heavily truncated and that fragments of pot was also recovered, indicating that they may originally have been urned. This could not be proved however. It must also be stated that deposits 5070, 6095 and 6093 could not be confirmed as human bone. The texture of some of the fragments of bone within these deposits was very dense, more similar to animal bone. In addition, in the case of 6093, the colour of the bone fragments was very varied, indicating varying degrees of oxidation, as may be expected of burnt animal bone waste. That said, the overall low weights and small fragment size of the bone from these three deposits precluded any firm identification of skeletal elements as either human or animal, hence their inclusion in this report.

A further deposit of cremated bone (5005) was recovered from feature 5006 (Hobbs Hole), recorded during excavation as a tree-throw.

The only unburnt human bone recovered came from Roman pit feature 7054 (fill 7056) at Hobbs Hole.

At Passingford Bridge, one Roman feature (group 2009) yielded cremated human bone. Pit 2003 contained cremation urn 2005 (SF 2000), and grave good vessel 2006 (SF 2001), which contained no bone. Loose cremated bone was present in the upper (2004) and lower (2008) fills of the pit.

Excavations at Pond 1791 revealed a single, unurned deposit of cremated human bone (110), within pit 109. The sole cremation deposit from Upminster Bund (1167) was also unurned, and came from pit 1166.

The following report provides a brief summary of the results of the osteological analysis and gives recommendations for further work.

Methodology

In accordance with recommended practice (McKinley and Roberts 1993) all cremation deposits were subjected to whole-earth recovery and cleaned by wet sieving, which sorted the bone into >10 mm, 4-10 mm, 4-2 mm and <2 mm (residues) fractions. This includes the cremation urns from Hobbs Hole and Passingford Bridge which, owing to fragmentation, could not be lifted as whole vessels and excavated in spits.

Full osteological analysis of the burnt and unburnt remains was carried out with reference to standard guidelines (Brickley and McKinley 2004). The cremated bone was examined for colour, weight and maximum fragment size. Each fraction was examined for identifiable bone elements and the presence of pyre and grave goods. The minimum number of individuals present, and estimation of age and sex was attempted for all deposits (burnt and unburnt). A summary of the results is given below.

Summary of results

Cremated bone

Table 24 summarises the cremated bone deposits with reference to weight, colour and fragmentation. Most deposits were largely white in colour. Small amounts of grey coloured bone was seen in deposits 5005, 5070, 6095 and 6097 (Hobbs Hole), 2004 (Passingford Bridge), 110 (Pond 1791) and 1167 (Upminster Bund). Deposit 6093 (Hobbs Hole) exhibited a wider variety of colours.

Of the Hobbs Hole deposits, 4304, 5070, 6093 and 6095 comprised very small amounts of bone (between 0.4 and 12.8g only). None of these deposits contained bone fragments larger than 10mm. As a result, no fragments could be identified to skeletal element in three of these four deposits (5070, 6093, 6095), therefore it could not be confirmed whether they were human or non-human. A small number of fragments were identified in deposit 4304, including mandible and upper and lower limb bones.

Deposit 5005 (Hobbs Hole) comprised a more moderate weight of bone (48.5g). Various skeletal elements were identified, including skull, ribs, upper and lower limb bones. The Hobbs Hole deposits that formed part of group 6104 (in pit 6096), with the exception of deposit 6101, also had higher bone weights (between 20.6g and 218.8g). These were also highly fragmented, but deposits 6100, 6102 and 6097 contained fragments over 10mm in size. Cranium, tooth roots, hand and foot, limb bones and ribs were all identified.

The cremation deposits from Passingford Bridge (group 2009) comprised moderate weights (57.3 g – 182.1 g), including a large proportion that were over 10 mm in size. Many fragments could be identified to element, including those from the cranium, ribs, and upper and lower limb bones.

Cremation deposit 110 from Pond 1791 weighed 46 g, with most fragments in the 4-2 mm fraction, and no fragments over 10 mm in size. A small proportion of fragments could be identified to element, including a piece of cranial vault and a foot phalanx fragment.

While the total weight of the Upminster Bund deposit (1167) was only 5.5 g, most of the fragments were 10-4 mm in size. Identified fragments included cranial vault and upper limb bones.

None of the cremation deposits, from any of the sites, contained repeated skeletal elements; therefore the minimum number of individuals (MNI) represented in each deposit was one.

All of the cremation deposits appeared to contain adult remains, although no specific skeletal indicators were present that could aid in estimation of specific age or sex. No pathological lesions or non-metric traits were observed.

Context	Colour of bone	Total weight of bone	Degree of fragmentation	Deposit type/relationship of deposits	Comments
Hobbs Hole (M25001.08)					
4304	White	12.8 g	Small quantity overall, most bone within 10-4mm, none >10mm	Unurned deposit, fill of pit 4303	Possibly urned originally
5005	White, grey	48.5g	Most bone in 10-4mm, few frags >10mm	Deposit from feature recorded as a treethrow	
5070	White/grey	0.4 g	V small quantity overall. All bone from 4-2mm and sorted <2 mm fractions	Unurned deposit, fill of pit 5069	Possibly urned originally. Unable to confirm as human bone.
6093	Mixed brown, black, grey, white	6.4g	Small quantity overall, most bone from 10-4mm, none >10mm	Unurned deposit, fill of pit 6092	Unable to confirm as human bone
6095	White/grey	3.0 g	Small quantity overall, none >10mm	Unurned deposit, fill of pit 6094	Unable to confirm as human bone
6100	White	194.1 g	Most bone from 4-2mm but almost equal amount in 10-4mm, a few frags >10mm, <2mm fraction rich in bone	Deposit from urn SF 110, in pit 6096 (part of group 6104)	Total weight includes estimated 76 g from unsorted <2 mm residues (est. 80% cremated bone)
6101	White	5.4 g	Small quantity overall, equal amounts in 10-4 mm, 4-2mm. None >10mm	Deposit from pot 111 – probably naturally accumulated in pot from surrounding fills, not an urned deposit (part of group 6104)	Total weight includes estimated 2g from unsorted <2mm residues (est. 0.5% cremated bone)
6102	White	54.6 g	Most bone from 10-4mm, v few frags >10mm, <2 mm fraction rich in bone	Deposit from urn SF 113, in pit 6096 (part of group 6104)	Total weight includes estimated 23g from unsorted <2 mm residues (est. 60% cremated bone)
6103	White	20.6 g	Most bone from 4-2mm, none >10mm	Lower fill of pit 6096 (part of group 6104)	Total weight includes estimated 9g from unsorted <2 mm residues (est. 25% cremated bone)
6097	White/grey	218.8 g	Most bone from 10-4 mm, numerous frags >10mm and <2 mm fractions	Upper fill of pit 6096 (part of group 6104)	Total weight includes estimated 66 g from unsorted <2 mm residues (est. 40% cremated bone)

Context	Colour of bone	Total weight of bone	Degree of fragmentation	Deposit type/relationship of deposits	Comments
Passingford Bridge (M25002.09)					
2004	White/grey	61 g	Some fragments >10 mm, most from 10-4 mm	Upper fill of pit 2003, part of group 2009)	Total weight includes estimated 12 g from unsorted <2 mm residues (est. 10% cremated bone)
2007	White	182.1 g	Large proportion of fragments >10 mm	Deposit from urn SF 2000, in pit 2003 (part of group 2009)	
2008	White	57.3 g	Some fragments >10 mm, most from 10-4 mm	Lower fill of pit 2003 (part of group 2009)	Total weight includes estimated 13 g from unsorted <2 mm residues (est. 10% cremated bone)
Pond 1791 (M25023.11)					
110	White/grey	46.0 g	No frags >10mm, most frags within 4-2mm fraction	Unurned deposit, fill of pit 109	Total weight includes estimated 4g from unsorted <2 mm residues (est. 1% cremated bone)
Upminter Bund (M25008.09)					
1167	White/grey	5.5 g	No frags >10 mm, all within 10-4mm and 4-2 mm fractions	Unurned deposit, fill of pit 1166	

Table 24: Summary of colour, weight and fragmentation of the cremation deposits (SF = small find)

Unburnt bone

The fragments comprised partially preserved left and right tibiae from a very young juvenile, probably a neonate or infant. Judging by the size and condition they were probably from the same individual. No pathological lesions were present.

APPENDIX C. ASSESSMENT OF ENVIRONMENTAL EVIDENCE

C.1 Animal bone

Lena Strid

Introduction

The animal bone assemblages from the sites along the section 4 of the M25 Widening road scheme - Hobbs Hole (M25001.08), Pond 1609 (M25003), Upminster Bund (M25008), Passingford Bund (M25002.9), Pond 1812 (M25024.11), and Pond 1824 (M25025.11) - comprises 1630, 6, 13, 2407, 3 and 18 fragments respectively. Bones from the residues of sieved soil samples form a substantial part of the Upminster Bund and Passingford Bund assemblages (77% and 89%) but comprise a more modest part of the Hobbs Hole assemblage (28%).

With exception of a small number of Bronze Age bones, the majority of the Hobbs Hole assemblage dates to the late Iron Age up to the late Roman period. Features excavated at Upminster Bund were solely the late Bronze Age/early Iron Age, while those from Passingford Bund range in date from the late Iron Age to the late Roman period, albeit with the majority dating to the late Iron Age. A full record of the assessed assemblage, documented in a Microsoft Access database, can be found with the site archive.

The bones were identified at Oxford Archaeology using a comparative skeletal reference collection in addition to standard osteological identification manuals, such as Cohen and Serjeantson (1996), Hillson (1992) and Schmid (1972). Approximately 10% of the total estimated number of bones were fully recorded for this assessment. All the animal remains were counted and weighed, and where possible identified to species, element, side and zone (Serjeantson 1996). With exception of skull and horn core fragments, no attempt was made at this stage to distinguish bones from sheep and goat; instead all were classified as ‘sheep/goat’. Long bone fragments, ribs and vertebrae, with the exception for atlas and axis, were classified by size: ‘large mammal’ representing cattle, horse and deer, ’medium mammal’ representing sheep/goat, pig and large dog, and ‘small mammal’ representing small dog, cat and hare sized.

The general condition of the bones was graded on a 6-point system (0-5), grade 0 equating to very well preserved bone and grade 5 indicating that the bone had suffered such structural and attritional damage as to make it unrecognisable (Table 25).

Ageing was carried out on fused and unfused epiphyses (Habermehl 1975) and mandibles with recordable teeth (Grant 1982). Sexable elements, ie. cattle pelves, sheep/goat skulls and pelves, pig canine teeth, deer antler and medullary bone in bird long bones, were recorded using data from Boessneck et al. (1964), Prummel and Frisch (1986), Schmid (1972) and Vretemark (1997). Bones were measured according to von den Driesch (1976).

Grade 0	Excellent preservation. Entire bone surface complete.
Grade 1	Good preservation. Almost all bone surface complete. No cracks in bone.
Grade 2	Fair preservation.
Grade 3	Poor preservation. Most bone surface destroyed.
Grade 4	Very poor preservation. No surface structure remaining.
Grade 5	Extremely poor preservation. Unlikely to be able to identify element.

Table 25: Bone preservation grading methodology

Hobbs Hole

The animal bone assemblage from Hobbs Hole comprises a total of 1170 hand-collected fragments, as well as approx. 460 fragments from sieved samples. A rapid scan of the sieved samples from Hobbs Hole indicates that only 17 bones, representing cattle, sheep/goat, pig and cf. teal (*Anas crecca*), can be identified to species. The sieved fragments have not been fully recorded and do not feature further in this assessment.

The assemblage is generally in a good to fair condition, the exception being the poorly preserved bones from Bronze Age features (Table 26). Bones with traces of carnivore gnawing are found in all time periods except for the Bronze Age. They are most common in the early and middle Roman assemblages, but are rare in the late Roman assemblage. This may be connected to differences in waste disposal. Burnt bones are very rare, only occurring in small numbers in the early Roman and unphased Roman assemblages.

Of the 1170 bones included in the assessment, an estimated 353 (30.2%) can be identified to taxon (Table 27). The identified animals include cattle, sheep/goat, pig, horse, dog, red deer, roe deer and domestic fowl. With the exception of a very small Bronze Age assemblage, the majority of the bones came from Roman features. Cattle is the dominant species throughout the period, which is consistent with other contemporary Essex sites (Johnstone and Albarella 2002, 46-47). Articulated remains or otherwise unusual deposits of animal bones were not discovered on the site.

The number of bones providing data for ageing, sexing, biometrics, butchery and pathology is relatively low, particularly when dividing the Roman assemblage into sub-phases (Table 28). The assemblage is therefore of more value as part of a regional study than as a chronological analysis of a single settlement. In order to carry out a reliable intra-site comparison of the major domestic taxa - cattle, sheep/goat and pig - a minimum number of 300 fragments or a calculated minimum number of 30 individuals is required (Hambleton 1999, 39). If the identifiable sieved fragments are added to the hand-collected fragments it will be possible to analyse the assemblage for the Roman period as a whole.

	n	0	1	2	3	4	5
Bronze Age	11		9.1%		9.1%	81.8%	
Early Roman	96	11.5%	35.4%	53.1%			
Early Roman - Middle Roman	149	4.0%	24.2%	66.4%	5.4%		
Mid Roman	109	0.9%	35.8%	31.2%	30.3%	1.8%	
Late Roman	283	3.5%	54.4%	41.3%	0.7%		
Roman	271	8.5%	68.3%	18.8%	1.8%		

Table 26: Preservation level for contexts from all phases of the Hobbs Hole assemblage

Species	BA	ER	ER-MR	MR	LR	Unphased Roman	Unphased
Cattle	1	23	31	24	44	118	25
Sheep/goat		2	10	5	8	17	14
Pig				2	2	1	1
Horse			6	2	3	2	4
Red deer			1	1			
Roe deer		1					
Dog		4					
Domestic fowl		1					
Indet. bird							1
Small mammal							1
Medium mammal		2	6	4	4	6	4
Large mammal		19	9	36	55	36	26
Indeterminate	10	44	86	45	167	101	175

Total fragment count (NISP)	11	96	149	109	283	271	251
Identifiable to species	1	31	48	34	57	138	44
Total weight (g)	4	2070	2750	2019	2699	4588	1457

Table 27: Number of identified fragments by species and phase for the Hobbs Hole assemblage

	Bronze Age	Roman					Unphased
		ER	ER-MR	MR	LR	R	
Ageable mandibles				1	4	11	2
Ageable bones		6	6	13	7	17	3
Sexable bones		4	2			1	
Measureable bones		1	1	2	1	6	1
Butchery marks		1		2		1	4
Pathologies					1		

Table 28: Number of mandibles and bones in the Hobbs Hole assemblage providing data on ageing, sexing, measuring, butchery and pathologies

Passingford Bund

The assessed part of the Passingford Bund assemblage comprises 1007 fragments, of which 842 (83.6%) come from sieved soil samples. Bones from sieved fractions less than 4mm, estimating 1400 fragments, are not included in this assessment. The features date from the late Iron Age to the Late Roman period.

Despite the comparatively large size of the assemblage only 39 bones from the assessed portion are identifiable to taxon (Table 29). Animals represented in the assemblage are cattle, sheep/goat, pig and horse. Data on ageing and pathologies are scant (Table 30) and the assemblage would yield very little information on animal keeping in the Iron Age and Roman periods.

Species	LIA	ER	MR	LR	Unphased
Cattle	10	4	1	10	
Sheep/goat	1				1
Pig	9				
Horse			1	2	
Medium mammal	30			1	6
Large mammal	10		1	4	2
Indeterminate	690	3	4	57	160
Total fragment count (NISP)	750	7	7	74	169
Identifiable to species	20	4	2	12	1
Total weight (g)	273	26	23	784	32

Table 29: Identified species for all phases of the Passingford Bund assemblage

	LIA	ER	MR	LR	Unphased
Ageable mandibles					1
Ageable bones				2	
Sexable bones					
Measureable bones					
Butchery marks					
Pathologies			1		

Table 30: Number of mandibles and bones in the Passingford Bund assemblage providing data on ageing, sexing, measuring, butchery and pathologies

Pond 1609

The assemblage from Pond 1609 consists of six bones from three possible cremations, which had been truncated by plough damage (Table 31). With exception of two intrusive rabbit bones from context (1021) the bone fragments are small and apparently accidentally deposited.

Species	Context 1007	Context 1015	Context 1021
Rabbit			2
Small mammal		1	
Indeterminate	1	2	
Total fragment count (NISP)	1	3	2
Identifiable to species			2
Total weight (g)	0	0	2

Table 31: Identified species from the Pond 1609 assemblage

Upminster Bund

The majority of the Upminster Bund assemblage are small unidentifiable burnt fragments from sieved soil samples, all from features preliminary dated to the late Bronze Age/early Iron Age. Only one fragment is speciable (Table 32): a cattle cheek tooth which came from pit (1026).

Species	LBA/EIA
Cattle	1
Medium mammal	1
Large mammal	1
Indeterminate	10
Total fragment count (NISP)	13
Identifiable to species	1
Total weight (g)	34

Table 32: Identified species from late Bronze Age/early Iron Age phase from the Upminster Bund assemblage

Pond 1812

The tiny assemblage from Pond 1812 comprises one fragmented cattle tooth from tree throw (238) and two large mammal bones from drainage ditch (203). As the area does not contain any settlement remains, the bones were probably deposited on the site as part of waste management or field fertilisation processes.

Species	Medieval	Post-medieval
Cattle	1	
Large mammal		2
Total fragment count (NISP)	1	2
Identifiable to species	1	
Total weight (g)	5	87

Table 33: Identified species from the Pond 1812 assemblage

Pond 1824

The assemblage from Pond 1824 comes from two late Bronze Age/early Iron Age pits (132, 137). The only speciable bones were tooth fragments from cattle and sheep/goat (Table 34). The bone preservation is poor, a common feature in contemporary deposits from the area (see Hobbs Hole).

Species	Fill 133 (pit 132)	Fill 138 (pit 137)
Cattle	5	
Sheep/goat		1
Large mammal	6	6
Total fragment count (NISP)	11	7
Identifiable to species	5	1
Total weight (g)	70	14

Table 34: Identified species from the Pond 1824 assemblage

C.2 Charred plant remains and charcoal

Sandra Bonsall, Denise Druce and John A Giorgi

Methodology for all sites except Hobbs Hole

Sample were processed by flotation in a modified Siraf-type machine. The resultant flots were collected in a 250 micron sieve and the heavy residues were retained in a 0.5mm nylon mesh. Both were then air-dried. The heavy residues were hand-sorted and any plant remains, or charcoal fragments over 4mm in size, were extracted. The flot and hand-sorted material was observed using a Leica MZ60 stereo microscope at up to x40 magnification and any surviving CPR was quantified and identified where possible. If waterlogged plant remains (WPR) were present, these were also quantified and provisionally identified. Other remains, such as insect fragments, molluscs, bone, coal, clinker, mortar, and ceramic building material (cbm) was also quantified, as were modern contaminants such as roots and modern seeds. Any charcoal fragments within the bulk samples were also quantified and provisionally identified where possible. In particular, the presence of any short-lived wood taxa such as *Alnus* (alder), *Corylus* (hazel) or *Prunus* sp. (blackthorn-type) (all diffuse porous wood) was noted for the purpose of providing suitable material for dating. Identifications were made with reference to standard texts (Cappers *et al.* 2006; Hather 2000) and a small reference collection. Classification and nomenclature follow Stace (2010) and Hather (2000).

Hobbs Hole (John A Giorgi)

Introduction

During excavations at Hobbs Hill, environmental bulk soil samples were systematically collected from three areas of the site for the potential recovery of biological materials including macro-botanical remains. The following report is concerned with the assessment of charred plant material from the site, which may provide information on crop-husbandry and processing, the function of the sampled features and thus the spatial distribution of different activities across the settlement. The samples were also assessed for the presence of identifiable charcoal fragments for potential information on woodland resources and management and fuel selection for domestic, economic and ritual use.

Sampling, recovery and identification methods

A total of 43 environmental samples were selected for assessment. Most of the samples (31) were from features within the Eastern Area of excavation, while seven and three samples were collected from the Western and Southern Areas respectively. The other two samples were from Evaluation Trench 43 situated *c* 40m north-east of the Southern Area. The samples were recovered from fills associated with the following feature types: pits (nine samples from eight pits); quarry pits (12 samples from eight pits); ditches (nine samples from seven ditches); and cremations (ten samples from five cremations). The other three fill samples were from a tree-throw hole, a linear feature and an undefined context.

Virtually all the datable samples were from the Roman period, almost half (21 samples) belonging to early/middle Roman (AD 43-250) features and 12 to late Roman (AD 250-400) contexts; two samples have been broadly dated to the Roman period. One sampled fill was dated to the Saxon period while the remaining seven samples are from presently undated

features. The volume of the individual soil samples ranged from under one to 40 litres, although most were at the upper end of this scale, with 26 samples being 40 litres. The samples were processed using a Siraf-style type flotation tank with mesh sizes of 0.25 mm and 0.5 mm for the recovery of the flot and residue respectively.

The residues were dried and sorted for biological remains and other archaeological material. The flots were also dried and measured, and ranged in volume size from under 1ml to 267ml, although the majority were small, with almost 50% of the flots being 10ml or less. The flots were divided into fractions using a stack of sieves for ease of assessment and scanned dry using a stereo-binocular microscope, with a magnification of up to x40.

The presence and relative abundance of charred grain, cereal chaff and other remains (potential food remains and wild plants/weed seeds) were recorded, along with the frequency of charcoal fragments larger and smaller than 2mm, the larger pieces being potentially identifiable and thus suitable for analysis. Other biological remains in the flots were also recorded which included un-charred plant material, bones, snails and insect remains.

The item frequency of the charred plant and other environmental remains was scored using the following scale: + = <5 items; ++ = 5-25 items; +++ = 26-100 items; ++++ = 101-300 items; +++++ = >300 items. Recommendations for analysis was based on the size of the individual charred plant assemblages in terms of the number of identifiable items, with the following codes being used to define their potential: A = rich charred plant assemblages (containing more than 300 identifiable items); B = good assemblages (between 100 and 300 identifiable items); C = moderately good remains (between 50 and 100 identifiable items); D = poor assemblages containing less than 50 and usually less than ten items); and F (unproductive flots with no identifiable charred plant remains). Provisional identification of the charred botanical remains was carried out during assessment although without direct comparison to reference material and seed reference manuals. Nomenclature used for these identifications followed Stace (2005).

Charcoal fragments (greater than 2mm) showing the transverse section were provisionally identified (using a magnification of up to x40) although this was based only on material with existing breaks which greatly limited the number of fragments available for assessment. At the analysis stage the radial and tangential sections will also be examined.

There follows a general discussion of the results and then a breakdown by area and period. Section 1.5 for an assessment of potential and recommendations for further analysis, based on the quantity and quality of the individual charred plant assemblages.

Results

The flot assessment results for the individual samples are listed by area in Table 35. This table shows the frequency of the different biological remains in the individual flots and comments on each assemblage, including provisional identifications of any botanical materials.

Identifiable charred plant remains were present in 32 of the 43 flots although most of the assemblages were small, with almost two-thirds (*c* 66%) producing only occasional or small amounts (D) of identifiable remains. Just five samples produced good sized (B) or rich (A) assemblages, from early/mid Roman quarry pit fills [5083] (sample 109) and [7014/7018] (sample 118), late Roman quarry pit fills [5098] (sample 107), [5099] (sample 108), and pit fill [6016] (sample 124). Six samples produced moderate sized (C) assemblages, from early/middle Roman ditch fill [7233] (sample 147) and pit fill [7055] (sample 132), late Roman quarry pit fill [5162] (sample 114) and Quarry Pit [6071] (samples 143, 144) and undated ditch fill [5133] (sample 110). Eleven flots contained no identifiable charred botanical material.

Charred cereal grains were noted in 28 samples although preservation of this material was generally very poor with the majority being fragmentary and unidentifiable. Only one sample, from late Roman quarry pit fill [5098] (sample 107) produced over a hundred poorly preserved grains, while four samples produced moderate amounts (between 25 and 100); from early/middle Roman ditch fill [7233] (sample 147), quarry pit fills [7014/7018] (sample 118) and [5085] (sample 109); and late Roman quarry pit fill [5099] (sample 108).

Triticum sp. (wheat) was the most frequent identifiable grain (in 22 samples) including both hulled wheat, cf. *Triticum spelta* (?spelt), *Triticum dicoccum/spelta* (emmer/spelt), and free-threshing wheat (*Triticum aestivum* type). There were relatively few and poorly preserved *Hordeum* sp. (barley) grains in four flots and a few possible *Avena* sp. (oat) grains in three samples although at this stage it was not possible to establish whether the latter were from cultivated and/or wild oats because no diagnostic floret bases were noted.

Charred cereal chaff was present in 23 flots and accounted for most of the identifiable material in the five richest assemblages listed above – the early/mid Roman quarry pit fills (samples 109, 118) and late Roman quarry pit fills (samples 107, 108) and pit fill (sample 124). There were moderate amounts of chaff (between 25 and 100 items) in four samples and occasional or small quantities in the other 14 flots. This material was generally well-preserved and identifiable and virtually all from hulled wheat, with glume bases, spikelet forks/bases and rachis fragments. The better preserved remains were provisionally identified as spelt wheat, suggesting that most of the hulled wheat grains are also from this species. Occasional barley rachis fragments were noted in the early/mid Roman quarry pit [5085] fill (sample 109) while other potential cereal debris included a few charred grass/cereal culm node fragments in late Roman quarry pit fill [6073] (sample 144).

Other identifiable charred plant material consisted of wild plant/weed seed remains in 25 samples; these assemblages, however, were generally very small with poor preservation of material and low species diversity. Only two flots contained moderate amounts of material (between 25 and 100 items), from early/mid Roman quarry pit fill [7014/7018] (sample 118) (consisting mainly of Bromus (brome) seeds) and late Roman quarry pit fill [5098] (sample 107). Charred Poaceae (grass) seeds (both large, mainly *Bromus*, and small-seeded) and small rounded indeterminate *Fabaceae* (legume) seeds were the most common finds; other arable weeds/wild plants included *Polygonum aviculare* (knotgrass), *Rumex* spp. (docks), *Plantago lanceolata* (ribwort plantain), *Galium* sp. (bedstraw), *Anthemis cotula* (stinking chamomile), *Vicia/Lathyrus/Pisum* spp. (vetch/tare/vetchling/pea), and *Medicago/Trifolium* spp. (medick/trefoil). A few *Rubus* (blackberry/raspberry) seeds in one flot may represent the burnt residues of a collected and consumed fruit although a large number of un-charred *Rubus* seeds in the same sample may suggest that all these seeds are intrusive. A small number of *Arrhenatherum elatius* (onion couch grass) tubers were present in the early/mid Roman cremation fill [4304] (sample 102), which may represent the residues of spent fuel.

Charcoal was present in all the flots with potentially identifiable charcoal fragments (greater than 2mm) being noted in 35 or just over 80% of the samples although 21 of these flots only contained small amounts of identifiable fragments. Ten samples produced moderately rich amounts of charcoal fragments greater than 2mm, from early/middle Roman quarry pit fill (sample 109), ditch fill (sample 123) and pit fill (sample 129); from late Roman pit fill (sample 124) and quarry pit fills (samples 107, 114, 143); from Roman quarry pit fill (sample 145); and from undated ditch fill (sample 110) and pit fill (sample 101). The four charcoal-rich samples were from early/middle Roman fill [5006] (sample 105) and quarry pit fill [7018/7014] (sample 118), and from undated fill [5051] (sample 126) and ditch fill [5149] (sample 112). The ten cremation fills only produced small flots (all less than 5ml) with just five of these fills containing occasional potentially identifiable charcoal fragments. Assessment and provisional identification

of the charcoal fragments was limited because of the paucity of clean breaks showing the transverse section although several fragments were tentatively identified as *Quercus* sp. (oak), *Quercus/Fraxinius* sp. (oak/ash) and Pomoideae (hawthorn, apple, pear etc.).

Un-charred plant remains, consisting virtually entirely of seeds and fruits, were present in 33 flots, being from a small range of plants associated mainly with disturbed/waste ground environments, for example *Atriplex/Chenopodium* spp. (oraches/goosefoots etc.), Polygonaceae (docks, knotgrasses, knotweeds), *Sambucus* sp. (elder) and *Rubus* sp. (brambles). The number of these seeds in most of the individual flots, however, was small, 27 of the 33 samples only containing occasional un-charred remains which are probably intrusive given the low number of seeds and the presence of roots/rootlets in many of the samples. Larger assemblages of un-charred seeds in the other six samples consisted almost entirely of seeds from the wetland plant, *Lemna* spp. (duckweeds), present in Roman quarry pit fills (samples 109, 114), ditch fills (sample 147, 148) and Saxon pit fill (sample 119), while large numbers of *Rubus* seeds made up most of the un-charred remains in an undated ditch fill (sample 125). These remains are also probably intrusive given the low species diversity and the presence of roots/moss fragments in all five samples although the presence of duckweed could tentatively point to the presence of temporary bodies of water in these features at some time in the past.

Other biological materials included very small poorly preserved bone fragments in 24 flots, 19 containing only occasional and probably unidentifiable remains. The other five samples mainly consisted of burnt bone flecks from Roman cremations [6092] (sample 130) and [6096] (samples 133, 134, 137) and an undated fill (sample 126). Eight of the ten cremation fills produced very fragmentary (and burnt) bone. There were a few small mammal bone fragments in six of the flots. Very occasional insect (including beetle) remains were noted in 13 flots although this material is probably intrusive while a few molluscs were recorded in 11 samples.

Eastern area

Thirty-one samples were assessed from the eastern area of excavation from early/middle Roman deposits (12 samples), late Roman contexts (11 samples), one Roman fill, a Saxon deposit and undated features (six samples).

Early to mid Roman: eight of the 12 early to mid Roman samples from the eastern area contained identifiable charred plant remains. Eight of the samples were from four cremations, five of the samples being associated with cremation [6096]; all these cremation fills however produced very small flots with only traces of grain, chaff and weed seeds in five samples and occasional potentially identifiable charcoal fragments in four flots. Pit fill [1105] (sample 100) contained a few charred grains and a few identifiable charcoal fragments, ditch fill [6059] a small charred plant assemblage and moderate numbers of identifiable charcoal fragments, while a large quantity of charcoal (but no other charred plant remains) was found in sample 105 from fill [5006] (along the fringes of the northern central part of the site). Only quarry pit fill [5085] in the north-western corner of the excavation produced a rich charred plant assemblage mainly consisting of spelt wheat chaff plus a moderate number of poorly preserved grains, a small number of weed seeds and moderate amounts of identifiable charcoal fragments.

Late Roman: charred plant remains were found in nine of the 11 late Roman samples associated with six pits (mainly quarry pits) and included three rich charred plant assemblages in Pit [6015] (sample 124) and Quarry Pit [5096] (samples 107, 108), all three flots consisting mainly of cereal chaff (mainly spelt wheat) and smaller numbers of grains and weed seeds. There was also a large amount of identifiable charcoal in both pits. These two features were fairly close to one another in the central western area of the excavation. There were also moderate amounts of identifiable charred plant remains (mainly chaff) (and including charcoal)

in samples 143 and 144 from Quarry Pit [6071] just to the south of the three rich assemblages. In the eastern half of this excavation area, two late Roman samples from Pit [5174] (sample 116) and Quarry Pit [5161] (sample 114) (relatively close to one another), produced small charred plant assemblages which included some identifiable charcoal fragments. Two other late Roman samples (120, 121) from Quarry Pit [6017] also contained occasional charred plant remains and a few identifiable charcoal fragments.

Roman: sample 113 from Quarry Pit [5158] only broadly dated as Roman, in the north-eastern corner of the excavation area, contained no identifiable charred plant remains but a few potentially identifiable charcoal fragments (including possibly *Quercus*).

Saxon: the one Saxon sample 119 from Pit [5071] (north central perimeter of the excavation) produced neither identifiable charred plant remains nor charcoal.

Undated: five of six samples from undated pit and ditch fills produced small charred plant assemblages, with the best remains being in Ditch [5132] (samples 110,111), in the same area containing the rich plant assemblages from the Late Roman features. All six samples produced identifiable charcoal fragments, with particularly rich amounts in linear feature [5046] (sample 126) (north-western corner) and Ditch [5148] (sample 112).

Western area

Seven samples were assessed from the western area of excavation, five from early/middle Roman deposits and single samples from a Late Roman and Roman context. All the samples were from the northern half of this excavation area.

Early to mid Roman: all five early to mid Roman samples contained identifiable charred plant remains with a very rich charred plant assemblage from Quarry Pit [7012] (sample 118) in the north-eastern corner of the western area, with large amounts of chaff (especially from spelt wheat) and moderate numbers of grain and weed seeds, as well as frequent identifiable charcoal fragments (possibly *Quercus* and Pomoideae). Moderate amounts of identifiable charred plant material (and occasional identifiable charcoal fragments) were recorded in Ditch [7231] (sample 147) (mainly spelt wheat chaff) and Pit [7054] (sample 132) (also mainly chaff), with these two features being relatively close to one another and to the south-east of the rich Quarry Pit [7012]. Occasional charred grains were found in sample 148 from Ditch [7223] just to the south of these two features.

Late Roman: sample 149 from the fill of an unknown feature [7225] produced no identifiable charred plant remains or charcoal.

Roman: Quarry Pit [7190] sample 145 (to the north of the northern enclosure) contained traces of charred grain and seeds and a moderate number of identifiable charcoal fragments including possibly *Quercus*.

Southern area

Three samples were assessed from the southern excavation area, two from early/middle Roman contexts and one from an undated pit fill.

Early to mid Roman: samples 127 and 129 from ditch fill [5955] and pit fill [5981] respectively, only contained very occasional charred plant remains (grain, chaff, weed seeds) and small amounts of identifiable charcoal.

Undated: sample 128 from undated Pit [5974] produced only traces of cereal grain and occasional potentially identifiable charcoal fragments.

Trench 43

This evaluation trench was located about 40m north-east of the southern excavation area with two samples (102, 103) being recovered from an early/mid Roman cremation [4303]; sample 102 contained a few identifiable charcoal fragments and charred *Arrhenatherum elatius* (onion couch grass) tubers, often found in cremation deposits and probably collected as tinder. There were no identifiable charred plant remains (including charcoal) in sample 103.

Discussion

The majority of the cereal grains were poorly preserved. The initial results suggest that wheat was the best represented grain, with the rich assemblages of hulled wheat chaff fragments in several samples suggesting spelt wheat was the main cereal, although the presence of emmer wheat cannot be ruled out while some free-threshing wheat grains were also recovered. There was relatively little evidence for the presence of barley (grain and occasional rachis fragments) and possibly oat which may however be wild and/or cultivated. No charred remains from any other plant foods were noted. Spelt wheat appears to have been the main wheat grain during the Roman period on the basis of previous botanical research along with barley and some emmer and free-threshing wheat in southern England (Greig 1991, 309).

The general paucity of wild plant/weed seeds in the samples (with the exception of two moderate sized assemblages from early/mid Roman quarry pit fill (sample 118) and late Roman quarry pit fill (sample 107)) plus the problem of identification of much of this material to species level, limits detailed investigation into other aspects of crop husbandry. The presence of crop-processing debris, particularly chaff fragments, suggest activities taking place on site, particularly the final cleaning of hulled wheat grains in the latter stages of the processing sequence; initial results suggest that such activities were mainly taking place in the north-western corners of both the Western and Eastern Areas of excavation during the early/middle Roman period and in the central western part of the Eastern excavation area during the late Roman period.

Variable amounts of potentially identifiable charcoal fragments were present in 35 of the 42 samples. Twenty-one of these flots, however, only contained occasional or very small amounts of charcoal which may be intrusive particularly given the presence of roots/rootlets in the same samples. This is less likely to be true for the other 14 flots which contained moderate or large amounts of charcoal particularly the rich charcoal assemblages from early/middle Roman fill (sample 105), quarry pit fill (sample 118), and undated fill (sample 126) and undated ditch fill (sample 112).

							charcoal		charred								
area	sample	context	dating	feature type	proc. soil vol (l)	flot vol (ml)	>2mm	<2mm	grain	chaff	other	unchd seeds	bone	insect	moll	CPR pot	comments
Eastern	134	6100	E/M Roman	Cremation 6096	1	1	-	++++		+			+++++			D	Mainly v fragmented charcoal (flecks) (NO id'ble frags) & >flecks burnt bone; chaff (one *Triticum* sp. glume base); little sediment crumb
Eastern	137	6102	E/M Roman	Cremation 6096	2	<1	-	++++			+		+++	+		D	Flecks & v small frags charcoal (none id'ble); one charred Poaceae;(small) seed; moss/roots+; flecks burnt bone; occ insect frags & little fine sediment crumb++
Eastern	135	6103	E/M Roman	Spillage cremation 6096	3	4	++	++++					+			F	Virtually all v fragmented charcoal (flecks) (v occ id'ble frags); NO CPR; occ flecks burnt bone
Eastern	136	6101	E/M Roman	Accessory vessel fill cremation 6096	1	1	-	++++								F	Flecks, v small frags charcoal (none id'ble)
Eastern	133	6097	E/M Roman	Backfill cremation 6096	1	2	+	++++	+			+	+++++	+	+	D	Mainly v frag charcoal (flecks) (v occ id'ble frags) & fine sediment crumb & >flecks burnt bone; traces of grain (cf *Triticum* sp., frags); uncharred seeds (*Fumaria* sp., *Atriplex* sp.); occ beetle frags, molluscs
Eastern	106	5070	E/M Roman	Cremation 5069	9	1	-	++++		+			+			D	V fragmented charcoal (small twig) (NO id'ble fragments) & fine sediment crumb; *Triticum spelta* glume base (1); few roots/moss; occ v small indet burnt bone frags
Eastern	130	6093	E/M Roman	Cremation 6092	2	3	++	++++	+	+		+	+++	+	+	D	Little fragmented charcoal (occ id'ble fragments) & traces grain (*Triticum aestivum*) & chaff (*Triticum* sp. glume base, rachis); uncharred seeds (*Chenopodium* sp.), moss/roots++; flecks burnt

							charcoal		charred								
area	sample	context	dating	feature type	proc. soil vol (l)	flot vol (ml)	>2mm	<2mm	grain	chaff	other	unchd seeds	bone	insect	moll	CPR pot	comments
																	bone; occ insect & molluscs; little fine sediment crumb
Eastern	131	6095	E/M Roman	Cremation 6094	1	<1	+	+++					+			F	Virtually nothing; fine sediment crumb; occ charcoal (1-2 pot id'ble frags); fleck burnt bone; roots/flecks wood
Eastern	123	6059	E/M Roman	Ditch 6058	40	16	+++	++++	+	++	+	+		+		D	Mainly fine sediment crumb & v fragmented charcoal (mod nos id'ble fragments) & v occ cp remains (*Triticum* sp., *Avena* sp., *Triticum* sp. glume bases, rachis, Fabaceae (small rounded), *Galium* sp.); uncharred seeds (*Rubus* sp.); occ beetle fragments
Eastern	100	1105	E/M Roman	Pit 1104	40	5	+	++++	++		+	+		+		D	Mainly roots/stem/straw fragments; v fragmented charcoal (v occ id'ble frags); occ chd grain *Triticum aestivum* (1), *Hordeum/Triticum* sp. (1), indet grain frags (3) (sorted), indet chd weed seed; uncharred seeds (*Stellaria media, Chenopodium* sp.); occ insect (beetle frags); little fine sediment crumb
Eastern	109	5085	E/M Roman	Quarry pit 5083	40	12	+++	++++	+++	++++	++	+++++				A	V RICH CP Assemblage (mainly *Titicum spelta* chaff);small nos poorly preserved grain & frags (*Triticum* sp., cf. *Hordeum* sp., cf. *Avena* sp.); chaff (*T.spelta* glume bases & rachis frags, *Triticum* sp. glume bases, spikelet bases, rachis, *Hordeum* sp. rachis; cf. *Bromus* sp., *Medicago/Trifolium* sp., *Vicia/Lathyrus/Pisum* sp. charcoal (mod nos id'ble frags); uncharred seeds (>*Lemna* sp++++, *Chenopodium* sp., *Rubus* sp.);

							charcoal		charred								
area	sample	context	dating	feature type	proc. soil vol (l)	flot vol (ml)	>2mm	<2mm	grain	chaff	other	unchd seeds	bone	insect	moll	CPR pot	comments
																	fine sediment crumb & moss/roots
Eastern	105	5006	E/M Roman	Tree throw-hole 5005	26	250	++++	++++				+	++			F	V rich charcoal sample (freq id'ble frags); NO CPR; uncharred seeds (*Chenopodium* sp.), roots+++; occ small indet burnt bone frags; fine sediment crumb++++; 25% flot<1mm scanned
Eastern	115	5175	Late Roman	Pit 5174	27	2	++	+++				+		+		F	V little fragmented charcoal (occ id'ble fragments) & fine sediment crumb; NO CPR; uncharred seeds (*Rubus* sp.); occ beetle fragments; few roots/moss fragments
Eastern	116	5175	Late Roman	Pit 5174	30	12	++	+++	++	+	+			+		D	Mainly sediment crumb, roots/moss & v fragmented charcoal (occ id'ble fragments) & small cp assemblage (cf *Hordeum* sp., *Hordeum/Triticum* sp., frags, *Triticum* sp. rachis, Fabaceae (small rounded), Poaceae); occ beetle fragments
Eastern	124	6016	Late Roman	Pit 6015	40	65	++++	++++	++	++++	++	++	+	+	+	B	Mainly fragmented charcoal (mod nos id'ble frags) & some fine sediment crumb; mod nos chaff fragments (*Triticum spelta*) & small nos of grains & weed seeds (*Triticum aestivum/spelta, T. dicoccum/spelta, Triticum* sp., indet, frags, *T. spelta* glume base, *Triticum* sp. glume bases, rachis, spikelet base, Fabaceae (small rounded), Poaceae); uncharred seeds (*Lemna* sp.++, *Sambucus* sp.), moss/roots; small indet bone frags, occ beetle fragments & molluscs; 25% flot <0.5mm scanned

							charcoal		charred								
area	sample	context	dating	feature type	proc. soil vol (l)	flot vol (ml)	>2mm	<2mm	grain	chaff	other	unchd seeds	bone	insect	moll	CPR pot	comments
Eastern	107	5098	Late Roman	Quarry pit 5096	40	21	+++++	+++++	++++	++++	+++	++	+		+	A	V RICH CP Assemblage (esp *Titicum spelta* chaff); mod nos poorly preserved grain & frags (*Triticum dicoccum/spelta*, cf *T. spelta*, *T aestivum/spelta*, *Triticum* sp., *Hordeum* sp., *Avena* sp.); >chaff (*T.spelta* glume bases, rachis, *Triticum* sp. glume bases, spikelet bases; *Bromus* sp., *Polygonum aviculare, Medicago/Trifolium* sp., *Rumex* sp., *Anthemis cotula, Vicia/Lathyrus/Pisum* sp., Poaceae indet; >charcoal (mod nos id'ble frags); uncharred seeds (*Lemna* sp.); occ small mammal bone & molluscs; fine sediment crumb
Eastern	108	5099	Late Roman	Quarry pit 5096	40	11	++	+++++	+++	++++	+	+	+	+		B	MOD RICH CP assemblage (esp *Titicum spelta* chaff); mod nos poorly preserved grain & frags (*Triticum dicoccum/spelta, Triticum* sp.); chaff (mainly *T.spelta* glume bases, *Triticum* sp. glume bases, spikelet bases, rachis frags; *Rumex* sp., indet seeds; charcoal (mod nos id'ble frags); uncharred seeds (*Polygonum aviculare, Rubus* sp.); occ v small large mammal bone & beetle fragments; fine sediment crumb & moss/roots
Eastern	114	5162	Late Roman	Quarry pit 5161	40	17	++++	+++++	+	++	++	+++++		++		C	Fragmented charcoal (mod nos id'ble frags including cf. *Quercus* sp., *Quercus/Fraxinius* sp.) & small charred plant assemblage (*Triticum dicoccum/spelta, Hordeum/Triticum* sp., *Triticum*

							charcoal		charred								
area	sample	context	dating	feature type	proc. soil vol (l)	flot vol (ml)	>2mm	<2mm	grain	chaff	other	unchd seeds	bone	insect	moll	CPR pot	comments
																	spelta glume base, rachis, *Triticum* sp. glume bases, spikelet base, *Bromus* sp, Fabaceae (small rounded), *Anthemis cotula, Polygonum aviculare, Plantago lanceolata*); uncharred seeds (*Lemna* sp.++++, *Sambucus* sp., *Rubus* sp., *Juncus* sp.), moss; occ beetle fragments; fine sediment crumb
Eastern	120	6018	Late Roman	Quarry pit 6017	40	28	++	+++++	++	++	+			+		D	Mainly fine sediment crumb, little roots/moss & little fragmented charcoal (v occ id'ble fragments) & occ cp remains (cf *Triticum spelta, Hordeum/Triticum* sp., *Triticum spelta* glume base, *Triticum* sp. glume base, Poaceae); occ beetle fragments; 50% flot <0.5mm scanned
Eastern	121	6020	Late Roman	Quarry pit 6017	20	10	+	++++	+	++		++				D	Mainly fine sediment crumb; charcoal flecks (1-2 id'ble frags); frag cereal grain, *Triticum spelta* glume base, *Triticum* sp. glume bases, spikelet bases; uncharred seeds (*Sambucus* sp., *Rubus* sp., *Carduus/Cirsium* sp.), moss.
Eastern	122	6021	Late Roman	Quarry pit 6017	4	3	-	+++				++		+		F	Mainly fine sediment crumb; flecks charcoal; uncharred seeds (*Lemna* sp., *Rubus* sp.); occ beetle frags; NO CPR
Eastern	143	6072	Late Roman	Quarry pit 6071	40	12	+++	+++++	++	+++	++	+	+			C	Small amount fragmented charcoal (mod id'ble fragments); small cp assemblage (*Triticum dicoccum/spelta, Hordeum/Triticum* sp., *T. spelta* glume base, *Triticum* sp. glume bases, Poaceae (large/small, cf

							charcoal		charred								
area	sample	context	dating	feature type	proc. soil vol (l)	flot vol (ml)	>2mm	<2mm	grain	chaff	other	unchd seeds	bone	insect	moll	CPR pot	comments
																	Bromus sp., *Medicago/Trifolium* sp.); uncharred seeds (*Rubus* sp.), moss/roots++; occ large mammal bone fragment; fine sediment crumb+++
Eastern	144	6073	Late Roman	Quarry pit 6071	40	22	++	+++++	+	+++	+	++				C	Mainly fine sediment crumb & v fragmented charcoal (occ id'ble fragments); small cp assemblage (mainly chaff) (indet grains, *Triticum spelta* glume base, *Triticum* sp. glume bases, spikelet forks/bases, culm node, *Bromus* sp.); uncharred seeds (*Chenopodium* sp., *Sambucus* sp., *Rubus* sp.); 50% flot<0.5mm scanned
Eastern	113	5165	Roman	Quarry pit 5158	40	2	++	+++++				+	+			F	V little fragmented charcoal (occ id'ble fragments including cf *Quercus* sp.); NO CPR; uncharred seeds (*Fumaria* sp., *Chenopodium* sp.); occ beetle fragments; fine sediment crumb; few roots
Eastern	119	6060	Saxon	Pit 5071	40	2	-	++				+++				F	Virtually all roots & fine sediment crumb; uncharred seeds (>*Lemna* sp., *Chenopodium* sp.); traces of charcoal (no id'ble frags); NO CPR
Eastern	126	5051	undated	Linear feature 5046	28	100	+++++	+++++	++	+	+	++	+++	++		D	>charcoal (freq id'ble frags); >moss; occ grain (*Triticum aestivum*, cf *T. dicoccum/spelta*, indet), chaff (*Triticum* sp. glume base), weed seeds (*Persicaria* sp., indet); occ uncharred seeds (*Sambucus* sp., *Rubus* sp., *Chenopodium* sp.), >moss; indet burnt bone frags+++; occ beetle frags+.

							charcoal		charred								
area	sample	context	dating	feature type	proc. soil vol (l)	flot vol (ml)	>2mm	<2mm	grain	chaff	other	unchd seeds	bone	insect	moll	CPR pot	comments
Eastern	101	1414	undated	Pit 1409	37	24	+++	+++++	+	++	+	+		+		D	Mainly roots/stem/straw fragments, v fragmented charcoal (mod nos id'ble frags) & fine sediment crumb; small charred plant assemblage (occ grain *Triticum* sp. (1), frags (+), *Triticum spelta* glume base (3), *Triticum* sp. spikelet base (4), *Triticum* sp. glume base (1) , *Bromus* sp. (sorted); uncharred seeds (*Fallopia convolvulus, Vicia/Lathyrus/Pisum* sp.); occ insect (beetle frags)
Eastern	111	5134	undated	Ditch 5132	40	4	++	+++++	++	++	+	++	+	+	++	D	Mainly fragmented charcoal (occ id'ble frags) & small charred plant assemblage (cf *Triticum* sp., *Triticum* sp. glume bases, cf. *Bromus* sp, Fabaceae (small), *Anthemis cotula*); uncharred seeds (*Lemna* sp.++, *Chenopodium* sp., *Rubus* sp.); occ v small indet large mammal bone, beetle fragments & molluscs; moss/roots & fine sediment crumb
Eastern	110	5133	undated	Ditch 5132	40	44	+++	+++++	++	++	+	+	+	+	+	C	Mainly fragmented charcoal (mod nos id'ble frags) & fine sediment crumb; small charred plant assemblage (occ grain *Triticum* sp., *Hordeum/Triticum* sp., chaff of *Triticum spelta* glume base, *Triticum* sp. spikelet base &. glume bases, cf. *Bromus* sp.; uncharred seeds (*Atriplex* sp., *Rubus* sp.); occ v small indet large mammal bone, beetle fragments & occ molluscs; moss/roots
Eastern	112	5149	undated	Ditch 5148	40	50	+++	+++				+	+	+		F	Virtually all charcoal (freq id'ble

							charcoal		charred								
area	sample	context	dating	feature type	proc. soil vol (l)	flot vol (ml)	>2mm	<2mm	grain	chaff	other	unchd seeds	bone	insect	moll	CPR pot	comments
							++	++									frags); NO CPR; uncharred seeds (*Rubus* sp frag); moss/roots; indet bone frag, occ beetle frag; sediment crumb
Eastern	125	6054	undated	Ditch 6053	40	40	++	+++++	++		+	+++++	+		+	D	Mainly fine sediment crumb & uncharred seeds (>nos *Rubus* sp. & frags); small amount of fragmented charcoal (occ id'ble frags) & v occ grain (cf. *Triticum aestivum*, indet, frags) & chd seeds (*Rubus* sp.); uncharred seeds (*Rubus* sp.++++ +,*Sambucus* sp.++, Labiatae +++, *Rumex* sp.++, *Atriplex/Chenopodium* spp., moss/roots; occ small mammal bone & molluscs
Western	148	7221	E/M Roman	Ditch 7223	40	2	+	++	++			+++++		+	+	D	Mainly roots & fine sediment crumb & >*Lemna* sp seeds; virtually no charcoal (one pot id'ble frag) & occ charred grain (well preserved *Triticum aestivum* grains (5) *Hordeum/Triticum* sp.); uncharred seeds (*Lemna* sp., *Atriplex/Chenopodium* sp.); occ insect & molluscs
Western	147	7233	E/M Roman	Enclosure Ditch 7231 (lower fill)	40	10	++	+++++	+++	+++	+	+++	+		+	C	Mainly fragmented charcoal (occ id'ble frags) & fine sediment crumb; small cp assemblage (mainly spelt chaff) (cf. *Triticum aestivum*, *T. dicoccum/spelta, Triticum* sp., *Triticum spelta* glume base, *Triticum* sp. glume bases, spikelet bases, *Bromus* sp. Poaceae); uncharred seeds (*Lemna* sp +++); moss/roots++++;

							charcoal		charred								
area	sample	context	dating	feature type	proc. soil vol (l)	flot vol (ml)	>2mm	<2mm	grain	chaff	other	unchd seeds	bone	insect	moll	CPR pot	comments
																	occ large & small mammal bone frags & molluscs
Western	146	7232	E/M Roman	Enclosure Ditch 7231 (upper fill)	40	2	+	++++	+	+	+	+		+	+	D	Mainly roots; little v fragmented charcoal (one pot id'ble frag); v occ grain (*Hordeum/Triticum* sp.), chaff (*Triticum spelta* glume base), weed seeds (Poaceae); uncharred seeds (*Chenopodium* sp.); occ insect & molluscs; fine sediment crumb+++
Western	132	7055	E/M Roman	Pit 7054	40	12	+	+++++	++	+++	+	+	+			C	V fragmented charcoal (v occ id'ble fragments); small cp (mainly chaff) assemblage (*Triticum dicoccum/spelta, Triticum* sp., cf *Hordeum* sp.; *T. spelta* glume base, rachis, *Triticum* sp. glume bases, spikelet forks/bases, *Rumex* sp., *Bromus* sp., Fabaceae (small); uncharred seeds (*Rubus* sp.), moss/roots+; occ large & small mammal bone fragment; fine sediment crumb+++++
Western	118	7018/ 7014	E/M Roman	Quarry pit 7012	40	267	+++++	+++++	+++	++++++	+++	+	+			A	V rich charcoal sample (freq nos id'ble frags, cf. *Quercus* sp., Pomoideae) & rich charred plant assemblage (esp spelt chaff, mod grains, mod weed seeds but low diversity mainly brome) (*Triticum dicoccum/spelta*, cf. *T. spelta*, *Triticum* sp., frags, *Triticum spelta* glume bases, rachis, spikelet forks *Triticum* sp. glume bases, spikelet base, *Bromus* sp,+++ Fabaceae (small rounded), Poaceae (small); uncharred seeds (*Rubus* sp.), occ large & small mammal bone frags; fine

							charcoal		charred								
area	sample	context	dating	feature type	proc. soil vol (l)	flot vol (ml)	>2mm	<2mm	grain	chaff	other	unchd seeds	bone	insect	moll	CPR pot	comments
																	sediment crumb; 25% flot<1mm scanned
Western	149	7224	Late Roman	Unid'ble feature 7225	40	<1	-	+++				+			+	F	Few flecks charcoal (none id'ble); NO CPR; uncharred seeds (*Rubus* sp., *Sambucus* sp.); roots/stem frags+; occ molluscs; fine sediment crumb+
Western	145	7192	Roman	Quarry pit 7190	40	42	+++	+++ ++	+		+		+			D	Virtually all charcoal (mod/freq id'ble frags including cf. *Quercus* sp.), traces of grain fragments & seeds (Poaceae); occ large mammal boen frag; some fine sediment crumb
South	127	5955	E/M Roman	Ditch 5954	40	18	++	+++ ++	++		+	+	+			D	Mainly fine sediment crumb & v fragmented charcoal (occ id'ble fragments) & v occ grains (*Triticum aestivum, Triticum* sp., *Hordeum/Triticum* sp., indet., frags, & seeds Fabaceae (small rounded), Poaceae (small, large); uncharred seeds (*Atriplex* sp., *Rubus* sp.), moss/roots; occ small mammal bone fragment
South	129	5981	E/M Roman	Pit	40	40	+++	+++ +	+	++	+	+				D	Mainly fine sediment crumb & some v fragmented charcoal (mod nos id'ble fragments) & v occ grains (cf. *Triticum* sp., indet., frags) chaff (*Triticum* sp. glume base) & seeds Fabaceae (small rounded), Poaceae (small); uncharred seeds (*Atriplex* sp.), >moss/roots
South	128	5975	undated	Pit 5974	40	10	++	+++ +	+			+		+		D	Mainly sediment crumb & little fragmented charcoal (occ id'ble

							charcoal		charred								
area	sample	context	dating	feature type	proc. soil vol (l)	flot vol (ml)	>2mm	<2mm	grain	chaff	other	unchd seeds	bone	insect	moll	CPR pot	comments
																	fragments); traces cereal grain fragments; uncharred seeds (*Atriplex* sp.); occ beetle fragments; few roots/moss fragments
Trench 43	102	4304	E/M Roman	Cremation 4303	2	5	++	+++++			++	+	+			D	V fragmented charcoal/twig frags (occ id'ble frags), roots & fine sediment crumb; *Arrhenatheum elatius* tuber frags (c 5); uncharred seeds (*Carduus/Cirsium* sp.); occ v small indet burnt bone frags.
Trench 43	103	4302	E/M Roman	Cremation 4303	2	1	-	+++								F	V fragmented charcoal (small twig) (NO id'ble fragments), roots & fine sediment crumb; NO CPR

Table 35: Hobbs Hole (M25001.08):Environmental samples: Flot Assessment results

Key:

Phase: E/M Roman – early-mid Roman (AD 43-250); Late Roman (AD 250-400)

Frequency of items: + = <5; ++ = 5-25; +++ = 26-100; ++++ = 101-300; +++++ =>300 items

Pot CPR (potential of charred plant assemblages): A = rich (more than 300 identifiable items); B = good (100 to 300 identifiable items); C = moderate (50 to 100 identifiable items); D = poor (less than 50, usually less than 10 items); F (no identifiable charred plant remains)

Chd (charred); unchd (uncharred); moll (molluscs); CPR (charred plant remains); occ (occasional); mod (moderate); freq (frequent); nos (numbers)

Passingford Bridge Bund (Denise Druce and Sandra Bonsall)

Introduction

One hundred and one bulk samples taken during excavation of the site were processed for the assessment of charred plant remains (CPR) and charcoal. The samples came from a range of different features and periods, including a Late Neolithic/Early Bronze Age ring ditch, Bronze Age postholes, Early to Late Roman ditches, and two Late Roman waterholes (3652 and 2714), the majority coming from the gullies, pits, postholes, ditches, and cremations of a Late Iron Age settlement. The aim of the assessment was to quantify and provisionally identify any surviving environmental material for providing information on local economic/cultural practices, fuel use, and environments, and changes in these over time.

Quantifications

In accordance with accepted professional guidelines (English Heritage 2002), bulk samples of 40 litres in volume, or entire contexts with volumes of less than this, were taken. A total of 102 bulk samples were processed and assessed. Out of these, seven are from a Late Neolithic/Early Bronze Age ring ditch (2100), three are from Bronze Age postholes, 47 are from Late Iron Age settlement features, and 21 are from Roman features (of which 12 came from Late Roman waterholes 3652 and 2714). The remainder came from various unphased features from the site.

Results

The results of both the plant remains and charcoal assessment are shown in Table 36 where material is scored on a scale of abundance of # to ####, where # is rare (up to 5 items) and #### is abundant (>100 items). The potential of each sample for the analysis of CPR, WPR and charcoal is also given. Separate summaries of both the plant remains and charcoal are given below in broad chronological order.

The plant remains

Prehistoric: The Late Neolithic/Early Bronze Age ring ditch was devoid of CPR. The three Bronze Age posthole fills (2153, 2178, and 2163), however, contained frequent to common poorly preserved charred cereals, including positively identified *Triticum* sp. (wheat) and *Hordeum* sp. (barley) grains. Two of the samples also contained rare *Bromus* (brome) seeds. Eleven of the 47 Late Iron Age features contained CPR. However, only one, ditch fill 4302, contained common cereal grains, including *Triticum* sp., and chaff fragments. The same sample also contained rare *Bromus* seeds and *Corylus* (hazel) nut fragments.

Roman: One Early Roman ditch fill (3605) and two Mid Roman ditch fills (1036 and 1033) contained common to abundant CPR, including *Triticum* sp. cereal grains and glume bases, and charred weed seeds. Two middle layers (3653, 3654) from the Late Roman waterhole (3652) also contained common to abundant CPR, including sprouted *Triticum* sp. grains and glume bases, *Hordeum* and *Avena* (oat) grains, and *Bromus* seeds. Common to abundant waterlogged seeds were also recorded in these and other layers from waterhole 3652 and the basal layer of waterhole 2714. Representative taxa are shown in the table. However the results need to be considered alongside the WPR Assessment Report (see Huckerby below).

Unphased: Three unphased features (posthole fills 3197 and 3301, and pit fill 3520) contained frequent to abundant CPR, including *Trticum* sp. grains and charred weed seeds. Pit fill 3520

also contained a relatively diverse range of charred weed seeds and chaff, the assemblage resembling the remains of crop processing waste.

The charcoal

Thirty-seven of the bulk samples from Passingford contained common to abundant charcoal fragments larger than 2mm in size (see Table 36). The majority came from Late Iron Age and Late Roman features, and apart from the two Late Iron Age cremation deposits (3468 and 5038), many were from negative features, such as gullies, ditches and pits, which are likely to contain the waste material from a number of different activities.

The two cremation deposits appear to be dominated by *Quercus*, as do the many postholes/postpipes from the site. The latter may represent the burnt remains of the post. However, it is also just as likely to represent general floor debris fallen into the void left after the post has rotted away.

A cursory look at the charcoal data suggests that a higher number of the Late Iron Age features were dominated by hardwood of mainly *Quercus* (oak) charcoal (12 out of 16), compared to the Late Roman features (1 out of 8). The latter features dominated by more mixed assemblages of *Quercus*, *Prunus* sp., *Maloideae* (hawthorn-type), *Alnus/Corylus*, and *Fraxinus excelsior* (ash). This might reflect a real trend in the data. However, it may also be a reflection of the type of features sampled.

Site Code	Sample no	Context number	Date	Feature Type	Processed Volume (l)	Flot Volume (ml)	Charred Cereals	Charred Chaff	Charred Weed Seeds	Charred Other	Waterlogged Weed seeds	Snails from flot	Small Bones	Charcoal <2mm	Charcoal > 2mm	Flot comments	Potential CPR	Potential WPR	Potential charcoal	Recommendations CPR
M25 002 09	1000	1036	MR (150+)	Ditch	20	50	####	####	##		#			##	##	Modern roots (4), HAVM (2) CPR: Mostly Triticum grains, Triticum glume bases, Rumex acetosella, Rumex acetosa, Poaceae, cf Alliaria petiolata	good			analyse
M25 002 09	1001	1075	LR (250+)	Hollow-way	11	15	##				#	#		###	##	Modern roots (4)				
M25 002 09	1002	1033	MR (150+)	Ditch	20	50	###	###	#		#			###	###	Modern roots (3), earthworm egg cases (1) CPR: Triticum grains, poorly preserved, Rumex acetosella, Poaceae	fair			scan
M25 002 09	2000	2004	LIA	Cremation 2009, backfill	4	15		#	#		##			###	##	Modern roots (2), calcined bone (2), WPR: Chenopodium album, Persicaria lapathifolia, Trifolium				
M25 002 09	2001	2008	LIA	Cremation 2009, backfill	5	5					#			###	##	Modern roots (2) calcined bone (1) WPR: Chenopodium album				
M25 002 09	2002	2105	Late Neo/EBA	Ring ditch 2100	35	90	#				#			##	##	Modern roots (4), Mixed charcoal including Quercus sp, cf Prunus sp and cf Alnus/Corylus (?suitable for c14)				
M25 002 09	2003	2149	Late Neo/EBA	Ring ditch 2100	36	100					#			#	#	Modern roots (4), earthworm egg cases (1)				
M25 002 09	2004	2151	Late Neo/EBA	Ring ditch 2100	32	25					##			###	##	Modern roots (4), earthworm egg cases (1), charcoal indeterminate and Quercus sp				

Site Code	Sample no	Context number	Date	Feature Type	Processed Volume (l)	Flot Volume (ml)	Charred Cereals	Charred Chaff	Charred Weed Seeds	Charred Other	Waterlogged Weed seeds	Snails from flot	Small Bones	Charcoal <2mm	Charcoal > 2mm	Flot comments	Potential CPR	Potential WPR	Potential charcoal	Recommendations CPR
M25 002 09	2005	2139	Late Neo/EBA	Ring ditch 2100	40	75					##			####	###	Modern roots (4), earthworm egg cases (2), insect remains (2) Charcoal includes Quercus and poorly preserved diffuse porous taxa (?suitable for c14)				
M25 002 09	2006	2103	Late Neo/EBA	Ring ditch 2100	40	50					##			##	##	Modern roots (4), earthworm egg cases (1) WPR Chenopodium album, Sonchus, charcoal includes cf Prunus sp and small roundwood (suitable for c14)				
M25 002 09	2007	2145	Late Neo/EBA	Ring ditch 2100	31	20					##			##	#	Modern roots (4), straw chaff (1), WPR: Chenopodium album, Sambucus nigra				
M25 002 09	2008	2196	Late Neo/EBA	Ring ditch 2100	36	25					#			###	##	Modern roots (4), straw chaff (1), Earthworm egg cases (1) WPR: Chenopodium album, charcoal indeterminate and Prunus sp (suitable for c14)				
M25 002 09	2009	2301	LIA	Gully	12	80								####	####	Modern roots (2), straw chaff (1) Charcoal all Maloideae?			good	
M25 002 09	2010	2208	Unphased	post hole	2	15								####	##	Modern roots (3)				
M25 002 09	2011	2153	BA	posthole	10	25	###				#				###	Modern roots (3), earthworm egg cases (1) CPR: Mostly Triticum, few Hordeum, poorly preserved (suitable for c14), WPR: Trifolium, Charcoal poorly preserved Quercus (mineral encrusted)	fair			analyse
M25 002 09	2012	2178	BA	posthole	8	5	##		#					##	##	Modern roots (2) CPR: poorly preserved Triticum, Bromus (suitable for c14)				

Site Code	Sample no	Context number	Date	Feature Type	Processed Volume (l)	Flot Volume (ml)	Charred Cereals	Charred Chaff	Charred Weed Seeds	Charred Other	Waterlogged Weed seeds	Snails from flot	Small Bones	Charcoal <2mm	Charcoal > 2mm	Flot comments	Potential CPR	Potential WPR	Potential charcoal	Recommendations CPR
M25 002 09	2013	2163	BA	posthole	7	15	###		#		#			####	####	Modern roots (2), earthworm egg cases CPR: poorly preserved Triticum, Bromus (suitable for c14), WPR: Chenopodium album, Charcoal poorly preserved Quercus	fair		fair	analyse
M25 002 09	2014	2189	Unphased	posthole	5	400	#				#			####	####	Modern roots (4) WPR: Chenopodium album, Charcoal cf Maloideae, mixed preservation			fair	
M25 002 09	2015	2355	Unphased	posthole 2354, upper fill	9	20					#			###	###	Modern roots (3), straw chaff (1) WPR: Chenopodium album, Charcoal poorly preserved Quercus				
M25 002 09	2016	2356	Unphased	posthole 2354, lower fill	9	15								##	##	Modern roots (3), straw chaff (1)				
M25 002 09	2017	2427	LR (250+)	enclosure ditch	40	50	##				##			##	##	Modern roots (4), straw chaff (1) insect remains (3), earthworm egg cases (1) WPR: Chenopodium album, Raphanus pod, Sambucus nigra, Rubus Sect 2 Glandulosus (unknowns)				
M25 002 09	2018	2370	Unphased	Pit 2367, upper fill	8	5					#			####	####	Modern roots (4), straw chaff (1) WPR: Galium, Charcoal poorly preserved, mostly cf Quercus			fair	
M25 002 09	2019	2369	Unphased	Pit 2367, middle fill	40	90					#			###	###	Modern roots (4), insect egg cases (1), insect remains (2) WPR Betula				
M25 002 09	2020	2368	Unphased	Pit 2367, lower fill	10	25								####	####	Modern roots (3), Charcoal mixed assemblage of Quercus and diffuse porous, possibly Alnus/Corylus			fair	
M25 002 09	2021	2383	Unphased	post pipe	10	100	##							####	####	Modern roots (3) CPR: cereals and unknown, Charcoal poorly preserved, mostly cf Quercus			good	

Site Code	Sample no	Context number	Date	Feature Type	Processed Volume (l)	Flot Volume (ml)	Charred Cereals	Charred Chaff	Charred Weed Seeds	Charred Other	Waterlogged Weed seeds	Snails from flot	Small Bones	Charcoal <2mm	Charcoal > 2mm	Flot comments	Potential CPR	Potential WPR	Potential charcoal	Recommendations CPR
M25 002 09	2022	2455	LR (250+)	ditch terminus	40	200	#		#		##			####	####	Modern roots (4), insect remains (4) WPR: Trifolium, Galium, Chenopodium album, Lamiaceae (1) CPR: Legume, Charcoal Quercus, cf Fraxinus and Maloideae			good	
M25 002 09	2023	2446	LR (250+)	Ditch	40	100	#		#		#			####	####	Modern roots (4), straw chaff (1), insect remains (1) WPR: Chenopodium album, Betula, CPR: Brassicaceae, Charcoal Quercus, cf Fraxinus and Alnus/Corylus			good	
M25 002 09	2024	2642	LIA	Pit	40	100	##				##			####	####	Modern roots (4) WPR: Chenopodium album, Sambucus nigra, Charcoal Quercus			good	
M25 002 09	2025	2819	LR	Waterhole	28	75					####			##	##	Amorphous plant remains (1) WPR: Rubus Sect 2 Glandulosus, Apiaceae, Carex trigonous, Potamogeton, Centaurea cyanus, Persicaria maculosa, Galeopsis, Potentilla erecta-type, Rumex acetosa, Silene, Ranunculus repens-type, Rumex acetosa		good		
M25 002 09	2026	2667	LIA?	posthole	2	10	#				##				##	Modern roots (1) WPR Sambucus nigra, Rubus Sect 2 Glandulosus, Stellaria media, Potentilla erecta				
M25 002 09	2027	2683	Unphased	Posthole	8	5	#				#				##	Modern roots (3), insect remains (1) CPR: Brassicaceae WPR: Stellaria media, Rubus Sect 2 Glandulosus				

Site Code	Sample no	Context number	Date	Feature Type	Processed Volume (l)	Flot Volume (ml)	Charred Cereals	Charred Chaff	Charred Weed Seeds	Charred Other	Waterlogged Weed seeds	Snails from flot	Small Bones	Charcoal <2mm	Charcoal > 2mm	Flot comments	Potential CPR	Potential WPR	Potential charcoal	Recommendations CPR
M25 002 09	2028	2841	Prehistoric	Posthole	40	1200	#				#			####	####	Modern roots (2), straw chaff (1), insect remains (1), earthworm egg cases (1), coal (1), HAVM (1) WPR: Chenopodium album, Trifolium, Charcoal Quercus			good	
M25 002 09	2029	2948	Unphased	post hole	5	100	#				#			####	####	Havm (2) WPR: Rubus Sect 2 Glandulosus, Charcoal poorly preserved, cf Quercus			fair	
M25 002 09	2030	2949	Unphased	post hole	10	5	#				#			####	####	WPR: Trifolium, Charcoal poorly preserved cf Quercus			fair	
M25 002 09	2031	2869	Prehistoric	post hole	17	25	##				#			##	##	Modern roots (3) CPR: unknown WPR: Rumex acetosa, Chenopodium album, Lapsana				
M25 002 09	2032	2984	LIA	posthole	30	100					##			##	####	Modern roots (4), straw chaff (1), HAVM (1), insect remains (1) WPR Chenopodium album, Brassicaceae, Charcoal poorly preserved cf Quercus			fair	
M25 002 09	2033	2896	LIA/ER	Ditch	30	100	##				##			####	####	Modern roots (4), insect remains (1) WPR: Brassicaceae, Rubus Sect 2 Glandulosus, Sambucus nigra, leaves, Charcoal poorly preserved cf Quercus			fair	
M25 002 09	2034	3240	Unphased	Gully, possibly geological	38	80	#				#			####	###	Modern roots (4), insect remains (1) CPR: Legume ? WPR: Chenopodium album, Trifolium, Brassicaceae, Sambucus nigra, Charcoal Quercus and Maloideae				

Site Code	Sample no	Context number	Date	Feature Type	Processed Volume (l)	Flot Volume (ml)	Charred Cereals	Charred Chaff	Charred Weed Seeds	Charred Other	Waterlogged Weed seeds	Snails from flot	Small Bones	Charcoal <2mm	Charcoal > 2mm	Flot comments	Potential CPR	Potential WPR	Potential charcoal	Recommendations CPR
M25 002 09	2035	3242	LIA	Gully	40	75	##			#	#					CPR: unknown, CPR: cf Triticum and Hordeum, tuber, WPR: Chenopodium album, Lapsana, Charcoal poorly preserved, mostly Quercus roundwood				
M25 002 09	2036	3244	LR (250+)	Ditch	40	50		#			#					Modern roots (4), straw chaff (1), HAVM (1), insect remains (1) WPR Chenopodium album, Brassicaceae				
M25 002 09	2037	3404	LIA	Ditch	20	30	#							##	##	Modern roots, straw chaff (1), insect remains (1)				
M25 002 09	2038	3468	LIA	Cremation	40	100	#				#			####	####	Modern roots (4), straw chaff (1) CPR Legume ?, WPR Sonchus, Charcoal Quercus			good	
M25 002 09	2039	2007	LIA	Cremation 2009, urn fill	1	5					#				#	Modern roots (4) WPR: Chenopodium album				
M25 002 09	2040	3197	Unphased	post hole	20	50	###		#		#			####	####	Modern roots (2), HAVM (2), Insect remains (1) CPR: cf Triticum, Bromus WPR: Brassicaceae, Chenopodium album, Charcoal Quercus	fair		fair	scan?
M25 002 09	2041	3520	Unphased	Pit	20	15	##	##	##		#			##	####	Modern roots (4), straw chaff, CPR: cf Triticum grains and chaff, Bromus, Legume, Rumex acetosa, Cyperaceae, unknown, WPR: Rubus Sect 2 Glandulosus, Charcoal Quercus	fair		fair	scan?
M25 002 09	2042	3289	MR (150+)	Pit	15	25	##				#			##	##	Modern Roots (3) WPR: Sonchus				
M25 002 09	2043	3301	Unphased	post hole	10	25	####				#			####	##	Modern roots (2), insect remains (1) CPR: Triticum, indeterminate, Bromus, WPR Chenopodium album	fair			scan?

Site Code	Sample no	Context number	Date	Feature Type	Processed Volume (l)	Flot Volume (ml)	Charred Cereals	Charred Chaff	Charred Weed Seeds	Charred Other	Waterlogged Weed seeds	Snails from flot	Small Bones	Charcoal <2mm	Charcoal > 2mm	Flot comments	Potential CPR	Potential WPR	Potential charcoal	Recommendations CPR
M25 002 09	2044	3355	LIA	Ditch	25	30			#		#			####	##	Modern roots (4), straw chaff (1) CPR: Legume WPR: Betula, Sambucus nigra				
M25 002 09	2045	3605	ER	Ditch	35	50	###	#	#	#	#			###	###	Modern roots (4), insect remains (1) CPR: Indeterminate and Triticum, Legume, Polygonum, Poaceae stems, WPR: Leaf, Chenopodium album, Rumex acetosa, Rumex acetosella, Charcoal Quercus roundwood and Prunus sp	fair		fair	scan
M25 002 09	2046	3371	LIA	Ring gully 3360	30	100					###			###	##	Modern roots (4), Insect remains (1), Earthworm egg cases (1) WPR Chenopodium album, Rubus Sect 2 Glandulosus, Trifolium, Sambucus nigra				
M25 002 09	2047	3387	LIA	Ring gully 3360	20	50					###			##	##	Modern roots (4) WPR Chenopodium album, Lamiaceae, Trifolium, Sambucus nigra, Betula				
M25 002 09	2048	5019	LIA	Ditch	40	50			#		#			##	##	Modern roots (4), earthworm egg cases CPR: unknown WPR: Chenopodium album				
M25 002 09	2049	5029	LIA	posthole	40	50	#		#		####			####	####	Modern roots (4), insect remains (3) CPR: Bromus WPR: Stellaria media, Betula, Rumex acetosa, Persicaria lapathifolia, Chenopodium album, Rubus Sect 2 Glandulosus, Lamiaceae, Charcoal mostly Quercus			fair	

Site Code	Sample no	Context number	Date	Feature Type	Processed Volume (l)	Flot Volume (ml)	Charred Cereals	Charred Chaff	Charred Weed Seeds	Charred Other	Waterlogged Weed seeds	Snails from flot	Small Bones	Charcoal <2mm	Charcoal > 2mm	Flot comments	Potential CPR	Potential WPR	Potential charcoal	Recommendations CPR
M25 002 09	2050	5031	LIA	posthole	36	25	#				#			##	###	Modern roots (4), insect remains (2), Calcined bone WPR Chenopodium album, Sambucus nigra, Charcoal Quercus			fair	
M25 002 09	2051	3653	LR	Waterhole	30	350	####	###	#		####			####	####	Wood (4), earthworm egg cases (2), thorns (1) CPR: sprouted Triticum, Avena, T. spelta glumes, Bromus WPR: Sonchus, Potentilla erecta-type, Apiaceae, Rorippa, Rumex acetosa, Hyoscyamus, Fumaria, Chenopodium album, Urtica dioica, Ranunculus repens-type, Buds, Rumex acetosa, Rubus Sect 2 Glandulosus, Mixed charcoal including roundwood	good	good	good	analyse
M25 002 09	2052	5038	LIA	Cremation	30	100					#			####	####	Modern roots (4), straw chaff (1), insect remains WPR: Chenopodium album, Charcoal poorly preserved, probably Quercus			fair	
M25 002 09	2053	4012	LIA	ring gully 4016	40	50					#			##	##	Modern roots (4), straw chaff (1), insect remains (3), WPR Trifolium, Stellaria media, Chenopodium album (1)				
M25 002 09	2054	4015	LIA	ring gully 4016	40	150					###			##	###	Modern roots (4), straw chaff (1), earthworm egg cases (1), Insect remains (1) WPR Galium, Trifolium, Rumex acetosa, Lamiaceae, Chenopodium album, Sambucus nigra				

Site Code	Sample no	Context number	Date	Feature Type	Processed Volume (l)	Flot Volume (ml)	Charred Cereals	Charred Chaff	Charred Weed Seeds	Charred Other	Waterlogged Weed seeds	Snails from flot	Small Bones	Charcoal <2mm	Charcoal > 2mm	Flot comments	Potential CPR	Potential WPR	Potential charcoal	Recommendations CPR
M25 002 09	2055	4018	LIA	ring gully 4016	40	60	#				##			#		Modern roots (4), straw chaff (1), insect remains (2) WPR Rumex acetosella, Stellaria media, Trifolium, Rubus Sect 2 Glandulosus, Chenopodium album				
M25 002 09	2056	4032	LIA	ring gully 4020	40	80	#				##			###	##	Modern roots (4), insect remains (2) WPR Sambucus nigra, Trifolium, Chenopodium album, Polygonum lapathifolium				
M25 002 09	2057	4025	LIA	ring gully 4016	40	50					#			#	#	Modern roots (4), Earthworm egg cases (1) WPR Polygonum aviculare, Chenopodium album, Juncus				
M25 002 09	2058	4041	LIA	ring gully 4016	40	30					###			###	##	Modern roots (4), Insect remains (1) WPR Trifolium, Chenopodium album, Betula, Solanum, Lamiaceae				
M25 002 09	2059	4042	LIA	ring gully 4016	40	50					###			##	##	Modern roots (4), Insect remains (2) WPR Lamiaceae, Brassicaceae, Rubus Sect 2 Glandulosus, Leaf, Chenopodium album, Betula, Polygonum aviculare, Chenopodium album				
M25 002 09	2060	4048	LIA	ring gully 4016	36	75					##			###	#	Modern roots (4), insect remains (2) WPR: Chenopodium album, Trifolium, Rubus Sect 2 Glandulosus				

Site Code	Sample no	Context number	Date	Feature Type	Processed Volume (l)	Flot Volume (ml)	Charred Cereals	Charred Chaff	Charred Weed Seeds	Charred Other	Waterlogged Weed seeds	Snails from flot	Small Bones	Charcoal <2mm	Charcoal > 2mm	Flot comments	Potential CPR	Potential WPR	Potential charcoal	Recommendations CPR
M25 002 09	2061	3662	LR	Waterhole	30	700					####					Wood (4), straw chaff (2), Bryophyte fragments WPR: Rubus Sect 2 Glandulosus, Ranunculus sardous, Stellaria media, Chenopodium album, Urtica dioica, Rumex acetosella, Centauria, Fumaria, Hyoscyamus, Sonchus, Polygonum aviculare, Rumex acetosa, Ranunculous repens-type, Rumex obtusifolius, Potentilla erecta-type, Apiaceae		good		
M25 002 09	2062	4077	LIA	ring gully 4141	40	150	#		#					####	####	Modern roots (4) CPR: Legume WPR: Chenopodium album, Trifolium, Charcoal well-preserved Quercus and Ulmus			good	
M25 002 09	2063	4097	LIA	ring gully 4095	40	85	#				##				##	Modern roots (4), insect remains (1) WPR: leaf, Solanum, Lamiaceae, Sambucus nigra, Polygonum aviculare, Sambucus nigra, Lapsana				
M25 002 09	2064	3663	LR	Waterhole	30	300		#			####			###	###	Wood (Vivianite staining (4)), Chenopodium album, Lamiaceae, Ranunculus repens-type, Stellaria gramineae, Conium maculatum, Carex lenticular, Rubus Sect 2 Glandulosus, Prunus, Hyoscyamus, Lapsana, Cirsium, Leaves, Agrostemma, Rumex obtusifolius, Urtica dioica, Apiaceae, Stellaria media, Polygonum aviculare, Charcoal Quercus and Prunus sp		good	fair	

Site Code	Sample no	Context number	Date	Feature Type	Processed Volume (l)	Flot Volume (ml)	Charred Cereals	Charred Chaff	Charred Weed Seeds	Charred Other	Waterlogged Weed seeds	Snails from flot	Small Bones	Charcoal <2mm	Charcoal > 2mm	Flot comments	Potential CPR	Potential WPR	Potential charcoal	Recommendations CPR
M25 002 09	2065	4098	LIA	posthole	40	90					##			####	###	Modern roots (4) insect remains (1) WPR Rubus Sect 2 Glandulosus, Trifolium, Lamiaceae, Brassicaceae, Stellaria media, Charcoal mostly Quercus			fair	
M25 002 09	2066	3664	LR	Waterhole	25	300	##				####			###	###	Wood (Vivianite staining (4)), small mammal bone (1), earthworm egg cases (1) CPR: Triticum, indeterminate, WPR: Anthriscus caucalis, Chenopodium album, Cirsium, Carex trigonous, Rumex obtusifolius, Conium maculatum, Prunus, Lamiaceae, Sonchus, Ranunculus repens-type, Stellaria media, Urtica dioica, Mixed charcoal		good	fair	
M25 002 09	2067	4115	LIA	Pit	40	30	#				#			###	##	Modern roots (4), HAVM (1) WPR: Chenopodium album				
M25 002 09	2068	4116	LIA?	posthole	40	150	##		#		#~			####	####	Wood (4), Modern roots (4), insect remains (1), Earthworm egg cases (1) CPR: Triticum, indeterminate, Brassicaceae WPR: Chenopodium album, Trifolium, Stellaria media, Well preserved charcoal, mixed assemblage			good	
M25 002 09	2069	3665	LR	Waterhole	30	60	##	#			####			##	###	Wood (4), Modern roots (4), insect remains (1), earthworm egg cases (1) CPR Brassicaceae WPR : Chenopodium album, Trifolium, Stellaria media		good		

Site Code	Sample no	Context number	Date	Feature Type	Processed Volume (l)	Flot Volume (ml)	Charred Cereals	Charred Chaff	Charred Weed Seeds	Charred Other	Waterlogged Weed seeds	Snails from flot	Small Bones	Charcoal <2mm	Charcoal > 2mm	Flot comments	Potential CPR	Potential WPR	Potential charcoal	Recommendations CPR
M25 002 09	2070	4119	Unphased	Posthole	40	60			#						##	Modern roots (4), Coal (1), insect remains (1) CPR Brassicaceae				
M25 002 09	2090	4179	LIA	Ring gully 4141	15	30					##			##	#	Modern roots (4)				
M25 002 09	2091	4214	LIA	ring gully 4310	30	30					#			##	##	Modern roots (4), Insect remains (1) WPR Trifolium (1), Lapsana, Rubus Sect 2 Glandulosus (1)				
M25 002 09	2092	4181	Roman?	Pit	40	30					#			####	##	Modern roots (4), WPR: Sambucus nigra, Trifolium				
M25 002 09	2093	4219	LIA	Pit	10	10	#							##	##	Modern roots (4), Earthworm egg cases (1)				
M25 002 09	2094	4154	LIA	Pit 4152, lower fill	10	10								###	#	Modern roots (4)				
M25 002 09	2095	4211	Unphased	post hole	40	2000								####	####	Modern roots (4), Charcoal immature Quercus			good	
M25 002 09	2096	3658	LR	Waterhole	30	10					#				##	Modern roots (3) WPR: Trifolium, Chenopodium album				
M25 002 09	2097	3568	LR	Waterhole		20	#				####				##	Modern roots (4), Earthworm egg cases (2) WPR: Rubus Sect 2 Glandulosus, Ranunculus repens-type, Rumex obtusifolius, Chenopodium album, Rumex acetosa, Potentilla erecta-type, Trifolium, Urtica dioica		good		

Site Code	Sample no	Context number	Date	Feature Type	Processed Volume (l)	Flot Volume (ml)	Charred Cereals	Charred Chaff	Charred Weed Seeds	Charred Other	Waterlogged Weed seeds	Snails from flot	Small Bones	Charcoal <2mm	Charcoal > 2mm	Flot comments	Potential CPR	Potential WPR	Potential charcoal	Recommendations CPR
M25 002 09	2097	3667	LR	Waterhole	15	200					####				###	Wood (4), Earthworm egg cases (2) WPR: Fumaria, Stellaria media, Potentilla erecta-type, Carex trigonous, Apiaceae, Lamiaceae, Sonchus, Ranunculus repens-type, Urtica dioica, Cirsium, Rumex obtusifolius, Rubus Sect 2 Glandulosus, Rumex acetosa		good		
M25 002 09	2098	3654	LR	Waterhole	30	120	##	##			####			###	####	Wood (4), Calcined bone (1) CPR: sprouted Triticum, Hordeum, T. spelta glumes, WPR: Fumaria, Rumex acetosa, Urtica dioica, Potentilla erecta-type, Stellaria media, Cirsium, Ranunculus repens-type, Carex trigonous, Rubus Sect 2 Glandulosus, Sambucus nigra, Conium maculatum, Charcoal mostly Quercus	fair	good	fair	scan
M25 002 09	2099	3667	LR	Waterhole	35	5									##					
M25 002 09	2101	4153	LIA	Pit 4152, upper fill	8	5									##	Modern roots (3) WPR: Chenopodium album				
M25 002 09	2118	4260	LIA	Pit	30	400					#			####	####	Modern roots (4), Insect remains (1) WPR: Lamiaceae, Charcoal mostly Quercus			good	
M25 002 09	2119	4221	LIA	ring gully	11	20					#			###		Modern roots (4) WPR: Solanum				
M25 002 09	2120	4221	LIA	ring gully	11	20					##			##		Modern roots (4), Insect egg cases (1) WPR Betula, Rubus Sect 2 Glandulosus, Chenopodium album, Brassicaceae				

Site Code	Sample no	Context number	Date	Feature Type	Processed Volume (l)	Flot Volume (ml)	Charred Cereals	Charred Chaff	Charred Weed Seeds	Charred Other	Waterlogged Weed seeds	Snails from flot	Small Bones	Charcoal <2mm	Charcoal > 2mm	Flot comments	Potential CPR	Potential WPR	Potential charcoal	Recommendations CPR
M25 002 09	2121	4259	LIA	Pit	40	100					#			###	##	Modern roots (4), Insect remains (1) WPR: Chenopodium album, Trifolium				
M25 002 09	2122	4296	LIA	ring gully 4020	15	20					#			#		Modern roots (4), Insect egg cases (1) WPR Chenopodium album, Trifolium				
M25 002 09	2123	4313	LIA	ring gully 4020	11	10	#				#			###	###	Modern roots (4), Straw chaff (1) WPR: Sambucus nigra, Betula, Charcoal mostly Quercus			fair	
M25 002 09	2124	4273	Unphased	posthole	7	10	#		#					####	####	Modern roots (2) CPR Bromus, Charcoal poorly preserved Quercus			fair	
M25 002 09	2125	4287	Unphased	posthole	10	5	#	#			#			###	###	Modern roots (2), HAVM (1) WPR Chenopodium album, Charcoal poorly preserved Quercus				
M25 002 09	2126	4074	LIA	ring gully 4141	10	5					#			###	##	Modern roots (3) WPR: Chenopodium album				
M25 002 09	2127	4302	LIA	Ditch fill	40	350	###		#	#				####	####	Modern roots (4) CPR: Indeterminate, cf Triticum, Corylus fragment, Bromus WPR: Chenopodium album, Charcoal mixed including Quercus roundwood, Maloideae, Prunus sp	fair		good	scan
M25 002 09	2128	4313	LIA	Posthole, 4-poster	38	200	#			#				###	####	Modern roots (4), HAVM (1), Earthworm egg cases (1) WPR: Chenopodium album, Charcoal mostly Quercus			fair	
M25 002 09	2129	4328	LIA	Ditch	40	75	##								##	Modern roots (4), Insect remains (1) WPR: Lamiaceae				

Site Code	Sample no	Context number	Date	Feature Type	Processed Volume (l)	Flot Volume (ml)	Charred Cereals	Charred Chaff	Charred Weed Seeds	Charred Other	Waterlogged Weed seeds	Snails from flot	Small Bones	Charcoal <2mm	Charcoal > 2mm	Flot comments	Potential CPR	Potential WPR	Potential charcoal	Recommendations CPR
M25 002 09	2130	4382	LIA	Ditch	30	100	##		#		###			####	####	Modern roots (4) CPR: Indeterminate and cf Triticum, Brassicaceae, Bromus WPR: Lamiaceae, Chenopodium album, Charcoal mixed			fair/ good	
M25 002 09	2132	4453	Roman	Pit	30	50	##	#	#					####	####	Modern roots (2) CPR: Indeterminate, hulled? Triticum, Brassica sp, Legume, Galium, Poaceae WPR: Fumaria, Rubus Sect 2 Glandulosus, Carex trigonous, Solanum, Charcoal cf Quercus roundwood			fair	
M25 002 09	2133	3656	LR	Waterhole	40	50	##		#					###	####	Modern roots (3), CPR: Indeterminate and hulled? Triticum, Legume, Poaceae, Bromus, Earthworm egg cases (1), Charcoal mixed including Quercus roundwood and Alnus/Corylus			fair	

Table 36: Passingford Bridge, assessment results of the plant remains and charcoal. Material is scored on a scale of abundance of # to ####, where # is rare (up to 5 items) and #### is abundant (>100 items). CPR = charred plant remains, WPR = waterlogged plant remains, HAVM = heat affected vesicular material

Pond 1609 (Denise Druce)

Introduction

Ten bulk samples taken during excavation of the site were processed for the assessment of charred plant remains (CPR) and charcoal. All ten samples came from shallow, or severely truncated, pits, which are interpreted as possible Roman cremation pits. The aim of the assessment was to quantify and provisionally identify any surviving environmental material present within the pits for providing information on any associated economic/cultural practices and local environments. Between 10 and 60 litres of material from each of the features were processed by flotation in a modified Siraf-type machine.

Results

The results of both the CPR and charcoal assessment are shown in Table 37 where plant remains and charcoal are scored on a scale of abundance of + to ++++, where + is rare (up to 5 items) and + +++ is abundant (>100 items). The components of the matrix were also noted and quantified.

All ten of the samples contained rare to common charred cereal grains consisting of mostly barley (*Hordeum vulgare*) with a few grains of the free-threshing wheat, probably bread/club wheat (*Triticum aestivum/compactum*). Rare to frequent barley rachis were also recorded in all samples, as were rare to common charred weed seeds dominated by small grass (Poaceae) seeds, with occasional weeds of cultivated or disturbed ground such as fat-hen (*Chenopodium album*) and knotgrass (*Polygonum aviculare*). Other common charred remains include rose family (*Rosaceae*) thorns and small grass stems and culm nodes. The former possibly from the wood/charcoal also present in the samples (see below).

All of the samples contained charcoal. However, only three, from pits 1006, 1014, and 1004, contained appreciable amounts of >2mm fragments, which were dominated by hawthorn-type (*Maloideae*) and/or blackthorn-type (*Prunus* sp) twigs, with a few oak (*Quercus* sp) and elm (*Ulmus* sp) fragments.

Only one of the pits, 1006, contained bone and even here only one or two fragments were recorded. Other rare material includes ceramic building material (cbm), daub, and metal waste.

Discussion

The assessment of the samples taken during the excavations at Pond 1609 demonstrate the presence of rare to common CPR and rare to abundant charcoal in the features, which has provided some indication as to the nature of the fills. Although dominant hawthorn/blackthorn type charcoal has been found in some Roman cremation deposits (Druce in prep), the lack of bone and consistent presence of charred cereal remains and weed seeds in all the pits from the excavations at Pond 1609 does not necessarily support that interpretation here. That is not to say, of course, that their original purpose was not as cremation pits. Without the support of radiocarbon dates it is difficult to say for certain whether the charred remains are contemporary with the pits, or represent material deposited much later. Either way, the material is likely to represent settlement and/or clearance waste from areas of scrub or hedgerows, which was either dumped or eroded into the pits. It is tempting to tentatively interpret the abundant barley and grass in the samples as the burnt remains of fodder or stable waste.

Sample no	Context	Cut/ feature no	Feature type	Date	Flot vol (ml)	Matrix	Charred grain	Charred chaff	Charred Weeds	Charred Other	Charcoal
1000	1007	1006	Pit/possible cremation	?Roman	280	Modern roots (++), bone (+), coal (++), havm (++)	++ *Hordeum vulgare* (barley)	++ *Hordeum* rachis, straw	++ <2mm Poaceae (grass family), *Chenopodium album* (fat-hen), *Polygonum aviculare* (knotgrass)	+++ Rosaceae (rose family) thorns	>2mm ++++ Mostly cf Maloideae (hawthorn-type) twigs. Some semi-charred. Few *Quercus* sp (oak) fragments
1001	1015	1014	Pit/possible cremation	?Roman	80	Modern straw (+), havm (+), cbm (+), daub (+)	+++ *Hordeum*, few *Triticum aestivum/ compactum* (bread/club wheat)	+ *Hordeum* rachis	+ Poaceae (grass family), *Galium aparine* (cleavers)	+++ Rosaceae thorns, Poaceae stems and stem bases	>2mm ++++ Mostly Maloideae/*Prunus* sp (blackthorn type) twigs
1002	1047	1046	Pit/possible cremation	?Roman	<5	Coal (+)	++ *Hordeum*, few *Triticum aestivum/ compactum*	++ *Hordeum* and indeterminate rachis, detached embryos	+ *Chenopodium*, Poaceae, *Polygonum*	+ Small culm nodes	Comminuted charcoal
1003	1045	1044	Pit/possible cremation	?Roman	<5	Coal (+)	+ *Hordeum*, indeterminate	+ *Hordeum* rachis	-	-	Comminuted charcoal
1004	1021	1020	Pit/possible cremation	?Roman	<5	Modern roots (++), coal (+)	+ *Hordeum*	++ *Hordeum* rachis	+ <2mm Poaceae	+ Poaceae stems and culm nodes	Comminuted charcoal
1005	1039	1038	Pit/possible cremation	?Roman	<5	Modern roots (+), modern straw (+), cbm (+)	+ *Hordeum*, indeterminate	+ *Hordeum* rachis	+ <2mm Poaceae	++ Poaceae stems and culm nodes	Comminuted charcoal
1006	1037	1036	Pit/possible cremation	?Roman	<5	Coal (++)	+ *Hordeum*	+ *Hordeum* rachis, detached embryos	+++ <2mm Poaceae	+++ Poaceae stems and culm nodes	Comminuted charcoal
1007	1027	1026	Pit/possible cremation	?Roman	<5	Modern roots (++), modern straw (+),	++ *Hordeum*, few *Triticum*	++ *Hordeum* rachis,	+ <2mm Poaceae, <4mm	+ Poaceae stems	Comminuted charcoal

Sample no	Context	Cut/ feature no	Feature type	Date	Flot vol (ml)	Matrix	Charred grain	Charred chaff	Charred Weeds	Charred Other	Charcoal
						wood (+), cbm (+)	*aestivum/ compactum*	detached emryos	Fabaceae (pea family), *Stellaria* sp (stitchworts)		
1008	1005	1004	Pit/possible cremation	?Roman	30	Wood (+), metal waste (+)	++ *Hordeum*	++ *Hordeum* rachis	+ <2mm Poaceae	-	>2mm +++ Mostly Maloideae/*Prunus* sp twigs, some semi-charred. Few >10mm fragments of *Prunus* sp and *Ulmus* (elm)
1009	1048	1048	Pit/possible cremation	?Roman	<5	Coal (+)	+ cf *Hordeum*	+ cf *Hordeum* rachis	-	-	Comminuted charcoal

Table 37: Pond 1609 (M25003.09): The charred plant remains and charcoal. Recorded on a scale of + to ++++, where + is rare (up to 5 items) and ++++ is abundant (>100 items). havm = heat affected vesicular material, cbm = ceramic building material

Pond 1615 (Denise Druce)

Introduction

Excavations at the site revealed a shallow pit (4), which contained Bronze Age pottery and a charcoal-rich fill. This was sampled for the recovery of charred plant remains (CPR) and charcoal. This report presents the results of the palaeoenvironmental assessment, which was to quantify and provisionally identify any surviving environmental material in the fill, and to assess its potential for providing information on the purpose of the pit alongside any local economic/cultural practices and environments. Sixteen litres of material from the fill was processed by flotation in a modified Siraf-type machine.

Results

The results of both the CPR and charcoal assessment are shown in Table 38 where plant remains and charcoal are scored on a scale of abundance of + to ++++, where + is rare (up to 5 items) and ++++ is abundant (>100 items). The components of the matrix were also noted and quantified.

The single fill from pit 4 was devoid of charred cereal remains and weed seeds but contained common blackthorn-type (*Prunus* sp) wood, with a few oak (*Quercus* sp) fragments.

Sample	Context	Cut/feature	Feature type	Date	Flot vol (ml)	Matrix	CPR	Charcoal
1	5	4	Pit	BA	60	Modern roots (+++), modern straw/stems (++), uncharred seeds (+), coal (+), havm (+), cbm (++)	-	>2mm +++ Mostly *Prunus* sp (blackthorn-type). Few *Quercus* sp (oak) fragments

Table 38: Pond 1615 and Haul Road MOUM25EX (M25004.09): The charred plant remains and charcoal. Recorded on a scale of + to ++++, where + is rare (up to 5 items) and ++++ is abundant (>100 items). havm = heat affected vesicular material, cbm = ceramic building material

Pond 1683 (Denise Druce)

Introduction

Excavations at the site revealed three charcoal-rich shallow pits, which were sampled for the recovery of charred plant remains (CPR) and charcoal. The function and date of the pits is uncertain. However, one produced fragments of burnt slag and burnt flint. This report presents the results of the palaeoenvironmental assessment, which was to quantify and provisionally identify any surviving charred material, and to assess its potential for providing information on the nature of the pits and any local economic/cultural practices and environments. Between seven and 17 litres of material from each of the three features was processed by flotation in a modified Siraf-type machine.

Results

The results of both the CPR and charcoal assessment are shown in Table 39 where plant remains and charcoal are scored on a scale of abundance of + to ++++, where + is rare (up to 5 items) and ++++ is abundant (>100 items). The components of the matrix were also noted and quantified.

All three pit fills were devoid of charred cereal remains and charred weed seeds. They all, however, contained common oak (*Quercus* sp.) charcoal, often larger than 10mm in size. Pit 1012 also contained a few alder/hazel (*Alnus/Corylus*) fragments.

Sample	Context	Cut/feature	Feature type	Date	Flot vol (ml)	Matrix	CPR	Charcoal
1000	1006	1005	Pit	Undated	1,400	-	-	>4mm ++++ *Quercus* sp (oak) including common >10mm fragments
1001	1008	1007	Pit	Undated	1,800	Coal (+)	-	>4mm ++++ *Quercus* sp including common >10mm fragments
1002	1013	1012	Pit	Undated	200	-	-	>4mm ++++ *Quercus* sp including heartwoot and few twigs. Few *Alnus/Corylus* (alder/hazel) fragments

Table 39: Pond 1683, NAKM25EX (M25007.09): The charred plant remains and charcoal. Recorded on a scale of + to ++++, where + is rare (up to 5 items) and ++++ is abundant (>100 items)

Upminster Bund (Denise Druce)

Introduction

Eight bulk samples taken during excavation of the site were processed for the assessment of charred plant remains (CPR) and charcoal. Seven of the samples came from a series of pits or short ditches thought to be part of an enclosure or prehistoric boundary containing pottery dated to the Bronze Age or Early Iron Age period. The eighth sample came from a single cremation, which was severely damaged through plough damage and contained no dating evidence. It is thought, however, to be either contemporary with or post-date the enclosure. The aim of the assessment was to quantify and provisionally identify any surviving environmental material in the features for providing information on any associated economic/cultural practices and environments. Between seven and forty litres of material from each of the features were processed by flotation in a modified Siraf-type machine.

Results

The results of both the CPR and charcoal assessment are shown in Table 40 where plant remains and charcoal are scored on a scale of abundance of +-++++, where + is rare (up to 5 items) and ++++ is abundant (>100 items). The components of the matrix were also noted and quantified.

Only two of the samples contained charred plant remains. A single charred seed of the cabbage family (*Brassica* sp.) was recorded in pit 1056. Plus common cereal grains of bread/club wheat (*Triticum aestivum/compactum*), together with frequent rye (*Secale cereale*) were recorded in pit 1168 alongside a single charred corncockle (*Agrostemma githago*) seed and a sloe/blackthorn (*Prunus spinosa*) stone. All eight of the samples contained comminuted charcoal, which was less than 2mm in size and therefore indeterminate. Abundant modern roots were notable in half of the samples.

Sample	Context	Cut/ feature	Feature type	Date	Flot vol (ml)	Matrix	Charred grain	Charred Weeds	Charred Other	Charcoal
100	1167	1166	Cremation pit	BA/IA	10	Modern roots (++++), uncharred seeds (++)	-	-	-	Comminuted charcoal
101	1102	1101	Pit	BA/IA	<5	Modern roots (+)	-	-	-	Comminuted charcoal
102	1087	1086	Terminus	BA/IA	5	Modern roots (++), uncharred seeds (+)	-	-	-	Comminuted charcoal
103	1057	1056	Pit	BA/IA	<5	Modern roots (++), uncharred seeds (+)	-	+ *Brassica* sp (cabbage family)	-	Comminuted charcoal
104	1064	1065	Ditch	BA/IA	<5	Modern roots (++++), uncharred seeds (++), havm (+)	-	-	-	Comminuted charcoal
105	1046	1045	Pit	BA/IA	<5	Modern roots (++++), uncharred seeds (+)	-	-	-	Comminuted charcoal
106	1169	1168	Pit	BA/IA	50	Modern roots (++++), uncharred seeds (+), coal (++), bone (+)	+++ Mostly *Triticum aestivum/compactum* (bread/club wheat), frequent *Secale cereale* (rye)	+ *Agrostemma githago* (corncockle)	+ *Prunus spinosa* (sloe/blackthorn) stone	Comminuted charcoal
107	1157	1156	Pit	BA/IA	<5	Modern roots (++), havm (+)	-	-	-	Comminuted charcoal

Table 40: Upminster Bund (M25008.09): The charred plant remains and charcoal. Recorded on a scale of + to ++++, where + is rare (up to 5 items) and ++++ is abundant (>100 items). havm = heat affected vesicular material, cbm = ceramic building material

Codham Hall (Denise Druce)

Introduction

Seven bulk samples taken during excavation of the site were processed for the assessment of charred plant remains (CPR) and charcoal. The samples came from a number of different features, such as pits, ditches and a hearth, possibly related to a late Iron Age/early Roman metalworking and/or pottery production site. The aim of the assessment was to quantify and provisionally identify any surviving environmental material for providing information on local economic/cultural practices and environments. Between three and 40 litres of material from each of the features were processed by flotation in a modified Siraf-type machine.

Results

The results of both the CPR and charcoal assessment are shown in Table 41 where plant remains and charcoal are scored on a scale of abundance of + to ++++, where + is rare (up to 5 items) and ++++ is abundant (>100 items). The components of the matrix were also noted and quantified.

Two of the samples, from hearth 196 and ditch 324 contained rare CPR. Hearth 196 contained a single scentless mayweed (*Tripleurospermum inordorum*) seed, and ditch 324 a few indeterminate and bread/club wheat (*Triticum aestivum/compactum*) cereal grains, and a few charred weed seeds of cleavers (*Galium aparine*), grass (Poaceae) and a small seed from the pea family (*Fabeacea*).

Three of the samples contained common to abundant charcoal dominated by oak (*Quercus* sp), including oak heartwood, which was often larger than 4mm, and in hearth 196 and pit 361 larger than 10mm in size. Pit 222 also contained a few hawthorn-type (*Prunus* sp.) and willow/poplar (*Salix/Populus*) fragments. Two of the samples, pits 274 and 358, contained abundant alder/hazel (*Alnus/Corylus*) and oak roundwood.

Discussion

The assessment of the samples taken during the excavations at Codham Hall demonstrates the presence of few charred cereals and weed seeds, suggestive of low levels of domestic activity. A number of the samples contained abundant charcoal dominated by oak or oak and alder/hazel, including oak heartwood. The evidence is consistent with the area being an industrial site given that oak, or oak and alder charcoal, would have provided the sustained and high temperatures required (Edlin 1949).

Sample	Context	Cut/ feature	Feature type	Date	Flot vol (ml)	Matrix	Charred grain	Charred chaff	Charred Weeds	Charred Other	Charcoal
101	197	196	Hearth	Roman	800	Modern straw (++), cbm (+)	-	-	+ *Tripleurospermum inodorum* (scentless mayweed)	+ Poaceae (grass family) stems	>4mm ++++ *Quercus* sp (oak) including heartwood. Abundant >10mm fragments
102	224	222	Pit	Roman	6,400	-	-	-	-	-	>2mm ++++ Mostly *Quercus* sp, few *Prunus* sp (hawthorn-type) and cf *Salix/Populus* (willow/poplar) fragments
103	258	260	Ditch	LIA/Roman	<5	Modern roots (++++), uncharred seeds (+), coal (+)	-	-	-	-	>2mm ++
104	275	274	Pit	Roman	40	Modern roots (++), coal (+)	-	-	-	-	>2mm +++ *Alnus/Corylus* (alder/hazel) and *Quercus* sp roundwood
105	322	324	Ditch	Roman	<5	Modern roots (++++), uncharred seeds (++), slag (+)	+ cf *Triticum aestivum/ compactum* (bread/club wheat), indeterminate	-	+ *Galium aparine* (cleavers), Poaceae (grass family), <4mm Fabaceae (pea fanily)	-	>2mm ++
106	356	358	Pit	Roman	300	Modern roots (++)	-	-	-	-	>4mm ++++ *Alnus/Corylus* and *Quercus* sp roundwood
107	359	361	Pit	Roman	700	Cbm (+)	-	-	-	-	>4mm ++++ *Quercus* sp including heartwood. Abundant >10mm fragments

Table 41: Codham Hall (M25018.09): The charred plant remains and charcoal. Recorded on a scale of + to ++++, where + is rare (up to 5 items) and ++++ is abundant (>100 items). cbm = ceramic building material

Pond 1791 (Denise Druce)

Introduction

A single bulk sample taken from the fill (110) of cremation burial 109 was assessed for its charred plant remains (CPR) and charcoal content. As yet the cremation remains undated. The aim of the assessment was to quantify and provisionally identify any surviving environmental material present within the fill for providing information on any associated cultural practices, fuel selection, and local environments.

Results

The results of both the CPR and charcoal assessment are shown in Table 42 where plant remains and charcoal are scored on a scale of abundance of + to ++++, where + is rare (up to 5 items) and ++++ is abundant (>100 items). The sample was devoid of CPR, but did contain very abundant well-preserved charcoal fragments often >4mm in size, which appeared to be dominated by *Quercus* sp (oak).

Sample no	Context no	Cut/feature no	Feature type	Date	Flot vol (ml)	Matrix	Charred	Charcoal >2mm
1	110	109	Cremation deposit	unknown	150	Molluscs (+)	-	++++ *Quercus* (oak)

Table 42: Pond 1791 (M25023.11): The charred plant remains and charcoal. Recorded on a scale of + to ++++, where + is rare (up to 5 items) and ++++ is abundant (>100 items).

Pond 1812 (Denise Druce)

Introduction

Six bulk samples taken during excavation of the site were processed for the assessment of charred plant remains (CPR) and charcoal. Two (225 and 222) were the fills of a medieval ditch (220), one, (202), was the single fill of a medieval pit (204), and three came from the fill (219) of an Early/Middle Bronze Age ?cremation vessel. The aim of the assessment was to quantify and provisionally identify any surviving environmental material present within the features/vessel for providing information on associated economic/cultural practices, fuel use, and local environments.

Results

The results of both the CPR and charcoal assessment are shown in Table 43 where plant remains and charcoal are scored on a scale of abundance of + to ++++, where + is rare (up to 5 items) and ++++ is abundant (>100 items). The components of the matrix were also noted and quantified.

The medieval ditch and pit fills contained frequent charred cereals, including *Triticum* sp. (wheat), *Avena* sp. (oat), and *Hordeum vulgare* (barley). Rare to frequent charred weed seeds, typical of disturbed and arable land were also recorded. However, none contained cereal processing waste such as chaff. Common to abundant >2mm charcoal was present in ditch fill 225 and the pit (204). The former containing a range of wood taxa, including *Quercus* sp. (oak),

Maloideae (hawthorn-type) and cf. *Ulmus glabra* (elm), and the latter dominated by *Quercus* sp. charcoal. Rare fragments of ceramic building material (cbm) were also recorded in pit 204.

The three samples from vessel 219 contained only very sparse CPR. Sample 5 producing a single charred cf *Danthonia decumbens* (heath-grass) seed and rare Poaceae (grass family) stem fragments, and sample 6 a single charred indeterminate bud. The same two samples also contained frequent to abundant comminuted charcoal, with only rare to frequent >2mm fragments.

Discussion

The charred remains and charcoal from the medieval ditch and pit are likely to represent general floor debris or dumped settlement waste. The limited evidence suggests that a number of different cereals were being handled at the site and that a range of wood for fuel was also being utilised. The dominant oak charcoal in pit 204 may be the waste from a specific activity. However, this is inconclusive given the lack of other evidence.

The nature of the Bronze Age cremation burial is enigmatic, as the lack of calcined bone fragments in its fill does not necessarily support its interpretation as a cremation urn. Although abundant fine charcoal was recorded in two of its fills, it is unclear whether it made up part of its original contents, or represents surrounding material that has subsequently fallen inside.

Sample	Context	Cut/feature	Feature type	Date	Flot vol (ml)	Matrix	Charred grain	Charred chaff	Charred Weeds	Charred Other	Charcoal >2mm
1	225	220	Ditch (top fill)	Medieval	10	Coal (+), uncharred seeds (+)	++ Indeterminate, *Triticum* sp (wheat), *Avena* sp (oat), *Hordeum vulgare* (barley)	-	++ Poaceae (grass family), *Chenopodium album* (fat-hen), small Fabaceae (pea family)	-	+++ Mixed assemblage including Quercus (oak), Maloideae (hawthorn-type) and cf *Ulmus glabra* (elm)
2	222	220	Ditch (secondary fill)	Medieval	5	-	++ Indeterminate, *Triticum* sp, *Avena* sp	-	+ Small Fabaceae	-	++
3	205	204	Pit (single fill)	Medieval	150	Coal (+), cbm (+)	++ Indeterminate, *Triticum* sp, *Hordeum vulgare*	-	++ *Rumex* sp (docks), small Fabaceae, *Anthemis cotula* (stinking chamomile)	+ Poaceae stem fragments	++++ Mostly *Quercus* including heartwood
4	219	219	Vessel	Early/Mid Bronze Age	<5	-	-	-	-	-	-
5	219	219	Vessel	Early/Mid Bronze Age	5	-	-	-	+ Poaceae including cf *Danthonia decumbens* (heath-grass)	+ Poaceae stem fragments	++ Comminuted charcoal
6	219	219	Vessel	Early/Mid Bronze Age	5	Havm (+)	-	-	-	+ Bud	+ Comminuted charcoal

Table 43: Pond 1812 (M25024.11): The charred plant remains and charcoal. Recorded on a scale of + to ++++, where + is rare (up to 5 items) and ++++ is abundant (>100 items). cbm = ceramic building material, havm = heat affected vesicular material

Pond 1824 (Denise Druce)

Introduction

Three bulk samples taken during excavation of the site were processed for the assessment of charred plant remains (CPR) and charcoal. All three were Neolithic/Bronze Age pit fills. The aim of the assessment was to quantify and provisionally identify any surviving environmental material present within the features for providing information on any associated economic/cultural practices, fuel use, and local environments.

Results

The results of both the CPR and charcoal assessment are shown in Table 44 where plant remains and charcoal are scored on a scale of abundance of + to ++++, where + is rare (up to 5 items) and ++++ is abundant (>100 items). The components of the matrix were also noted and quantified.

All three samples contained very abundant modern roots, making the risk of contamination high. Two of the pits, 130 and 137, contained rare to frequent charred cereal grains that were, unfortunately, too heat-distorted to allow positive identifications. Pit 130 also contained a single charred *Chenopodium album* (goosefoot) seed. Pits 132 and 137 contained frequent to common calcined bone fragments.

Pits 130 and 137 contained common to abundant >2mm charcoal fragments. However, those in the former were highly distorted and mineral encrusted and therefore mostly indeterminate. The charcoal fragments in pit 137, although also poorly preserved, were identified as *Quercus* sp. (oak) and diffuse porous taxa, probably *Alnus/Corylus* (alder/hazel).

Sample	Context	Cut/feature	Feature type	Date	Flot vol (ml)	Matrix	Charred grain	Charred Weeds	Charred Other	Charcoal >2mm
1	131	130	Pit (single fill)	Late Neolithic/Bronze Age	10	Modern roots (++++) coal (+), havm (+), uncharred seeds (++)	++ Indeterminate-very poorly preserved	+ *Chenopodium album* (fat-hen)	-	++++ Indeterminate-very poorly preserved
2	133	132	Pit (single fill)	Late Neolithic/Bronze Age	5	Modern roots (++++) coal (+), havm (+), uncharred seeds (+), calcined bone (+++)	-	-	-	++
3	138	137	Pit (secondary fills)	Late Neolithic/Bronze Age	10	Modern roots (++++) coal (+), havm (+), calcined bone (++)	+ Indeterminate	-	-	+++ Poorly preserved. *Quercus* and diffuse porous, cf *Alnus/Corylus*

Table 44: Pond 1824 (M25025.11): The charred plant remains and charcoal. Recorded on a scale of + to ++++, where + is rare (up to 5 items) and ++++ is abundant (>100 items). havm = heat affected vesicular material

C.3 Waterlogged plant remains

Elizabeth Huckerby and Sandra Bonsall

Introduction

Twenty samples processed from one litre of sediment were submitted to OA North for the assessment of waterlogged plant remains from the multi-period site at Passingford Bund along the M25. Eighteen of the samples were taken from Waterhole 3652 and one each from Waterhole/pit 2714 and Pit 4453. The majority of the samples (14) from Waterhole 3652 were small series samples with the remaining four coming from bulk samples that have also been assessed for charred plant remains and charcoal. All the samples except for one have been dated to the Late Roman period, the exception being Pit 4453, sample 2132 which is described as Roman.

Methodology

The 1 litre samples were hand floated at OA South and the flots were collected on a 250 micron mesh and retained in water. The residues were also retained wet. A representative sample from each was examined with a binocular microscope and all readily identified plant remains were recorded and the total number of waterlogged and or charred seeds was recorded on a scale of 1-4, where 1 is fewer than five items and 4 is more than 100 items. The components of the matrix were also noted and recorded as + present or frequent ++. Plant nomenclature follows Stace (2010) and the results are shown in Tables 46 and Tables 47.

Results

Some waterlogged remains were identified in all of the samples although the number of seeds in several were low. The preservation of the plant remains was good in the samples.

Waterhole 3652

No waterlogged seeds were identified in the six of the samples from the three upper contexts, 3659, 3658, 3656 (the upper sample (2075) of two from this context), except for the occasional rush (*Juncus* sp) seed in context 3656.

In the lower part of context 3656 (the lower sample, 2076) and the three contexts below, 3654 (bulk sample 2098), 3653 and 3652, there were moderate numbers of seeds with a number from plants of waste, cultivated or open ground including corn marigold (*Gleobionis segetum*), stinking chamomile (*Anthemis cotula*), common mallow (*Malva sylvestris*) and common nettle (*Urtica dioica*). Other seeds included creeping buttercup type (*Ranunculus repens*-type) and rushes.

In the four samples from the lower fills, 3662 and 3664, waterlogged plant remains were considerably more frequent. Plants of from waste, cultivated or open ground were the most frequent and in addition to the ones mentioned above knotgrass (*Polygonum aviculare*), broad-leaved dock (*Rumex obtusifolius*), common stitchwort (*Stellaria media*) and small nettle (*Urtica urens*) were also recorded. Other plants, which grow in broader ecological conditions, included creeping buttercup type, goosefoots (*Chenopodium* sp.) and thistles (*Cirsium* sp.). The number of seeds recorded in the sample in the lowest fill 3665 decreased.

Occasional charred indeterminate cereal grains were recorded in fills 3659, 3656, 3653 and 3664. Some charcoal was recorded in many of the samples with moderate amounts of fragments greater than 2mm in five of the samples. Amorphous plant remains were present in all but three of the samples from waterhole 3652 with abundant wood fragments in contexts 3652, 3656, 3653, 3662 and 3664. Insects were present in some contexts (3662, 3663) and *Daphnia ephippia* were noted in a number of samples.

Waterhole/pit 2714 and Pit 4453

Abundant waterlogged seeds were identified in the fill 2819 of Waterhole/pit 2714. Many of the taxa recorded were from aquatic or wet ground plants and included rushes, water-starworts (*Callitriche* sp.), water crowfoots (*Ranunculus subgenus Batrachium*) and water cresses (*Nasturtium* sp.). Other seeds identified included a few plants from waste, cultivated or open ground, grassland, from grassland including grasses with seeds 2-4mm, (Poaceae) and common sorrel, *Rumex acetosella*) and undifferentiated goosefoots (*Chenopodium*), which can grow in many different habitat. Amorphous plant remains and charcoal fragments less than 2mm were abundant and there are a few insect remains.

The final sample from Pit 4453 contained very few waterlogged seeds with occasional seeds of grasses with seeds 2-4mm, pale persicaria (*Persicaria lapathifolia*), common sorrel, brambles (*Rubus sect 2 Glandulosus* formerly *Rubus fruticosus* agg.) and elder (*Sambucus nigra*). The matrix is similar to that from fill 2819 of Waterhole/pit 2714 with the exception that there were abundant fragments of charcoal greater than 2mm.

Discussion

The assessment of the samples from the three features at M25 Passingford Bund has demonstrated that waterlogged plant remains have been recorded in many of the 20 samples examined. The seeds, which have been identified, suggest that conditions around the features were open with some possible cultivation. The assessment also suggests that ground around waterhole 3652 may have been relatively dry and that the feature was kept clear of aquatic plants. However, it suggests that the condition of waterhole/pit 2714 differs and was quite overgrown with aquatic plants (including water-starwort, water crowfoots and water cresses) and that its margins may have been muddy with the sedges and rushes. There is little evidence of shrubs or trees overhanging the features the three features although abundant wood fragments were recorded in some of the fills from waterhole 3652 and occasional seeds of elder and brambles in waterhole/pit 2714.

Feature	Context number	Sample number	Potential for WPR analysis	Potential for insects	Potential for dating
Waterhole *3652*	3558	2075	None	Possible	None
Waterhole *3652*	3656	2076	None		Possible
Waterhole *3652*	3653	2078	Moderate	Possible	Yes
Waterhole *3652*	3653	2079	Low	Possible	Low
Waterhole *3652*	3652	2080	Moderate	Possible	Yes
Waterhole *3652*	3662	2081	Good	Possible	Yes
Waterhole *3652*	3662	2082	Good	Yes	Yes
Waterhole *3652*	3664	2083	Good	Possible	Yes
Waterhole *3652*	3664	2084	Good	Possible	Yes
Waterhole *3652*	3665	2085	Low		Possible
Waterhole *3652*	3662	2061	Good		Yes
Waterhole *3652*	3663	2064	Good	Yes	Yes
Waterhole *3652*	3654	2098	Moderate	Possible	Yes
Waterhole/pit *2719*	2819	2025	Good	Possible	Yes
Pit cut *4453*	4453	2132	Good		Yes

Table 45: Samples with the potential for the analysis of waterlogged plant remains, insect assessment/analysis and or dating from M25, Passingford Bund

Site Code	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09
Sample no	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085
Context no	3659	3659	3659	3558	3656	3656	3653	3653	3652	3662	3662	3664	3664	3665
Date	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR
Feature Type	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652
Sample volume	1	1	1	1		1	1	1	1	1	1	1		1
Potential for analysis	None	None	None	None	None	Moderate	Low	Low	Moderate	Good	Good	Good	Good	Low
Potential for scientific dating	None	None	None	None	Possible	Yes	Possible	Possible	Yes	Yes	Yes	Yes	Yes	Possible
Potential for insect assessment/analysis	None	None	None	Possible		None	Possible	Possible	Possible	Possible	Yes	Possible	Possible	None
PossibleMatrix														
Amorphous plant remains	+	+	++		++	++	++	++	++	++	++	++	++	
Wood fragments					++	++	++	++	+		++	+	++	+
Roundwood									+			+		+
Buds and bud scales								+	+					
Thorns								+				+		
Charcoal >2mm		+	+	++	+	+				++	+	++	++	
Charcoal <2mm	+	+	++	++	++					++		++		++
Moss remains									+					+
Base of grass/sedge/rush plant								+						
Insect remains				+			+	+	+	+	++	+	+	
Fly puparia										+	+	+		
Mollusc shells													+	
Daphnia ephippia						+							++	
Earthworm egg cases						+					+	+		
Sand and gravel	++	++	++	++	++	++			++	++	++		++	+
Silt/clay								++		++	++		++	
Waterlogged seeds scale of 1-4					1	3	2	2	3	4	4	4	4	2

Site Code	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09
Sample no	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085
Context no	3659	3659	3659	3558	3656	3656	3653	3653	3652	3662	3662	3664	3664	3665
Date	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR
Feature Type	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652
Sample volume	1	1	1	1		1	1	1	1	1	1	1		1
Plants of waste, cultivated or open ground														
Anthemis cotula – Stinking chamomile									+		++	+		
Anthriscus caucalis – Bur-parsley												+	++	
Arctium sp - Burdocks												+		
Gleobionis segetum - Corn marigold								+		++		+		
Malva sylvestris - Common mallow							+				+	+	++	
Onopordum acanthium - Cotton thistles													+	+
Papaver cf *somniferum* – Opium poppy													+	
Polygonum aviculare – Knotgrass							+			++	+		+	
Rumex obtusifolius - Broad-leaved dock								+		++	++	+	+	
Stellaria media - Common chickweed									+		++	+	++	+
Urtica dioica - Common nettle								+	+		++	++	++	+
Urtica urens - Small nettle											++	++		
Grassland plants														
Poaceae - Grasses with seeds 2mm -4mm						+	+			+	+	+		+
Rumex acetosella - Sheep's sorrel										++				
Rumex acetosa - Common sorrel									+				+	+
Stellaria graminea - Lesser stitchwort												+		+

Site Code	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09
Sample no	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085
Context no	3659	3659	3659	3558	3656	3656	3653	3653	3652	3662	3662	3664	3664	3665
Date	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR
Feature Type	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652
Sample volume	1	1	1	1		1	1	1	1	1	1	1		1
Sonchus asper – Prickly sow-thistle												+	+	
Wet ground and aquatic plants														
Althaea officinalis – Marsh-mallow												+		
Carex trigonous - Sedge with three sided seeds											+			
Carex lenticular - Sedge with biconvex seeds								+		+				
Juncus-Rushes					+	++	+							
Montia fontana - Blinks													+	
Nasturtium – Water cresses												+		
Typha sp – Bulrushes														+
Plants from broad ecological groupings														
Apiaceae – Carrot family									+			+		
Brassicaceae - cabbage family												+	+	
Caryophyllaceae – Pink family													+	
Chenopodium spp - Goosefoots								+		+	+	+	++	
Cirsium sp -- thistles										+	++			
Fabaceae – Pea family												+ ch		
Lamium sp - Dead nettles											+	+		+
Poaceae - Grasses with seeds less than 2mm						+								
Ranunculus repens type - Creeping Buttercup						+	+	+	+					
Solanum sp – Nightshade						+								
Veronica sp - Speedwells							+							
Possible food plants														

Site Code	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09
Sample no	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085
Context no	3659	3659	3659	3558	3656	3656	3653	3653	3652	3662	3662	3664	3664	3665
Date	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR	LR
Feature Type	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652
Sample volume	1	1	1	1		1	1	1	1	1	1	1		1
Cerealia indeterminate charred			+		+		+					+		
Triticum glume charred					+									
Unknowns				+					+			+		

Table 46: Waterlogged plant remains in the series samples from Waterhole 3652 from M25, Passingford Bund

Site Code	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09
Sample no	2025	2061	2064	2097	2098	2132
Context no	2819	3662	3663	3568	3654	4453
Date	LR	LR	LR	LR	LR	Roman
Feature Type	Waterhole or pit 2714	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Pit 4453
Sample volume			1		1	1
Potential for analysis	Yes	Yes	Yes	None	Moderate	None
Potential for scientific dating	Yes	Yes	Yes	None	Yes	Possible
Potential for insect assessment/analysis	Possible		Yes		Possible	
Matrix						
Amorphous plant remains	++	++	++	++		++
Wood fragments		++	++		++	
Roundwood		+				
Leaf fragments	+					
Thorns		+				
Charcoal >2mm	+			+	++	++
Charcoal <2mm	++		+	+		++
Insect remains	+		++		+	
Daphnia ephippia		+	+		+	
Earthworm egg cases		+	+			
Sand and gravel		++	++	++	++	++
Silt/clay						
Waterlogged seeds scale of 1-4	4	4	4	0	3	1
Plants of waste, cultivated or open ground						
Anthemis cotula – Stinking chamomile		+				
Anthriscus caucalis – Bur-parsley			+			
Conium maculatum - Hemlock		+			+	
Fumaria sp – Fumitories					+	
cf *Lepidium* sp – pepperworts			+			
Malva sylvestris - Common mallow			+			
Persicaria lapathifolia - Pale persicaria						+
Polygonum aviculare – Knotgrass	+	++	+			
Prunella vulgaris - Selfheal		+				
Ranunculus sardous – Hairy buttercup		+				
Rumex obtusifolius - Broad-leaved dock	+	++	+			
Stellaria media - Common chickweed		+	++		+	
Urtica dioica - Common nettle	+	+	+		+	
Urtica urens - Small nettle		+				
Grassland plants						
Poaceae - Grasses with seeds 2mm -4mm		+ ch				+
Rumex acetosella - Sheep's sorrel			+			
Rumex acetosa - Common sorrel	+	++	+			+
Stellaria graminea - Lesser stitchwort	+					
Wet ground and aquatic plants						
Callitriche sp – Water-starworts	+					
Carex trigonous - Sedge with three sided seeds	+		+			

Site Code	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09	M25 002 09
Sample no	2025	2061	2064	2097	2098	2132
Context no	2819	3662	3663	3568	3654	4453
Date	LR	LR	LR	LR	LR	Roman
Feature Type	Waterhole or pit 2714	Waterhole 3652	Waterhole 3652	Waterhole 3652	Waterhole 3652	Pit 4453
Sample volume			1		1	1
Carex lenticular - Sedge with biconvex seeds	+					
Juncus-Rushes	++	+			++	
Lemna – Duckweeds		+				
Montia fontana - Blinks	+					
Nasturtium – Water cresses	+					
Ranunculus subgenus Batrachium	++	+				
Ranunuculus flammula - Lesser spearwort		+				
Scirpus sp – club-rushes		+				
Plants from broad ecological groupings						
Apiaceae – Carrot family			+			
Chenopodium spp - Goosefoots	++	++	+		+	
Cirsium sp -- thistles			+		+	
Lamium sp - Dead nettles			+			
Polygonum/*Persicaria* – Knotweeds					+	
Potentilla erecta - type - Cinquefoils		+			+	
Ranunculus repens type - Creeping Buttercup	+	++	+		+	
Rumex sp – Dock sp					+	
Possible food plants						
Rubus sect 2 Glandulosus - Brambles	+	+				+
Sambucus nigra - Elder						+
Unknowns						

Table 47: waterlogged plant remains in the bulk samples from Waterhole 3652, Waterhole/pit 2714 and Pit cut 4453 from M25, Passingford Bund

C.4 Pollen

Mairead Rutherford

Introduction

Four samples from Passingford Bridge Bund (2086, 2087, 2088 and 2089) were submitted to OA North for pollen assessment. The pollen samples come from a waterhole, feature 3652.

Quantification

Seven sub-samples were assessed for pollen from four overlapping monoliths (samples 2086-2089), a total deposit thickness of 1.55m. No sub-samples were selected for pollen assessment from the uppermost sample 2086 as the sediments were deemed unsuitable for pollen preservation. The following sub-samples were chosen on the basis of suitability of the lithologies; details are presented in the table below.

Standard volumes (1cc) of the sediment samples were prepared for pollen analysis using a standard chemical procedure, using HCl, NaOH, sieving, HF, and Erdtman's acetolysis to remove carbonates, humic acids, particles >170 microns, silicates, and cellulose, respectively. The samples were then stained with safranin, dehydrated in tertiary butyl alcohol, and the residues mounted in 2000 cs silicone oil (method B of Berglund & Ralska-Jasiewiczowa (1986). Tablets containing a known number of Lycopodium spores were added to the known volume of sediment at the beginning of the preparation so that pollen and spore concentrations could be calculated (Stockmarr 1972). Slides were examined at a magnification of 400x (1000x for critical examination) by 10 equally-spaced traverses across two slides to reduce the possible effects of differential dispersal on the slides (Brooks and Thomas 1967). Pollen identification, where necessary, was aided using the keys of Moore *et al*. (1991) and a small modern pollen reference collection. Andersen (1979) was followed for identification of cereal-type pollen. Indeterminable and unknown grains were recorded as an indication of the state of the pollen preservation. Any other identifiable non-pollen palynomorphs encountered on the slides were also recorded – including fungal spores (van Geel 1978; Blackford *et al.* in press) and microscopic charcoal particles (>5um) (Peglar 1993), the inclusion of which can add to the interpretation of the pollen analytical results. Plant nomenclature follows Stace (1997). The pollen counts are presented in Table 49.

Sampling depth (m)	Sample Number	Context Number	Lithology
0.47-0.48	2087	3658	0-0.43 Stones/pebbles grading to grey silty clay with sandy intervals
		0.43.0.54	Silty clay
			0.54-0.90 Stones / pebbles in clay matrix
0.90-0.91; 0.99-1.00; 1.09-1.10;	2088	3662 0.90.1.30	Dark grey, soft silty clay.
1.14-1.15;		3664 1.30.1.40	Mixed stones and clay interval
1.19-1.20;	2089	1.40.1.45	Very sticky pale brown/orange clay
1.29-1.30		3663	1.45-1.55 Blue/grey sticky silty clay

Table 48: Feature 3652 Sub-sampling for pollen and lithological descriptions

Results and interpretation

Waterhole 3652

A single sub-sample from a silty clay interval in sample 2087 yielded a moderate pollen assemblage. Sub-samples taken from sample 2088 were marginally productive whereas those from sample 2089 yielded sparser assemblages.

During the infilling of the lower part of the waterhole, contexts 3663 and 3664, low pollen counts of several taxa may be used tentatively to infer open environmental conditions existed locally, indicated by common occurrences of Poaceae (Grasses) and some herb taxa, for example, *Taraxacum* (Dandelions), *Asteraceae* (Daisies) and *Ranunculaceae* (Buttercups). Low counts for *Plantago lanceolata* (Ribwort Plantain) and Cereal-type pollen together with the herb taxa already mentioned may be used as evidence to infer a landscape with grassland/pastures and ruderal communities. There is limited evidence for regional vegetation type but mixed deciduous woodland may be suggested by the recovery of a few pollen grains of *Quercus* (Oak), *Ulmus* (Elm) and *Alnus* (Alder). The only evidence for aquatic environments from the infilled waterhole sediments is present in context 3663 where rare occurrences of *Typha angustifolia*-type (Lesser Reedmace) and *Lemna* spp. (Duckweed) suggest standing water. Of interest also is the occurrence of fungal spores of *Sporomiella*. Species of the genus are obligately coprophilous, occurring on the dung of domestic livestock as well as wild herbivores (Blackford *et al.* in press). Low levels of microcharcoal indicate possible local burning activities.

The upper three sub-samples assessed, from contexts 3662 and the uppermost from 3658 have produced reasonable pollen assemblages. The pollen assemblages are all very similar to those outlined above but additionally include species of *Caryophyllaceae* (Pinks), *Apiaceae* (Carrot family) and *Brassicaceae* (Cabbage family), again suggesting grassland/pasture environments. The occurrence of obligate coprophilous fungal spores is again of note in context 3662, taxa comprising *Sordaria* spp., *Podospora* species and *Sporomiella* spp., suggesting the presence of grazing animals (Blackford *et al.* in press). No fungal spores are present in the sub-sample from context 3658. Microcharcoal values also increase within context 3662 but drop back to lower levels in context 3658.

Discussion

The infilled waterhole sediments from Passingford Bund reveal similar pollen assemblages throughout. The assemblages are generally moderate to marginally productive and of mixed preservation. The palynoflora reflect a dominantly local grassland / pastureland environment. A couple of grains of aquatic taxa, duckweed (*Lemna*) and bulrush (*Typha angustifolia*-type) in context 3663 could be evidence that the waterhole was perhaps not being kept so clean at the time of this fill. Of interest is the occurrence of a fungal spore assemblage, strongly linked to the presence of grazing animals, perhaps suggesting that animals were using the waterhole for drinking.

Sample		2087	2088	2088	2088	2089	2089	2089
Context		3658	3662	3662	3662	3664	3664	3663
Preservation		Poor	Poor	Mixed	Mixed	Mixed	Mixed	Mixed
Potential		Possible	Possible	Possible	No	No	No	No
Depth (m)		0.47-0.48	0.90-0.91	0.99-1.00	1.09-1.10	1.14-1.15	1.19-1.20	1.29-1.30
Trees/Shrubs								
Alnus	Alder	1	1	1		1		
Betula	Birch	2						
Ulmus	Elm					1		
Pinus	Pine			1				1
Quercus	Oak			3		2		1
Tilia	Lime							
Corylus	Hazel	1	1		1			1
Salix	Willow							
Hedera	Ivy							
Ilex	Holly							
Sambucus	Elder					1		
Calluna	Heather							
Salix	Willow					2		
Crops								
Cereal-type		1	2				1	1
Herbs								
Apiaceae	Carrot family	8	2	2				
Artemisia	Mugwort							
Aster-type	Daisy-type	6	3	5	2	1	1	
Brassicaceae	Cabbage family		4	2				
Caryophyllaceac	Pinks	1	1	1				
Centaurea nigra			1		1		1	
Chenopodiaceae	Goosefoot family	2						
Cyperaceae	Sedge			4	3	1	2	
Epilobium-type	Fireweed							
Filipendula	Meadowsweet				1	1		
Fabaceae	Pea family	1				2		
Mentha -type	Mints							
Plantago lanceolata	Ribwort Plantain	9	5	5	3	3		
Plantago spp.	Plantains							
Poaceae	Grasses	53	28	32	14	34	3	15
Polygonum aviculare		1	2	1				
Prunus-type	Rose family							
Ranunculus	Buttercup	4	4	3	1	1	1	
Rubiaceae	Bedstraw	1						
Rubus-type	Bramble							
Rumex	Docks		1	1	2			
Serratula-type	Saw-wort							
Silene-type	Campion							1
Stellaria-type	Chickweed							
Succisa pratensis	Devil's Bit Scabious	1					1	
Taraxacum-type	Dandelion	12	3	13	3	7	2	4
Trifolium-type	Clover							
Urtica	Nettle							
Vicia sylvatica	Wood vetch							
Viola-t	Violet							
Unknown herbs		12	12	5		3	2	1
	Total land pollen	115	70	79	31	60	14	25
	Number of traverses	3	10	10	10	10	10	10
Ferns & Mosses								
Polypodium	Polypodies	1	4				2	
Pteridium	Bracken	3		3	1	2		
Pteridophyta (monolete)	Fern spores (monolete)	1	2			1		
Pteridophyta (trilete)	Fern spores (trilete)			1				
Broken grains		4		5		1		
Concealed grains		6	22	5		3	1	

Sample		2087	2088	2088	2088	2089	2089	2089
Context		3658	3662	3662	3662	3664	3664	3663
Preservation		Poor	Poor	Mixed	Mixed	Mixed	Mixed	Mixed
Potential		Possible	Possible	Possible	No	No	No	No
Depth (m)		0.47-0.48	0.90-0.91	0.99-1.00	1.09-1.10	1.14-1.15	1.19-1.20	1.29-1.30
Corroded grains								
Crumpled grains		17		11	2	2		
Aquatics								
Lemna	Duckweed				1	1		
Myriophyllum spicatum	Water Milfoil							
Typha angustifolia	Lesser Bulrush					1		
Algae								
Botryococcus	Green alga		1					
Alga spp.			1					
Microscopic charcoal		21	52	24	10	16	10	4
Fungal spores								
Gelasinospora								
Glomus-type			1	4	3	4	3	5
Podospora /Sordaria type			4	20	12	8	8	
Sporomiella				11		2		1
Fungal spores (undifferentiated)				10	3	10		
Type 4				2	1			1

Table 49: Pollen counts for Passingford Bund, Waterhole 3652

C.5 Scientific dating

Edward Biddulph

To address the research aims, a total of 11 radiocarbon determinations will be sought. Features provisionally selected for dating are shown in Table 50.

Site	Feature	Context	Sample	Material for dating	Current dating
M25001.08	Cremation 6093	6092	130	Charcoal	?Roman
M25001.08	Cremation 5069	5070	106	Charcoal	?Roman
M25002.10	Ring ditch 2100	2139	2005	Charcoal	Late Neolithic/early Bronze Age
M15002.10	Posthole avenue	2163	2013	Charred plant remains	Bronze Age
M25002.10	Posthole structure	2153	2011	Charred plant remains	Bronze Age
M25003.09	Pit 1014	1015	1001	Charcoal/charred plant remains	Undated
M25004.09	Pit 4	5	1	Charcoal	Bronze Age
M25007.09	Pit 1005	1006	1000	Charcoal	Undated
M25008.09	Cremation 1166	1167		?Charcoal/human bone	Undated
M25008.09	Pit 1168	1169	106	Charred plant remains	Bronze Age
M25018.10	Pit 222	224	102	Charcoal	Iron Age/Roman
M25023.11	Cremation 109	110	1	Charcoal	Undated
M25025.11	Pit 130	131	1	Charcoal/charred plant remains	Late Neolithic/early Bronze Age

Table 50: Provisional selection of samples for radiocarbon dating

In addition, twelve amino acid dates will be derived from the *Bithynia opercula* remains recovered from the Belhus Cutting sequence (context 104). These will aim to establish with certainty the association of the sequence to MIS 9.

APPENDIX D. ASSESSMENT OF ENVIRONMENTAL EVIDENCE FROM BELHUS CUTTING

D.1 Waterlogged plant remains

Elizabeth Huckerby and Kath Hunter

Introduction

An initial programme of environmental assessment was undertaken to determine the preservation levels of the different environmental indicators, the level of modern contamination and to make recommendations for more detailed assessment (Champness *et al.* 2011). Following this preliminary work fourteen bulk samples were submitted to Oxford Archaeology (North) for the further assessment of plant remains and to record the potential for further analysis.

The samples came from three sampling locations in the channel sequence and of the fourteen samples taken, five samples came from a sandy clay deposits (sampling location 1), three came from an organic deposits (sampling location 2) and six came from a channel edge environment (sampling location 3).

Methodology

Fourteen bulk samples, each 20 litres in volume, were processed by water flotation using a modified Siraf style flotation machine at Oxford Archaeology (South). The flots were collected on a 250 micron mesh and retained in water. The residues were also retained wet. A representative sample from each was examined rapidly with a binocular microscope and all readily identified plant remains were recorded. The total number of waterlogged seeds was recorded on a scale of 1-4, where 1 is fewer than five items and 4 is more than 100 items. The components of the flot were also noted and recorded as + present or frequent ++. Plant nomenclature follows Stace (2005) and the present results are shown in Table 51 and any material that was observed during the preliminary assessment has also been incorporated.

Results

Waterlogged seeds were identified in thirteen of the samples, the exception being from context 307 near the base of sample location 3. The frequency of the seeds varied in the samples from abundant to rare. *Alnus glutinosa* (alder) and *Rubus* sp (the genus includes brambles and raspberries) were present in many of the samples and there were records of *Cornus* cf *sanguinea* (dogwood) and *Prunus* sp (includes cherries and blackthorn) in some samples. Some seeds of plants from open ground, for example *Ranunculus repens*-type (creeping buttercup), *Urtica dioica* (common nettle), were also identified. Seeds from plants of wet ground or aquatic environments including *Ranunculus scleratus* (celery-leaved buttercup), *Carex* sp (sedges), *Lycopus europaeus* (gypsywort), *Sparganium* sp (bur-reeds) and *Callitriche* sp (water-starworts).

A number of the identifications were tentative and no attempt was made during the assessment, to identify several unknown seeds or other plant remains. However, significantly a number of seeds were tentatively identified as being from *Najas minor* (brittle naiad), an aquatic plant which is not found in the British Isles at present time but has been recorded in several interglacial periods including the Cromerian and the Ipswichian (Eeemian) (Godwin 1975,

Anderson *et al.* 2007). If the seed is confirmed as *Najas minor* it suggests that the climate was warmer during the Purfleet Interglacial than it has been during the Holocene.

The quantities of organic plant material recorded in the flots were large in some flots especially in contexts 205, 305 and 306. Wood fragments, amorphous plant remains, rooty material and monocotyledenous remains were frequently recorded together with dicotyledenous leaf fragments and moss shoots. There were also some thorns from plants of the *Rosaceae* (rose) family, which may come from *Rubus* sp.

Sample location	Sample no	Context no	Flot size ml	Waterlogged plant remains	Other flot components	Potential for analysis
1	27	101	75	WPR (3) including *Alnus glutinosa*, seeds and cone scales, *Ranunculus* cf *sardous*, *Rubus* sp	Amorphous plant remains ++, ?rooty material ++, roundwood +, marine molluscs, charcoal	Possible
1	28	102	200	WPR (3) including *Alnus glutinosa*, seeds and cone scales, *Rubus* sp, *Potentilla* sp, *Urtica dioica*, *Hypericum* sp, Caryophyllaceae fragment, cf *Najas minor*	Amorphous plant remains ++, Monocotyledonous remains +, rooty material ++, wood fragments ++, dicotyledonous leaf fragments +, insects present, *Daphne*	Yes
1	29	103	200	WPR (2) including *Alnus glutinosa*, cone scales, *Rubus* sp, cf connifer leaf, unknowns	Amorphous plant remains ++, Monocotyledonous remains ++, wood fragments ++, dicotyledonous leaf fragments +, insects present, silty/clay, very humified	Possible
1	30	104	300	WPR (4) including *Alnus glutinosa*, seeds and cone scales, *Rubus* sp, woody fruit stones including *Crataegus*-type, *Cornus* cf *sanguinea* and fragment of cf *Prunus* sp, *Sparganium* sp, *Carex* sp trigonous, *Ranunculus* subgenus 2 – Batrachium	Wood fragments ++ (well preserved), molluscs ++ terrestrial or freshwater	Yes
1	31	105	20	WPR (3) including *Alnus glutinosa*, seeds and cone scales, *Rubus* sp, *Potentilla* sp, cf *Solanum* sp, *Urtica dioica*, *Callitriche* sp, unknowns	Amorphous plant remains ++, rooty material ++, wood fragments ++, roundwood +, charcoal +, dicotyledonous leaf fragments +, Rosaceae thorn +, moss remains +, insects present, *Daphnia* ephippia, marine? mollusc shells ++, sand and gravel	Yes
2	73	205 top	200	WPR (4) *Alnus glutinosa*, seeds, *Carex* sp trigonous, Poaceae with seeds 2-4m, *Filipendula* sp, cf *Solanum* sp	Amorphous plant remains ++, Monocotyledonous remains +, wood fragments ++, charcoal flecks +, dicotyledonous leaf fragments ++, moss remains+, insects present, very humified flot	Yes
2	74	205 middle	200	WPR (4) including *Alnus glutinosa*, seeds and cone scales, *Rubus* sp, *Prunus* sp, *Ranunculus repens*-type, *Ranunculus* cf *sardous*, cf *Najas minor*, unknown Apiaceae,	Amorphous plant remains ++, monocotyledonous remains ++, +, wood fragments +, dicotyledonous leaf fragments ++, Rosaceae thorn +, moss remains++, insects present, silt++	Yes
2	75	205 bottom	n/a	WPR (3) including *Alnus glutinosa*, seeds and cone scale, *Betula*, *Rubus* sp, *Lapsana communis*, *Ranunculus* sp, cf *Najas*/*Butomus* sp, unknowns	Amorphous plant remains ++, monocotyledonous remains ++, very small wood fragments +, dicotyledonous leaf fragments ++, moss remains ++, insects present and abundant, molluscs marine and bivalves, a fine flot	Yes
3	33	305	n/a	WPR (3) including *Alnus glutinosa*, seeds, *Cirsium* sp, *Chenopodium* sp, unknowns	Amorphous plant remains ++, modern? rooty material ++, wood fragments ++, occasional charcoal flecks stem bases	Yes
3	34	302	80	WPR (1) including *Ranunculus scleratus*, Asteraceae undifferentiated	Amorphous plant remains ++, modern? rooty material ++, insects present, sand++	Possible
3	77	304	200	WPR (2) including *Rubus* sp, *Prunus* sp, *Carex* sp lenticular,	Amorphous plant remains ++, rooty material ++, wood fragments ++,	Possible

Sample location	Sample no	Context no	Flot size ml	Waterlogged plant remains	Other flot components	Potential for analysis
				Ranunculus subgenus 2 – Batrachium, unknowns	dicotyledonous leaf fragments +, bark +, Rosaceae thorn +, sand and gravel+, silt++, flint chipping	
3	76	305		WPR (3) including *Alnus glutinosa*, seeds and cone axis, *Rubus* sp	Amorphous plant remains ++, rooty material ++, wood fragments ++ stem bases	Possible
3	35	306	n/a	WPR (4) including *Alnus glutinosa*, seeds and cone scales, *Rubus* sp, *Lycopus europaeus*, *Sparganium* sp, *Scirpus*, *Carex* sp trigonous and lenticular	Amorphous plant remains ++, monocotyledonous fragments +, rooty material +, wood fragments + +, roundwood +, charcoal +, dicotyledonous leaf fragments +, moss fragments, thorns, molluscs + +, modern roots	Yes
3	36	307	25	None	Rooty material+, wood fragments +, modern seeds +, fragmented marine shell +, silty/clay ++	None

Table 51: Belhus Cutting M25 Widening, Junctions 29-30, Essex (M25027.11): Assessment of waterlogged plant remains. Total number of seeds recorded on a scale of 1-4 where 1 is fewer than 5 items and 4 is more than 100. Other components of the flots are recorded as present (+) or frequent (++)

Discussion

The assessment was able to identify that the sites waterlogged plant remains are well preserved and worthy of further analysis. Waterlogged seeds were identified in the samples and were present in all but one of them. Of the 14 samples assessed, eight were assessed as having a high potential for further analysis, four as having moderate potential and two as having no potential (see Table 51).

The seeds recorded infer that the vegetation was predominantly that of alder carr or scrubby woodland the latter with *Prunus, Rubus* and *Cornus.* This is also supported by the large numbers of woody fragments preserved in the samples and a possible conifer leaf.

There is evidence for fenland, ponds and slow moving rivers and this comes from the seeds of plants such as *Lycopus europaeus*, *Sparganium* sp, *Ranunculus* subgenus 2 – *Batrachium* and *Ranunculus scleratus*. Some areas of drier open ground were also present at the site (*Urtica dioica*).

The very tentative identification of *Najas minor* seeds and *Azolla* (water fern) megaspores from the organic deposits (context 205) is of considerable significance as *Najas* is not found in the British Isles today and *Azolla* is a recent introduction (Stace 2010), but their remains have been recorded in more than one interglacial period.

Significance

The authors are unaware of any previous analysis of the deposits at Belhus Cutting for plant remains or other Purfleet interglacial sites; although pollen was analysed from the deposits of this age by Gibbard (1994; 1995). The preservation of the plant remains from the deposits at Belhus Cutting is good for sites of this period in the British Isles. Perhaps one of the most important features of the assemblage plant remains recorded is that, unlike the pollen, plant macrofossils provide a very local picture of the environment, whereas it is difficult to distinguish which pollen types are local and which are more regional. These reasons make the proposed analysis of the plant remains from the site of regional and national importance especially as Palaeolithic flint tools have previously been found nearby and some fragments of charcoal were recorded in these samples.

D.2 Pollen

Sylvia Peglar

Introduction

Purfleet interglacial sediments (MIS 9) were exposed in the Belhus Cutting during widening of the M25. Three series of monoliths were taken from three separate sampling locations: 1, 2 and 3. At each location sub-samples were taken from the three fine organic facies recognised at the site — phases 2, 3, and 4. Ten sub-samples were submitted for pollen and spore analysis, four from location 1, five from location 2 and one from location 3. The aim of the analysis was to evaluate the state of preservation of the contained pollen and their approximate concentrations to ascertain whether it would be possible to make full analyses to determine the vegetational history and inferred climate during the Purfleet interglacial.

Methods

Standard volumes of the sediment samples were prepared for pollen analysis using a standard chemical procedure, using HCl, NaOH, sieving, HF, and Erdtman's acetolysis to remove carbonates, humic acids, particles >170 microns, silicates, and cellulose, respectively. The samples were then stained with safranin, dehydrated in tertiary butyl alcohol, and the residues mounted in 2000 cs silicone oil (method B of Berglund & Ralska-Jasiewiczowa (1986)). Tablets containing a known number of Lycopodium spores were added to a known volume of sediment at the beginning of the preparation so that approximate pollen and spore concentrations could be calculated (Stockmarr 1972). Slides were examined at a magnification of 400x by equally-spaced traverses across slides to reduce the possible effects of differential dispersal on the slides (Brooks and Thomas 1967). The aim was to achieve a count of at least 100 land pollen and spores. Indeterminable and unknown grains were recorded as an indication of the state of the pollen preservation. Other identifiable palynomorphs encountered on the slides were also recorded – vegetative remains, fungal spores, dinoflagellate cysts, pre-Quaternary spores, algal remains, etc., the inclusion of which can add to the interpretation of the pollen analytical results. Plant nomenclature follows Stace (1997).

Results and discussion

The results are presented as two tables: Table 52 showing the pollen and spore counts, and Table 53 the assessments and possible potential of the samples.

Sampling location	1			2			
Phase	3	4		4			
Context	104	103	102	205C	205B	205A	204
Monolith	5	11	10	26	25	24	22
Depth	0.45-0.47m	0.46-0.48m	0.47-0.49m	0.42-0.44m	0.42-0.44m	0.28-0.30m	0.45-0.47m
Trees & shrubs							
Betula			1	1	3	2	
Pinus sylvestris	7	1	16	16	13	15	4
Ulmus		21		2			
Corylus avellana	5	60	1	4	5	7	2
Salix		1	2		1		1
Quercus	43	13	57	34	68	49	50
Tilia					3		1
Alnus glutinosa	31	9	18	20	13	26	19

Sampling location	1			2			
Phase	3	4		4			
Context	104	103	102	205C	205B	205A	204
Monolith	5	11	10	26	25	24	22
Depth	0.45-0.47m	0.46-0.48m	0.47-0.49m	0.42-0.44m	0.42-0.44m	0.28-0.30m	0.45-0.47m
Acer						1	6
Hedera helix		1	2	1	1		1
Total	86	106	97	78	108	100	93
Herbs							
Poaceae undiff.	7	2	13	13	3	11	4
Cyperaceae	1	1		4	1	4	2
Artemisia		1					
Aster-type							1
Apiaceae	1	2	2	4	2		4
Brassicaceae				1			
Caryophyllaceae		1					1
Chenopodiaceae	2			1	1	1	2
Filipendula	1	1					
Plantago lanceolata			1	2	1		1
Polygonum aviculare-type							1
Urtica				1			
Total	12	8	16	26	8	16	16
Pteridophytes							
Monolete spores und.	1	2	3			2	1
Osmunda					1		
Polypodium vulgare		1	1				
Pteridium aquilinum	3		1		1	1	1
Total	4	3	5	-	2	3	2
Total land pollen & spores	103	117	118	104	118	119	111
Aquatics							
cf. *Azolla* microspore	1						
Potamogeton	1					1	
Typha angustifolia/Sparganium	1		1				
Total	3	-	1	-	-	1	-
Indeterminable pollen & spores	12	13	10	11	11	15	29
Algae (*Pediastrum*)		2					
Dinoflagellate cyst				1		1	3

Table 52: Pollen and spore counts from Belhus Cutting (M25)

Sub-sample	Preservation	Approximate Concentration	Vegetation type	Potential
Phase 4 (102) <10> 0.47-0.49 m	Quite good	76,000/cc	Woodland (*Quercus/Pinus/ Alnus* – oak/pine/alder)	Good
Phase 4 (103) <11> 0.46-0.48 m	Quite good	138,000/cc	Woodland (*Ulmus/Corylus* – elm/hazel)	Good
Phase 3 (104) <5> 0.45-0.47 m	Good	9,000/cc	Woodland (*Quercus/Alnus* – oak/alder)	Good
Phase 2 (105) <7> 0.46-0.48 m	Uncountable – very low concentration			None
Phase 4 (203) <22> 0.17-0.19 m	Uncountable – very low concentration			None
Phase 4 (204) <22>	Quite good	62,000/cc	Woodland	Good

0.45-0.47 m			(*Quercus/Alnus/ Acer* – oak/alder/maple)	
Phase 4 (205a) <24> 0.28-0.30 m	Quite good	149,000/cc	Woodland (*Quercus/Pinus/ Alnus* – oak/pine/alder)	Good
Phase 4 (205b) <25> 0.42-0.44 m	Good	98,000/cc	Woodland (*Quercus/Pinus/ Alnus* – oak/pine/alder)	Good
Phase 4 (205c) <26> 0.42-0.44 m	Quite good	90,000/cc	Woodland (*Quercus/Pinus/ Alnus* – oak/pine/alder)	Good
Phase 2 (307) <70> 0.45-0.47 m	Uncountable – very low concentration			None

Table 53: Belhus Cutting : pollen assessments and potential

Location 1

Four sub-samples were submitted:

- 1 from phase 2: Context 105, monolith 7, 0.46-0.48 m
- 1 from phase 3: Context 104, monolith 5, 0.45-0.47 m
- 2 from phase 4: Context 103, monolith 11, 0.46-0.48 m; Context 102, monolith 10, 0.47-0.49 m

Phase 2

The sub-sample from context 105, monolith 7, was impossible to count as concentration was very low.

Phase 3

The sample from context 104, monolith 5, was good although at a quite low concentration. The pollen was dominated by tree and shrub pollen, particularly that of oak (*Quercus*) and alder (*Alnus*) with some hazel (*Corylus*) and pine (*Pinus*). Taxa associated with fresh water were also found: pondweed (*Potamogeton*), lesser bulrush/bur-reed (T*ypha angustifolia*-type), and probably a microspore of the water fern (*Azolla*) which grows on the surface of quiet waters, and is characteristic of middle Pleistocene interglacials but is absent from the Ipswichian interglacial and the Holocene flora. Several clumps of the *Cyanobacterium Gloeotrichium* were also found. This is a organism which fixes nitrogen and is found in nutrient-poor conditions thus allowing other aquatic plants to grow (van Geel *et al.* 1989). Such an assemblage suggests the occurrence locally of alder carr and freshwater pools with mixed woodland on drier ground.

Phase 4

One sub-sample from context 103, monolith 11, was analysed. The pollen was dominated by tree and shrub pollen particularly that of elm (*Ulmus*) and hazel with oak and alder. Odd grains of sedge (*Cyperaceae*), meadow sweet (*Filipendula*) and umbellifers (*Apiaceae*) may be indicative of the occurrence of marsh/fen whilst other herb taxa suggest open grassy areas. The assemblage suggests that alder and willow (*Salix*) were growing on damper soils with woodland of elm and hazel with oak on drier areas.

Analysis was made of sub-sample from context 102, monolith 10. Oak was the dominant pollen taxon together with pine and alder. The grass (*Poaceae*) grains are similar to those of common reed (*Phragmites australis*), and lesser bulrush/bur-reed also occurs, suggesting the local occurrence of reed marsh. A couple of colonies of the blue-green alga *Pediastrum* which grows in fresh water were also found. Woodland on drier soils probably consisted of mixed oak and pine with some hazel and birch (*Betula*).

Location 2

Five sub-samples were submitted from this sample, all from Phase 4:

- Context 205c, monolith 26, 0.42-0.44 m
- Context 205b, monolith 25, 0.42-0.44 m
- Context 205a,monolith 24, 0.28-0.30 m
- Context 204, monolith 22, 0.17-0.19 m

All sub-samples from context 205 (A, B and C) contained good or quite good pollen at high concentrations. The assemblages from the three sub-samples were very similar, dominated by the pollen of oak, alder and pine with hazel, elm, lime (*Tilia)* and birch also present. This is indicative of mixed woodland growing on the drier soils with alder on wetter soils. Quite high values of grasses and umbellifers suggest there were probably areas of reed swamp, and odd grains of goosefoot family (*Chenopodiaceae*) and the occurrence of a few dinoflagellate cysts, which only live in brackish/salt water, may suggest some salt marsh in the area. These assemblages are very similar to those from Sample 1 phase 4 (see above).

The assemblage derived from context 204 is like those from context 205 (above) but also has >5% total pollen and spores of maple (Acer). Maple is a very low pollen producer, and this amount would suggest that maple was an important component of the mixed woodland. Such high values of maple are only found in the Ipswichian interglacial and are absent from the Hoxnian and the Holocene periods.

A sub-sample was submitted from context 203 (monolith 22, 0.17-0.19 m), but could not be analysed due to very low concentration.

Location 3

One sub-sample was submitted from Phase 2 context 307, monolith 70, 0.45-0.47 m. This could not be analysed due to very low concentration.

A pollen diagram from the western section of Belhus Park (Gibbard 1994) suggests a woodland of oak/alder/pine, as found in Phase 4 here.

D.3 Insects

David Smith

Introduction

The insect faunas described in this assessment report come from a series of six samples taken from the Purfleet interglacial (MIS9) sediments from the Belhus Cutting, Ockendon. It was hoped that an assessment of the insect remains from these samples would provide information on the following:

- Are insects remains present?
- Are the insect faunas of interpretative value and warrant further investigation?
- Do the insects suggest the nature of the environment and landscape in which these deposits formed?
- Are enough reference taxa recovered to allow climatic/ temperature reconstruction using the Mutual Climatic Range technique (Coope 1977, Atkinson et al. 1997).

Methods

The samples were processed using the standard method of paraffin flotation as outlined in Kenward *et al.* (1980). The system for 'scanning' faunas as outlined by Kenward *et al.* (1985) was followed for this assessment.

When discussing the faunas recovered, the following considerations should be taken into account:

- Identifications of the insects present are provisional.
- The various proportions of insects suggested are very notional and subjective.

Results

The insect taxa recovered are listed in Table 54. The taxonomy follows that of Lucht (1987) for the Coleoptera (beetles). The numbers of individuals present for each taxa is estimated using the following scale: + = 1-2 individuals, ++ = 2-5 individuals, +++ = 5-10 individuals, ++++ = 10-20 individuals, +++++ = 100s of individuals. The nature of the preservation and the potential for archaeological interpretation is outlined in Table 55. The majority of the insect fauna recovered were Coleoptera (beetles) or Tricoptera (Caddis flies).

Phase	4a			3	2
Context number	205	205	205	104	306
Sample number	73	74	75	30	35
Sample weight kg	7	7	9	11	9
Sample volume l	7	7	8	7	7
COLEOPTERA					
Carabidae					
Clivina spp.	-	+	-	-	-
Dyschirius spp.	-	-	+	-	-
Bembidion spp.	-	-	+	-	-

Phase	4a			3	2
Context number	205	205	205	104	306
Sample number	73	74	75	30	35
Sample weight kg	7	7	9	11	9
Sample volume l	7	7	8	7	7
Dytiscidae					
Colymbetes fuscus L.	-	-	+	-	-
Hydraenidae					
Ochthebius spp.	+	-	+	++	-
Hydrophilidae					
Cercyon spp.	-	+	-	+	-
Megasternum boletophagum (Marsh.)	-	+	-	-	-
Chaetarthria seminulum (Hbst.)	-	-	-	+	-
Staphylinidae					
Philonthus spp.	-	+	-	++	-
Aleocharinidae Genus & spp. Indet.	-	-	-	+	-
Elateridae					
Agriotes spp.	-	+	+	-	-
Dryopidae					
Dryops spp.	-	+	+	-	+
Oulimnius spp.	-	+	-	+++	+++
Limnius volckmari (Panz.)	-	-	-	+	-
Phalacridae					
Phalacrus spp.	-	-	-	-	+
Cisidae					
Cis sp.	-	-	-	-	+
Anobiidae					
Grynobius spp.	-	-	-	-	+
Anobium punctatum (Geer)	-	-	-	-	+
Scarabaeidae					
Geotrupes spp.	-	-	-	+	-
Onthophagus spp.	+	-	-	-	-
Chyrsomelidae					
Donacia spp.	++	+	-	-	+
Phyllotreta spp.	-	+	-	+	-
Chaetocnema spp.	-	-	-	+	-
Scolytidae					
Dryocoetes sp.	-	-	-	-	+
Curculionidae					
Apion spp.	-	+	+	+	-
*Dryophthorus corticalis (*Payk)	+	-	+	-	-
Magdalis spp.	+	-	-	-	-
Limnobaris pilistriata (Steph.)	-	+	-	+	-
Rhynchaenus sp.	-	+	+	-	+
TRICOPTERA					
Genus and spp. Indet.	++	++	++	+++	++

Table 54: The insect remains recovered from productive samples at the M25 Belhus Cutting, Ockenden (Taxonomy follows that of Lucht 1987). NB. No insects were recovered from Sample 76/ Context 305.

Sample number	Degree of preservation	Comparative size of faunas	Water conditions	Landscape	Overall potential of sample	Estimate of time needed for full analysis (laying out / ID days)
73	poor	Small	No information	Slight indications for woodland (*Magdalis, Dryphtophorus corticalis*) and reed bed (*Donacia*)	low	One day
74	Poor	Small	No information	Slight indications for reed bed (*Donacia* and *Limnobaris*)	low	
75	Poor	Small	Slight indications for slow flowing waters (*Colymbetes fuscus* and *Ochthebius*)	Slight indications for woodland (*Dryphtophorus corticalis, Rynchaenus)* and reed bed (*Donacia*)	low	
76	Very poor	Very small	No information	No information	none	
30	Poor	Small	Slight indications for slow flowing waters (*Ochthebius* and *Chaetarthria seminulum* (Hbst.). Indications for fast flowing waters (*Oulimnius* and *Limnebius volckmari*)	Slight indications for reed bed (*Limnobaris*)	low	
35	Poor	Small	Indications for fast flowing waters (*Oulimnius* spp.)	Indicators for woodland (*Cis, Grynobius*, *Anobium punctatum* and *Rhynchaenus*)	low	

Table 55: Summary of the nature of the insect faunas from the M25 Belhus Cutting

Discussion

The five insect faunas recovered from the deposits in the sequence at Belhus cutting were very poorly preserved. There was considerable evidence for erosion and fragmentation of the sclerites recovered. Equally, the number of fragments that could be identified to either genus or species level was quite low.

There is limited evidence for the presence of woodland and dead wood throughout the sequence. This is suggested by the recovery of a number of 'woodworms' such as *Anobium punctatum* and *Grynobius* and weevils such as *Dryophthorus corticalis* which are associated with deadwood. There are also suggestions, such as the *Donacia* and *Limnobaris* fragments recovered, that reed beds, or similar stands of waterside vegetation also were present.

There appears to be some limited evidence for fast flowing water conditions in phases 2 and 3 with several individuals of elmid 'riffle beetles', such as *Oulimnius* and *Elmis volckmari*, present.

D.4 Molluscan remains

Tom S White

Eight samples from the M25 Belhus Cutting were provided by Carl Champness of Oxford Archaeology (OA) for palaeoenvironmental assessment. Although molluscan faunas are the primary focus of this report, the presence and relative abundance of other fossil groups have been recorded and summarised (see below and Table 56). The assemblages have been related to the preliminary sedimentary sequence provided by OA.

Samples were provided as washed, unpicked residues which were assessed using a low-powered binocular microscope. Less shelly samples were fully picked and sorted; those rich in molluscan remains (containing literally thousands of individuals) were partially picked to get an idea of relative abundances and scanned for unusual species and other remains such as vertebrates and ostracods.

The results are presented in Table 56:

+ present (1 – 10 specimens)

++ common (10 – 100 specimens)

+++ abundant (several hundred specimens)

Notes on the samples

Phase 2

- <30>, <31> (Loc. 1)
- <35>, <36> (Loc. 3)

Phase 3

- <29> (Loc. 1)
- <76> (Loc. 3)

Phase 4

- <75> (Loc. 2)
- <77> (Loc. 3)

Sample Location 1

<31> (105)

Molluscs are present in low numbers; all the species represented are bivalves, the most common component of the molluscan faunas in all of the Belhus Cutting material. These include fragments of large unionids and several species of *Pisidium*, as well as the biostratigraphically significant species *Corbicula fluminialis*. These are all indicative of flowing water and coarse substrates. The large size of these shells suggests a substantial river. Also present are occasional ostracod valves, fish remains and fragments of woody plant detritus.

<30> (104)

Residues consist of coarse gravel and sand with a more substantial organic component (wood fragments and plant macrofossils) than the underlying context (105). Ostracod, vertebrate (fish) and insect remains were also noted. Molluscan remains are abundant and are again dominated by the freshwater bivalves *Pisidium moitessierianum*, *P henslowanum* and *Corbicula fluminalis*, indicative of a high-energy fluvial setting. Several gastropod species are also present, including *Valvata piscinalis*; several shells are of the antiqua form, common in many MIS 11 and MIS 9 deposits in the Thames. *Bithynia tentaculata* shells are present in low numbers, with substantially more opercula; this is also indicative of fast-flowing conditions in which lighter shells are swept away, leaving a concentration of heavier remains such as opercula. The presence of the hydrobiid snail *Heleobia* sp. is indicative of slightly brackish conditions.

<29> (103)

Shells are present in lower numbers than in context 104, but the fauna is similar. Bivalves remain the dominant component of the fauna, with a more limited gastropod fauna consisting mainly of *V piscinalis* and *Bithynia opercula*. *Heleobia* sp. is again represented, indicating the continuation of slightly brackish conditions in the Phase 3 sediments. Also present were ostracods, vertebrates (fish), plant debris and insect remains.

Sample Location 2

<75> (205)

This residue is highly organic, with abundant wood fragments, plant macrofossils and insect remains. No molluscan or ostracod remains were present.

Sample Location 3

<36> (307)

A single fragment of *Corbicula fluminalis* was present in this sample, which also contained a small number of vertebrates (fish) and plant detritus.

<35> (306)

Like sample <30>, this sample contained prolific molluscan remains, including a more diverse terrestrial fauna. It also contained the a substantial vertebrate assemblage consisting of fish and rodent teeth, along with ostracods, fish otoliths, plant debris and insect remains. The aquatic molluscs are similar to other contexts, comprising mainly bivalves with subordinate gastropods such as *Valvata piscinalis antiqua* and *Bithynia tentaculata*. *Belgrandia marginata* first appears in this sample; this species is common in late Middle Pleistocene interglacial deposits in Britain, although its modern distribution is limited to a handful of springs in southern France and Spain. It has therefore been used as an indicator of interglacial warmth probably in excess of the present day. The presence of *Heleobia* sp. again indicates slightly brackish conditions.

The terrestrial fauna comprises species indicative of marshy environments (*Carychium minimum*), grasslands (*Vallonia pulchella/excentrica*) and woodland *(Clausiliidae, Aegopinella pura*).

<76> (305)

This sample was also rich in molluscan, ostracod and vertebrate remains, with fish otoliths and plant detritus. The diversity of the aquatic fauna is slightly higher than sample <35>, including a similar range of gastropods to sample <30>. This perhaps indicates the presence nearby of more sheltered environments rich in aquatic plants. *Belgrandia marginata* is again present. Also of significance is the bivalve *Pisidium clessini*, a globally extinct species not known after MIS 7. *Heleobia* sp. indicates continuing brackish influence.

The terrestrial fauna is similar to sample <35>, although the presence of *Vallonia costata* rather than *Vallonia pulchella/excentrica* perhaps suggests slightly drier grassland environments.

<77> (304)

Two *Bithynia opercula* were recovered from this sample.

	Location 1			Location 2	Location 3			
Phase	2	2	3	4	2	2	3	4
Sample	<31>	<30>	<29>	<75>	<36>	<35>	<76>	<77>
Context	105	104	103	205	307	306	305	304
Aquatic taxa								
Valvata piscinalis	+	++	+			++	++	
Heleobia sp.		++	+			++	+	
Belgrandia marginata						+	+	
Bithynia tentaculata						+	+	
Bithynia opercula		+	+			+	++	+
Galba truncatula		+					++	
Radix balthica		+					++	
Planorbis planorbis		+					+	
Gyraulus albus		+						
Ancylus fluvialitilis		+	+			+	++	
Unionidae	+	++	++			++	+++	
Corbicula fluminalis	+	+++	++		+	+++	+++	
Sphaerium corneum	+		+				+	
Pisidium amnicum		++	+			++	++	
Pisidium clessini							+	
Pisidium henslowanum	+	++	++			++	+++	
Pisidium moitessierianum	+	+++	++			++	+++	
Terrestrial taxa								
Carychium minimum						++	+	
Succineidae		+				+	+	

	Location 1			Location 2	Location 3			
Phase	2	2	3	4	2	2	3	4
Sample	<31>	<30>	<29>	<75>	<36>	<35>	<76>	<77>
Context	105	104	103	205	307	306	305	304
Cochlicopa sp.			+			+	+	
Vallonia costata							+	
Vallonia pulchella/excentrica						+		
Clausiliidae						+	+	
Aegopinella pura						+		
Nesovitrea hammonis							+	
Deroceras/Limax						+	+	
Cepaea sp.		+				+		
Ostracods	+	+++	++			++	+++	
Vertebrates	+	+	+		+	++	++	
Fish otoliths		+	+			+	+	
Plant detritus	+	+	+	+++	++	+	+	+
Insect remains		+	+	++		+		

Table 56: Mollusc counts

Discussion

Although full quantitative analysis has not yet been carried out, the data from this preliminary assessment already allow a number of significant observations.

Several biostratigraphically significant species are present, although none of these constrains the age of the site to a single interglacial. *Corbicula fluminalis* is known from the first three post-Anglian interglacials (MIS 11, 9 and 7) but failed to recolonize Britain during the last interglacial (MIS 5e). Similarly, *Pisidium clessini* is known from Cromerian and post-Anglian interglacials but became globally extinct after MIS 7. *Belgrandia marginata*, an indicator of warm temperatures, is present in all four post-Anglian interglacials. Finally, the antiqua form of *Valvata piscinalis* is characteristic of MIS 11 and MIS 9 sites in the Thames; the type locality of this species is the MIS 9 site at Grays. Taken together, these species are completely compatible with the MIS 9 age suggested by river terrace stratigraphy (Bridgland 1994) and amino acid dating (Penkman *et al.* 2011).

Hydrobiid molluscs (*Heleobia* sp.) indicative of brackish conditions apparently first occur in the upper part of the Phase 2 deposits, being absent from sample <31> and <36> (Table 56). Evidence for brackish conditions in the ostracod record, in the form of noded *Cyprideis torosa*, is similarly absent from sample <31> but present in sample <36> (cf. ostracod report by Dr John Whittaker). Both the hydrobiid molluscs and the brackish ostracods become more abundant in the upper part of Phase 2 deposits and into the Phase 3 deposits. A pattern of increasing marine influence (rising sea-level) can therefore be tentatively discerned in the Belhus Cutting sequence.

The more diverse terrestrial fauna preserved in samples <35> and <76> at Location 3 suggest that this was a more peripheral part of the river where material swept from neighbouring habitats could accumulate. More detailed analysis of these samples therefore has the potential

to provide better characterization of the local terrestrial environments as a context for hominin occupation during MIS 9.

The pattern of colonisation by certain molluscan species has been shown to be very important in the Hoxnian (MIS 11) interglacial in the Thames. MIS 9 has a palynological signature very similar to that of the Hoxnian, so discrimination between these two interglacials has been based mainly on river terrace stratigraphy and biostratigraphy. It has previously been noted that *Corbicula fluminalis*, a late arrival in the MIS 11 molluscan succession, first appears at an earlier stage in MIS 9 (Bridgland *et al.* 2001). There is potential for this to be tested at Belhus Cutting should pollen analyses be undertaken.

The fact that changing environmental conditions are apparent in the preliminary studies of the molluscan and ostracod faunas from Belhus Cutting is extremely important. The few MIS 9 sites known have not provided sequences in which significant changes to the local environment can be observed. At Purfleet, the best-studied MIS 9 locality (Bridgland *et al.* in press), the molluscan remains represent a shell bank which accumulated very rapidly, providing only a snapshot of the prevailing local environment. Belhus Cutting therefore has considerable potential for reconstructing the changing environmental conditions during part of MIS 9, possibly including the onset of estuarine conditions in the Thames. Study of the latter will require close collaboration with the ostracod specialist, since brackish conditions are reflected in both the mollusc and ostracod records. Information about changing sea-level has important implications for the archaeological record, since Britain's island status is known to be a crucial factor in preventing immigration of hominin populations during the Pleistocene. Although no archaeological material was forthcoming in these excavations, artefacts found in the overlying gravels were suggested to have been derived from the underlying channel deposits (Wymer 1985).

D.5 Microfauna

John E Whittaker

Introduction

Six samples from the Belhus Cutting were provided by Carl Champness (Oxford Archaeology South) on January 19th 2012. The locality is situated in what is known as the Ockendon Loop, a large wide Z-shaped meander of the palaeo-Thames north of its present course, evidenced by sediments of the Corbets Tey Formation, and thought to have been laid down in the period MIS 10-9-8, incorporating the same interglacial as represented at Purfleet. A major multidisciplinary project analysing the sediments of the Purfleet area has recently been undertaken during the building of the Channel Tunnel Rail Link (CTRL). From this study Bridgland *et al.* (in press) have characterised the "Purfleet Interglacial", referred it conclusively to MIS 9 and proposed the Purfleet deposits as its stratotype. The Corbets Tey Formation further to the north in the Ockendon area at Belhus Park and environs remains yet little studied, and precise correlation of constituent beds, such as the Belhus channel, with the new Purfleet stratotype sequence is yet to be established, and the present work is indeed the first study of the microfauna. The purpose of the present analysis was thus to examine the ostracods with an aim of furthering our understanding the palaeoenvironment at this site.

Material and methods

Sample	Context	Weight processed
74	205 (middle)	230g
75	205 (bottom)	225g
29	103	240g
30	104	270g
36	307	280g
31	105	210g

Each sample was put into a ceramic bowl and dried in the oven, some (eg sample 74) being very wet on arrival. Once dried, a little sodium carbonate was added to aid removal of the clay fraction and hot water poured over them. They were then left to soak overnight. Washing was through a 75 micron sieve with hand-hot water. They were then returned to the oven for final drying. The samples were of two types: sands (samples 30, 31 and 36) and organic silts (samples 29, 74 and 75). The former broke down readily whereas with the latter the process had to be repeated to achieve a satisfactory breakdown. For examination, each sample was put into a nest of sieves (>500, >250, >150, with a collecting pan) and the residues from each was looked at, a little at a time under a binocular microscope. The ostracods were recorded semi-quantitatively by experience and by eye, and this information is listed in Table 58. Useful “organic remains” were also noted and these are shown in Table 57.

PHASE	4a			3	2	
CONTEXT	205 (middle)	205 (base)	103	104	307	105
SAMPLE	74	75	29	30	36	31
plant debris + seeds	x	x	x	x	x	x
insect remains	x	x	x	x		
Azolla	x					
molluscs		x	x	x	x	x
ostracods		x	x	x	x	x
Bithynia opercula				x		
fish remains				x	x	x
charophyte oogonia		x				
iron mineral/tubes					x	
Lithology (ecology)	Organic-rich silts (quiet backwater deposition)			Sands (high energy)	Sands (low energy)	

Table 57: Microfauna – organic remains. Organic remains are recorded on a presence (x)/absence basis.

BRACKISH OSTRACODS						
PHASE	4a			3	2	
CONTEXT	205 (middle)	205 (base)	103	104	307	105
SAMPLE	74	75	29	30	36	31
Cyprideis torosa (noded)		xx(j)	xx(j)	xxx	xx	
Cytheromorpha fuscata		xx(j)	x(j)			
NON-MARINE OSTRACODS						
PHASE	4a			3	2	
CONTEXT	205 (middle)	205 (base)	103	104	307	105
SAMPLE	74	75	29	30	36	31
Ilyocypris decipiens		x	x	x	x	
Ilyocypris lacustris		x	x	x	x	x
Darwinula stevensoni		x	x			
Candona spp.		x	x(j)		o(j)	
Limnocythere inopinata		x	o			
Cypridopsis vidua		o			o	
Pseudocandona sp.					o(j)	

Table 58: Ostracods – Ostracods are recorded: o – one specimen; x – present (several specimens); xx – common; xxx – abundant; j – small juveniles only.

Results

Six samples were analysed for microfossils from the excavations during widening of the M25 Belhus Cutting, Ockendon, Essex. This lies to the north of the Purfleet locality (Greenlands Pit, CTRL excavations, etc.), where the ancestral Thames terrace deposits, referred to the Corbets

Tey Formation, provide the stratotype of the MIS 9 Purfleet Interglacial (Bridgland *et al.* in press). The ostracods of the Purfleet area were examined in detail in Bridgland *et al.* 2012, and not only provided strong evidence that the proto-Thames at that locality was brackish and tidal, but it also contained two ostracod species of biostratigraphical importance (*Scottia tumida* and *Ilyocypris salebrosa*) which strongly supported the MIS 9 age designation (for more details see Whittaker and Horne, 2009). Belhus Park and environs, on the other hand, lie further to the north within a large Z-shaped meander called the Ockendon Loop, and has not previously been analysed for its microfauna.

In discussions with Dr F F Wenban-Smith Tables 57 and 58 are arranged according to his suggestions. Three phases are recorded in ascending order: 2, 3 and 4a; Phase 1 being the underlying Corbets Tey Gravel.

Phase 2 and 3 comprise sands and silty-sands and to these are referred samples 31, 36 and 30 (from contexts 105, 307 and 104, respectively). The lowest sample in the sequence, 31 (Context 105), contains only a few specimens of the non-marine ostracod *Ilyocypris lacustris*. The sands are quite clean; the tables show the “organic remains” encountered, any plant debris being very sparse. On the other hand the succeeding sample (36; Context 307) contains a great deal of iron mineral, tubes and the like, including rhizoliths. This appears to represent a weathered sediment perhaps close to the margin of the main channel or in an exposed area after the main channel flow changed course. It contains many brackish, noded *Cyprideis torosa* and therefore the site was within tidal access, but whether this marks the onset of tidal access within Phase 2 is debatable. Phase 2 seems to represent low energy sedimentation near the margin of the main channel which was prone to frequent migration, although a sedimentary analysis would be needed to clarify this interpretation.

Sample 30 (Context 104) is referred to Phase 3 and contains rich molluscs (mainly bivalves) and very large numbers of noded *Cyprideis torosa*, together with a few non-marine ostracods. The noding of *C torosa* occupies all seven sites on the valve and from modern proxy data indicates a salinity of no more than *c* 6‰. *Bithynia* opercula and fish remains also occur and these sands seems to suggest they were formed in a much higher energy environment of the main river. Any forthcoming mollusc analysis would prove/disprove this reconstruction.

The succeeding Phase 4a sediments, encompassing samples 29 (Context 103), and 74 and 75 (both from Context 205), are characterised by very organic-rich deposits. They contain much plant debris, seeds and the like which ought to be ideal for palynological and macro-plant specialist analysis and will, no doubt, produce much better ecological information in due course. The residues also contain many insects remains, but only a few small, often scrappy molluscs, and charophyte oogonia (but only in sample 75). In sample 74 the “ice-cream cone” heads of the fern *Azolla* occur, complete with their megaspores, the significance of which which will be discussed further below. Ostracods occur in two of the three samples – 29 (Context 103) and 75 (from the base of Context 205) but the brackish component is represented only by very small juveniles of the well-known tidal-river species, *Cyprideis torosa* and *Cytheromorpha fuscata*, and have probably been introduced in the silt fraction at times of of highest tides. They are accompanied by some adult non-marine ostracods which no doubt actually lived there; they can also tolerate low salinity. The uppermost sample (74; now from the middle of Context 205) is totally barren of ostracods and anything else calcareous. It would suggest the environment had become very reducing and anything calcareous had subsequently been decalcified. Phase 4a therefore seems to represent very quiet sedimentation, which formed in a backwater of the meander, which ultimately become a cut-off with encroaching vegetation.

The occurrence of *Azolla* is quite significant. Examples of the “ice-cream-cone-like” remains of *Azolla filiculoides* were found in sample 74 (Context 205; middle), and this is noted in Tables 57 and 58. This, the so-called “duckweed fern”, is found only in (near)-freshwater locales.

Preservation here was very good and the spores were still attached. If the *Azolla* was indeed *in situ*, as seems the case, then it has very important age significance, because according to Watts (1988), restated by Turner (in Wenban-Smith *et al.* 2006, “it seems to have become extinct in Britain after MIS9”. This is the only item of biostratigraphical importance found in the samples I examined from the Belhus Cutting excavation.

It is hoped that further samples can now be provided from some of the rest of the material collected to develop the palaeoenvironmental reconstruction much further. Not only is the area of great interest (within a large meander of the proto-Thames), but it has not been examined in any detail before. For example, analysis of the finer fraction of any shell beds with abundant molluscs may have particularly potential as they will also contain many ostracods. Collaboration on this point with the mollusc specialist would therefore be useful. It is from deposits such as these at the Greenlands Pit locality that the MIS9 ostracod markers (*Scottia tumida* and *Ilyocypris salebrosa*), so far absent from Belhus, were encountered.

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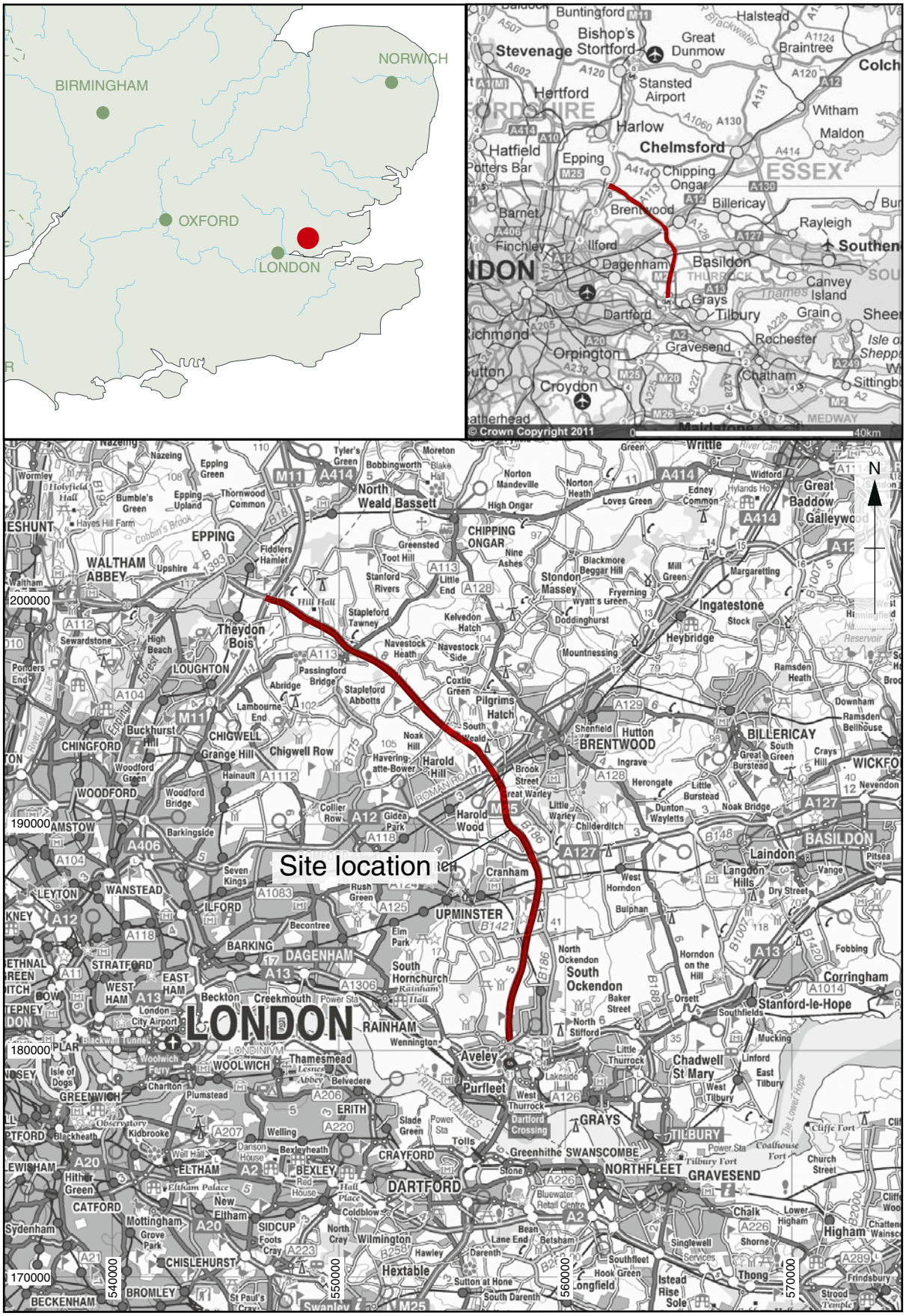

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Figure 1: Route of M25
DBFO Widening Section 4

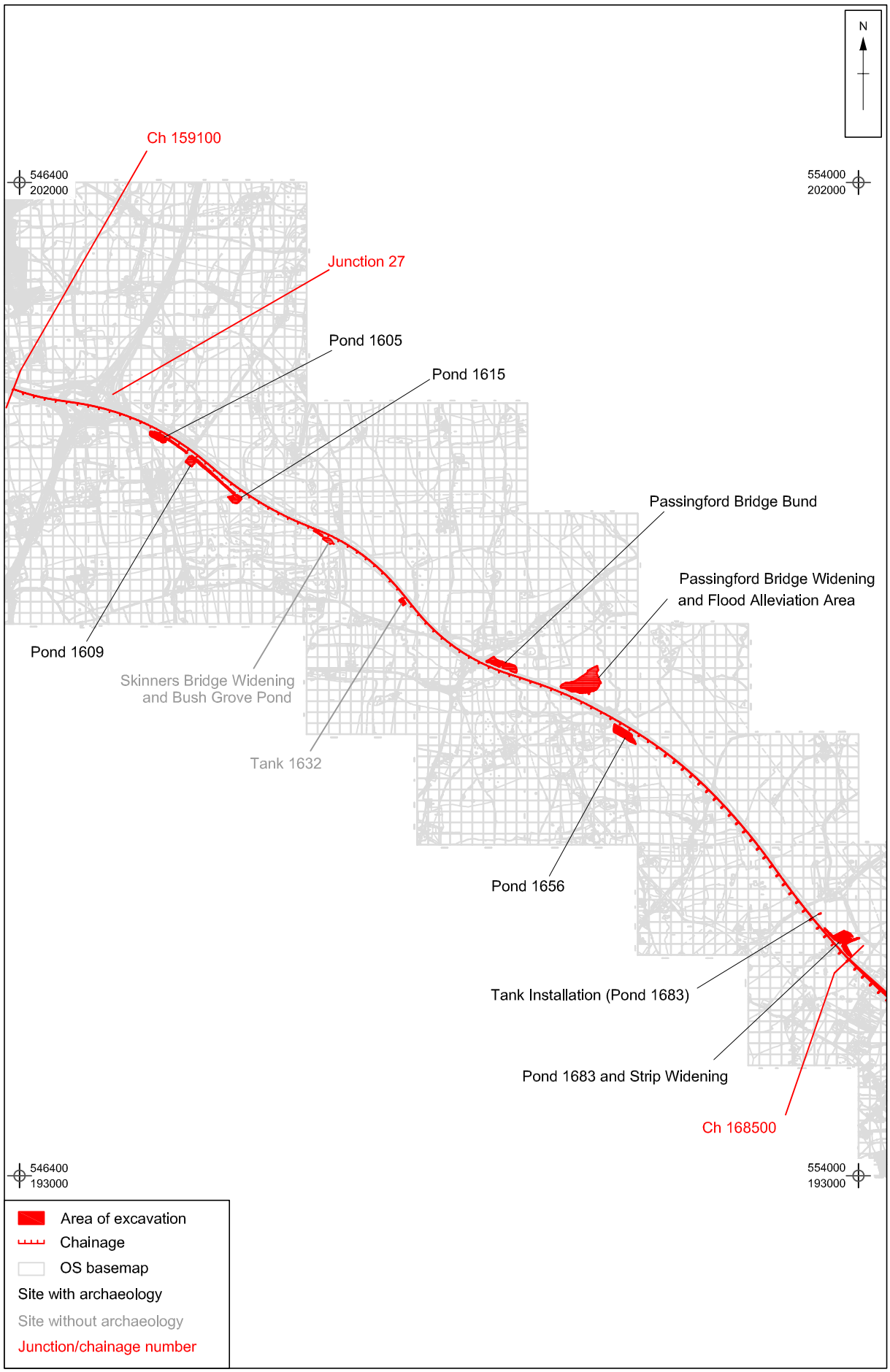

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Figure 2a: Location of sites, Section 4a

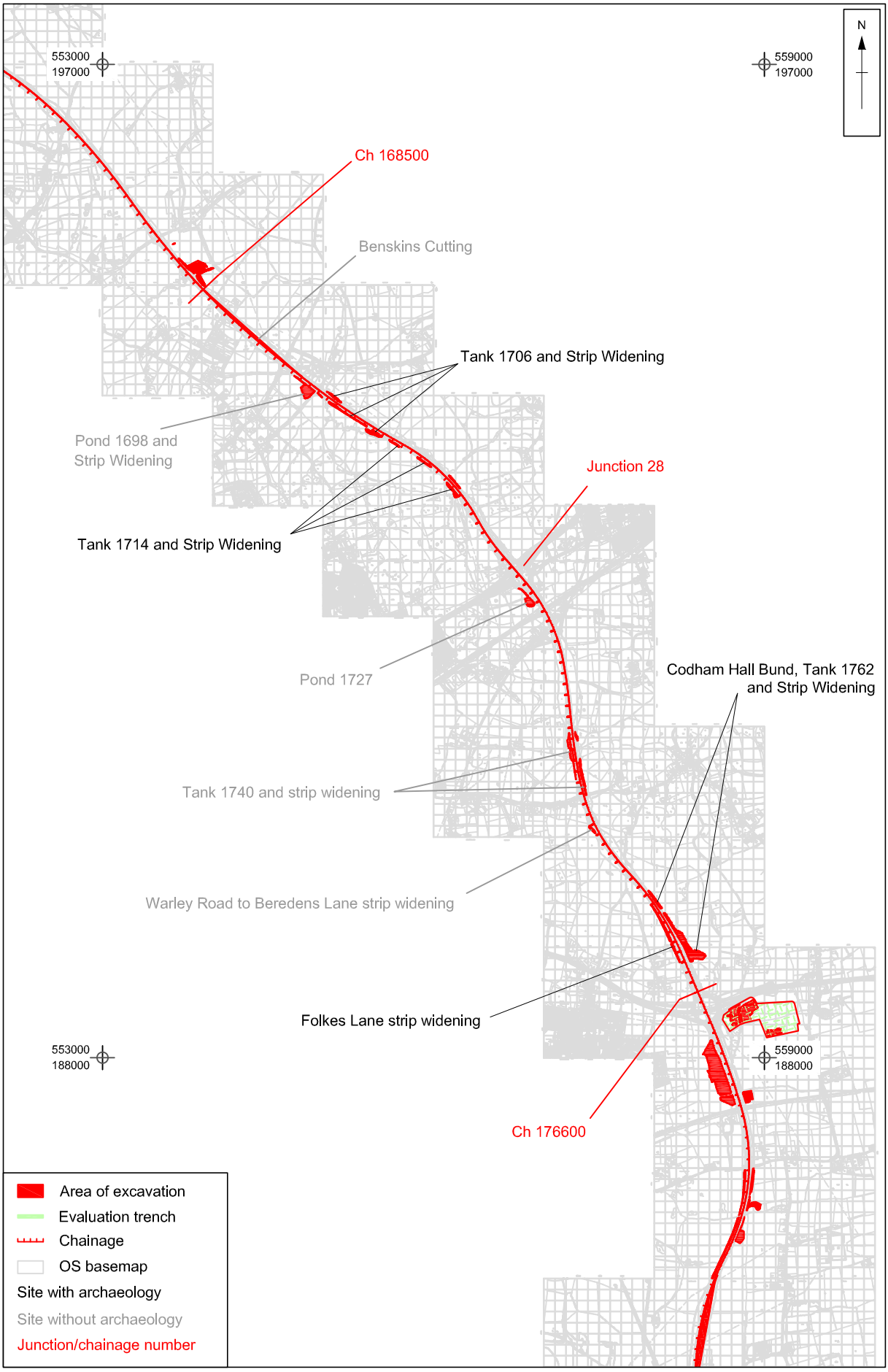

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Figure 2b: Location of sites, Section 4b

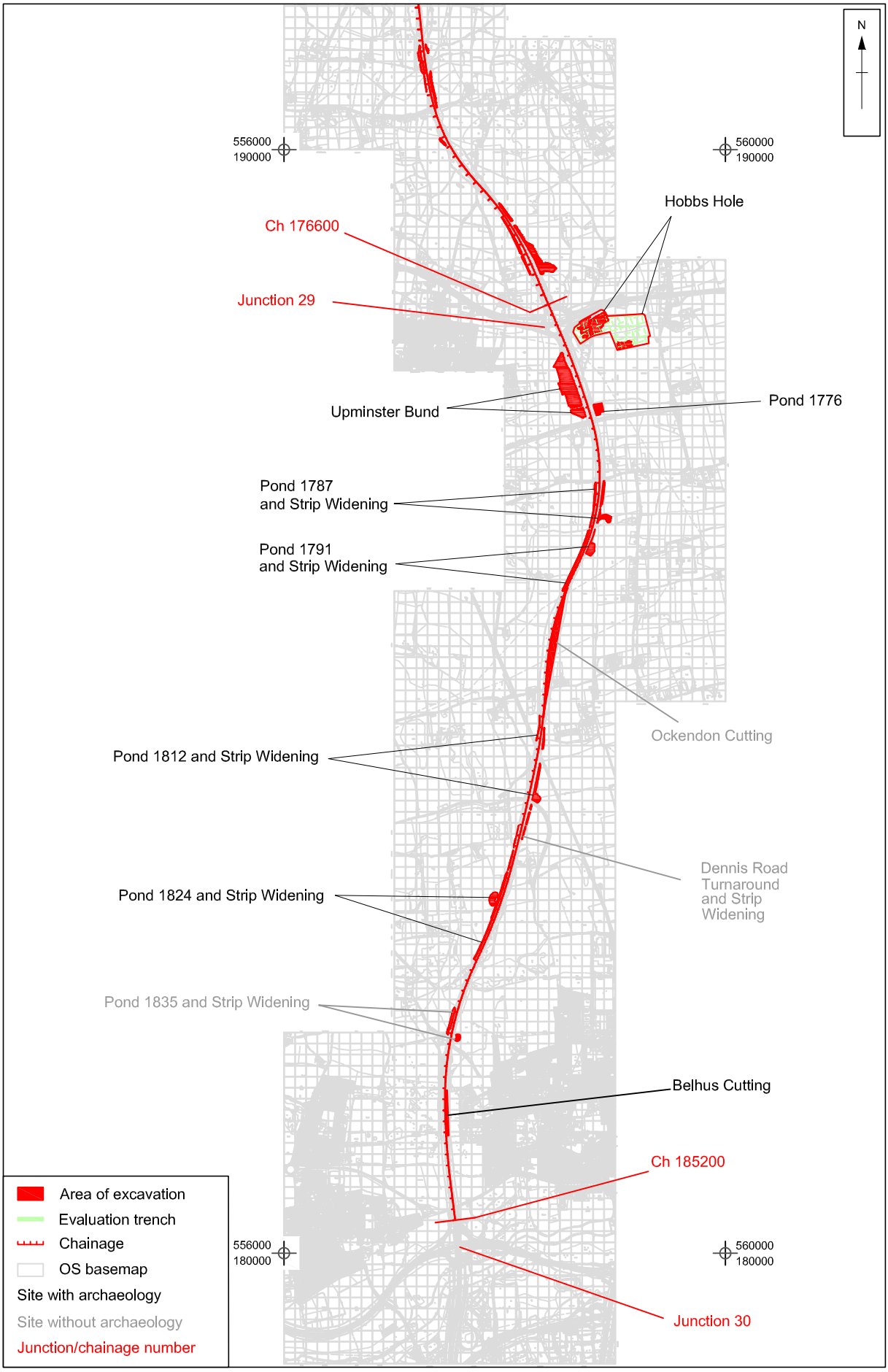

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Figure 2c: Location of sites, Section 4c

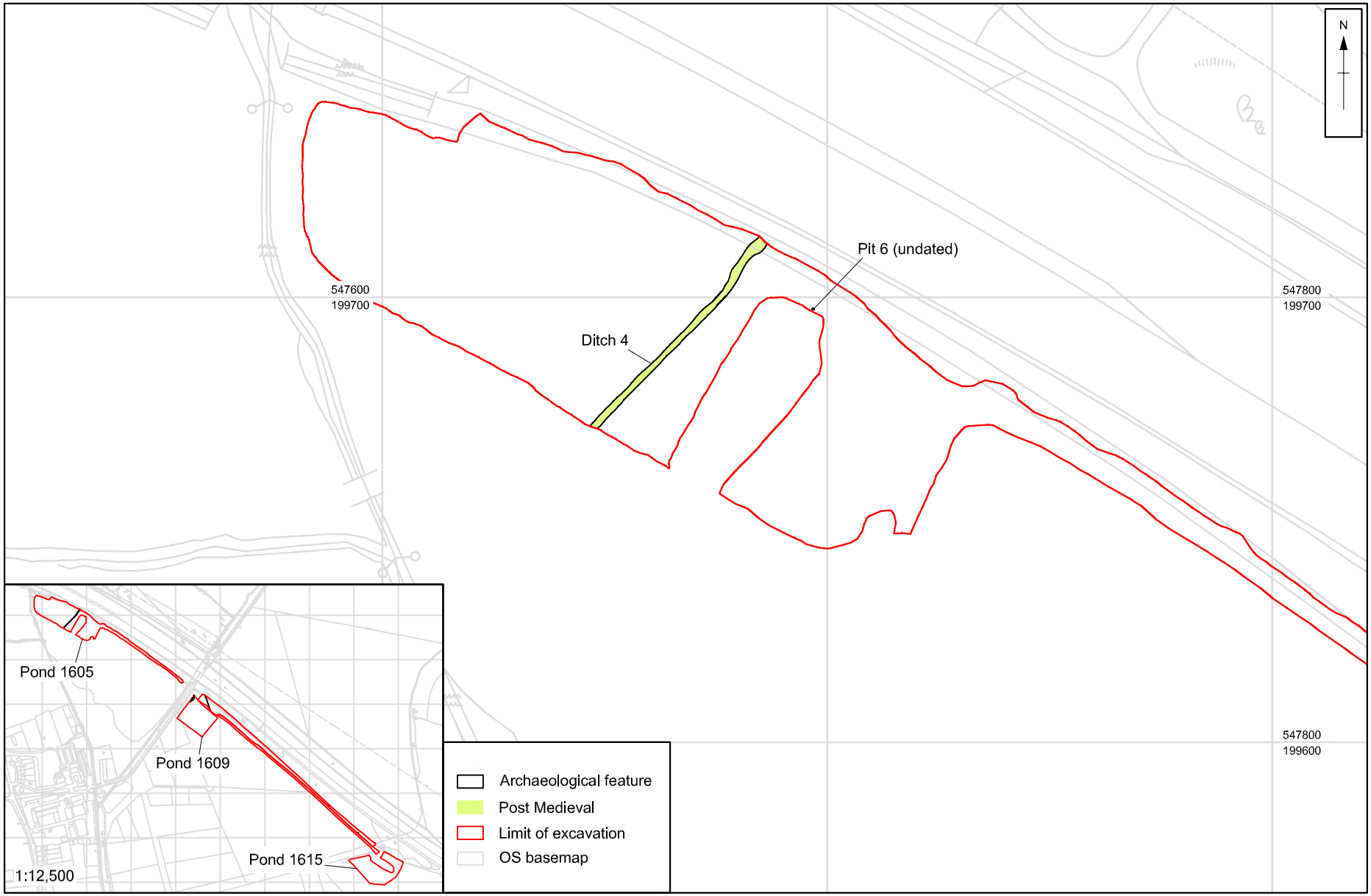

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Figure 3: Plan of Pond 1605 (M25006.09)

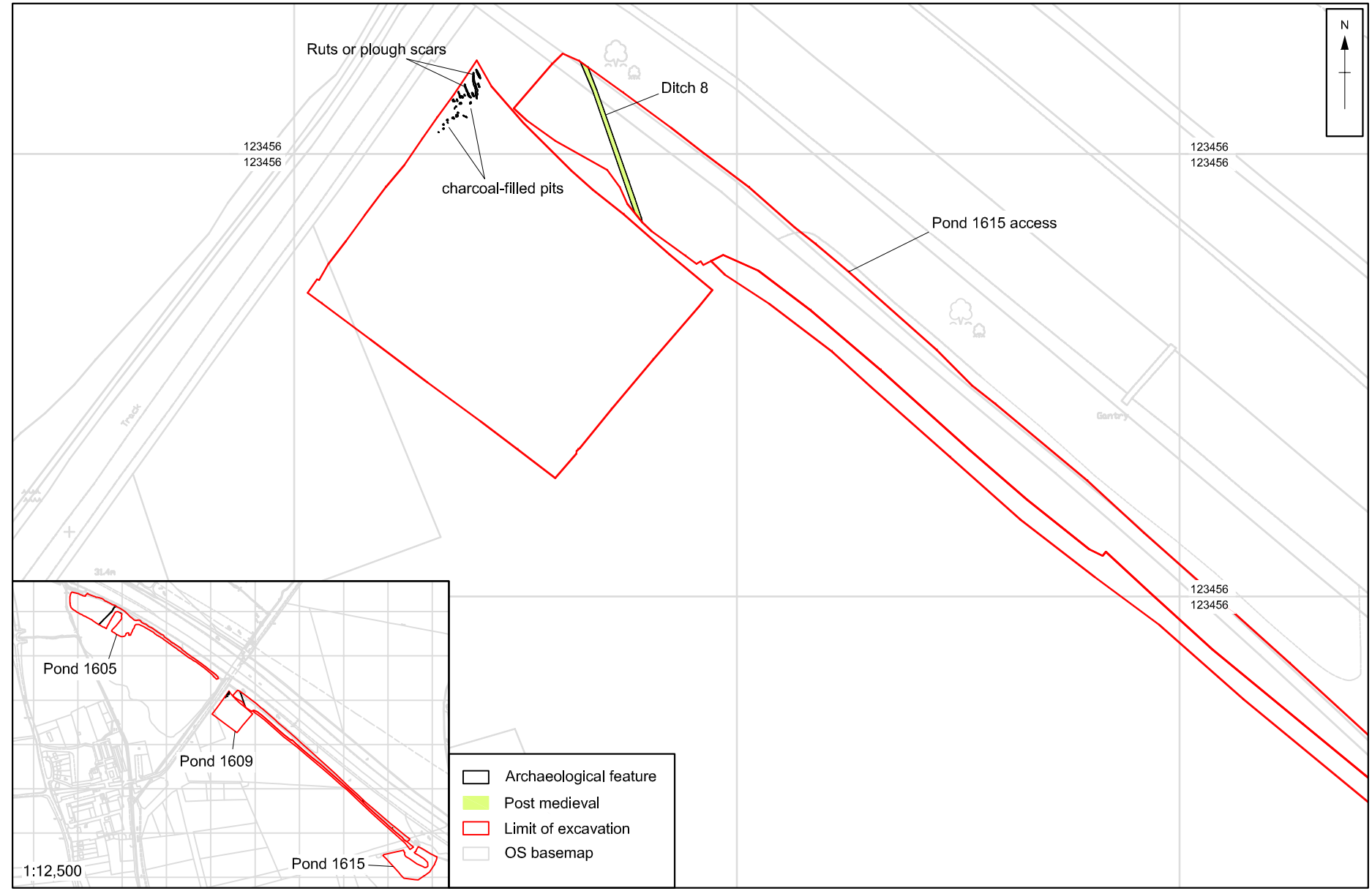

Figure 4: Plan of Pond 1609 (M25003.09)

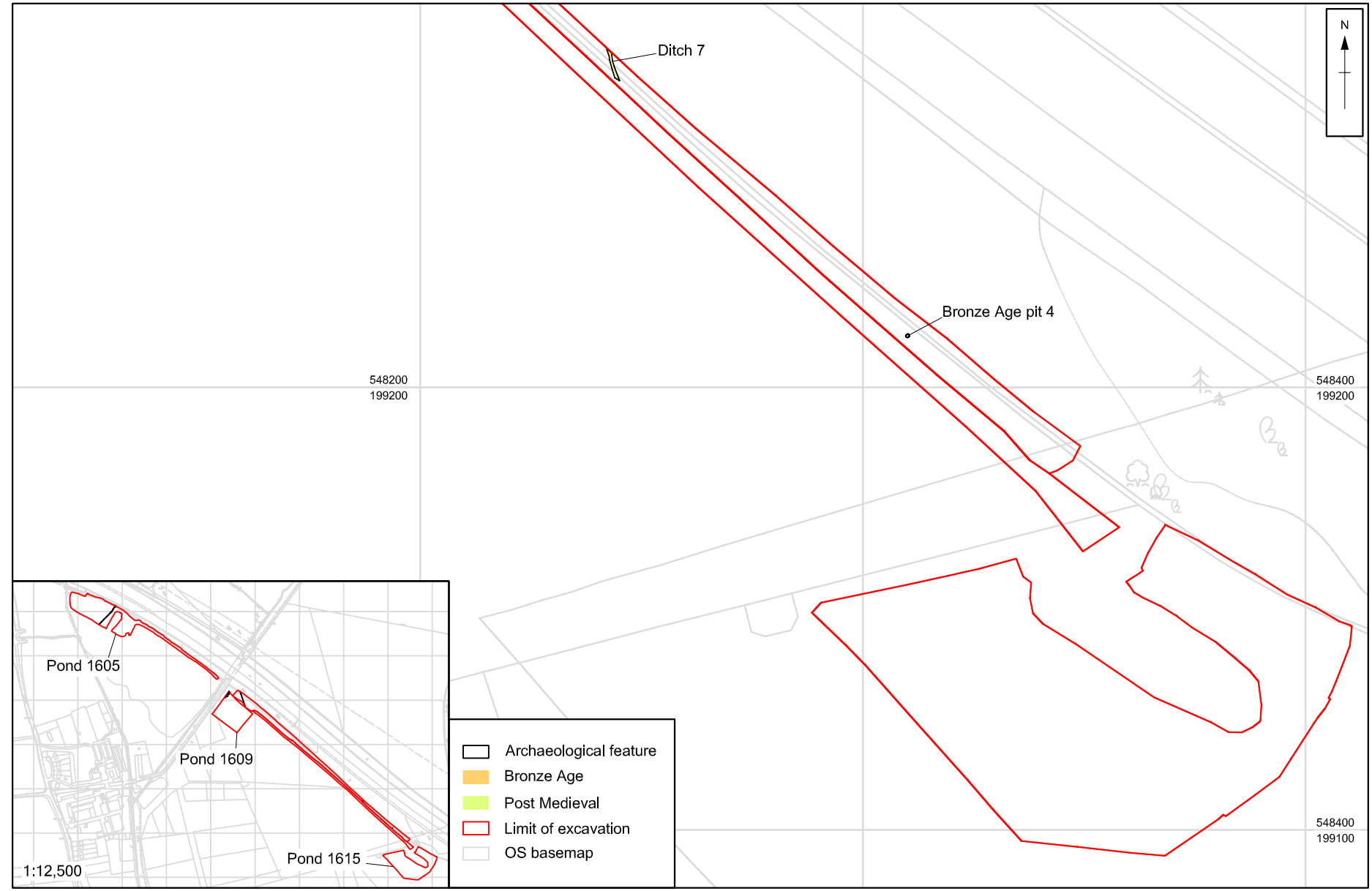

Figure 5: Pond 1615 (M25004.09)

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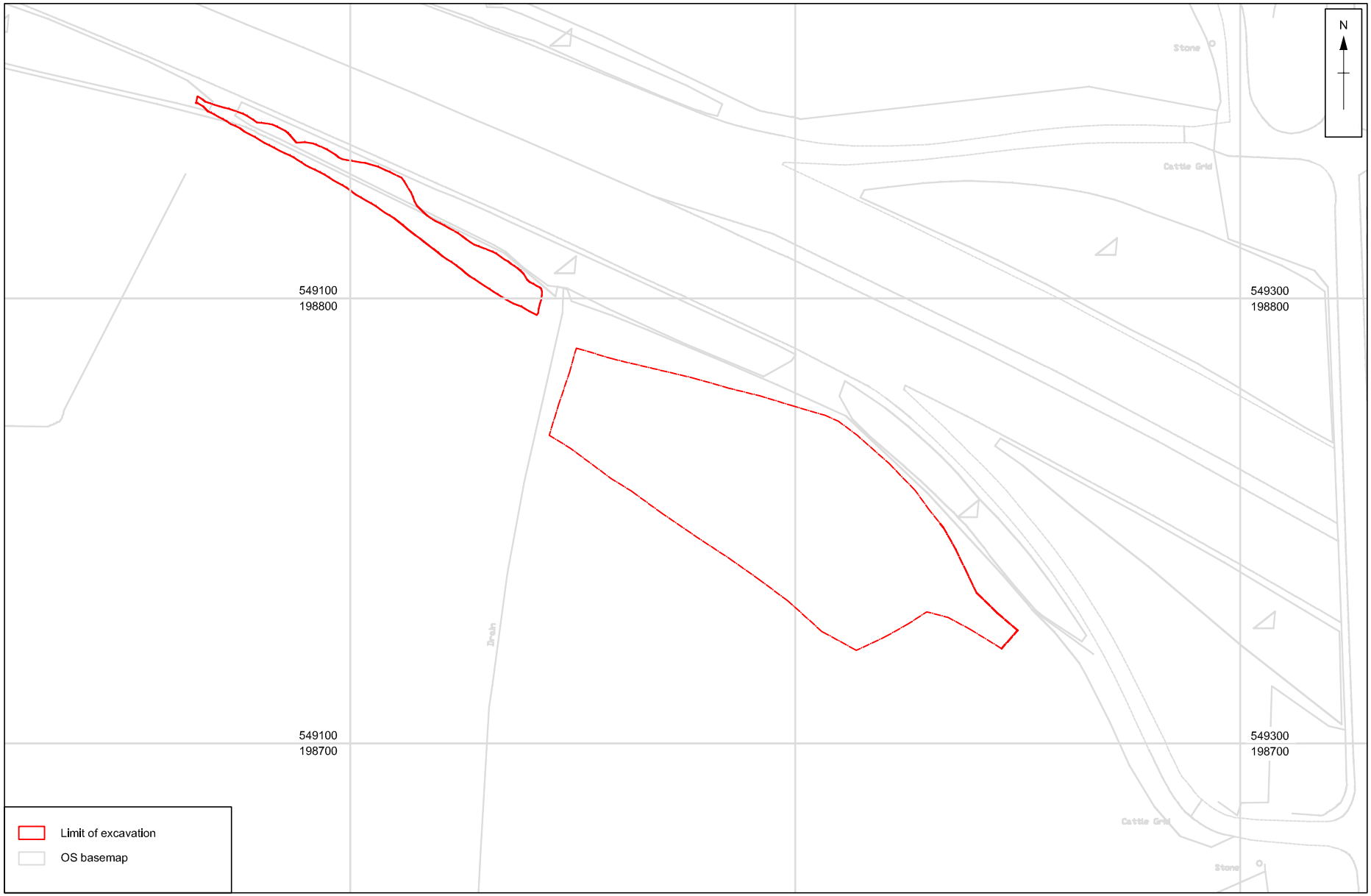

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Figure 6: Plan of Skinners Bridge and Bush Grove Pond (M25009.09)

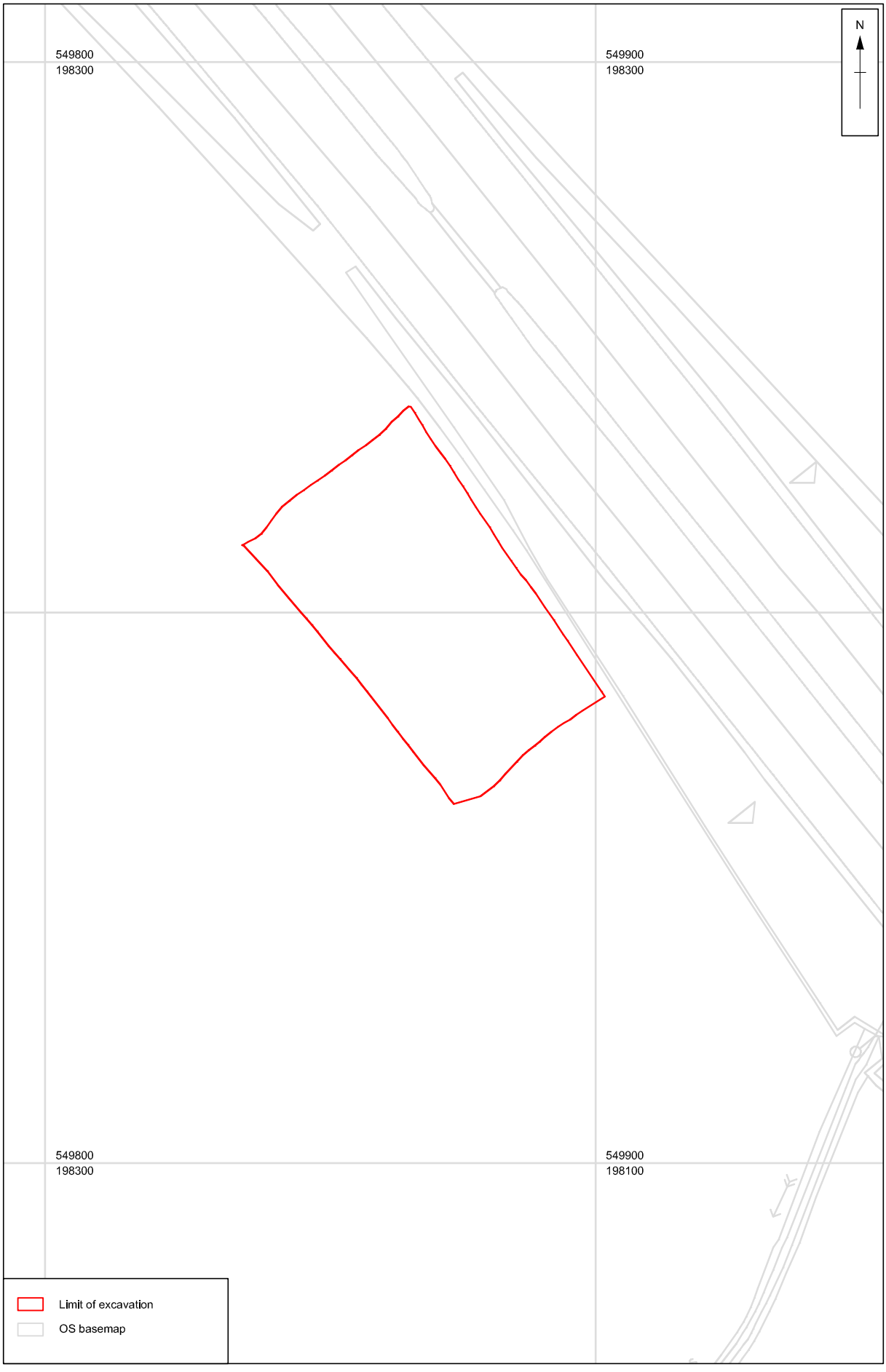

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Figure 7: Plan of Tank 1632 (M25029.11)

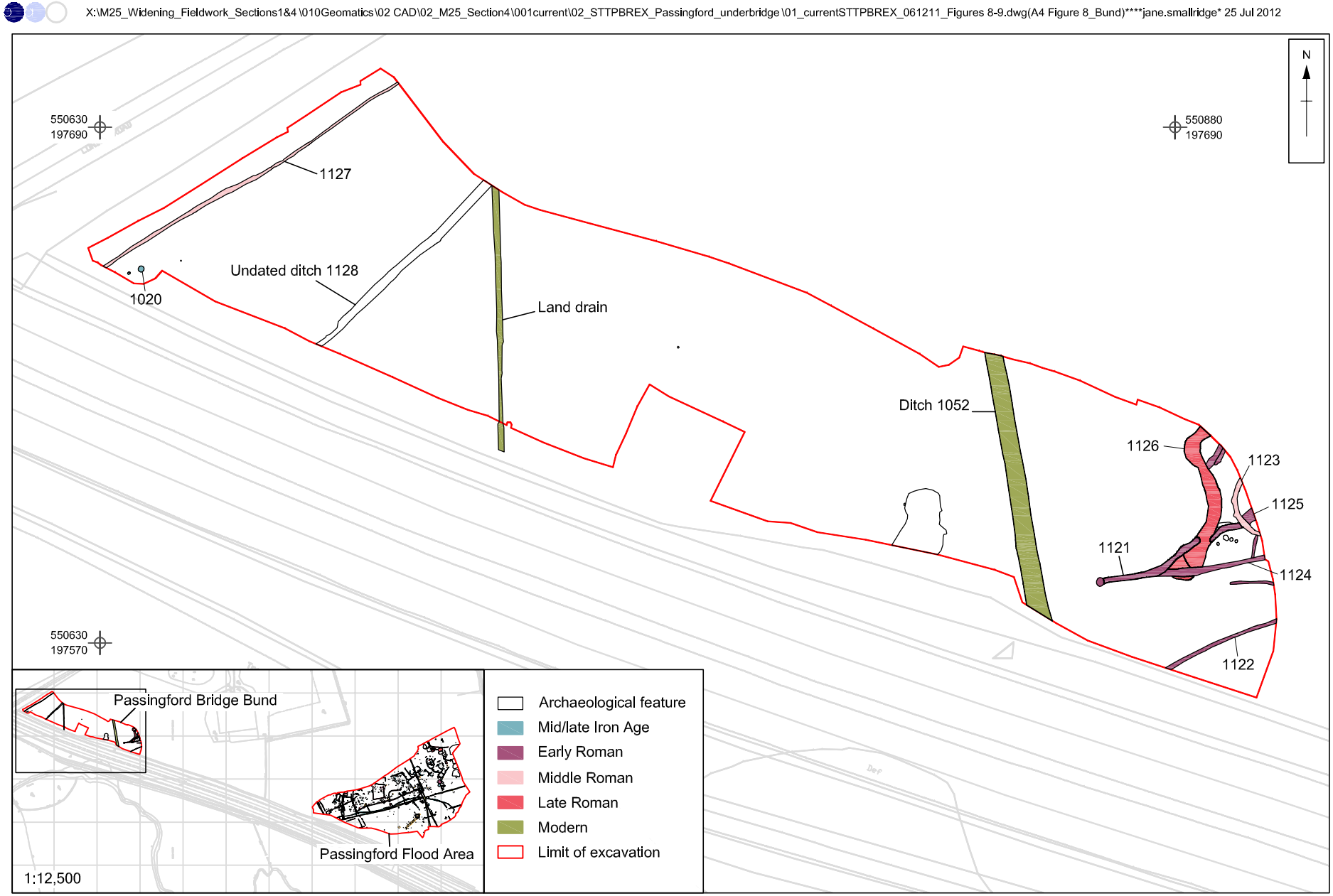

Figure 8: Plan of Passingford Bridge Bund (M25002.09)

Archaeological feature
Late Neolithic/early Bronze Age
Bronze Age
Late Iron Age
Late Iron Age/early Roman
Early Roman
Middle Roman
Late Roman
Post medieval/Modern
Limit of excavation

Passingford Bridge Bund

Passingford Flood Area

1:12,500

N

551370
197560

551640
197560

4465
4269
4020
4315
4016
4310
3360
4377
4095
4251
4431
4151
4141
3119
2423
2650
3652
2297
3609
2432
Trackway
2799
3671
Cremation 2009
2100
Posthole avenue
2281
Burnt flint features
2152

551370
197390

551640
197390

0
50 m
Scale at A3 1:1000

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Figure 9: Plan of Passingford Flood Alleviation Area (M25002.09)

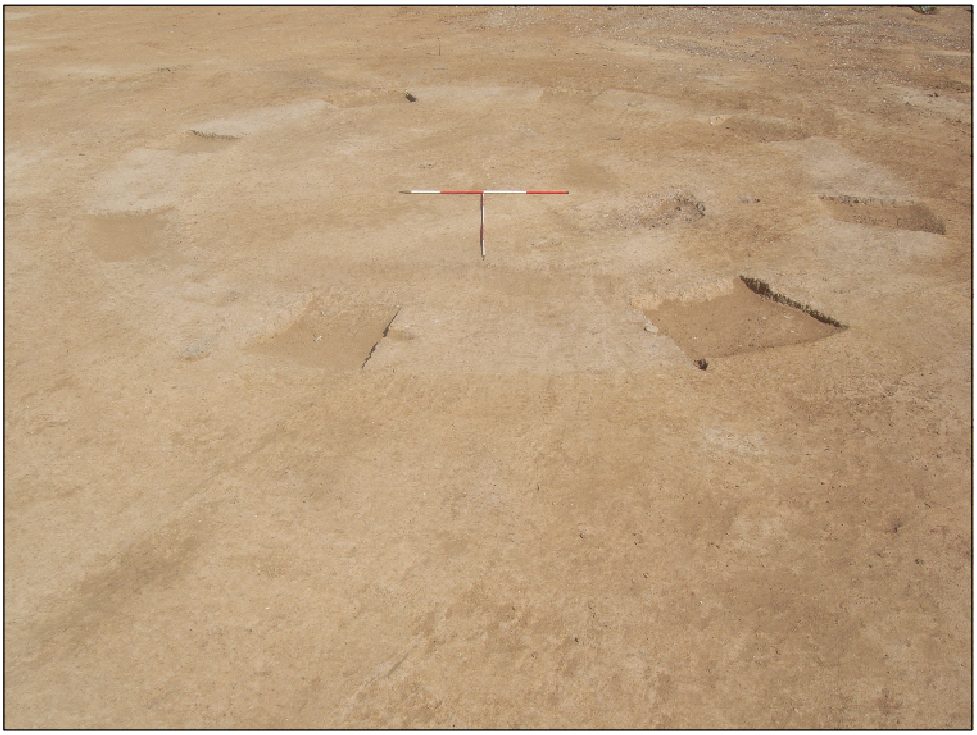


Figure 10: Late Neolithic/early Bronze Age ring ditch 2100, Passingford Flood Alleviation Area (M25002.09)

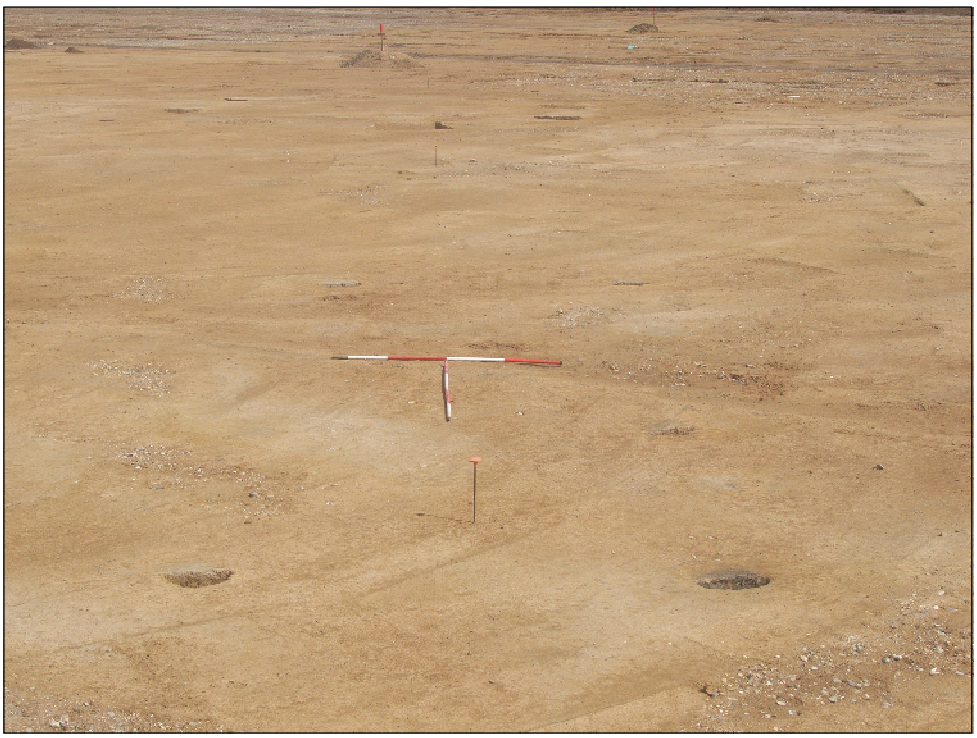
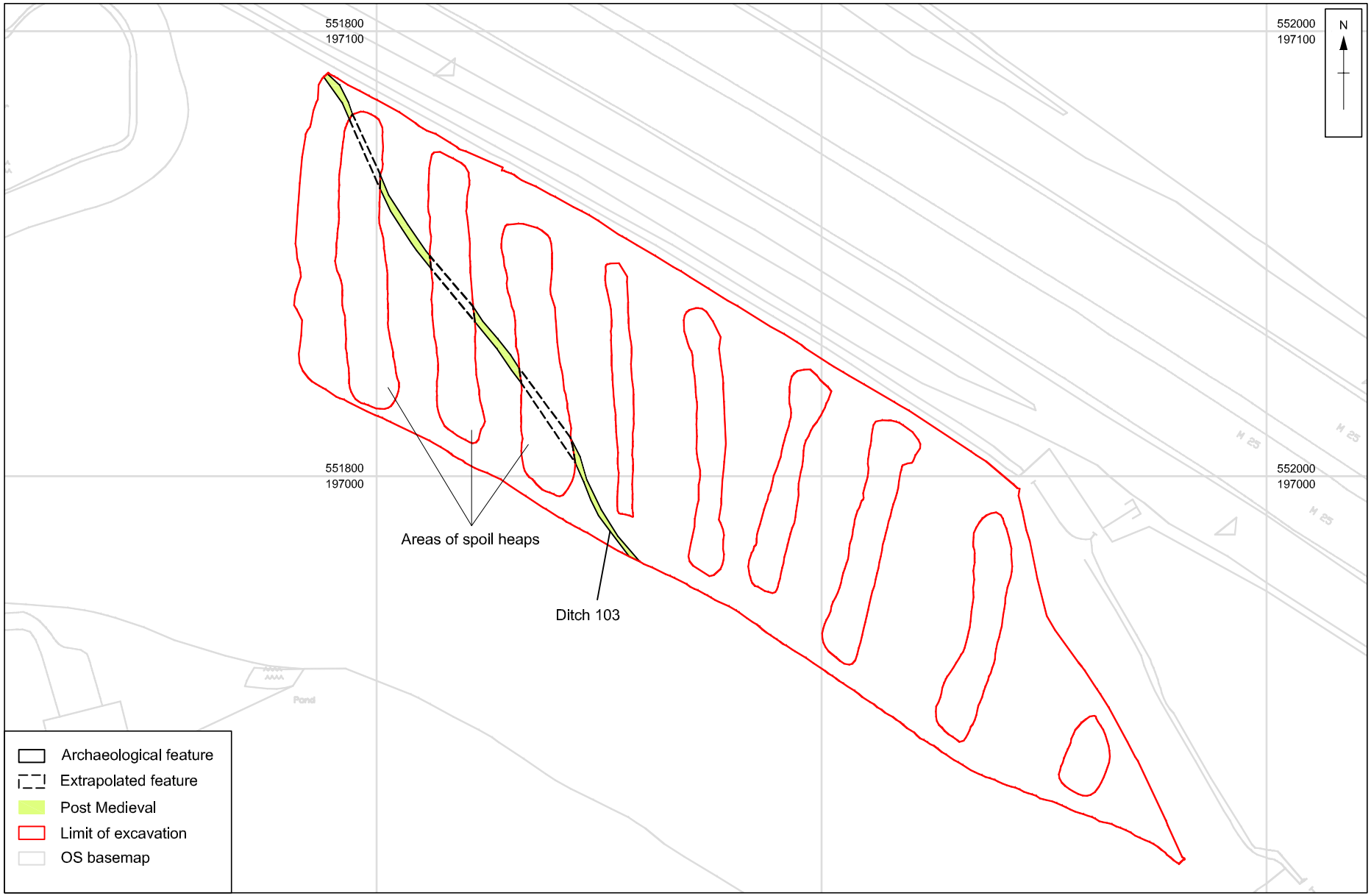


Figure 11: Bronze Age posthole alignment viewed from south-west, with ring ditch 2100 in background, Passingford Flood Alleviation Area (M25002.09)

X:\M25_Widening_Fieldwork_Sections1&4\010Geomatics\02 CAD\02_M25_Section4\001current\05_NAVM25EX_Pond_1656\NAVM25EX_061211_Figure 12.dwg(A4 Figure12)****jane.smallridge* 25 Jul 2012



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Scale at A4 1:1250

Figure 12: Plan of Pond 1656 (M25005.09)

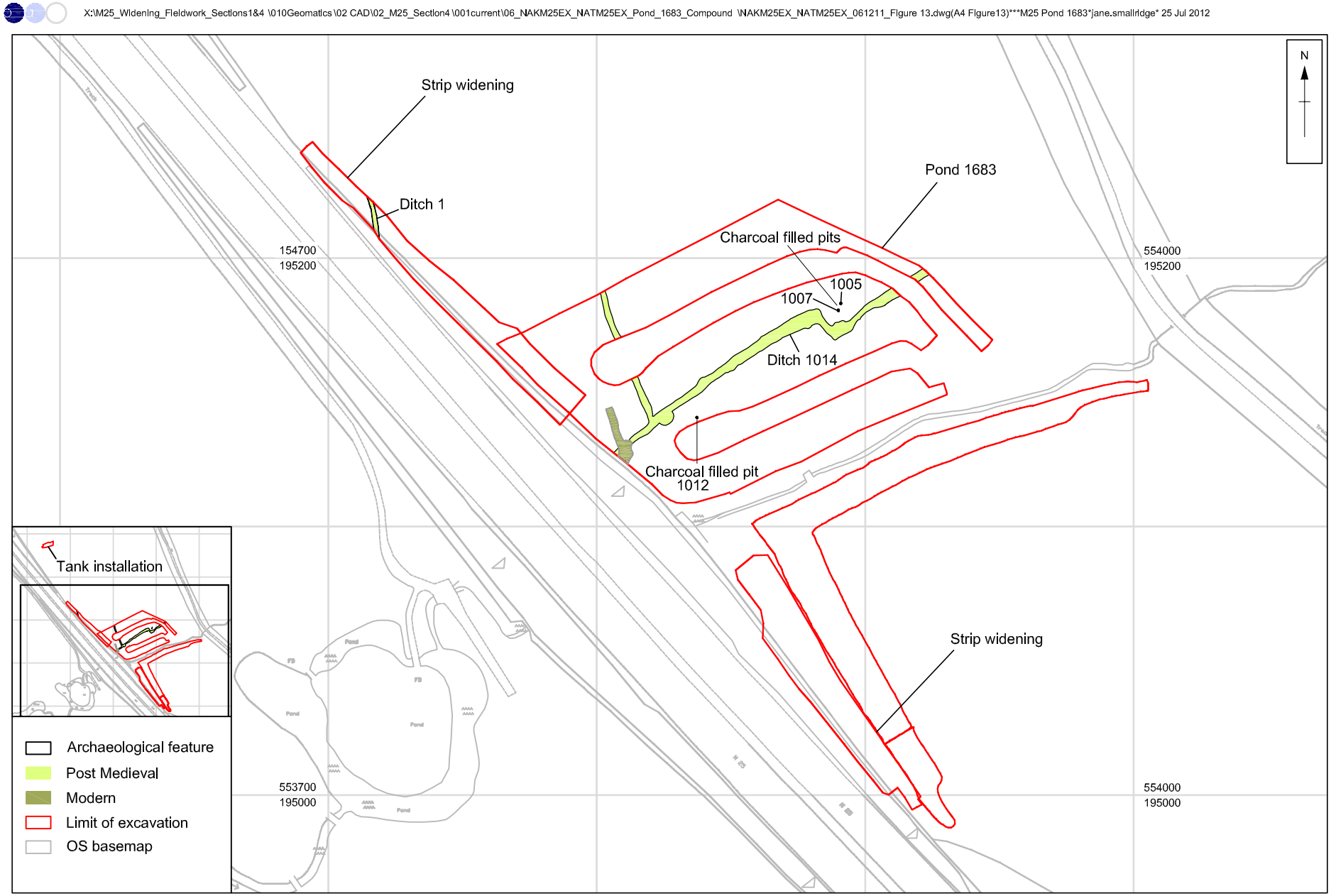

Figure 13: Plan of Pond 1683 and Pond 1683 Strip Widening, Topsoil Storage, Recovery Compound and Tank installation (M25007.09, M25010.10)

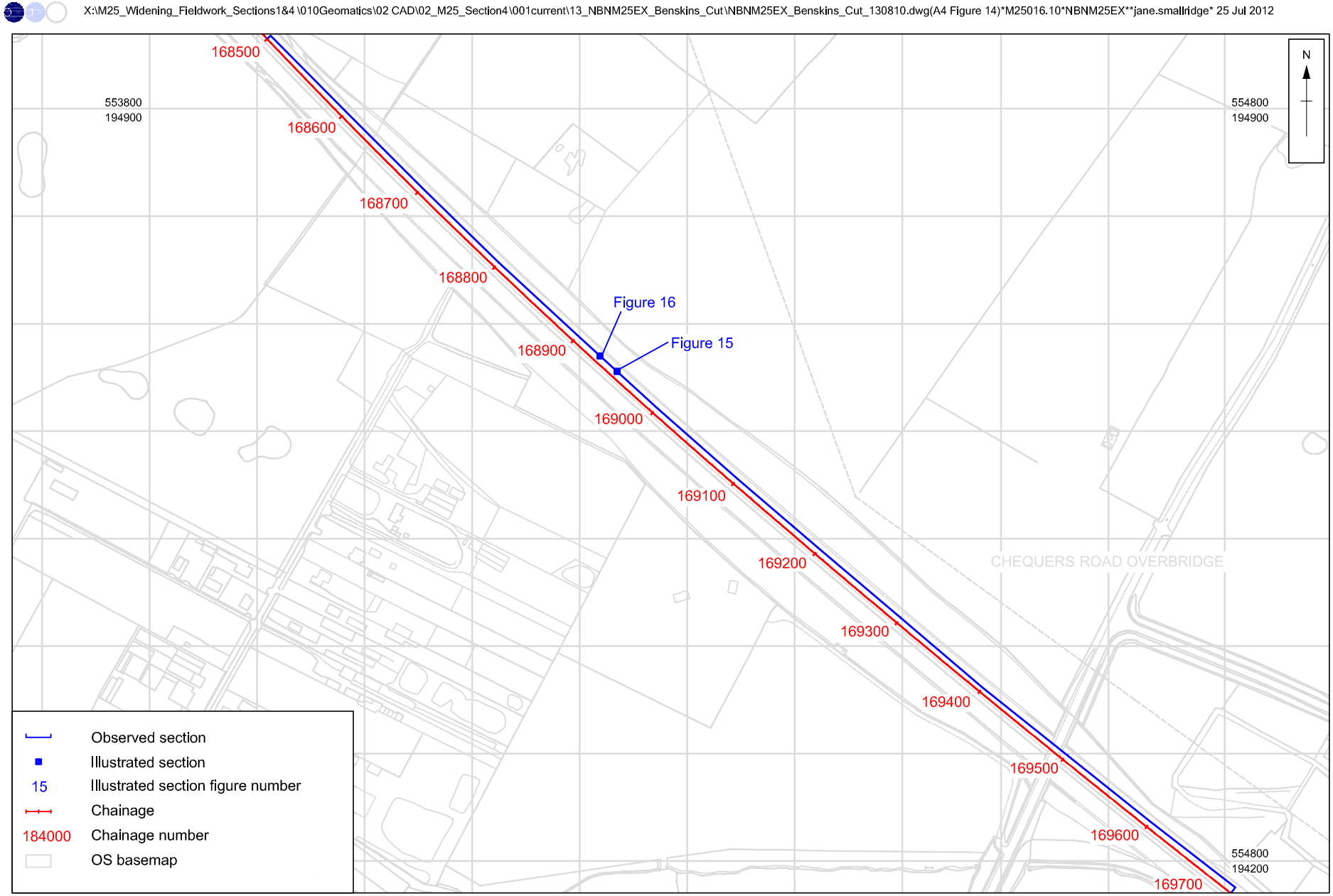

Figure 14: Plan of Benskin's Cutting (M25016.10)

Figure 15: Benskins Cutting, view of section at Chainage 168950 (M25016.10)

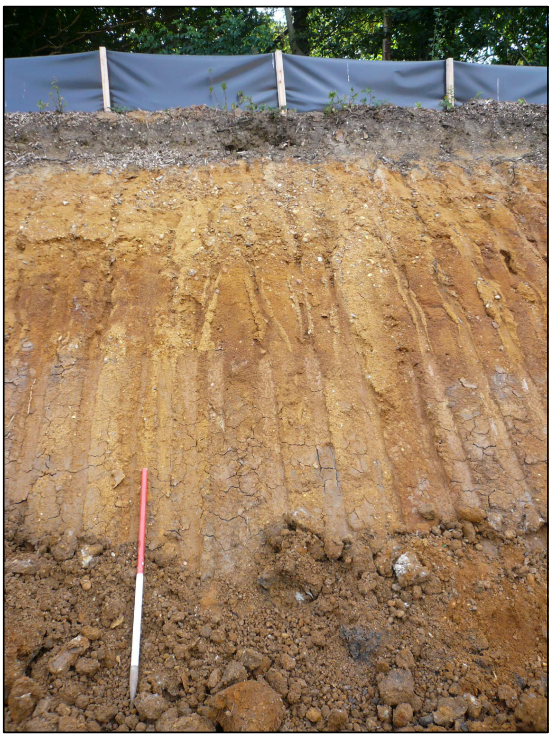

Figure 16: Benskins Cutting, view of section at Chainage 168930 (M25016.10)

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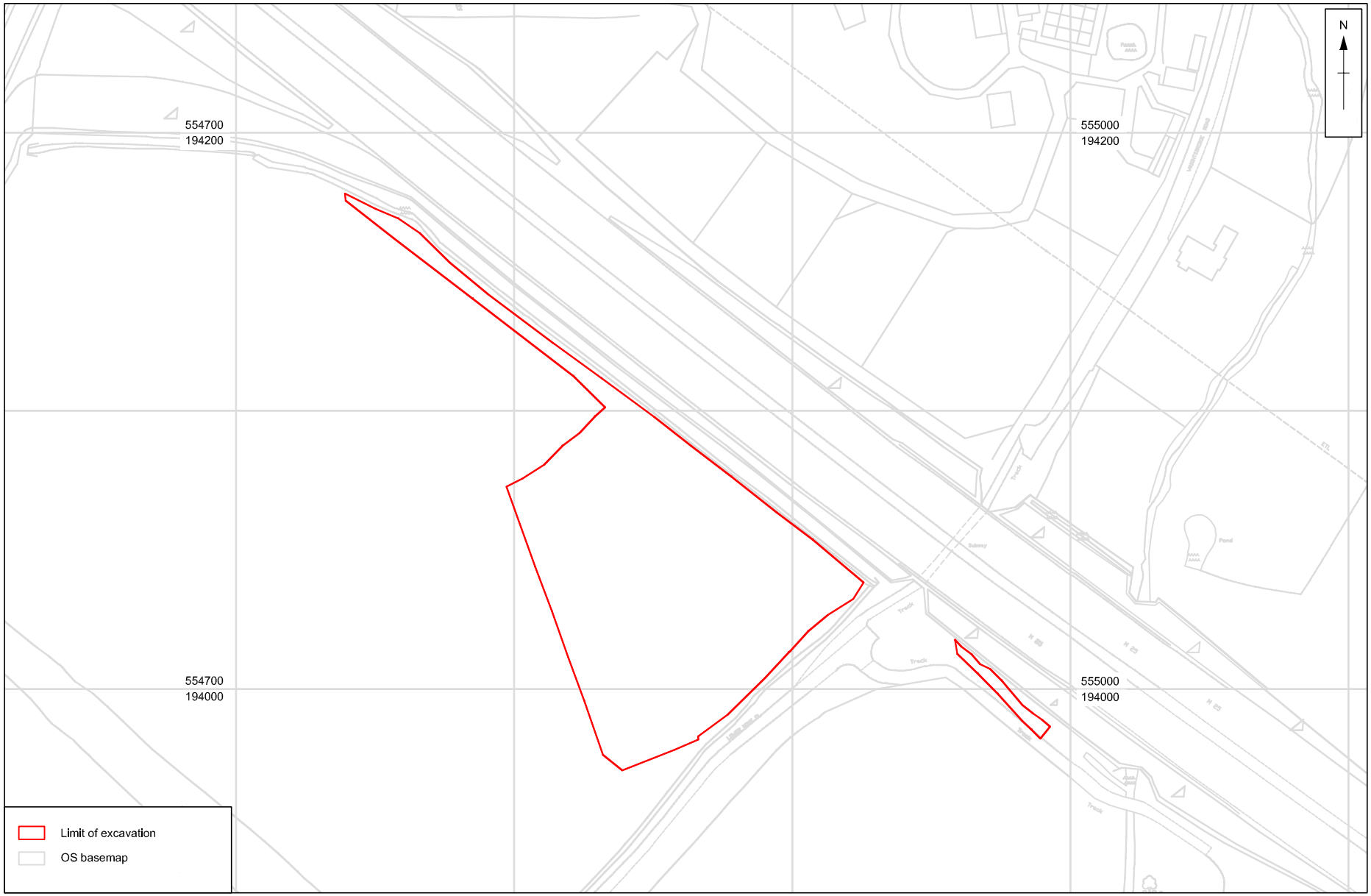

0 100 m

Scale at A4 1:2000

Figure 17: Plan of Pond 1698 (M25013.10)

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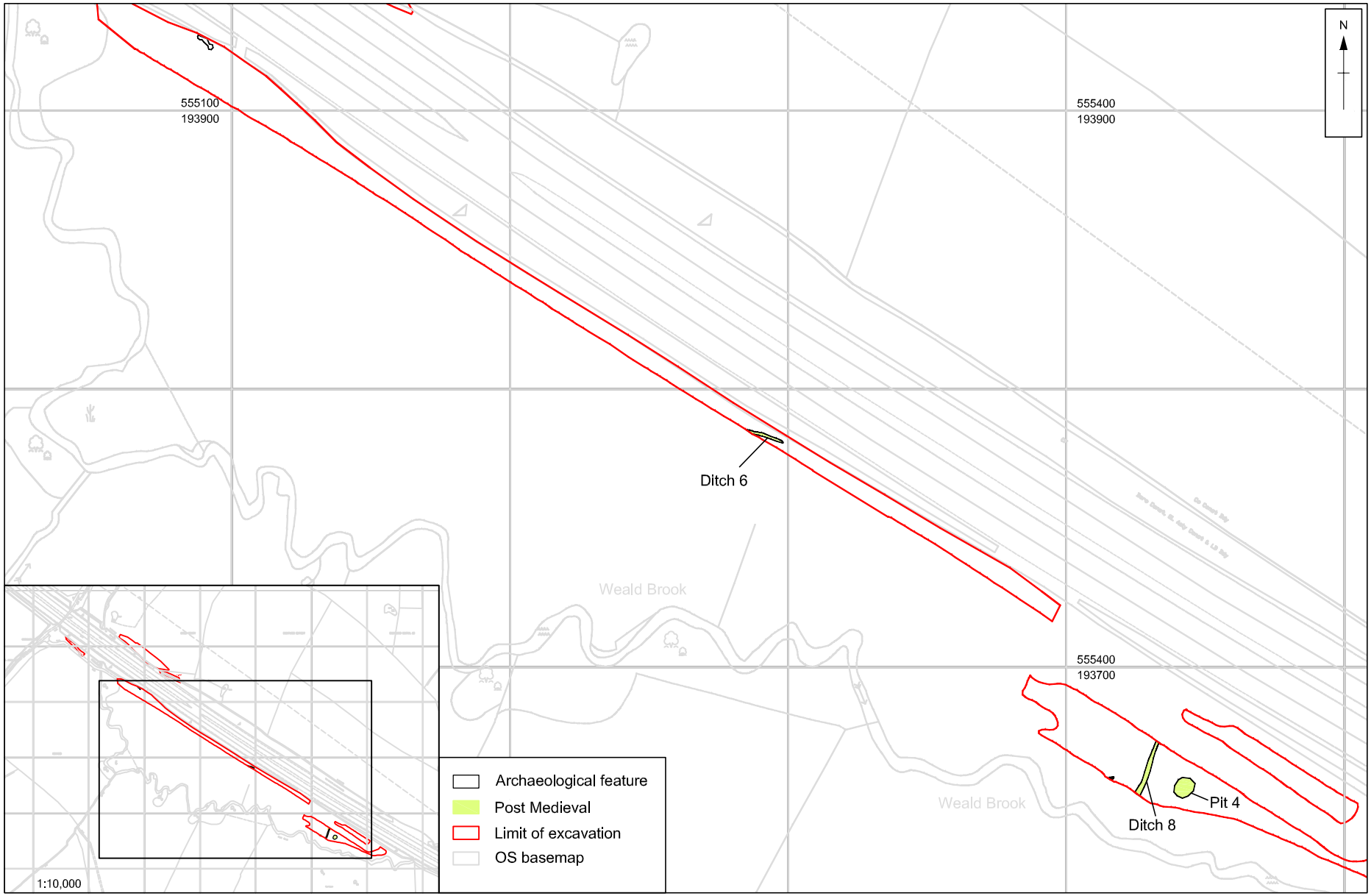

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Figure 18: Plan of Tank 1706 (M25011.10)

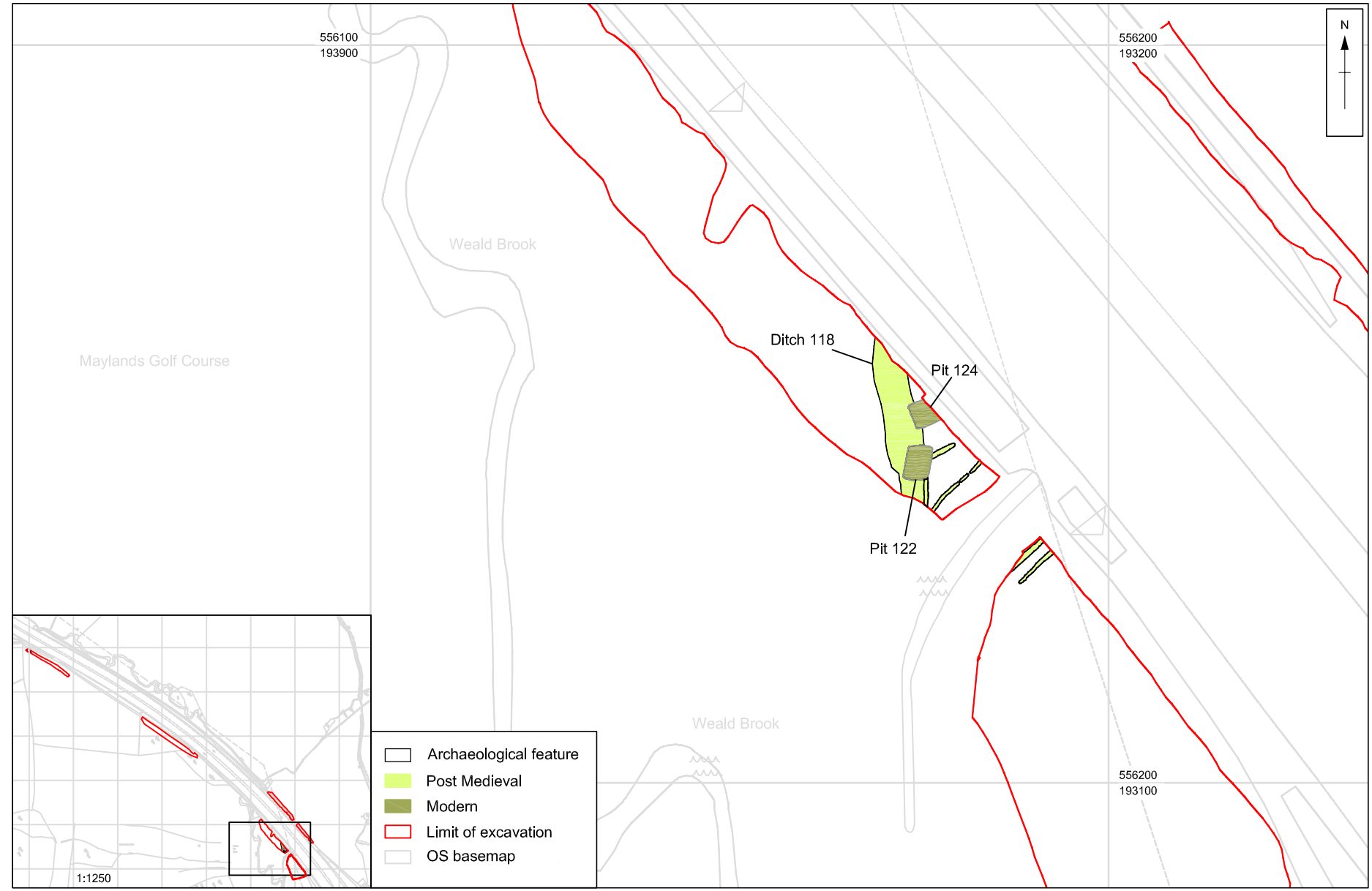
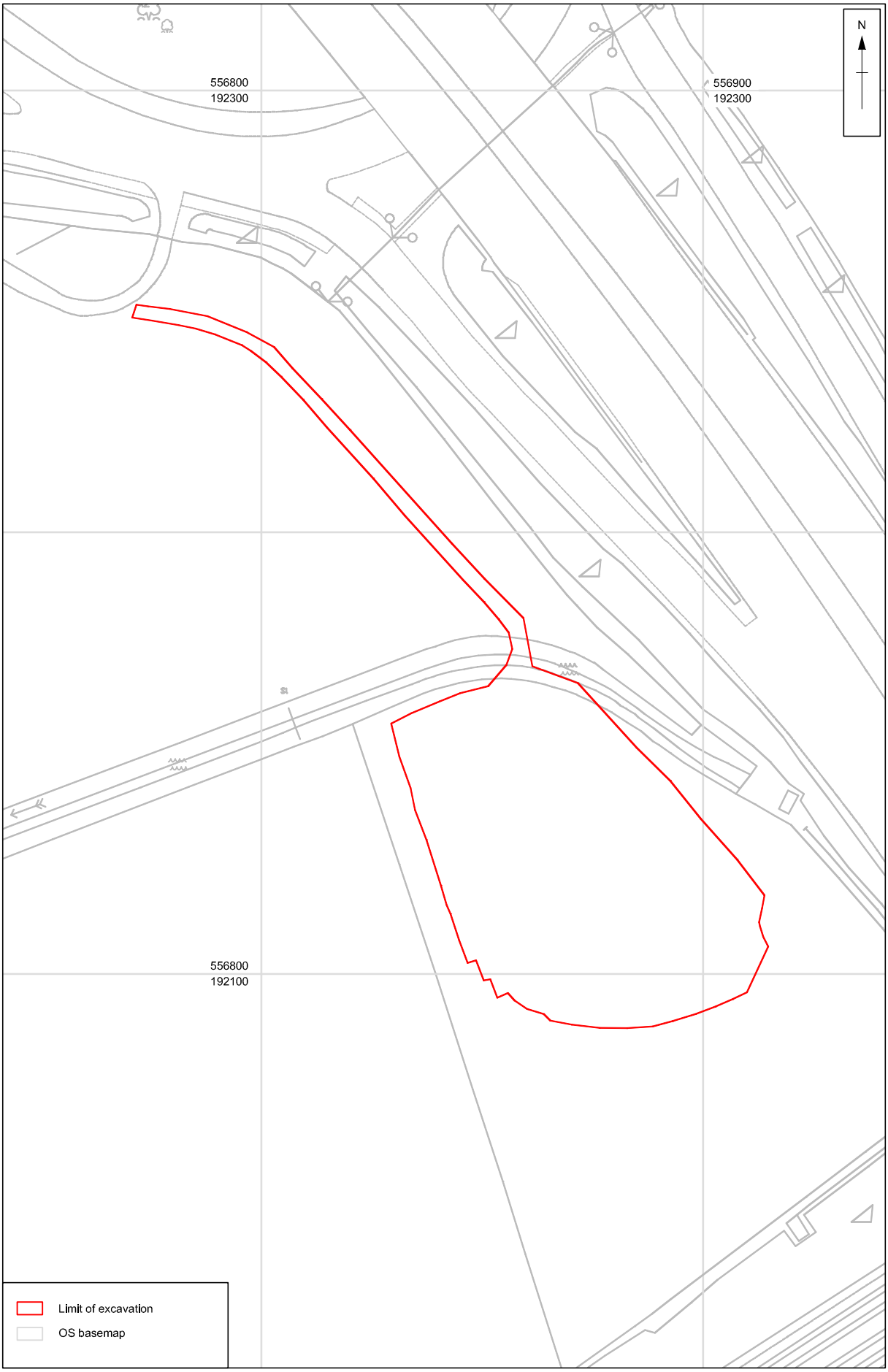


Figure 19: Plan of Tank 1714 (M25017.10)



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Scale at A4 1:1250

Figure 20: Plan of Pond 1727 (M25019.10)

0 100 m

Scale at A4 1:2500

Figure 21: Plan of Tank 1740 and strip widening (M25015.10)

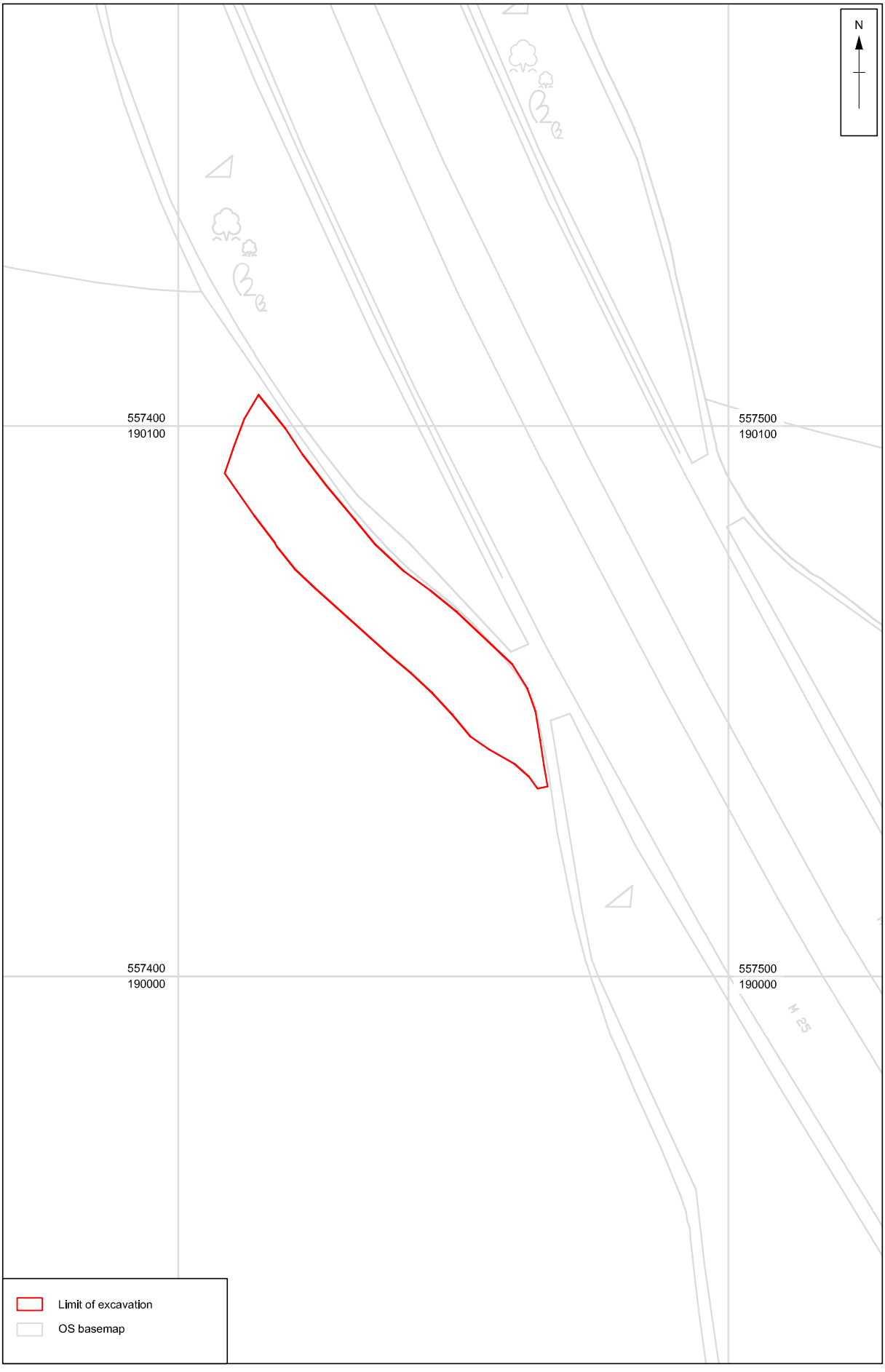
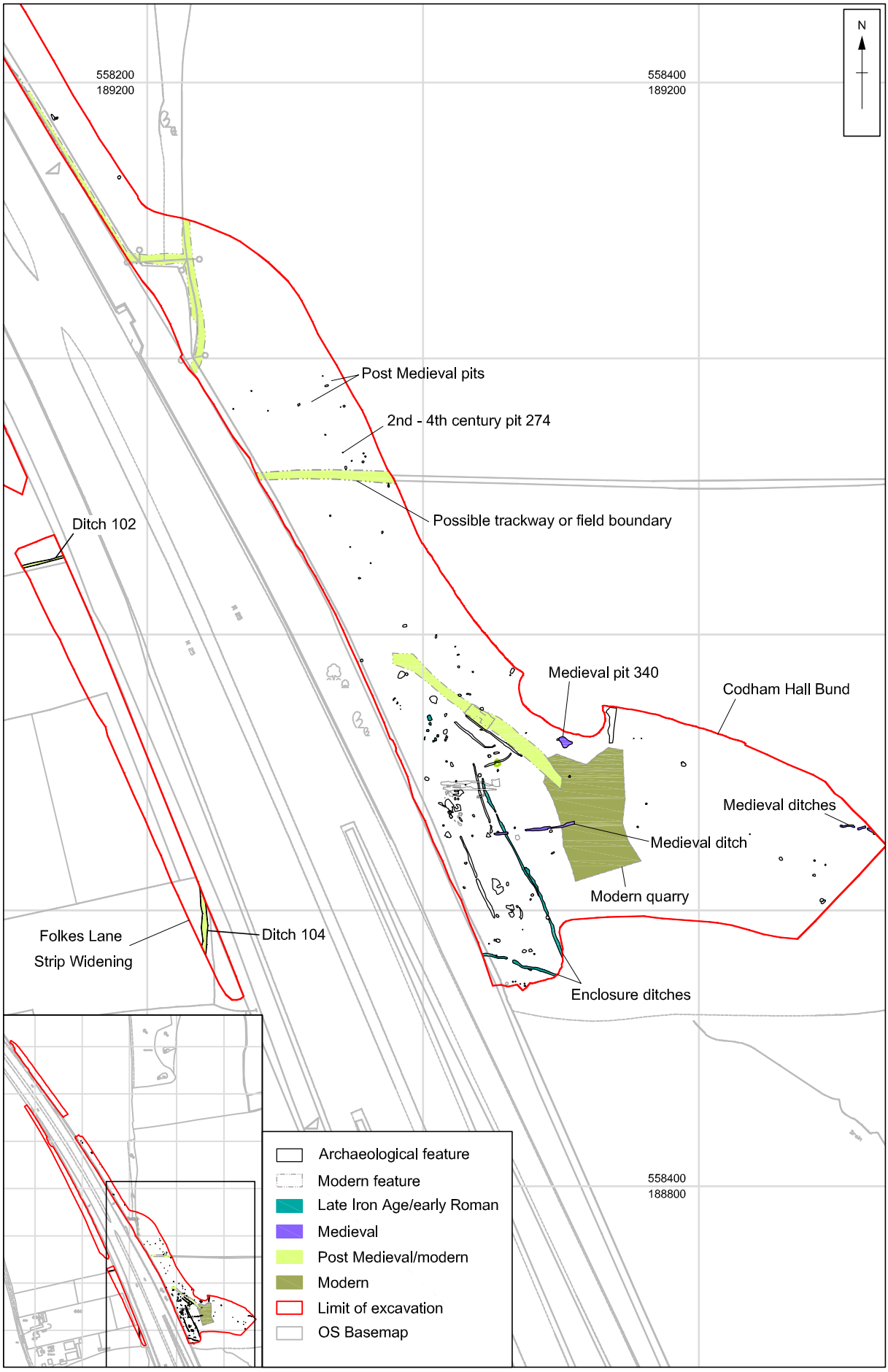


Figure 22: Plan of Warley Road strip widening (M25014.10)



0 100 m

Scale at A4 1:2000

Figure 23: Plan of Folkes Lane Strip Widening and Codham Hall Bund (M25012.10, M25018.10)

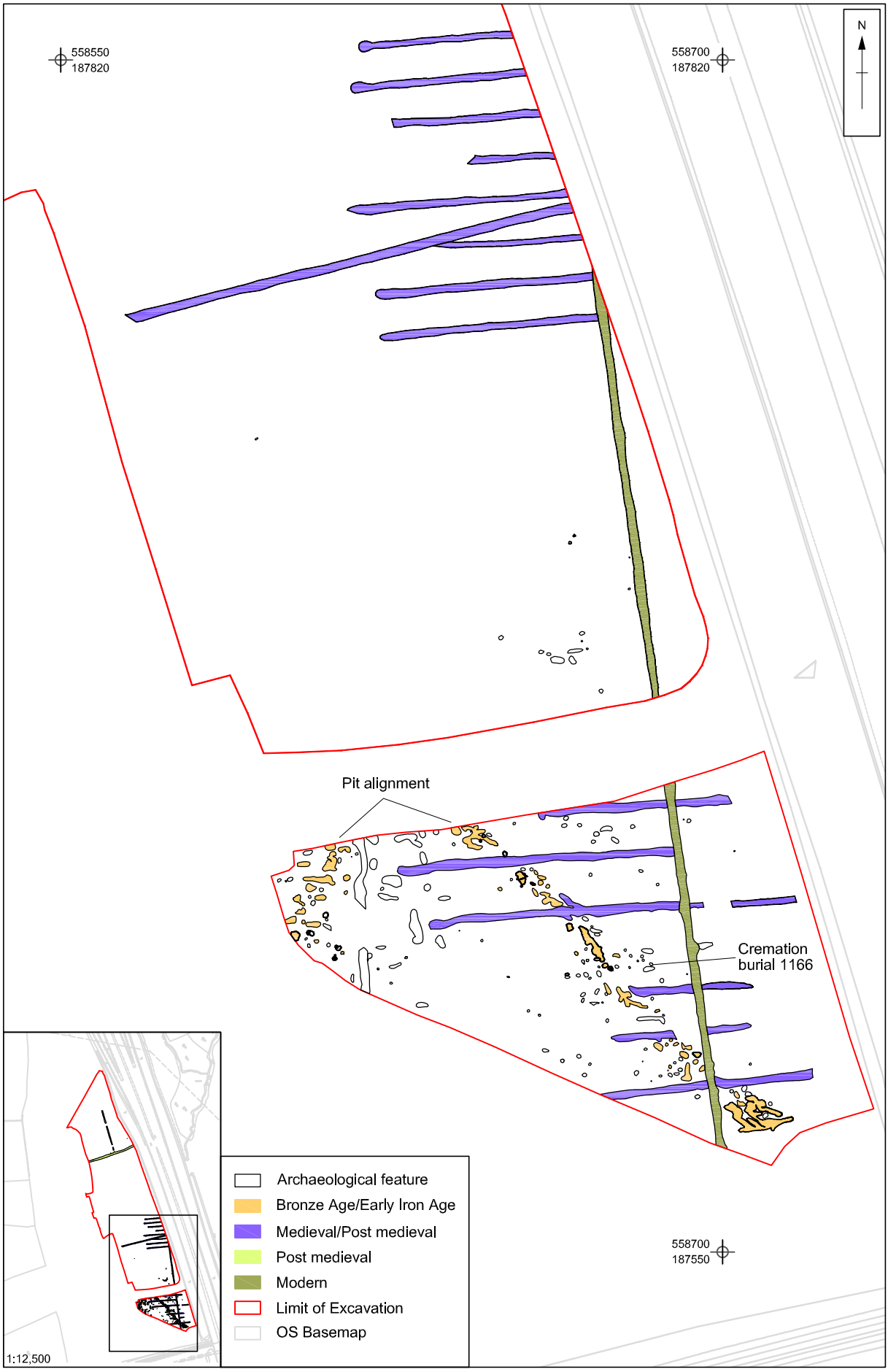
0 100 m

Scale at A3 1:2000

Figure 24: Plan of Junction 29, Hobbs Hole (M25001.08/09)

Figure 25: Hobbs Hole, general view of excavation (M25001.08/09)

Figure 26: Hobbs Hole, Cremation burial 6096 (M25001.08/09)



0 50 m

Scale at A4 1:1250

Figure 27: Plan of Upminster Bund (M25008.09)

X:\M25_Widening_Fieldwork_Sections1&4\010Geomatics\02 CAD\02_M25_Section4\001current\17_GWPONDEX_Pond_1776\GWPONDEX_Pond_1776_061211_Figure 28.dwg(A4 Figure 28)****jane.smallridge* 25 Jul 2012

0 50 m

Scale at A4 1:750

Figure 28: Plan of Pond 1776 (M25021.11)

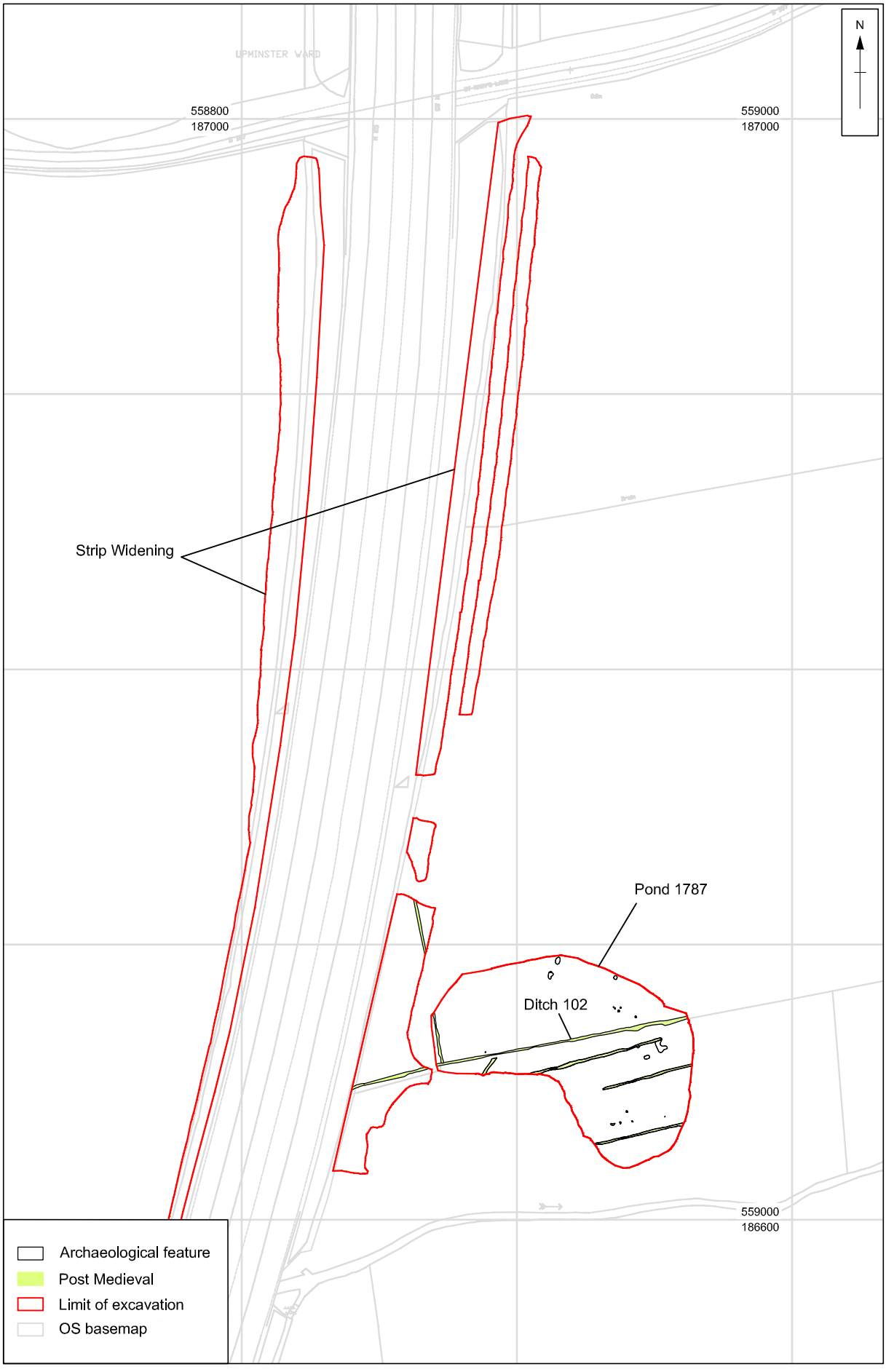
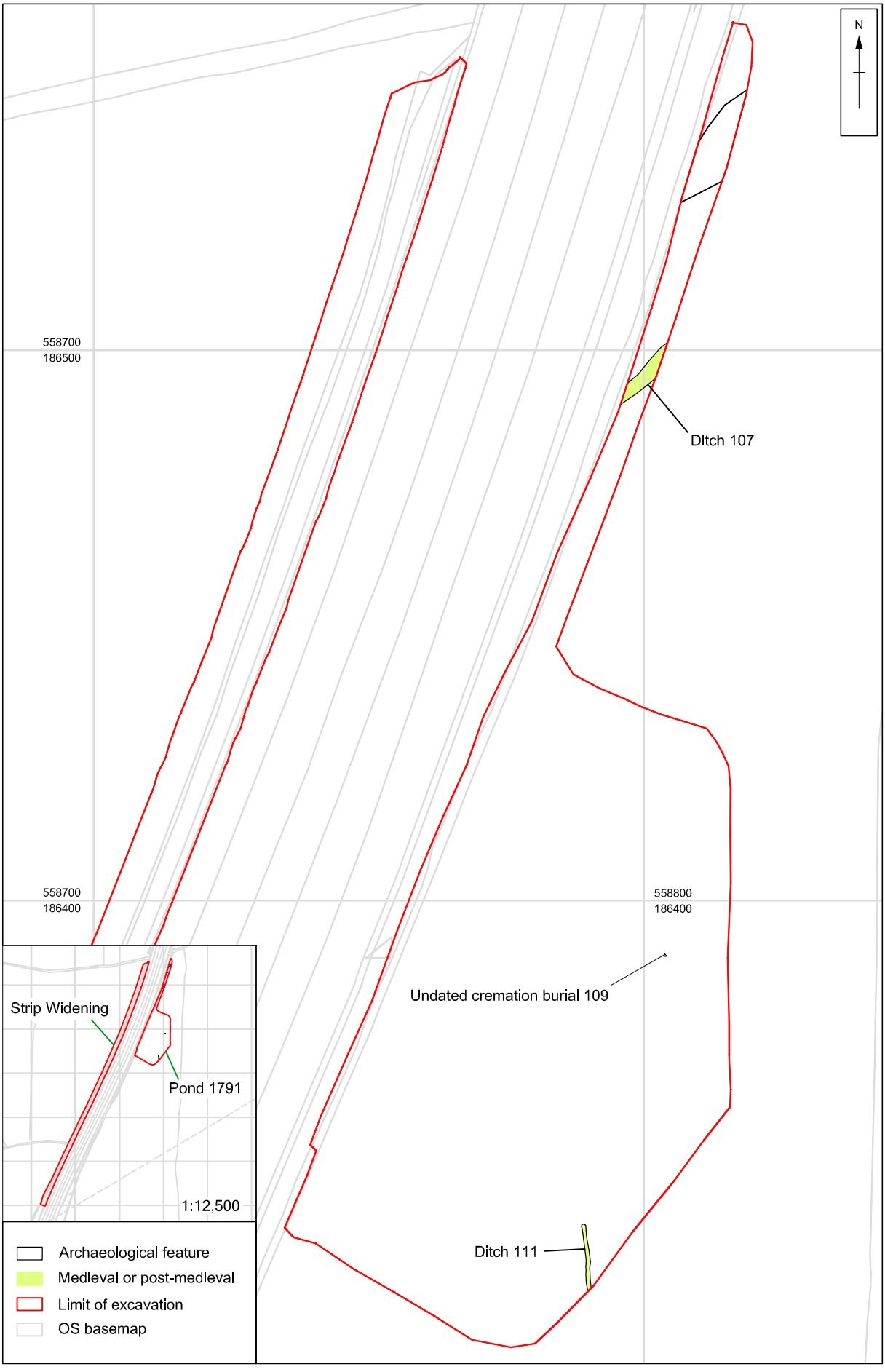


Figure 29: Plan of Pond 1787 (M25020.11)



0 50 m

Scale at A4 1:1000

Figure 30: Plan of Pond 1791 (M25023.11)

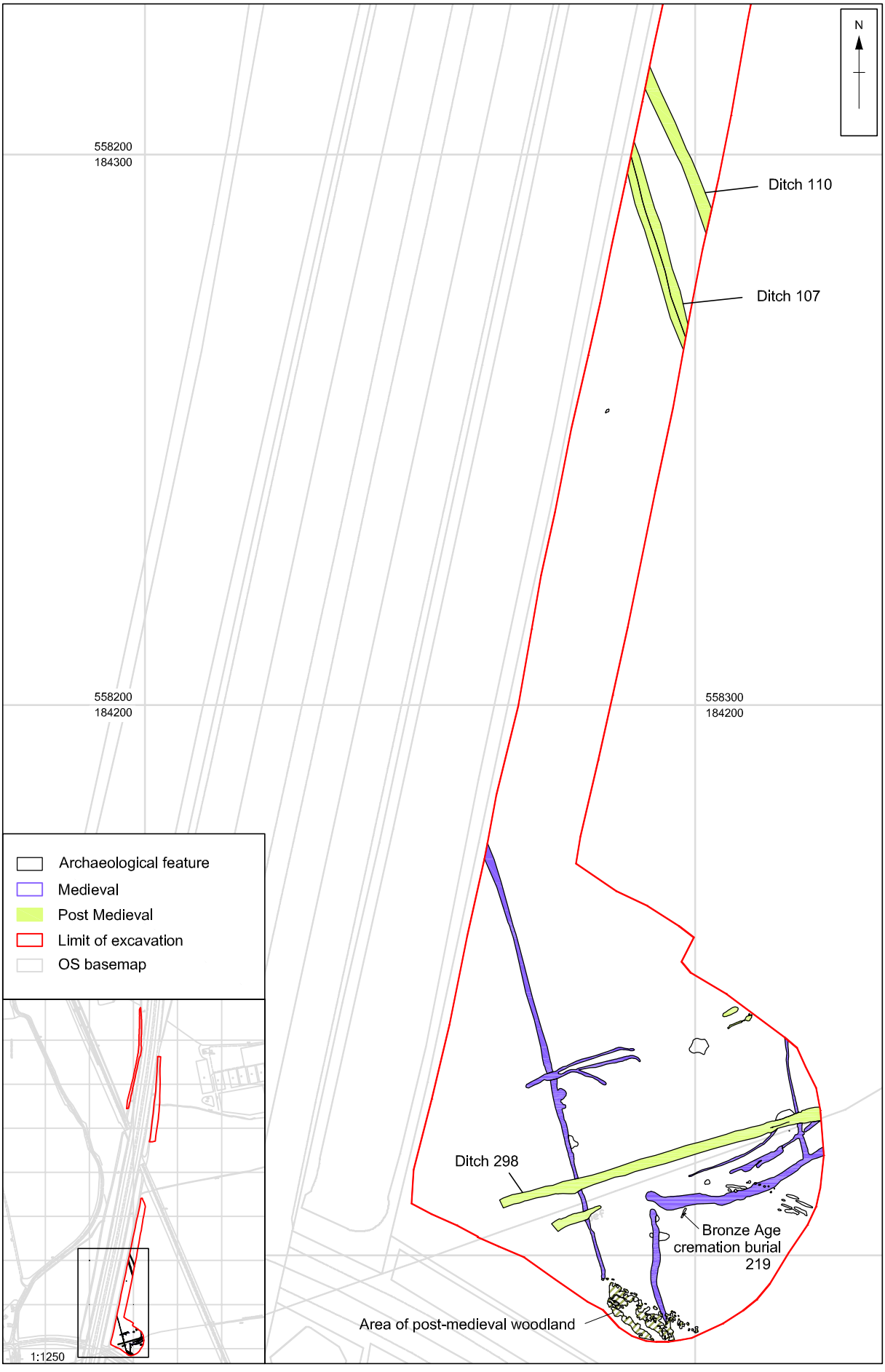
0 200 m

Scale at A4 1:5000

Figure 31: Plan of Ockendon Cutting (M25026.11)

Figure 32: Ockendon Cutting, view north from Chainage 180400 (M25026.11)

Figure 33: Ockendon Cutting, view of section at Chainage 179500 showing Boyne Hill gravel and sands (M25026.11)



0 50 m

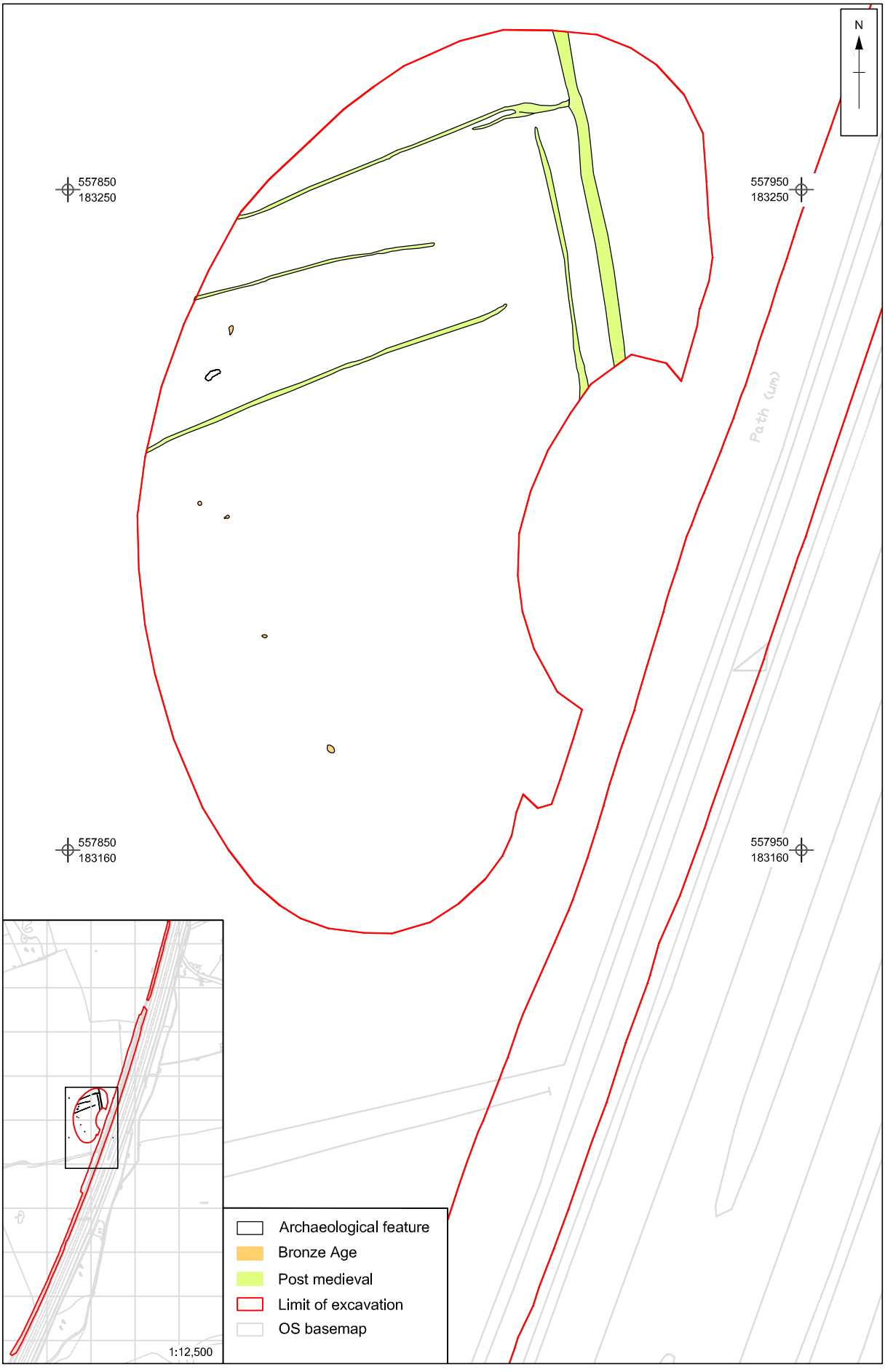
Scale at A4 1:1000

Figure 34: Plan of Pond 1812 (M25024.11)

0 100 m

Scale at A4 1:2000

Figure 35: Plan of Dennis Road Turnaround and Strip Widening (M25022.11)



X:\M25_WidenIng_Fieldwork_Sections1&4\010Geomatics\02 CAD\02_M25_Section4\001current\21_SOPONDEX_Pond_1824\SOPONDEX_Pond_1824_061211_Figure 36.dwg(A4 Figure 36)***Pond 1824*jane.smallridge* 25 Jul 2012

0 50 m

Scale at A4 1:750

Figure 36: Plan of Pond 1824 (M25025.11)

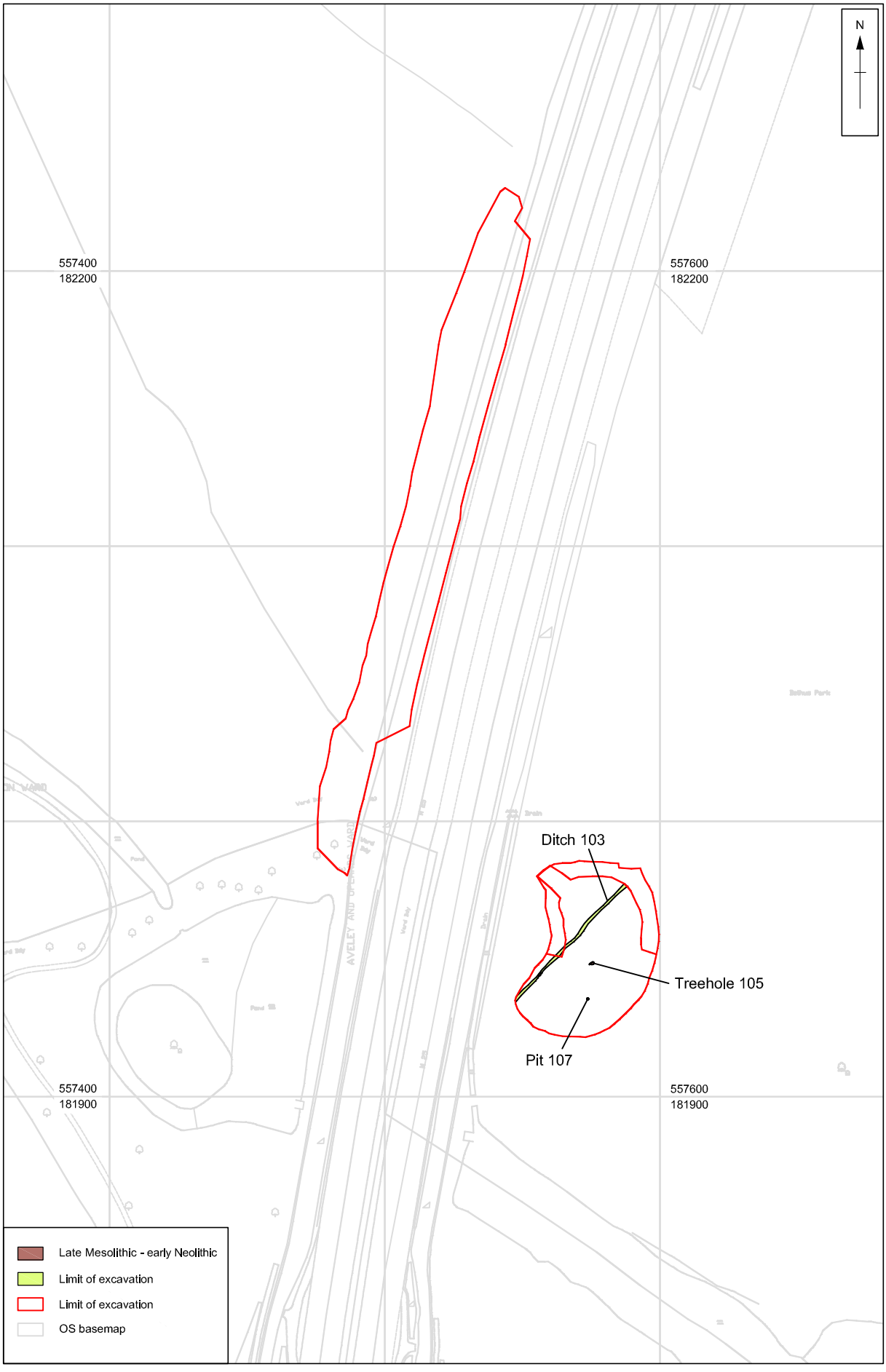


Figure 37: Plan of Pond 1835 and strip widening (M25028.11)

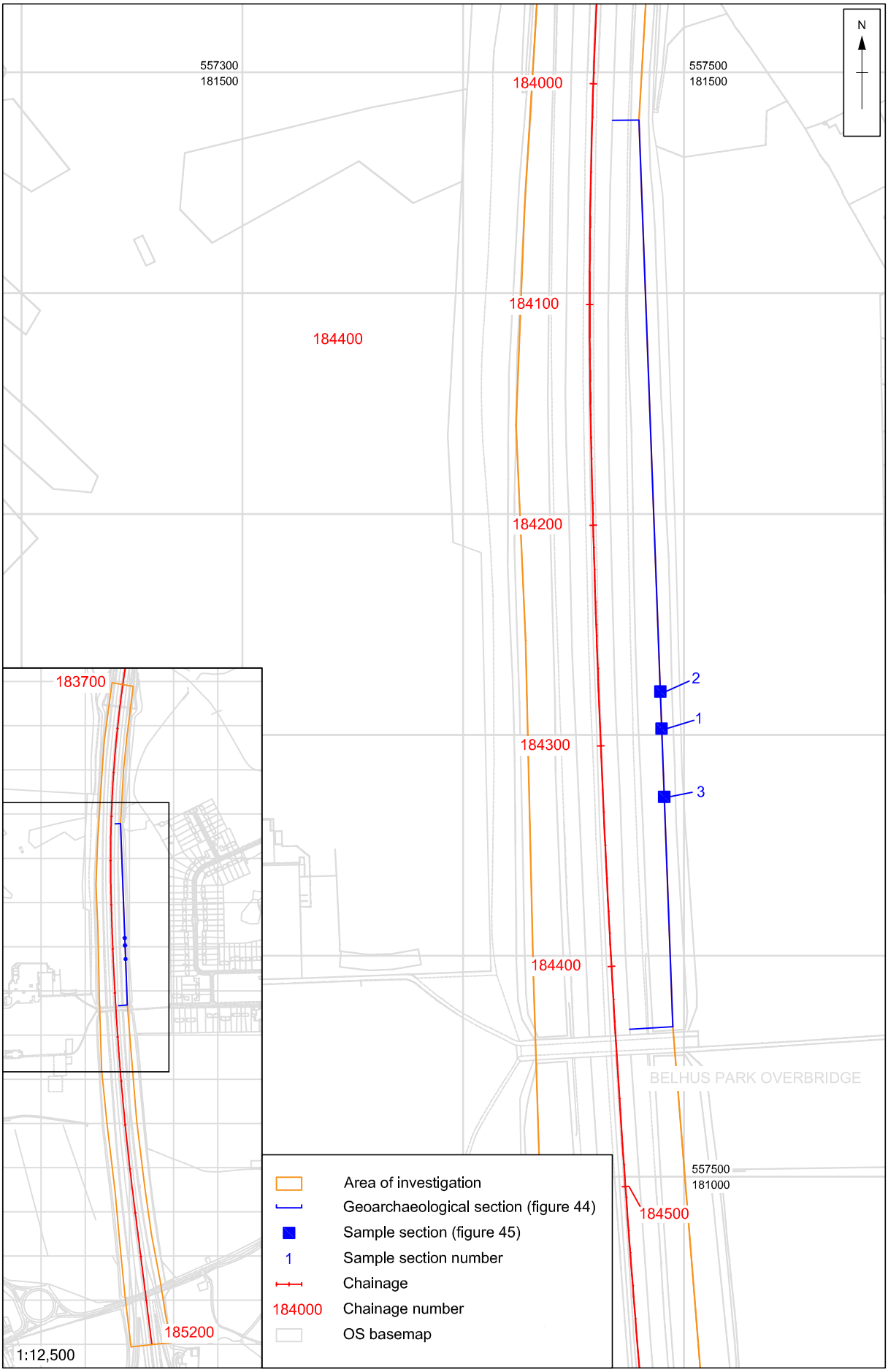


Figure 38: Plan of Belhus Cutting (M25027.11)

Figure 39: Belhus Cutting, interglacial (stage 9) channel sequence identified within the Lynch Hill gravels, view north from Chainage 184300 (M25027.11)

Figure 40: Belhus Cutting, close-up shot of the main organic rich interglacial channel sequence, view north from Chainage 184300 (M25027.11)

Figure 41: Belhus Cutting, detailed view of section at Chainage 184295, showing the complexity of the channel sequence (M25027.11)

Figure 42: Belhus Cutting, organic channel deposits disappearing into the base of the section (M25027.11)

Figure 43: Belhus Cutting, two pieces of worked flint recovered from the channel edge deposits (M25027.11)

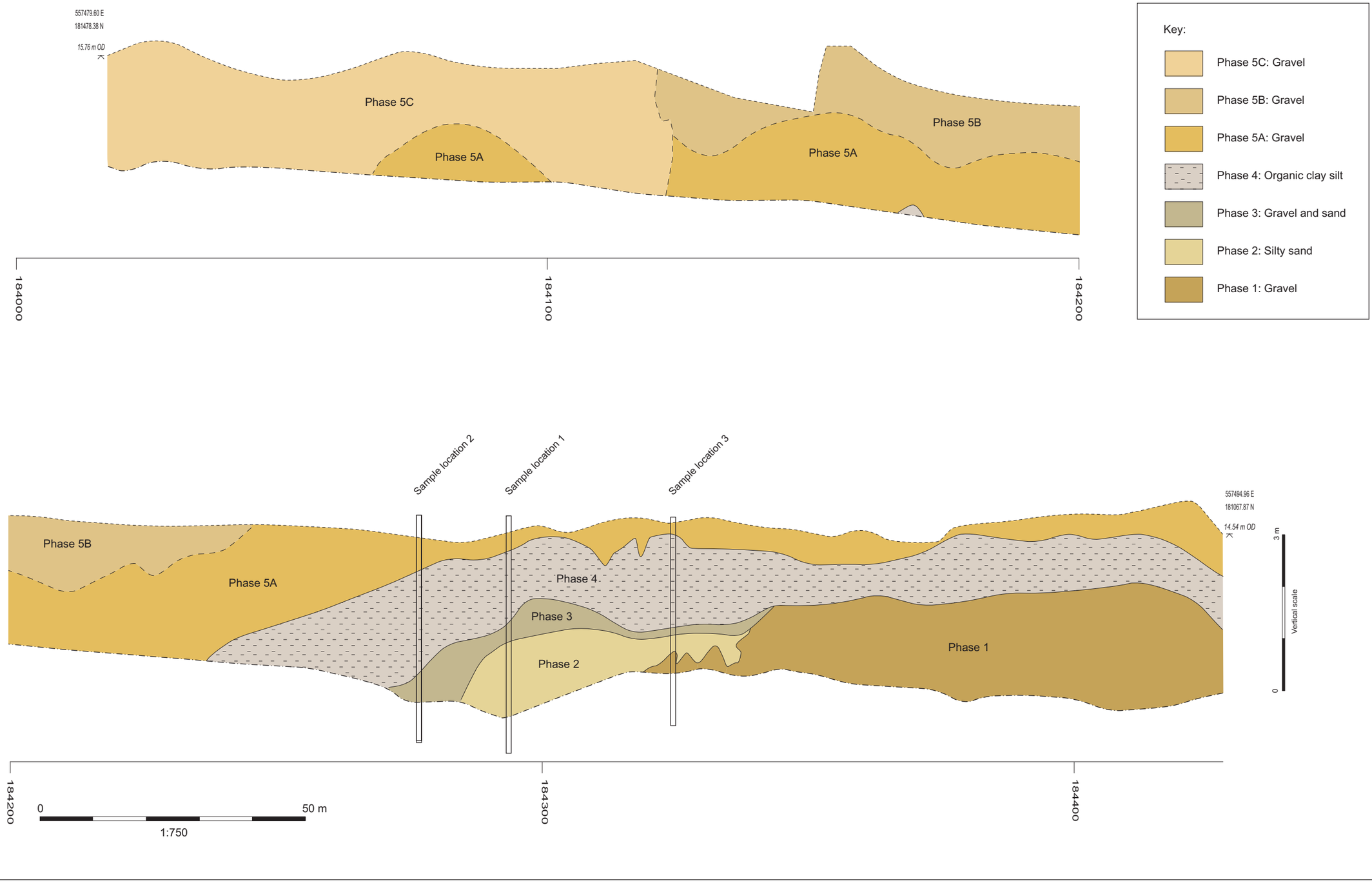


Figure 44: Belhus Cutting, side view of full section survey, with phasing and sampling locations 1, 2 and 3 (M25027.11)

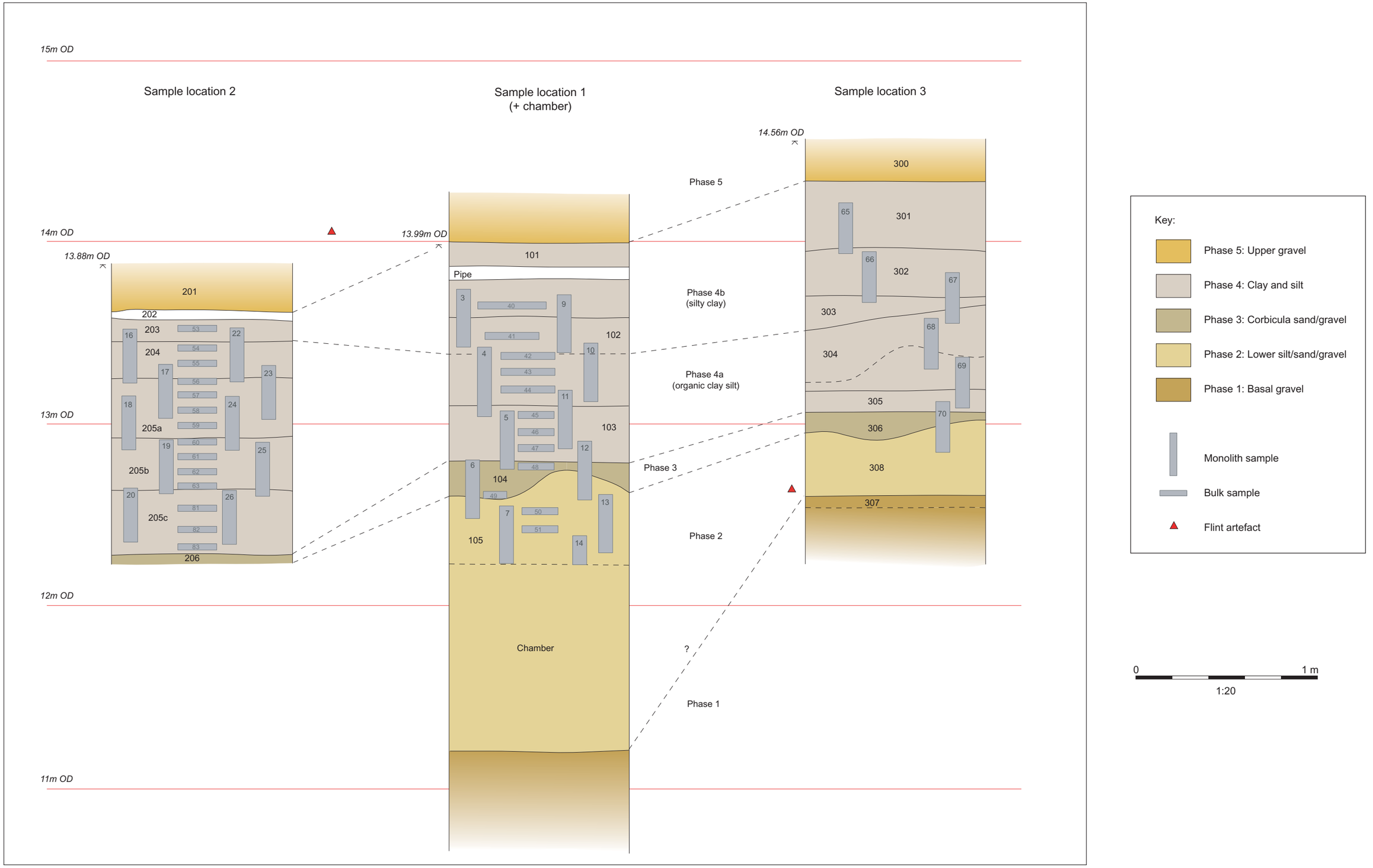


Figure 45: Belhus Cutting, individual sampling locations (M25027.11)

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