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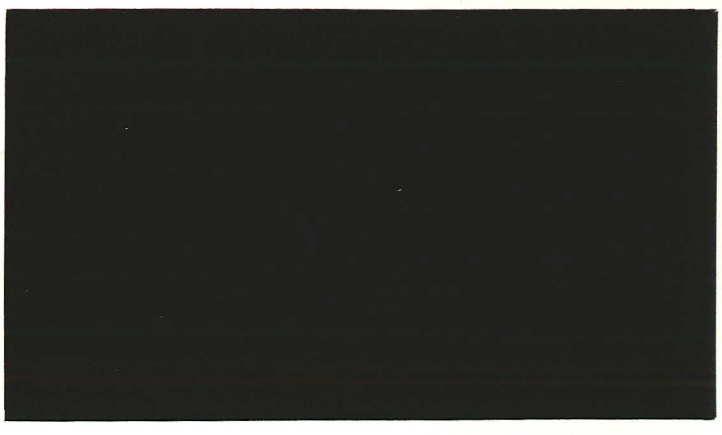
PRE-CONSTRUCT ARCHAEOLOGY

LINCOLN

ARCHAEOLOGICAL EVALUATION REPORT LAND BELONGING TO SPALDING GOLF CLUB, SURFLEET SEAS END, LINCOLNSHIRE.

NGR: TF 2700 2837
LCCM ACC. NO. 2001.125
Site Code: SPGC 01
Planning Ref.: H14/1342/00



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Report Prepared for
Bill Hawthorne, on behalf of Spalding Golf Club
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June 2001

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Summary

- *A programme of archaeological trial excavation was undertaken on land belonging to Spalding Golf Club, Surfleet Seas End, Lincolnshire, prior to the determination of a planning application for the construction of an irrigation reservoir.*

- *This intrusive fieldwork followed a detailed gradiometer survey, which produced results suggesting the presence of in-situ, sub-surface archaeological remains.*

- *Six trenches were opened, one of which was found to contain the remains of a number of structures that had been utilised in the salt production process. A second trench was found to contain a series of ashy deposits that represented the residues from hearths used to boil brine. Artefactual materials recovered from both of these trenches indicated that this activity had taken place in the medieval period, possibly from the later 12th century, but certainly in the 13th century.*

- *Deposits of archaeological significance were not exposed in the other four trenches.*

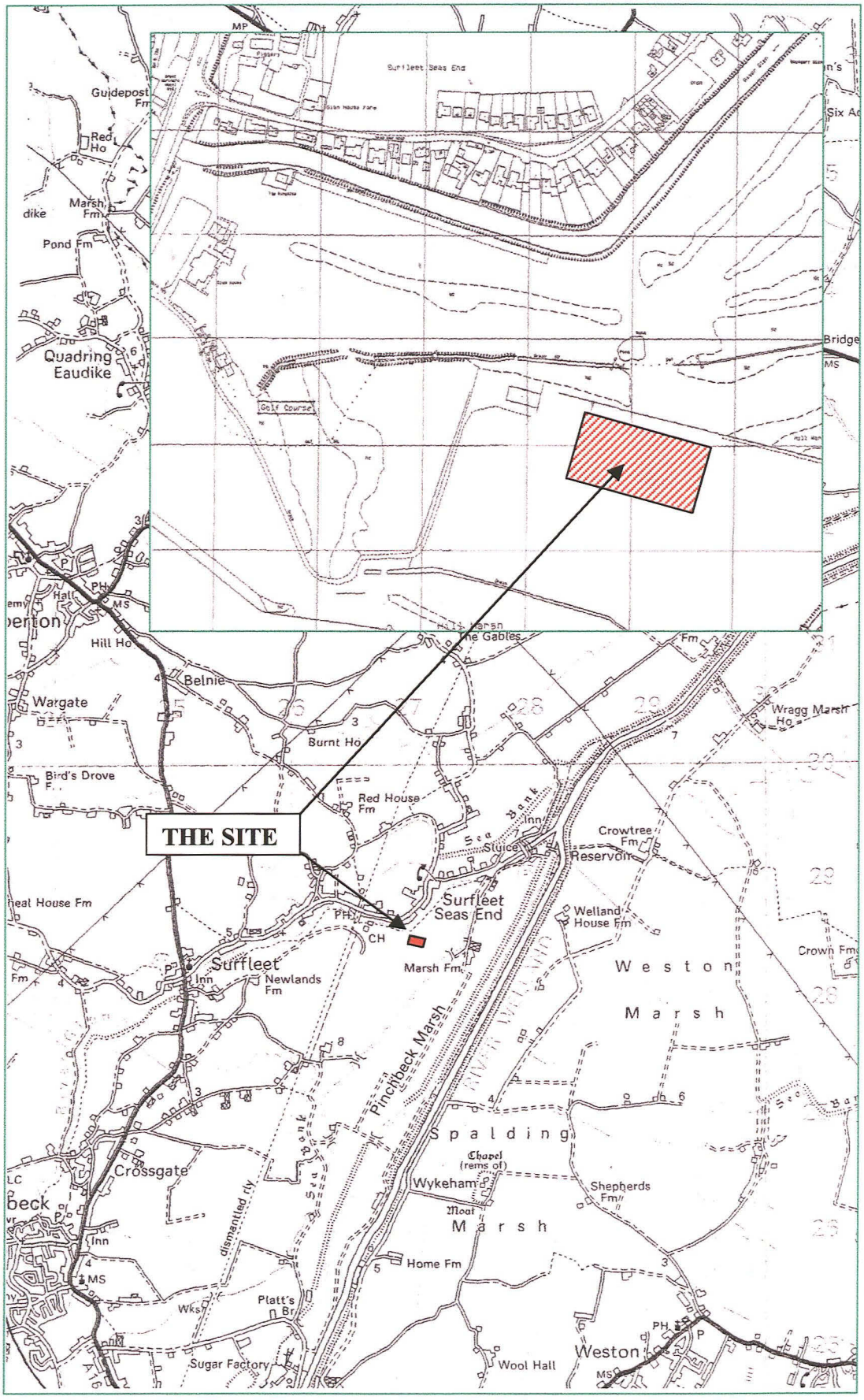

Figure 1: Site location at a scale of 1: 50,000, with an inset at1: 5,000.
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1.0 Introduction

Bill Hawthorn, Golf Irrigation Doctor, on behalf of Spalding Golf Club, commissioned Pre-Construct Archaeology (Lincoln) to undertake a programme of archaeological investigation on land at Spalding Golf Club, Surfleet Seas End, Lincolnshire, in advance of the determination of a planning application for the construction of an irrigation reservoir.

This report details the results of an archaeological field evaluation that followed a geophysical survey of the site (Rylatt & Bunn, 2001). It incorporates a series of assessments by specialist researchers who studied the archaeological materials recovered during excavation. The text follows current national guidelines produced by the Institute of Field Archaeologists (IFA, 1994) and local guidelines set out in the Lincolnshire County Council publication *Lincolnshire Archaeological Handbook: A Manual of Archaeological Practice* (LCC, 1998).

2.0 Location and description

Surfleet Seas End lies within the administrative district of South Holland, at the centre of the fens of south Lincolnshire. It is situated approximately 5.5km north-north-east of Spalding and c. 16km south-south-west of Boston.

The site is situated c. 200m to the south of Surfleet Seas End, a linear development following the northern bank of the River Glen, and c. 2km from the centre of the medieval settlement of Surfleet (fig. 1). It lies within a 7.0ha block of mown grassland, which is bordered to the north, south and west by terrain laid out and utilised as components of the golf course. To the east, beyond a large drain, lies an area of cultivated agricultural land. A modern steel-framed building is situated at the north-west corner of the field containing the site; this serves as the green keepers' maintenance facility (fig. 2).

The proposed development will be contained within a sub-rectangular unit of land extending over approximately 0.8ha. Two possible locations have been proposed for this reservoir. One, Area A, lies near, and roughly parallel to, the northern boundary of the field, c. 65m east of the green keepers' facility. The alternative location, Area B, is situated immediately to the south-east, toward the centre of the field; the south-eastern corner of A and the north-western corner of B are coincident.

The north-western quarter of the field, including the site of the green keepers' building and much of Area A, lies on higher ground that slopes down toward the east, west and south. The southern and eastern slopes are particularly pronounced in a fenland landscape that exhibits relatively little topographical variation. Area B is situated on the level, low-lying ground at the junction of the bases of the east-facing and south-facing slopes. The elevated area had been identified as raised ground, the by-product of medieval salt extraction industries, prior to the programme of archaeological investigation (BGS, 1992).

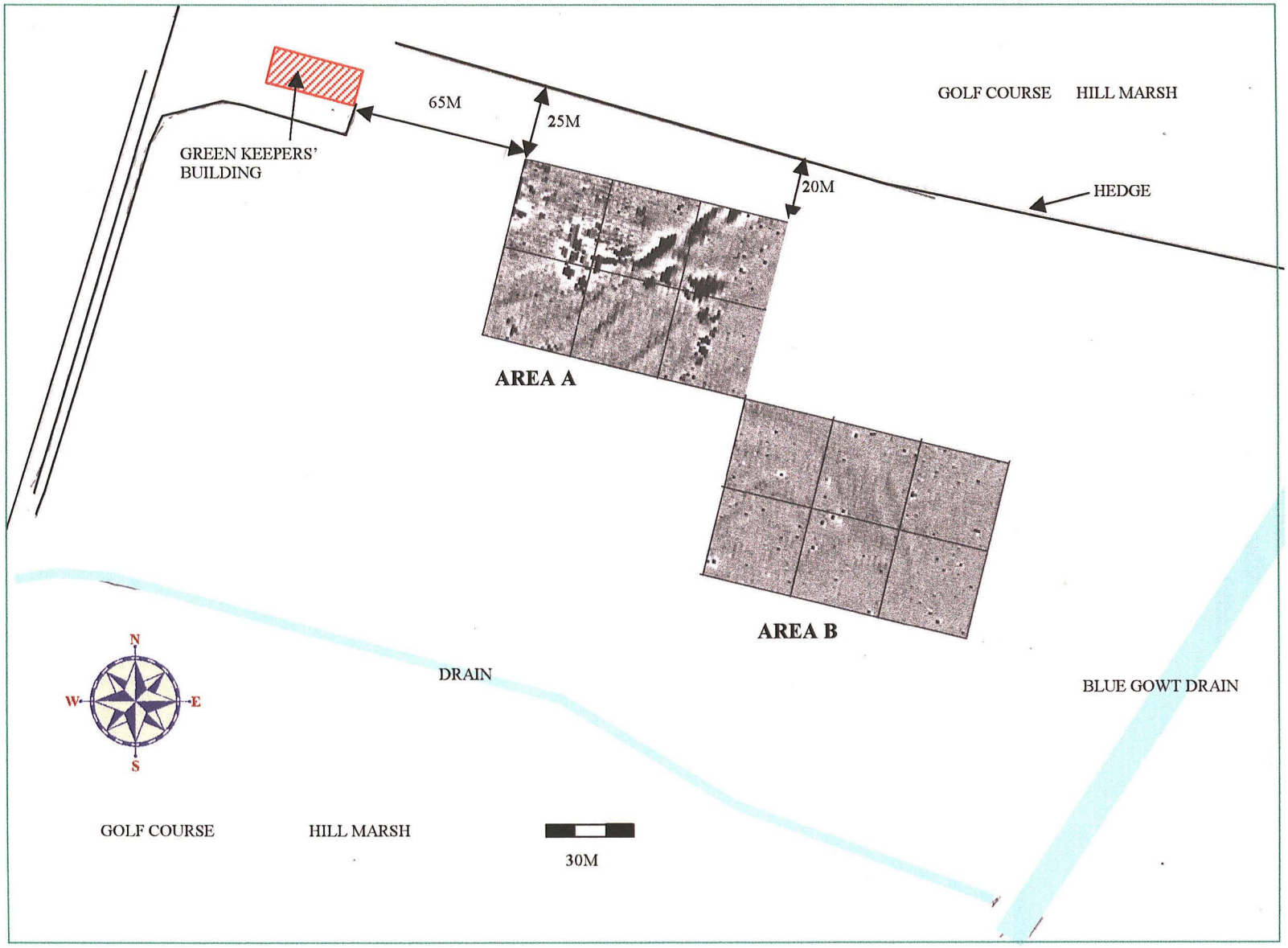

Figure 2: Location of the geophysical survey grids, showing the relative positions of Areas A and B, with a grey scale image of the gradiometer results, at a scale of 1: 2,000.

The region is covered by a series of Quaternary drift deposits, which have a depth of up to 20m. The uppermost of these are the Terrington Beds, a series of sandy silts, sands and clays, which were deposited in a variety of environments, including tidal creeks, salt marshes, rivers and by marine inundation (*ibid.*). Beneath the Terrington Beds are further drift deposits, possibly including Devensian Abbey Sand and Gravel, and beds of Glacial Sand and Gravel of Anglian age. These cover the uppermost formations of the solid geology, which consist of the mudstones of the Oxford Clay Series, deposited during the Upper Jurassic period.

Central National Grid Reference: TF 2700 2837.

3.0 Planning background

Spalding Golf Club has applied to South Holland District Council for planning permission to construct an irrigation reservoir on the course at Surfleet Seas End (planning ref. H14/1342/00). That authority, acting on the advice of Lincolnshire County Council's Senior Built Environment Officer, requested that a programme of investigation be undertaken to determine the archaeological potential of the site. This procedure would inform the decision making process and enable the application to be determined.

4.0 Archaeological and historical background

The extent of the prehistoric Fenland is not easy to define, as this low-lying area has been subject to sustained periods of inundation, linked to changes in sea level. At these times it is likely that much of the region was unsuited to permanent human occupation, a theory supported by the punctuated nature of the archaeological record.

Numerous salt procurement and processing sites appeared along the western fen edge during the Iron Age (Simmons, 1980). Many of these sites have been identified during the Fenland Survey, but unfortunately the Lincolnshire component of the project did not extend as far south as Spalding (Lane, 1993). However, work undertaken by Simmons (1980) suggests that during the Iron Age the Surfleet area was underwater, with the coastline lying c. 15km to the west and around 8km to the south.

There was a significant change in relative sea level toward the beginning of the Roman period with large areas of land emerging from the water. Numerous islands constituted much of the latter, one of the largest of which encompassed the area between Holbeach and Spalding, extending northwards past Surfleet (*ibid.*). These new lands were rapidly exploited, and the new foundations tended to be relatively small and numerous, often being concentrated on the leeward sides of the islands. This activity and occupation began at the end of the 1st century AD and continued throughout the 2nd century (Hallam, 1970). However, some of these new settlements began to be abandoned toward the end of that century, with a period of freshwater inundation that occurred in the mid 3rd century leading to further contraction in their numbers. This process appears to have resulted in the development of a small number of larger, more concentrated settlement foci.

As in the Iron Age, salt production appears to have been of particular importance to these Romano-British communities, but they were also engaged in farming, fishing and wild fowling. Trading would also have been important, and the large number of coins recovered from settlement sites suggests that Fenland settlements were fully integrated into the Roman monetary system. A range of artefactual material suggests that Spalding may have been the site of one such centre, as in Roman times it is likely to have been a bridging point immediately downstream from the mouth of the Welland estuary. Comparable material has yet to be recovered in Surfleet, but this absence may merely result from the Romano-British ground surface being buried beneath a considerable depth of alluvium.

There is no archaeological evidence for Anglo-Saxon activity in the parish. However, the etymology of the place-name suggests that the origin of the modern settlement lay in the later Anglo-Saxon period. The village appears as *Sverefelt* in the *Domesday Book*, a word utilising Old English components *sur* and *fleot*, meaning 'the sour inlet, or creek' and presumably referring to the River Glen (Cameron, 1998). The suffix 'Seas End' is later and refers to the satellite community lying to the east of this *Domesday* settlement, adjacent to, or beyond, the 'Roman Bank', a sea bank created by c. AD 1300 (BGS, 1992); its meaning is self explanatory.

The *Domesday Book* indicates that 'Heppo the Crossbowman' had the jurisdiction over some property in the parish (Morgan & Thorn, 1986). This included 4.5 carucates of land held by Alsige and land for a number of ploughs. In addition, two salt houses are mentioned, which were valued at 12d. Although a church was not referred to by the 11th century survey, the present building contains a small quantity of fabric of Norman date, this primarily consisting of a number of pier bases (Pevsner & Harris, 1989). It is therefore likely that St Laurence's overlies the site of a Saxon or Saxo-Norman precursor and indicates the general location of the Domesday settlement.

The church also contains some Early English fabric of the later 12th and 13th centuries. This includes further pier bases, the chancel arch, and reused dog-tooth moulding in the south porch (*ibid.*). A much larger proportion of the present building was constructed in the Decorated style from the last third of the 13th to the middle of the 14th century. Among this material are the piers themselves, the arches and aisle walls, parts of the porch, the south doorway and the west tower. The latter is the most distinctive element of the church, as the top leans markedly toward the west due to subsidence. The remainder of the building is of the later 14th to 15th century, and is constructed in the Perpendicular style. As part of these works, the chancel was reconstructed to shorten it. The contract for this work survives. It dates to 1418 and was made between the rector, Adlard Welby, and a London based mason Roger Denys (Owen, 1971).

A limestone effigy of a knight in plate and chain armour is situated at the north-eastern corner of the chancel. It is partially inset into the eastern wall, suggesting that it was positioned prior to the rebuilding of 1418. It is thought to represent Sir Hugh de Cressy, 1313-1347, of Cressy Hall, Gosberton, who was responsible for instigating much of the later rebuilding work, including the addition of the spire, following his return from the Battle of Cressy in 1346 (Anon, 2000). One of Sir Hugh's ancestors

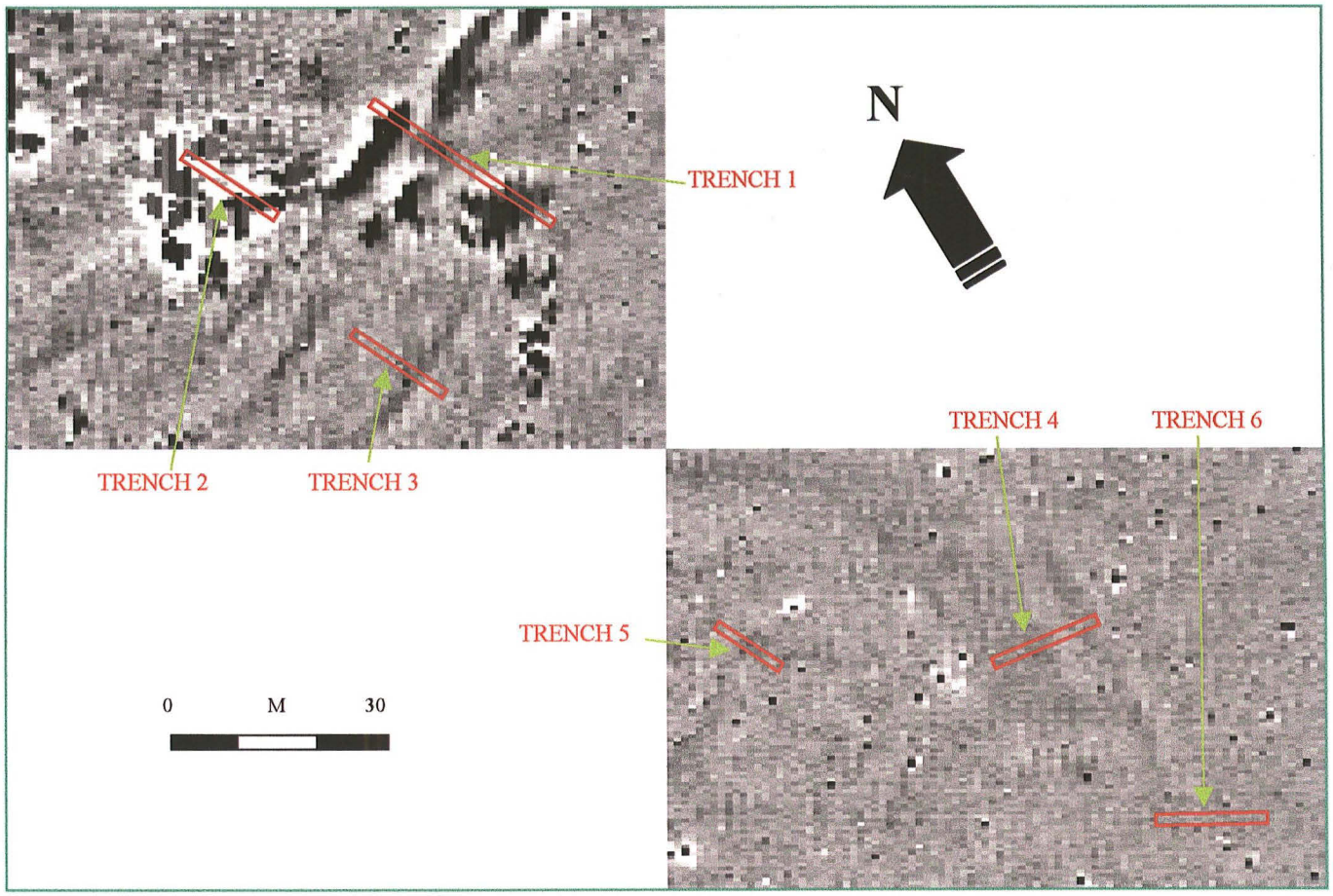

Figure 3: Trench location plan showing position of trenches relative to the areas surveyed by gradiometry. For position of survey grids see figure 2.

had established a market and fair at Surfleet during the reign of Edward I (1272-1307), but both had ceased to trade well before the 19th century (White, 1856).

Jocelin, son of Helpron, had gifted Surfleet church to Spalding Priory, during the 12th century. This entitled the monastery to farm the glebe land and appropriate the income of the church in the form of tithes and customary offerings, such as unpaid labour (Owen, 1971). These would have provided this monastic establishment with the resources necessary for land reclamation and salt procurement. The population of Surfleet, and any satellite settlement, may have been associated with these works. However, the modern settlement of Surfleet Seas End is largely situated on the north bank of the River Glen, whereas the medieval salt mounds are clustered along the southern bank. This may indicate that the 'Seas End' settlement post-dates the cessation of salt manufacturing in this area, and is a late medieval or post-medieval foundation.

Salt manufacturing during the medieval period predominantly took the form of sand washing, which involved three main stages. These were the collection of salt rich sand and silts, their washing and filtration, and the evaporation of the resultant brine. The residues of these activities were uncovered during drainage work on the golf course in the 1980s, in an area to the north of the site considered in this document (J. Ward, Head Green Keeper, *pers. comm.*). Further to this, 99 medieval gold coins were discovered c. 30m from the south-west corner of Area A (SMR No: 23632). These 14th century gold nobles of Edward III and Richard II were found close to a number of preserved timbers and a cobbled surface (H. Healey, *pers. comm.*). A silver halfpenny of Henry VI, minted in Calais between 1424 and 1427, has also been recovered from the field containing the current site.

5.0 Methodology

The trenching scheme devised for the evaluation of the site was based upon the results of the gradiometer survey (fig. 3) (Rylatt & Bunn, 2001). Three trenches were placed within Area A, two being 15m long, with another, 30m in length, being situated over the area of greatest magnetic disturbance. A further three trenches were opened in Area B, two of these were 15m in length, with the other being 10m long.

A JCB fitted with a 1.6m wide, toothless ditching blade was used to remove all topsoil and subsoil in spits no greater than 0.2m in depth. The removal of these deposits was monitored constantly to ensure that any archaeological features exposed by this process were identified. Where this process had failed to uncover archaeologically significant deposits, deeper sondages were excavated to ensure that such material was not sealed beneath thick deposits of redeposited silt.

Where exposed, archaeological features and deposits were sample excavated by hand in order to assess their nature, dimensions and to attempt to recover datable materials. These investigations resulted in the production of written descriptions of all deposits and features. Where possible these descriptions were made on standard context record sheets, but much of the fieldwork was conducted under adverse weather conditions, which necessitated the use of a water-proof medium (drawing film) for the written

reports. In addition, complementary scale drawings were made in both plan and section. A photographic record (colour prints) of exposed features was maintained. Selective prints have been reproduced in this report, with the remainder forming part of the project archive.

A team of four experienced field archaeologists carried out the excavation over a period of five days, from the 2nd to the 6th April 2001.

Artefactual materials recovered from the site were cleaned and processed prior to their submission to researchers specialising in the examination of archaeological materials. Additionally, a recognised specialist has analysed processed soil samples to ascertain the presence and nature of any palaeo-environmental remains that they may contain. The results of these investigations have been included as independent appendices to this report, and the general conclusions of these accounts have been integrated into the main text.

6.0 Results

The topsoil varied very slightly in composition across Areas A and B, the main distinctions essentially stemming from differences in the coarseness of the sand component of these sandy silts. The depth of this layer did not seem to fluctuate significantly, being c. 0.3m in most of the trenches examined, with the notable exception of Trench 2, where it was nearly 0.4m deep. The homogeneity and distinct horizontal lower interface of this layer indicated that it had been ploughed until relatively recently.

Trench 1

(See fig. 4)
This trench was situated toward the south-eastern corner of Area A, on the top of area of raised ground. It was aligned from north to south and at 30m was the longest trench opened during the evaluation. It traversed the area of greatest and strongest magnetic disturbance detected by the gradiometer survey; these anomalies could be characterised as three linear or nebulous blocks, the long axes of which ran perpendicular to the trench.

The topsoil, (100), was a relatively homogenous layer of mid browny-grey sandy silt, c. 0.3m deep, that contained higher concentrations of coarse components than were observed elsewhere on the site. These constituents, while still relatively sparse, included flecks of charcoal and burnt silt, and moderate quantities of mollusc shell, the latter including cockle, mussel, oyster and periwinkle.

Removal of (100) exposed an area of modern disturbance at the northern end of the trench. This proved to be part of a test pit, which was excavated in 2000 on behalf of Spalding Golf Club. A pipe was inserted into this pit in order to monitor fluctuations in the water table as part of the works related to the creation of the proposed irrigation reservoir.

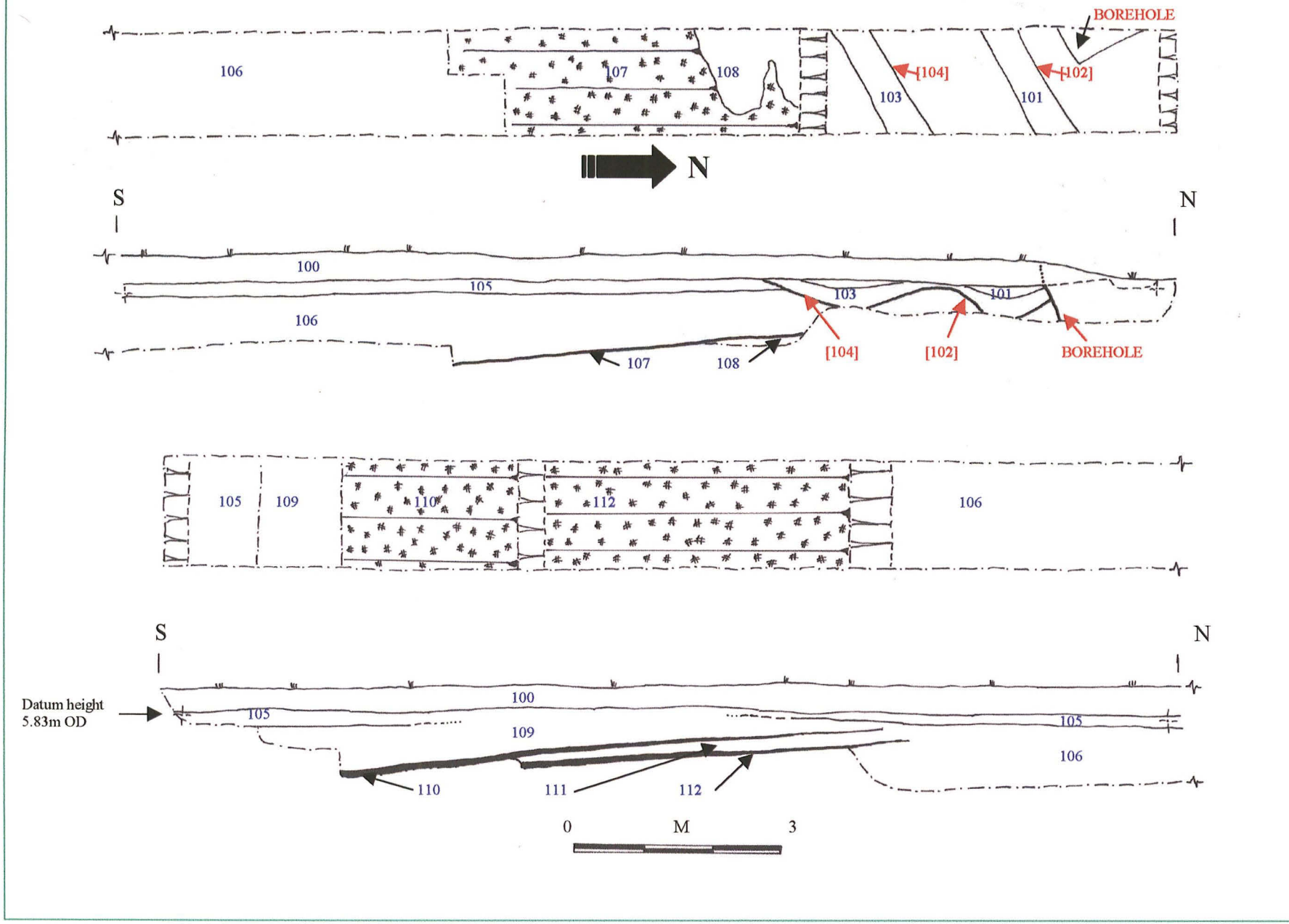

Figure 4: Trench 1, plan and east facing section, showing the three ashy tips (107), (110) and (112).

The test pit had cut through and truncated the fill, (101), of a north-east to south-west orientated ditch, [102]. This ditch was in excess of 1.5m wide and was c. 0.6m deep, with a 'U'-shaped profile. The southern edge of [102] was adjoined by another parallel ditch, [104], there being no berm between the two features. Ditch [104] was similar to its neighbour, being c. 2.5m wide and 0.45m deep with a flattened 'U'-shaped profile. Both contained identical fills intimating that they had existed contemporaneously; their spatial relationship would therefore suggest the possibility that they had run down either side of a hedge. The lower fill of both ditches, (101)b/(103)b, were mid brownish grey sandy silts, within which were rusty mottles that increased in density toward the base of the features. Both ditches also had the same upper fills, (101)a/(103)a, grey mottled yellowish-brown sandy silts. The location of these two ditches appears to correspond to a boundary shown on the Ordnance Survey Second Edition 6": 1 mile map of 1906 (fig. 10). This suggests that these features were relatively modern, a theory receiving corroboration from the stratigraphic relationships of the fills, which were sealed immediately beneath the topsoil, (100).

Although the subsoil, (105), had been removed by the creation of ditches [102] and [104], it remained undisturbed beneath the topsoil throughout the remainder of the trench. Layer (105) was a mid greyish-brown sandy silt that contained small quantities of mollusc shell and charcoal. Its lower interface with (109) was relatively indistinct, the two deposits being partially homogenised by bioturbation. Deposit (109), a relatively homogenous pale yellowish-brown sandy silt, was exposed in the southern 10m of the trench. The base of the deposit sloped down ward toward the south, with the maximum depth revealed in the trench being 0.65m.

Immediately beneath (109), was a dark greyish-brown to mid-brown spread of ash and burnt sandy silt, (110), c. 0.1m deep. The clear distinction between the colour and texture of this deposit and those above and below it meant that the angle of the slope onto which it had been deposited could be accurately defined. This incline proved to be 5-6° to the horizontal. A sample of (110) was analysed to determine whether it contained palaeo-environmental remains. It was found to contain quantities of peat ash, fired silt, including some that was vitrified, and small quantities of fuel ash slag. Additionally, there were fragments of marine cockle and mussel shell, a sherd of pottery and a flake of flint.

Beneath (110) lay another layer of pale yellowish-brown sandy silt, (111), that was very similar in character to (109). However, this was a relatively thin deposit only 0.2 - 0.25m thick, that rested upon another dark grey ashy layer, (112), which was also c. 0.2m thick. Again the angle of the slope could be defined, and this again proved to be 5-6° to the horizontal. Examination of a bulk sample from (112) demonstrated that a large percentage of the material was a crumbly dark grey to pink concretion, likely to be peat ash. Additionally, there was a large quantity of fired silt, much of which was glassy and vitrified on one surface. There were frequent voids within this material, which represented the impressions of organic temper. The presence of this material indicates that these fragments are likely to have derived from a deliberately fabricated structure, such as a hearth base. Furthermore, the slight greenish hue of some of the vitrified surfaces implies that they had been splashed with salt, thereby unintentionally forming a glaze. The sample was also found to contain small amounts of burnt mollusc

shells and (chicken?) eggshell, implying that there was a 'domestic' component to this deposit.

Another layer of pale yellowish-brown sandy silt, (106), was sealed beneath (112). This was a particularly voluminous and deep deposit in comparison to (109) and (111), with a depth exceeding 1.05m near the centre of the trench. Indeed, a projection of the orientations of the two ashy layers above and below (106) suggested that the deposit originally had a depth in excess of 1.65m. Two sherds of pottery were recovered from (106), these having been manufactured in either Boston or Toynton during the 13th century. The lower of the two ashy layers bracketing (106) was (107), which was essentially analogous to (110) and (112), although it was relatively unsubstantial in comparison, being only 0.03 - 0.05m deep.

The earliest deposit exposed in Trench 1 was (108), another layer of pale yellowish-brown sandy silt, which exceeded 0.15m in depth.

Trench 2

(See fig. 5)
This 15m long trench was placed c. 20m to the north-west of Trench 1 in order to investigate an amorphous area of strong magnetic disturbance that had been detected in Area A. Again the trench was situated on level ground on top of the saltern mound, and had its long axis aligned from north to south.

In the southern half the trench the removal of the topsoil, (200), immediately exposed a variety of archaeological deposits. Subsequent excavation demonstrated that these could be resolved into two distinct groups, the most southerly of which will be considered first.

The latest deposit in this southern group was a thin layer of mid greyish-brown ashy sandy silt, (201), that had been largely truncated by later ploughing. The constituents of this deposit were comparable to those of the ashy spreads examined in Trench 1. Immediately beneath (201) was a deposit of pale browny-yellow sandy silt, (202), c. 0.18m deep, the edge of which extended beyond the southern end of the trench. With the exception of a few charcoal flecks this material was relatively clean and free of artefactual material. Two other yellowish sandy silt deposits, (203) and (211), lay beneath (202), the former having been badly disturbed by animal burrows. All four of these deposits, (201)-(203) and (211), appeared to be contained within a 'cut', [225], but the morphological attributes of the exposed component did not enable it to be identified as a typologically definable feature. However, it was notable that the base of [225] was inclined at c. 4° to the horizontal, an angle comparable to that of the slope face onto which the ashy spreads had been deposited in Trench 1. It is therefore possible that rather than being part of a feature, [225] represented a deliberate levelling and redistribution of waste deposits that had accumulated as a result of activities associated with salt manufacturing.

The uppermost deposit truncated by [225] was a pale brown sandy silt, (204), which contained frequent flecks of charcoal and pinkish crumbs of burnt silt. Two sherds of

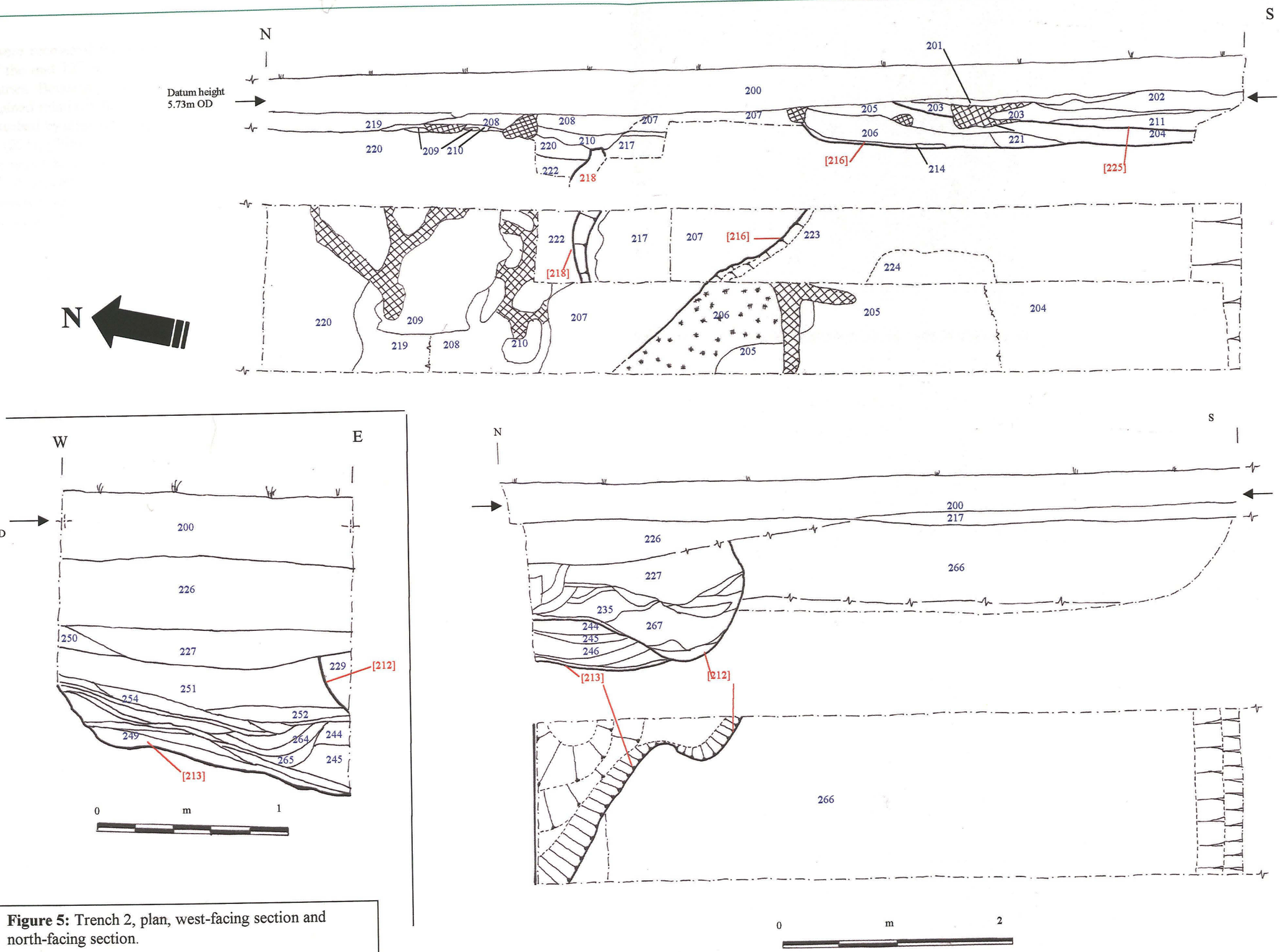

Figure 5: Trench 2, plan, west-facing section and north-facing section.

pottery were recovered from this material, one a piece of Early Medieval Handmade Fabric of the mid 12th to 13th century, the other a local medieval fabric of the 13th to 14th centuries. Beneath (204) lay a pale orangey-brown sandy silt, (205). This deposit also contained relatively large quantities of charcoal and burnt silt, but it had also been badly disturbed by animal burrows. Sealed beneath (204) and (205) were three orangey deposits, (221), (206) and (214), that also contained large quantities of burnt material. A sample was taken from (206) and analysis demonstrated that much of this deposit consisted of concreted peat ash and fired silt. In addition two pieces of wall plaster were recovered from the sample, one of which had a preserved surface. It is therefore likely that most of this material came from in or around the hearths used for boiling brine.

Below (214) lay a very thin, intermittent layer of pale yellow to white firm sediment, (215). This may have been a reduced, fired silt, but it had a mortar-like consistency and appeared to line the base and sides of a large feature, [216]. Only the most northerly edge of the latter was exposed within the trench, this being orientated from north-west to south-east. Its position indicated that [216] exceeded 3.7m in length and 1.8m in width. The single visible edge sloped at c. 60° to the horizontal before turning acutely at the base of the feature, which lay c. 0.7m below modern ground level. This base was even and virtually horizontal, being very slightly inclined, by c. 1°, down toward the south-west. Comparison with features excavated on other medieval salt production sites suggests that [216] was likely to be part of a filtration bed. This would have been utilised in the early stages of salt production, with impregnated marine silts, known as 'mould', being placed in such tanks so that the salt could be dissolved and washed from them.

The second group of deposits lay c. 1.2m to the north of those contained by [225]/[216]. Immediately beneath the topsoil lay a pale brown sandy silt, (208), which had been heavily disturbed by animal activity. It sealed a brown sandy silt, (210), and a very pale, mortar-like material, (209). Under these two rather mixed deposits lay two layers of pale yellow sandy silt, (220) and (222), the removal of which exposed the curving edge of a structure, (218). Only the north-western edge of (218) was exposed, but this proved to be part of a dome capping a brine collecting vat. These cylindrical containers were constructed at the end of each filtration bed to collect the brine washed from the 'mould'. The stratigraphic relationships between (218) and [216] indicated that they were not part of the same phase of activity, the vat belonging to an earlier episode of industry.

The collecting vat was found to contain at least two deposits, the later of which was (207), a pale yellow sandy silt. The deposit beneath this, (217), was not dissimilar, being a yellowish-brown sandy silt. The general similarity of these deposits to the waste silts forming the mounds indicates that this material was redeposited into the vat after it had been abandoned. A sooty sherd of Early Medieval Handmade Fabric was recovered from (217), and provides a tentative date in the mid 12th to 13th centuries for this event. A comparable fragment of pottery was also retrieved from ~~(210)~~ 204, one of the deposits covering the outer surface of the abandoned vat (see above).

Two other features inter-cutting were exposed at the northern end of the trench, but these were rather more deeply buried suggesting that they belonged to another earlier

phase of activity that preceded the construction of the collecting vat, which lay nearly 7m away.

Only a small portion of the later feature was exposed in the trench. This was the rounded south-western corner of a straight sided feature, [212]. The northern component of the visible part of the base of [212] was level, but the rest dipped markedly toward its southern edge, reaching a maximum depth of 1.66m below ground level. While this variation in depth might suggest that [212] was merely a pit, its form in plan, which exceeded 1.5 by 0.55m, and the fact that there was a flat component, raises the possibility that it was part of another filtration unit. This theory receives some support from the observation that the base of the feature appeared to be lined with a thin deposit of lime mortar or pale grey, hard fired sandy silt, (240). A lining is only likely to have been applied to a structure designed to retain liquid. If, as conjectured, [212] were a filtration unit, the 0.4m deep depression along the southern edge may have represented a gutter used to channel the filtered brine toward the mouth of a pipe that fed into the collecting vat.

A sherd of 12th to 14th century locally produced medieval pottery was recovered from lining (240), with another of the 11th to 13th centuries being found in (241), the primary fill of [212]. There were at least nineteen different deposits within [212], the majority of which were a series of small irregular lenses that were sandwiched between two more substantial layers of pale to mid greyish-brown sandy silt, (227) and (267). This would suggest that [212] was filled in two distinct, but probably short, episodes of activity, which may equate to separate firings and the subsequent cleaning of a nearby hearth.

When [212] was created, it was cut through the fills of another redundant feature, [213]. Rather more of [213] was exposed in the trench, indicating that the southern edge, which was over 1.75m long, was orientated from north-west to south-east, while its width exceeded 0.95m. The western edge of Trench 2 coincided with the western edge of [213], which was inclined at c. 45°. The base of the feature also dipped, dropping toward the north-east at an angle of 12° to the horizontal. These morphological characteristics provide a strong indication that [213] represents another filtration unit. Furthermore, as with [212], the base of the feature was lined, this time with a thin layer of hard fired mid greyish-brown sandy silt, (249), that had created a relatively impermeable membrane.

There were twenty-one thin, laminar deposits, which had survived the subsequent creation of [212] and continued to fill [213]. The relationships between these lenses was more regular than between those filling the later feature, and suggested that this initial filtration unit had filled incrementally, possibly as a result of sediments washing in. A single sherd of pottery was recovered from these fills, this being a sherd of 13th to 14th century fabric found in (251), one of the latest surviving deposits.

Trench 3

(See fig. 6)
This 15m long trench was situated near the south-western limit of Area A, at the very edge of the higher ground forming the plateau of the saltern mound. It was orientated approximately from north to south, perpendicular to, and crossing, one of a parallel series of weak linear anomalies that had been detected by the gradiometer survey.

Removal of the topsoil, (300), a 0.3m deep layer of mid to dark brown humic sandy silt, revealed a single deposit, (301). This was a mid greyish-brown sandy silt, which contained very occasional fragments of charcoal, shell and fired silt. Initial machining exposed the uppermost c. 0.45m of (301), but at no point was the base of this deposit evident. Consequently, a sondage was placed at the northern end of the trench, in an attempt to reveal the underlying deposits. However, despite removing material to a depth exceeding 1.6m below the modern ground surface, the base of layer (301) was not exposed.

The position of the trench on the raised ground of the saltern mound indicated that all the sediments exposed must have been redeposited as a result of human activity. However, the colour and texture of (301) was particularly homogenous throughout the length of the trench. Consequently, it was not possible to establish what had generated the geophysical anomaly detected in this area. At a very general level, the morphological similarities with the much stronger linear anomalies examined in Trench 1 raise the possibility that there are spreads of burnt material situated beneath Trench 3 that are comparable to (107)/(110)/(112). The gross differences in the relative strengths of the magnetic signals between the two areas, combined with the lack of evidence exposed by the excavation, would imply that if such deposits existed beneath Trench 3 they would be much more deeply buried.

Whilst the origin of the magnetic variation remains equivocal, it quickly became obvious that in comparison to all of the other five areas examined by trenches there was a significant difference in the structure of the sediments into which Trench 3 had been excavated. The sides of the trench readily and rapidly sagged and collapsed, and the base of the trench soon filled with water, despite being somewhat higher than the bases of Trenches 4, 5 and 6 which all remained dry at this time.

Trench 4

(See fig. 7)
This 15m long trench was situated near the centre of Area B, at the base of the south-facing slope of the saltern mound. It was orientated from west-north-west to east-south-east, and crossed a slight depression that corresponded closely to a large diffuse magnetic anomaly that extended approximately 80m from north to south. The eastern end of the trench extended over a narrower, diffuse linear anomaly, which ran parallel to, and c. 5m from, the large area of magnetic disturbance.

The topsoil, (400), was a mid greyish-brown humic sandy silt, c. 0.3m deep, which contained occasional charcoal and mollusc shell fragments, and a few small siltstone

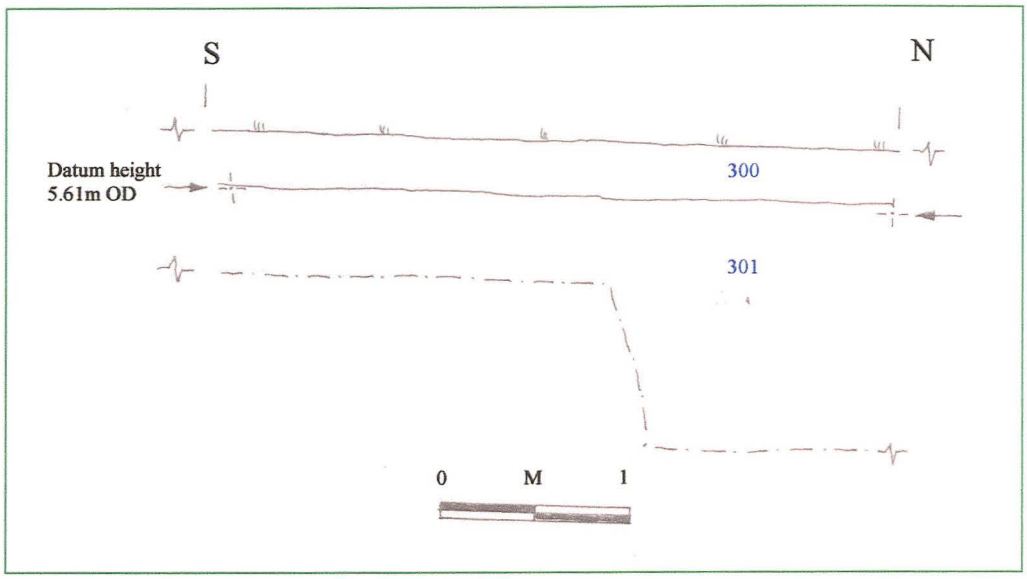

Figure 6: Trench 3, representative segment of the east facing section.

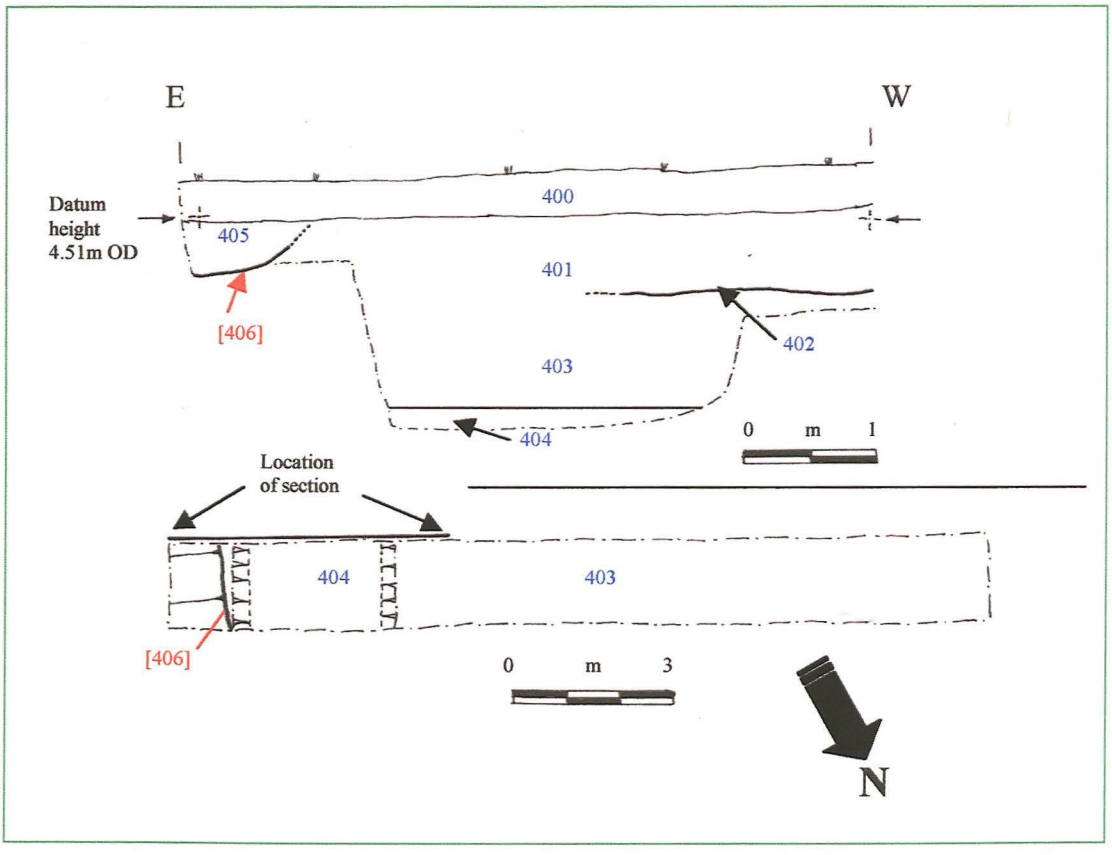

Figure 7: Trench 4, plan and representative segment of the north facing section.

pebbles. Sealed beneath the topsoil was an orangey-brown sandy silt with a slight greyish hue, (401). This layer was up to 0.6m deep, and also contained occasional charcoal and shell fragments. A thin lens of rusty brown sandy silt, (402), c. 0.01 to 0.02m thick, separated (401) from (403). Although similar to iron pan in many respects, the elements of layer (402) did not form a concreted mass.

Layer (403) was composed of pale greyish-brown sandy silt, again containing occasional charcoal flecks. A deep slot was excavated near the eastern end of the trench by the JCB, in order to determine the stratigraphic sequence. This demonstrated that (403) was approximately 0.8m deep. At the base of this sondage, beneath (403), was a layer of mid grey to dark brownish-grey humic sandy silt, (404). The top of (404) lay a little over 1.7m below the modern ground surface, but its total depth (exceeding 0.2m) was not established due to the instability of the trench sides, which resulted in their partial collapse. This layer had a strong odour of decay, and as well as fragments of mollusc shell, contained a multitude of very small fibres of c. 0.001m in length.

It seems likely that (404) represents partially decayed organic material lining the base of a palaeo-channel. Such material would produce magnetic variation detectable by a fluxgate gradiometer, but it is questionable as to whether the instrument would be able to penetrate through 1.7m of overlying sediment to detect the resultant anomaly. However, examination of the other deposits in Trench 4 did not provide evidence for a possible alternative source for the large anomaly detected in this part of the site (**4** - in Rylatt & Bunn, 2001). It therefore seems that this large, diffuse anomaly, crossing the northern half of Area B, relates to organic rich sediments filling the base of a short, relict water course running southward from the saltern mound. Certainly, as all of the sediments overlying (404) contain small quantities of charcoal, it is evident that they were redeposited during, or following, the human activity associated with the creation and operation of the mounds.

The western edge of a north to south aligned ditch, [406], was exposed at the very eastern end of Trench 4. This linear feature was in excess of 0.96m wide and 0.4m deep, with the exposed edge sloping at c. 45° to meet a level, horizontal base. It was filled by mid greyish-brown sandy silt, (405), that was sealed directly beneath the topsoil. This latter relationship suggests that the feature was relatively modern, although it did not appear on the Ordnance Survey Second Edition 6": 1 mile map of 1906 (fig. 10). Its orientation and position raise the possibility that [406] generated the narrower geophysical anomaly that appeared to run parallel to the putative palaeo-channel.

Trench 5

(See fig. 8)
This 10m long trench was situated near the northern end of Area B. It ran approximately perpendicular to another weak linear magnetic anomaly that had an east - west alignment.

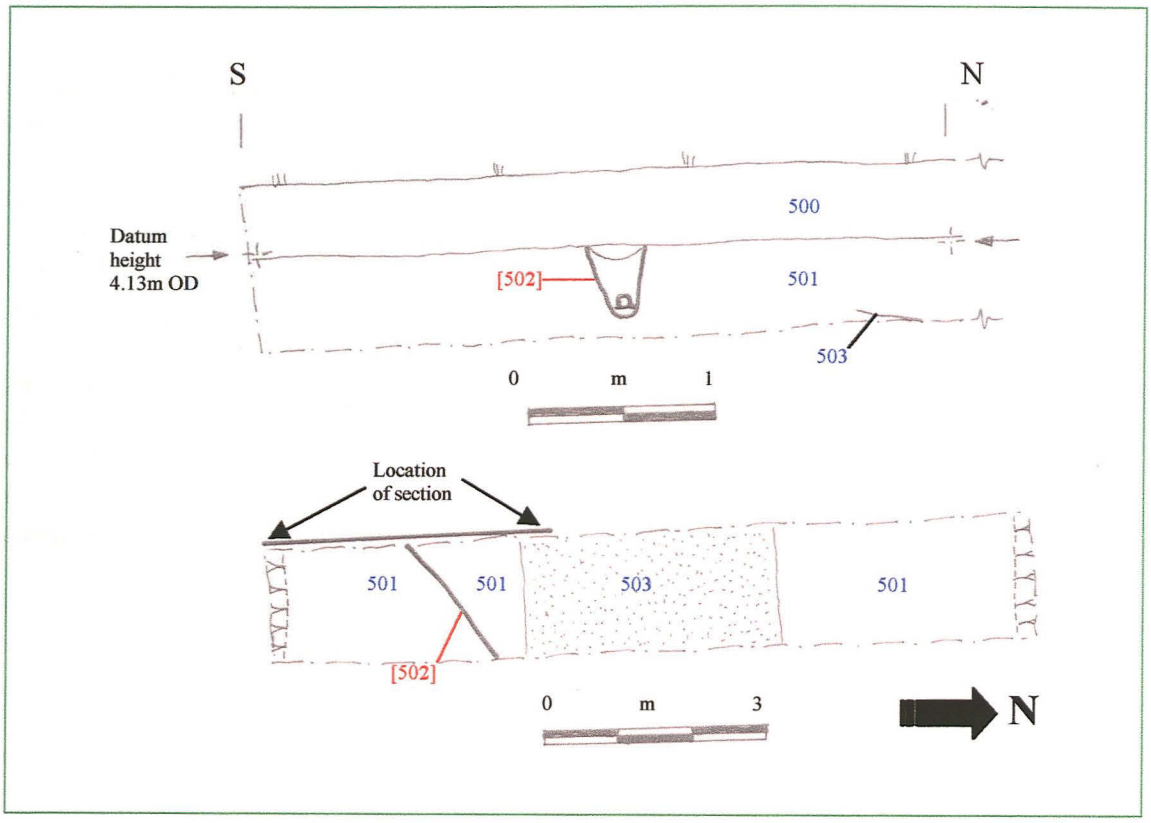

Figure 8: Trench 5, plan and representative segment of the east facing section.

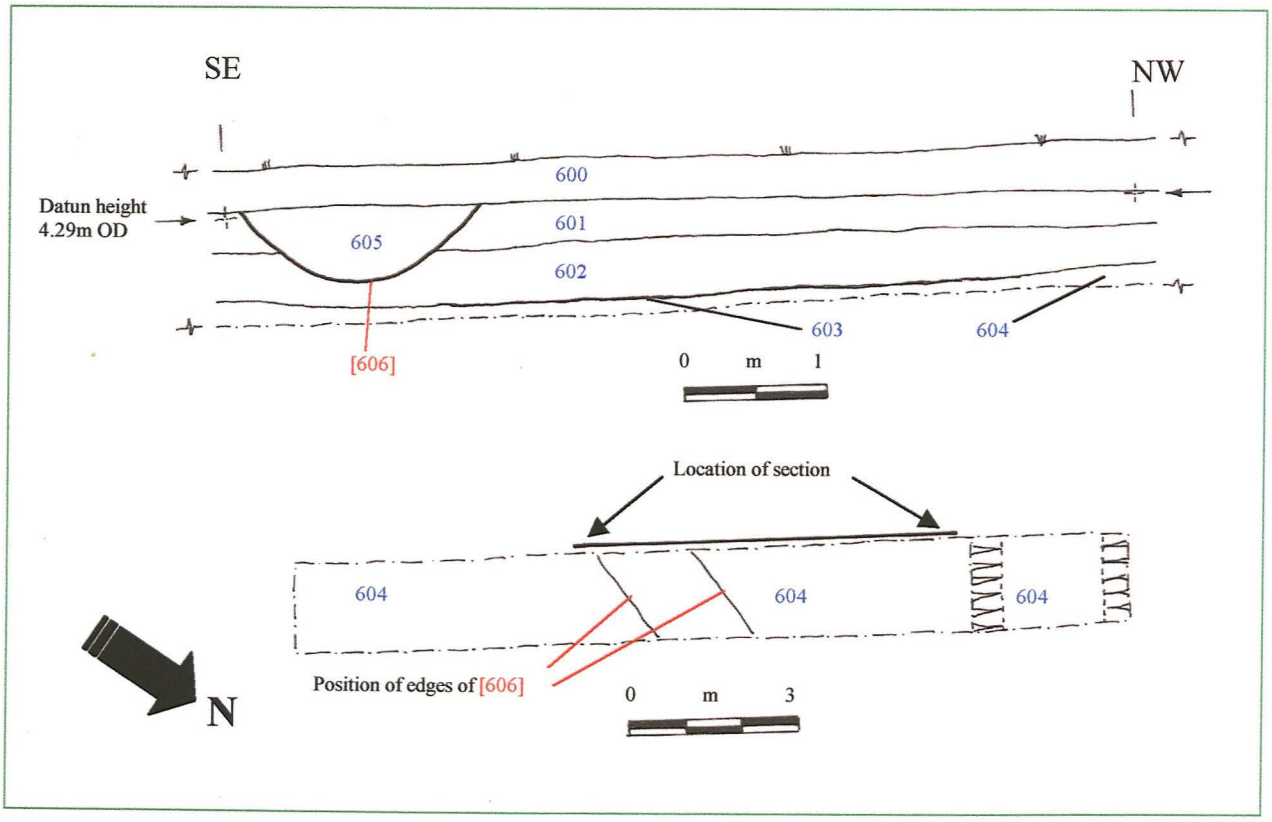

Figure 9: Trench 6, plan and representative segment of the north-east facing section.

The topsoil, (500), c. 0.38m deep, sealed a deposit of pale greyish-brown to orangey-brown sandy silt, (501), which was in excess of 0.52m deep. A narrow, north-east to south-west orientated slot had been cut into this layer at a point c. 2m from the southern end of the trench. A red ceramic land drain, (502), had been placed at the base of this slot, which lay c. 0.8m below the modern ground surface. Internally, this land drain had a circular cross section c. 0.035m in diameter, while externally it had a flat base and scoring on its surface, the latter suggesting that it had been extruded.

At the centre of the trench lay a deposit of pale greyish-brown sandy silt, (503), within which was a high density of rusty mottles. These mottles undoubtedly represented a concentration of iron oxide, which constituted approximately 40% of the deposit. This deposit was c. 3.3m wide and dipped down gently toward the north, suggesting that it represented an exposed cross-section through a truncated 'sand bank' or similar mounded deposit. Both the position of this deposit and the presence of concentrations of ferrous material, suggest that (503) generated the magnetic anomaly detected by the gradiometer survey.

Trench 6

(See fig. 9)
A 15m long trench orientated from north-west to south-east and situated near the south-western corner of Area B. It was not positioned over an area of distinct magnetic variation, but was located to determine whether there was a south-westerly continuation of the narrow, diffuse linear anomaly also examined in Trench 4.

The topsoil, (600), was a mid greyish-brown humic sandy silt, c. 0.3m deep, which contained very occasional mollusc shell fragments. One or two small pieces of coal and flint grit were also observed. Removal of (600) exposed a pale orangey-brown sandy silt, (601), c. 0.15m deep, which contained evenly distributed grey mottles and a number of very thin rusty brown lenses. Beneath (601) was a layer of pale greyish-brown sandy silt, (602), with orange mottles. This deposit also contained a number of very thin lenses of rusty brown or dark grey silt, as well as one relatively large, distinct lens of each colour. Components of anthropogenic origin were limited to a few flecks of charcoal and oxidised burnt silt. A lens of uncemented rusty brown sandy silt, (603), c. 0.01 to 0.02m thick, was situated at the base of (602) and separated it from (604).

Layer (604) was a mid brown silty clay, within which were small rusty mottles. Coarse inclusions were not observed within this layer and it should be noted that it became increasingly silty with progress toward the western end of the trench. A sondage was excavated at the western end of the trench, but the base of (604) was not detected, indicating that this deposit was more than 1.16m deep.

A deposit equivalent to the humic sandy silt, (404), observed in Trench 4 was not exposed in Trench 6, despite the fact that the base of the sondage was slightly deeper at c. 2.1m below the modern ground surface. Further excavation was prevented by the collapse of the trench sides, but the apparent absence of the humic layer corresponds closely to the geophysical survey results, with the putative palaeo-channel appearing to terminate to the north-east of Trench 6. Consequently, these factors would appear to

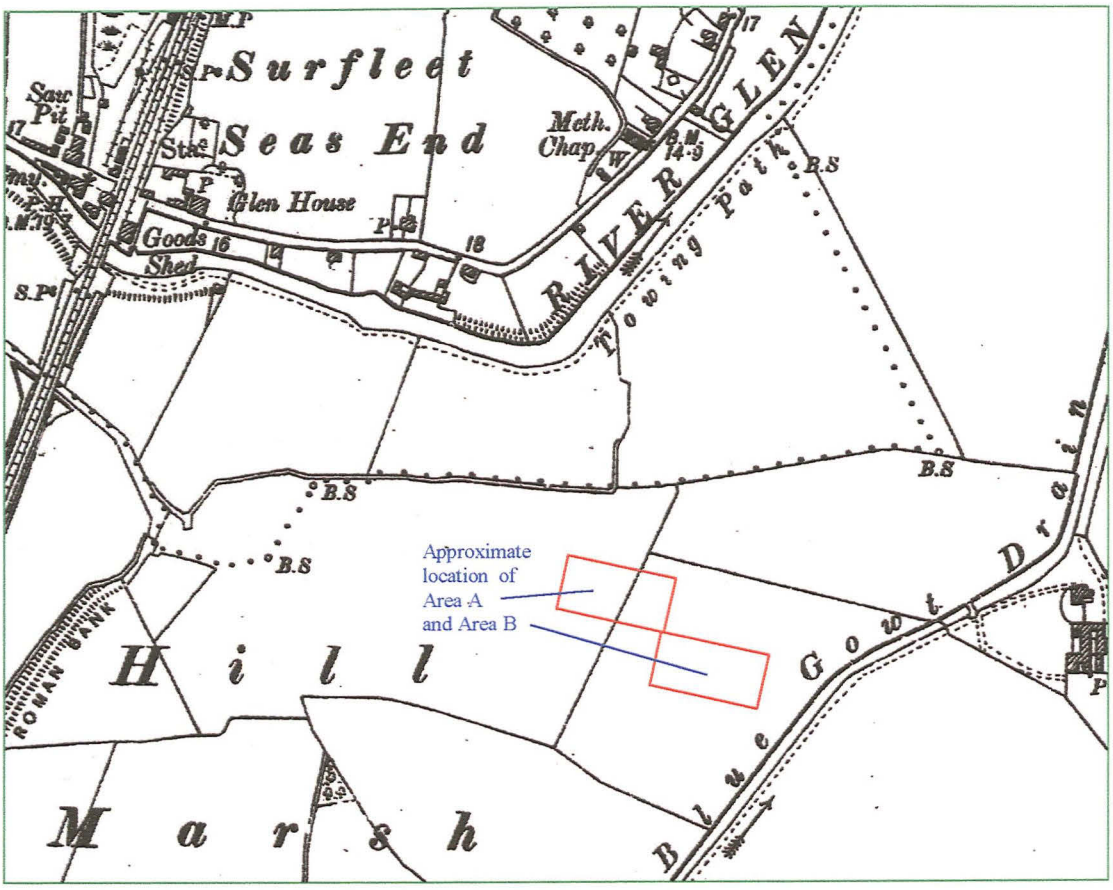

Figure 10: Extract from the Ordnance Survey Second Edition 6": 1 mile map of 1906, annotated with the approximate positions of Areas A and B. Note the old field boundary running north-eastward through Area A

confirm that the gradiometer had been remarkable sensitive and had been able to differentiate certain deposits lying over 1.5m beneath the ground surface

Removal of the topsoil had revealed a north to south orientated ditch, [606] at the centre of the trench. It was c. 1.7m wide and 0.52m deep, with a 'U'-shaped profile. The fill of this feature was a mid greyish-brown sandy silt, (605), within which were occasional discrete blocks of orange sandy silt. The position, orientation and stratigraphic relationships of [606] indicated that it was part of the same linear feature as [406].

7.0 Interpretation and discussion

The topographical variation displayed by the area under investigation, together with the results of the geophysical survey, had already provided indications that the evaluation would encounter archaeological deposits associated with salt production. Additionally, a series of finds made on and around the site during the 1980s by Mr Ronald Stocker provided strong indications that this activity had taken place in the medieval period.

The fact that such large mounds of sediment were created over much of the area now occupied by Spalding Golf Club not only signifies that the area was utilised for salt production, but also indicates that the process used was 'sand-washing' (Grady, 1998). Sand-washing was the most extensively applied method of extracting salt from sea water in England during the medieval period, a factor largely resulting from the relatively low average ambient temperature. Previous archaeological investigations have indicated that the techniques employed varied considerably from parish to parish, but it is possible to provide a general outline of the main stages of production.

The initial stage of this process involved the collection of salt impregnated sands and silts. Essentially these deposits were collected during the summer months, following the fortnightly flooding of the salt marshes by the high `spring' tides (Healey, 1999). A short interval would have elapsed after the flooding, during which time the water would have either drained away under the effects of gravity, or evaporated. This would have resulted in a significant enhancement of the salt content of the top few centimetres of silt in the salt marsh. The silt was gathered in such quantities that a horse drawn sled was used to plane it off and transport it toward the processing sites. This silt was referred to as 'mould' and was stored in mounds lying adjacent to the production site, which were covered to prevent rainwater from washing out the salt crystals (Sturman, 1984).

Gradually each of these mounds of 'mould' would be processed, the initial stage involving controlled washing of the sediment. Excavations at two sites at Wainfleet St Mary, Lincolnshire, completely exposed a number of filtration beds (McAvoy, 1994; Albone, 1999). At Wainfleet these structures were relatively shallow, rectangular, clay-lined pits, with sloping bases, c. 1.5m wide by 3.5m long. It is not entirely clear how these filtration units operated, but it appears that a layer of turf blocks were placed onto the base of each to act as a support for a vertically sided timber box or frame. A quantity of mould was placed into the frame and was washed, preferably with fresh

water, to dissolve and extract the salt. This brine would then run along the base of the unit to the end where it was channelled into an adjacent collection vat.

Three of the features investigated in Trench 2, [212], [213] and [216], share a number of morphological characteristics with the filtration beds observed at Wainfleet. Consequently, a comparable function has been tentatively attributed to these features, although certainty is difficult, because only a small section of each feature was exposed. A more secure attribution can be provided for the remains of the collection vat, (218), that was partially uncovered in Trench 2. This feature directly parallels the form of the domed pits examined at Wainfleet.

In contrast to the similarities, it should also be noted that the putative filtration units at Surfleet Seas End differ in some respects from the examples examined at Wainfleet. While the latter were lined with clay to ensure that they were water tight, the examples at Surfleet appear to have either been lined with lime mortar, or have had there bases fired to achieve the same end. This appears to have been a preferred strategy, possibly reflecting local custom, as the strata exposed in Trench 6 indicate that clay deposits were readily available in the immediate vicinity. It also appears from the few dimensions available, that the filter beds at Surfleet were somewhat bigger than the examples at Wainfleet.

Of potentially greater importance is the difference in the siting of these structures. At Wainfleet the filtration units were arranged in rows running from end to end, which were bracketed on either side by the mounds of waste silt representing the washed 'mould'. However, at Surfleet these pits appear to have been excavated into the top of comparable silt mounds. While this increase in elevation would have resulted in the expenditure of additional effort to transport water for silt washing, it would also have provided the salt makers with added security against the effects of storms and floods.

The final stage of the salt production process was the evaporation of the brine from the collection vats. The salt solution would be poured into shallow lead pans or trays situated above a hearth (Sturman, 1984). The pan and hearth would be situated inside a small building known as a saltcote, which is likely to have been of mud and stud construction, with a timber door and windows, and a thatch or shingle roof (Grady, 1998).

Surprisingly, the remains of this part of the process are poorly represented in the archaeological record, in comparison to the other stages. To date, there is only one site in Lincolnshire from which the *in-situ* remains of medieval hearths have been examined (Healey, 1999). This was situated in Quadring parish, c. 7km to the north of Spalding Golf Club. Here, two kilns or hearths, each c. 1.4m by 0.45m, survived to a depth of c. 0.4m and were associated with a building, and an ash heap situated to the rear of the stoke holes. Similar ashy spreads and fragments of broken hearths have been found on numerous other sites. Analysis of these burnt residues at both Quadring and Wainfleet indicated that peat was the main, or only, fuel used (*ibid*; McAvoy, 1994). This evidence is matched by the analysis of samples taken from deposits in both Trench 1 and Trench 2 at Surfleet, where the dark grey to pink sediment crumb is most likely to be a burnt peat residue (see Appendix 13.3). Fragments of fired silt, some of which had been deliberately tempered, were also recovered (Appendix 13.4). These are likely to

be hearth fragments, and together with the ash, are likely to indicate that the remains of one or more saltcotes like in close proximity to Trenches 1 and 2.

Peat would have proved to be an ideal fuel for several reasons. It was relatively slow burning and would have maintained a constant temperature during firing. Additionally, while the surrounding area is likely to have lacked significant quantities of timber during the medieval period, it is known that there were peat beds in Pinchbeck Fen. As the site lies at the northern end of this particular fen acquisition of fuel from this source would not have been particularly troublesome. Furthermore, it is known that these beds were being worked in the medieval period as there is a documentary reference of 1327 to the turbary rights on this land (Healey, 1999).

The most extensive archaeological deposits encountered on any saltern site are those which are essentially the most unpromising and artefactually sterile. These are the waste silts, the residues of the filtration process, which, like the ash from the hearths, would have been disposed of close to the saltcotes. Such deposits would have gradually built up to create low mounds, but the instability of the sediments from which they were created would have meant that the angle of the slope faces would have remained relatively gradual. This in turn restricted the height of the mounds, as increased height equated to a longer slope, and thus a greater distance to the water's edge and the salt marsh. Consequently, as the mounds reached their maximum viable height, which would be a little above the high water mark, they would gradually migrate seawards. The saltcotes would also periodically move in order to minimise the distance travelled to the salt marsh. This process accounts for the depth of deposits and the frequency with which features cut through each other.

The raised ground to the rear of the saltcotes, while no longer useful for salt production would be utilised for agricultural purposes. The palaeo-environmental samples collected from Surfleet Seas End contained abundant snail shells. This assemblage was dominated by species that inhabited dry calcareous grassland, but there were other species that would have favoured open ground. Consequently, it has been suggested that the area around Trenches 1 and 2 was a dune-like habitat of mixed vegetation. While this would appear to preclude any arable activity in the immediate vicinity of the site, the presence of grassland, together with the remains of cattle and sheep would suggest that these areas were utilised for grazing. Evidence of comparable activity was recovered from Wainfleet St Mary, where the bones of calves and neonatal pigs provided compelling evidence of husbandry rather than consumption (Albone, 1999).

Another correlate of the gradual seaward migration of the saltern mounds is that those furthest from the sea are likely to be the oldest (Grady, 1998). The initial production sites are likely to have be erected on, or immediately outside, the nearest active sea bank (Healey, 1999). In the case of Surfleet Seas End this would be the 'Roman Bank', situated c. 200-250m to the west. The size of this particular saltern mound, in line with many of the others situated on the margins of Bicker Haven, suggests that it accumulated over several centuries. Consequently, it is particularly significant that the site under consideration in this report was situated on the very south-eastern edge of this mound. Its position indicates that structures examined in Trench 2 are likely to relate to the final episodes of salt production on this saltern, or at the very least, this

part of the saltern. Therefore, the recovery of a small quantity of 13th century pottery from a number of the abandoned features provides a tentative end date for salt production (Appendix 13.2). This in turn would suggest that the initial production, and the nearby section of the 'Roman Bank' itself, was of a significantly earlier date. Whether this could be related to the two salt houses at Surfleet mentioned in the *Domesday Book* (see 4.0, above) is debatable, as the site itself represents the northern part of Hill Marsh, which is actually situated in Pinchbeck Parish.

The abandonment of the site during or at the end of the 13th century seems to be unusually early. At Quadring, the features examined contained sherds of Toynton and Bourne B ware that were dated to the first half of the 14th century. Furthermore, these contexts were sealed beneath c. 2m of later deposits (Healey, 1999). The material from Wainfleet was even later, being primarily of 15th and 16th century date (McAvoy, 1994; Albone, 1999). Consequently, it is to be wondered why the Surfleet site was abandoned. It was ideally placed on a particularly favoured location for salt production, namely on the edge of Bicker Haven, and adjacent to the estuary of the Rivers Glen and Welland. Such relatively sheltered parts of the coastline had ample access to large tracts of sand or silt marsh at times of low tide, while being protected from the worst ravages of the sea. Additionally, the proximity of the River Glen would have ensured that there was an abundant supply of fresh water, in order to ensure that the brine produced from the 'mould' was particularly pure in sodium chloride, and relatively unadulterated by the other salts present in seawater.

A possible reason for the cessation of salt making in this particular vicinity is tentatively offered here, but this should not be taken as a definitive answer to this problem. It is possible that silting in the estuaries of the two rivers resulted in the adjacent marsh becoming isolated from the sea, even at high tide. This would have instantly prevented further salt production. The reason for such increased silting may lie in the fact that during the 13th century - the `stormy century' - weather conditions appeared to worsen (Grady, 1998). This resulted in a breach of the offshore sandbanks that formed a barrier along the Lincolnshire section of the East Coast, which generated significantly increased quantities of mobile sediments.

8.0 Conclusions

The archaeological deposits examined during the evaluation relate to a relatively restricted period of activity, which possibly began in the late 12th century, but more certainly centred on the 13th century. This activity is almost entirely industrial in nature and relates to the production of salt from seawater. However, it is also possible that there was limited later medieval activity within the area of the proposed development, as a large 14th century coin hoard and a single isolated 15th century coin have been recovered from the field in which the archaeological investigations detailed in this report were conducted.

The evidence obtained from the evaluation suggests that while all of the raised ground was created as a result salt production activities, the structures and burnt residues relating to these processes are spatially restricted to the higher ground on the top of the mound.

The close correspondence between the archaeological features examined and the strongest anomalies detected by the geophysical survey attests to the presence of further archaeological deposits located within the area of the proposed development. It is anticipated that these will also be of medieval date.

A number of aspects relating to the production of salt at this site remain unanswered. Firstly, the type of material placed into the filter beds to form the actual filter has not been identified. Furthermore, the location and form of the saltcotes, and their associated hearths, remains to be determined. Any further excavation should involve a programme of sampling to address these deficiencies.

9.0 Effectiveness of Methodology

Only two of the trenches opened at Surfleet Seas End contained significant archaeological deposits. However, these corresponded to the areas of the strongest magnetic variation detected by the gradiometer survey. The other trenches demonstrated that the weaker anomalies were produced by variations in the natural strata, or by deeply buried deposits of possible archaeological significance. The close spatial correlation between geophysical anomalies and the features or deposits exposed by the evaluation allows a greater appreciation of the results of the gradiometer survey. Consequently, it is concluded that the survey provides a relatively accurate representation of the density and distribution of the archaeological deposits surviving on the site.

The recovery of artefactual material and the morphological attributes of the features examined indicated that Area A was utilised for a relatively short but concentrated period of time. In contrast there is far less evidence for any sustained human activity in Area B. These observations provide a basis for anticipating the nature of any further deposits that may be encountered during the proposed development.

It is therefore concluded that the evaluation achieved its primary objective by satisfactorily determining the nature, date and distribution of sub-surface archaeological deposits located within the confines of the site.

10.0 Site archive

The site archive for this project is in preparation and will be deposited at the Lincoln City and County Museum (physical) and the Lincolnshire Archives Office (documentary) within six months. Access to the archive may be granted by quoting the global accession number 2001.125.

11.0 Acknowledgements

Pre-Construct Archaeology (Lincoln) would like to thank Bill Hawthorn and Spalding Golf Club for commissioning this programme of archaeological investigation. Additionally, thanks are extended to Mr J. Ward and his staff for the assistance and information provided during the fieldwork, and to Hilary Healey and Jim Bonnor, both of whom provided further background information.

12.0 References

Albone, J. 1999 *Archaeological Excavation Report: A Late Medieval/Early Post-Medieval Saltern at St Michael's Lane, Wainfleet St. Mary, Lincolnshire*. Pre-Construct Archaeology (Unpublished report).

Anon, 2000 *A Walk Around the Parish Church of St Laurence, Surfleet: A Guide for Visitors*. (Obtained from the church).

B.G.S., 1992 *Spalding, England and Wales Sheet **144***. Solid and Drift Geology, 1: 50,000. Keyworth, British Geological Survey.

Cameron, K. 1998 *A Dictionary of Lincolnshire Place-Names*. Nottingham, English Place-Name Society, Popular Series, Vol **1**.

Grady, D.M. 1998 Medieval and post-medieval salt extraction in north-east Lincolnshire. In Bewley, R. (ed.) *Lincolnshire's Archaeology from the Air*. Lincoln, The Society for Lincolnshire History and Archaeology, Occasional Papers, **11**: 81-95.

Hallam, S.J. 1970 `Settlement Around the Wash' in Phillips, CW (ed.) *The Fenland in Roman Times*. RGS Research Series No. **5**, 22-113

Healey, H. 1999 A medieval salt –making site at Bicker Haven. In Bell, A., Gurney, D. & Healey, H. (eds.) *Lincolnshire Salterns: Excavations at Helpringham, Holbeach St Johns and Bicker Haven*. Sleaford, Heritage Trust of Lincolnshire, East Anglian Archaeology, **89**.

IFA 1994 *Standard and Guidance for Archaeological Field Evaluations*. Birmingham, Institute for Field Archaeologists.

Lane, T.W. *1993 The Fenland Project Number 8: Lincolnshire Survey, the Northern Fen Edge*. Sleaford, Heritage Trust of Lincolnshire, East Anglian Archaeology, **66**.

LCC, 1998 *Lincolnshire Archaeological Handbook: A Manual of Archaeological Practice*. Lincoln, Built Environment Section, Lincolnshire County Council.

McAvoy, F. 1994 Marine salt extraction: the excavations of salterns at Wainfleet St Mary, Lincolnshire. *Medieval Archaeology*, **38**: 134-163.

Morgan, P. & Thorn, C. (eds.) 1986 *Domesday Book: 31 Lincolnshire*. Chichester, Phillimore.

Owen, D.M. 1971 *Church and Society in Medieval Lincolnshire*. Lincoln, History of Lincolnshire Committee. History of Lincolnshire Series, Vol. **V**.

Pevsner, N. & Harris, J. 1989 *The Buildings of England: Lincolnshire* (2nd Edition revised by N. Antram). London, Penguin.

Rylatt, J. & Bunn, D. 2001 *Fluxgate Gradiometer Survey: Land at Spalding Golf Club, Surfleet Seas End, Lincolnshire*. Pre-Construct Geophysics (Unpublished report).

Simmons, B.B. 1980 Iron Age and Roman coasts around the Wash. In Thompson, F.H. (ed.) *Archaeology and Coastal Change*. Society of Antiquaries of London, Occasional Papers (new series), **1**: 56-73.

Sturman, C.J. 1984 Salt-making in the Lindsey Marshland in the 16th and early 17th centuries. In Field, N & White, A. (eds.) *A Prospect of Lincolnshire*.

White, W. 1856 History, Gazetteer and Directory of Lincolnshire (2nd Edition). Sheffield (reprinted 1969 by David & Charles Reprints, Newton Abbot).

Appendix 13.5 List of Archaeological Contexts

Trench 1

Context No.	*Category*	*Description*
100	Layer	Topsoil
101	Fill	Fill of ditch [102]: 'a' upper fill, a yellowish-brown sandy silt 'b' lower fill, a mid browny-grey sandy silt
102	Cut	Ditch - north-south aligned linear
103	Fill	Fill of ditch [104]: 'a' upper fill, a yellowish-brown sandy silt 'b' lower fill, a mid browny-grey sandy silt
104	Cut	Ditch - north-south aligned linear, adjacent to [102]
105	Layer	Subsoil
106	Deposit	Pale yellowish-brown sandy silt
107	Deposit	Dark greyish-brown to mid-brown ashy spread and burnt sandy silt
108	Deposit	Pale yellowish-brown sandy silt
109	Deposit	Pale yellowish-brown sandy silt
110	Deposit	Dark greyish-brown to mid-brown ashy spread and burnt sandy silt
111	Deposit	Pale yellowish-brown sandy silt
112	Deposit	Dark greyish-brown to mid-brown ashy spread and burnt sandy silt

Trench 2

Context No.	*Category*	*Description*
200	Layer	Topsoil
201	Deposit	Burnt deposit - ash and charcoal
202	Deposit	Pale browny-yellow sandy silt
203	Deposit	Pale yellow sandy silt
204	Deposit	Pale brown sandy silt, secondary fill of [216]
205	Deposit	Pale orangey-brown sandy silt, secondary fill of [216]
206	Fill	Lower fill of [216]
207	Deposit	Pale yellow sandy silt
208	Deposit	Pale brown s sandy silt
209	Deposit	Tan-brown sandy silt, with burnt component
210	Deposit	Reddish burnt sandy silt
211	Deposit	Pale browny-yellow sandy silt
212	Cut	Pit, cuts fill of [213]
213	Cut	Pit
214	Fill	Primary fill of [216]
215	Fill	Probable lining of [216]
216	Cut	Filtration tank
217	Fill	Fill of [218]
218	Cut	Brine collection vat
219	Deposit	Pale brown sandy silt
220	Deposit	Pale yellow sandy silt
221	Fill	Lower fill of [216]
222	Deposit	Pale yellow sandy silt
223	Deposit	Pale yellow sandy silt
224	Deposit	Reddish burnt sandy silt
225	Cut	Truncation of deposits filling [216], possibly associated with levelling of mound at the end of salt production in this immediate locality
226	Deposit	Mid greyish-brown sandy silt
227	Deposit	Pale to mid greyish-brown sandy silt
228	Deposit	Pale greyish-brown sandy silt
229	Deposit	Mid greyish-brown sandy silt, with frequent rusty mottles
230	Deposit	Mid grey sandy silt, fired hard
231	Deposit	Pale to mid greyish-brown sandy silt

232	Deposit	Reddish-brown briquetage fragments
233	Deposit	Reddish-brown to purple sandy silt
234	Deposit	Mid greyish-brown sandy silt
235	Deposit	Reddish-brown to purple sandy silt, with mid grey mottles
236	Deposit	Pale to mid greyish-brown sandy silt
237	Cut	Animal disturbance - filled in burrow
238	Deposit	Mid brownish-grey sandy silt
239	Deposit	Reddish-brown to purple sandy silt
240	Deposit	Grey to white silt or lime mortar, hard concretion lining [212]
241	Deposit	Mid greyish-brown sandy silt, with frequent charcoal flecks and dark grey lenses
242	Deposit	Pale grey sandy silt
243	Deposit	Pale grey sandy silt
244	Deposit	Pale yellowish-brown sandy silt
245	Deposit	Mid brownish-greyish sandy silt, with frequent charcoal flecks and dark grey lenses
246	Deposit	Orangey-brown sandy silt
247	Deposit	Mid greyish-brown sandy silt, with frequent charcoal flecks and dark grey lenses
248	Deposit	Orangey-brown sandy silt
249	Deposit	Mid greyish-brown sandy silt, hard fired to form lining to base of [213]
250	Deposit	Pale greyish-brown sandy silt
251	Deposit	Mottled greyish-brown to brownish-orange sandy silt
252	Deposit	Mid greyish-brown sandy silt
253	Deposit	Mid greyish-brown sandy silt, with frequent rusty mottles
254	Deposit	Orangey-brown sandy silt, with grey mottles
255	Deposit	Pale grey sandy silt
256	Deposit	Dark grey to black sandy silt, heated to hard surface
257	Deposit	Yellowish-brown sandy silt, fired to hard surface
258	Deposit	Orangey-brown sandy silt
259	Deposit	Pale grey sandy silt
260	Deposit	Dark grey to black ashy sandy silt
261	Deposit	Orangey-brown sandy silt
262	Deposit	Mid to dark greyish-brown sandy silt
263	Deposit	Yellowish-brown sandy silt
264	Deposit	Mid grey to black ashy sandy silt
265	Deposit	Orangey-brown sandy silt, with purplish-brown lenses
266		
267	Deposit	Pale to mid greyish-brown sandy silt

Trench 3

Context No.	*Category*	*Description*
300	Layer	Topsoil
301	Deposit	Mid greyish-brown sandy silt

Trench 4

Context No.	*Category*	*Description*
400	Layer	Topsoil
401	Deposit	Pale greyish orangey-brown sandy silt
402	Deposit	Rusty brown sandy silt
403	Deposit	Pale greyish-brown sandy silt
404	Deposit	Mid grey to brownish-grey humic sandy silt
405	Fill	Fill of [406], mid greyish-brown sandy silt
406	Cut	Ditch, aligned north to south, same as [606]

Trench 5

Context No.	*Category*	*Description*

500	Layer	Topsoil
501	Deposit	Pale greyish-brown to orangey-brown sandy silt
502	Cut/fill	Ceramic land drain
503	Deposit	Pale greyish-brown sandy silt, with frequent rusty mottles

Trench 6

Context No.	*Category*	*Description*
600	Layer	Topsoil
601	Deposit	Pale orangey-brown sandy silt
602	Deposit	Pale greyish-brown sandy silt
603	Deposit	Rusty brown sandy silt
604	Deposit	Mid brown silty clay
605	Deposit	Mid greyish-brown sandy silt
606	Cut	Ditch, aligned north to south, same as [406]

Appendix 13.1: Colour photographs

Plate 1: General view of the site, with Trench 6 situated nearest to the viewer and the green keepers' workshop toward the left hand side of the picture, in the distance, looking north.

Plate 2: Trench 1, showing the three ashy spreads, (110) being situated toward the foreground, (112) beneath the far end of the nearest photo scale, and (107) beyond the farthest photo scale, looking north-west.

Plate 3: Trench 2, north-east corner, with the vertical photo scale standing in [212], which has cut through the bright red laminated fills of [213], looking east.

Plate 4: Trench 2, a section through filtration bed (216), looking south-east.

Plate 5: Trench 2, deposit (209) overlying collection vat (218), prior to excavation, looking east.

Plate 6: Trench 2, the upper part of collection vat (218), following to excavation, looking east.

Plate 7: Trench 3,demonstratng the degree to which these sediments were prone to inundation and collapse, looking south-east.

Plate 8: Trench 4, decayed organic deposit (404) situated at the base of the sondage excavated at the eastern end of the trench, looking south.

Pottery Archive SPGC01

Jane Young *Lindsey Archaeological Services*

A small group of pottery, probably all dating to the 13th century, although some sherds could be of earlier date (12th century). The pottery should be retained for future regional study.

context	cname	sub fabric	form type	sherds	vessels	decoration	part	description	date
106	MEDLOC	bright oxid;med sandy;hard	jug	1	1		BS	? Boston or Toynton;brown glaze	mid 13th-14th
106	TOY	? BOSTTT	jug	1	1	fe dot	BS		mid 13th-14th
204	EMHM		?	1	1		BS	discoloured;burnt ?;spalled;oxid; ? ID	12th-13th
204	MEDLOC	reduced;med sandy;hard	jug	1	1	applied arm with slashing under	BS	pocked light copper glaze comm fine-med clear quartz comm black fe incl metaseds but not a typical LSW	13th-14th
210	EMHM	fabric T ?	jar	1	1		BS	soot	mid 12th-13th
217	EMHM	fabric T ?	jar	1	1		BS	soot	mid 12th-13th
240	MEDLOC	OX/R;fine-med sandy + lime	?	1	1		BS	burnt;discoloured;fine-very fine abundant quartz comm fe & metaseds? Mod limestone	12th-14th
241	MEDLOC	oxid;fine-med sandy;hard	small jar	1	1		rim	hollow everted rim;abun fine quartz some larger mod fe & metaseds occ limestone	11th-13th
251	MEDLOC	OX/R;med-coarse sandy + li	?	1	1		BS	burnt; Comm very mixed quartz incl larger rounded ? Greensand mod limestone incl fossil shell carb veg odd soft grey-red rock/fe occ very fine aggregate sandstone;looks visually like BOUA	13th-14th

context	cname	sub fabric	form type	sherds	vessels	decoration	part	description	date
U/S	EMHM	fabric T ?	jar	1	1		BS	soot;joins sherd in context 210	12th-13th
U/S	MEDLOC	OX/R;med-coarse sandy + li	jar ?	1	1		base	discoloured; Comm very mixed quartz incl larger rounded ? Greensand mod limestone incl fossil shell carb veg odd soft grey-red rock/fe occ very fine aggregate sandstone;looks visually like BOUA	13th-14th
U/S	TOY	prob BOSTTT	small jug	4	1	applied vert fe strips	rim handle & BS	oval grooved handle;slightly cuffed rim	mid 13th-early 14th

SPGC cname key

cname	full name	earliest date	latest date
EMHM	Early Medieval Handmade ware	1100	1250
MEDLOC	Medieval local fabrics	1150	1450
TOY	Toynton Medieval Ware	1250	1450

Spalding Golf Club, Surfleet, Seas End - SPGC 01

Environmental Archaeology Assessment

Introduction

An evaluation excavation conducted by Pre-Construct Archaeology investigated a saltern site situated on an extensive mound, over 1km long, at Spalding Golf Club, Surfleet. A 13-14th century date is suggested from pottery associated with some of the features. Four samples were collected from the mound and were submitted to the Environmental Archaeology Consultancy for processing and assessment (Table 1).

Table 1: Spalding Golf Club, Surfleet. Samples taken for environmental analysis

sample no.	context no.	sample volume (l)	feaure	date
1	206	30	possible fill of disused filter bed	
2	110	10	latest ashy spread on salt mound	13-14th C
3	112	30.5	middle ashy spread on salt mound	13-14th C
4	107	23.5	earliest ashy spread on salt mound	13-14th C

Methods

The soil samples were processed in the following manner. Sample volume and weight was measured prior to processing. The samples were washed in a 'Siraf' tank (Williams 1973) using a flotation sieve with a 0.5mm mesh and an internal wet sieve of 1mm mesh for the residue. Both residue and flot were dried and the residues subsequently re-floated to ensure the efficient recovery of charred material. The dry volume of the flots was measured and the volume and weight of the residue recorded. A total of 94 litres of soil was processed in this way.

The residue was sorted by eye, and environmental and archaeological finds picked out, noted on the assessment sheet and bagged independently. A magnet was run through each residue in order to recover magnetised material such as hammerscale and prill and a count made of the number of flakes or spheroids of hammerscale collected. The residue was then discarded. The flot of each sample was studied using x10 magnification and the presence of environmental finds (i.e. snails, charcoal, carbonised seeds, bones etc) was noted and their abundance and species diversity recorded on the assessment sheet. The flots were then bagged and along with the finds from the sorted residue, constitute the material archive of the samples.

The individual components of the samples were then preliminarily identified and the results are summarised below in Tables 2 and 3.

Results

A low level of contamination was evident in all of the samples. This is typified by the presence of modern rootlets; *Cecilioides acicula* (the blind burrowing snail) and uncharred modern weed seeds, including *Chenopodium* spp. and *Urtica* spp. These are not considered to be contemporary with the archaeology and are treated as intrusive.

A few fragments of charcoal were recorded in each sample, but more abundant was a burnt, crumbly concretion, which could be peat ash. A relatively high concentration of small pink, dark grey and orange fired sediment crumb, reminiscent of the mineral ash of peat fires, and much amorphous charred plant debris suggests that peat was probably the main fuel used at

the site, although specific identification of the well preserved charred seeds will be required to confirm this interpretation. All the samples contained fired earth, some of which had plant impressions on the outer surfaces, and slaggy material which includes both partially and fully vitrified fragments. Some of this has the appearance of fuel ash slag and much could be derived from the vitrification of the sandy silts on the site. The latter material is particularly abundant in context 107. Small calcined (burnt) bone fragments were present in three of the samples and context 107 included unburnt fragments of sheep-sized rib. Pottery was identified in two samples and there is a single flint flake from 110. Fragments of marine cockle and mussel shells were recovered from all four samples, some of which were burnt in contexts 206 and 112. Bird eggshell, probably chicken, was relatively abundant in contexts 112 and 107.

Table 2: Spalding Golf Club, Surfleet. Finds from the processed samples

sample no.	context number	sample volume (l)	residue volume (l)	pot no/wt (g)	flint no/wt (g)	fired earth (g)	mag. (g.)	slag	peat/ cinder *	bone (g)	comments
1	206	30	3.15			47	11	+	4	<1	mortar - 17g
2	110	10	1	1/1	1/<1	5	<1	+	3	<1	
3	112	30.5	4.1			29	10	++	2	5	plant impressions on vitrified fragments
4	107	23.5	2.8	1/3		46	30	+++	5	3	plant impressions on some outer surfaces

+ = present, ++ = moderate abundance, +++ = abundant
* frequency – 1= 1-10; 2=11-20; 3=21-50; 4=51-150 pieces

There were no charred cereal remains in any of the samples and only a handful of charred seeds in three, these included docks (*Rumex* spp.) and other small weed seeds which have not been identified but may derive from the peats. A single oospore of *Chara* sp., a freshwater plant, was noted in context 112.

Context 206. The coarse residue from this context has a large proportion of concreted ashy matter with fine fired sediment crumb, probably concreted peat ash, and a range of oxidised and reduced fired sediment which may have derived from hearth floors. Two pieces of wall plaster, one with a face, and a few pieces of harder partially or completely vitrified sediment are present. The deposit appears to be, in the main, a dump of ash debris from the saltern fires with some other material.

Context 110. The coarse residue of this sample is composed of very pale ashy debris with a number of hard vitrified pieces and occasional charred inclusions. Although quite different in colour from the other sample residues, it appears to have a similar origin.

Context 112. A part of the coarse residue from this context is extensively vitrified, tending to glassy, slightly green amorphous fragments with visible organic impressions. The glassy surface is generally restricted to one side of the fragment with the other grey side carrying the visible organic inclusions. The remainder of the residue is composed of rough, generally plate like, concretions with clear evidence of ashy and charred inclusions. The vitrified material appears to represent a structure/hearth constructed with an organic tempered fabric which has sustained considerable heat on one surface sufficient to vitrify the sediment used in its manufacture. Its context, on the side of the saltern silt mound, suggests a dumped deposit rather than an *in situ* structure.

Table 3: Spalding Golf Club, Surfleet. Environmental finds from the processed samples

sample no.	context no.	sample volume (l)	flot volume (ml)	char-coal *	charred seed *	un-charred seed *	marine shell *	snails *	egg shell *	comment
1	206	30	5	1	1	1	2	4		charcoal, includes stem frags, probable peat ash, small fish
2	110	10	1	1		2	1	3		probable peat ash, stickleback
3	112	30.5	6	1	1	2	2	5	3	probable peat ash, *Chara* sp.
4	107	23.5	14	2	2	2	2	5	3	charcoal, includes stem frags, probable peat ash, stickleback

*frequency 1=1-10; 2=11-50; 3=51-150; 4=151-250; 5=>250

Context 107. The coarse residue from this context is essentially similar to context 110, although with a few fragments of fired, but not appreciably vitrified material, similar to the 'structural' debris from context 112. Some of this material is fairly heavily concreted and there are occasional vitrified fragments.

The fine and medium fractions of all these samples (<7mm) comprise what appears to be largely concreted peat ash and burnt silt crumb.

Snail shells were abundant in all of the samples and the taxa were preliminarily identified and a note made of the most abundant taxa (Table 4).

Table 4: Molluscan taxa recorded from the samples

Sample	1	2	3	4
Context	206	110	112	107
Hydrobia ulvae			+	+
Hydrobia cf *ventrosa*		+		
Open country				
Cecilioides acicula	++	++	+++	++
Vertigo pygmaea			+	+
Vertigo sp.	+			+
Pupilla muscorum	++*	++	++	++
Vallonia costata	+*	+	+	+
Vallonia excentrica	++*	+	++*	++
Vallonia pulchella	+			
Truncatellina cylindrica	+		+	+
Catholic				
Trichia hispida	+	+	+	+
Cochlicopa lubrica			+	+
Cochlicopa lubricella				+
Cochlicopa sp.	+			
Shade or marsh				
Punctum pygmaeum	++			
Vitrina sp.	+			+
Marsh				
Carychium sp.	+*	+		
Vertigo antivertigo				+
Vertigo angustior	+*			
Succinea sp.				+
Aquatic				
Bithynia tentaculata			?	
Planorbis leucostoma	+*			
Planorbis planorbis	+			

+ = present, ++ = moderate abundance, +++ = abundant
* includes burnt shells; habitat groupings broadly taken from Evans, 1972; Macan 1977; Ellis 1969; Cameron and Redfern 1976

The faunal assemblages are dominated by species characteristic of dry calcareous grassland. The ubiquitous *Cecilioides acicula*, the blind burrowing snail, may be contemporary but could be intrusive into the deposits. An abundance of *Pupilla muscorum* and the occurrence of

Truncatellina cylindrica, both species that favour sandhills and exposed ground (Cameron and Redfern 1976; Evans 1972; Ellis 1951), suggests that the silt mounds of the saltern were sand dune like habitats with exposed silts as well as the grassland indicated by taxa such as *Vallonia excentrica* and *Vertigo pygmaea*.

Context 206 contains a few shells of taxa associated with marsh and aquatic habitats (Table 4) and the presence of a number of burnt shells among these taxa suggest that this component of the fauna may have been introduced with material from wet or marsh environments. It is possible that such shells could have been introduced with the fuel, although peats are generally acid and unsuited to the survival of shells.

The relatively rare occurrence of shells of *Hydrobia ulvae* or *Hydrobia ventrosa*, both characteristic estuarine and salt marsh taxa, implies comparatively little input of salt marsh sediment into the sampled layers which appear to be primarily dumps from the fires and other deposits associated with the processing. Tide lines and high tide marks on the Wash are characterised by thousands of these shells and *Hydrobia* formed a relatively high proportion of the shells identified from the sampled deposits at the medieval saltern at Wainfleet St Mary (Rackham *et al* 1999).

A very small assemblage of seventeen animal bones was recovered during excavation. These included fragments of cattle, dog, cattle size and sheep sized animals. Their preservation condition indicates a consistent level of erosion indicating some corrosion of the bone in the soil. Three bones were burnt, one was chopped and this bone also showed evidence of having been chewed by a dog (see Archive).

Discussion

The site has been identified as a saltern and the large silt mound is characteristic of such medieval sites. However, there is little from the environmental evidence that corroborates this. The samples include much evidence for fires and ash debris, including vitrified silts and fine sands that indicate locally high temperatures occuring in association with organic tempered silt features. The evidence indicates that peat, rather than wood or charcoal, formed the main fuel being used in the processes undertaken at the site. This is unsurprising given that the area would have been largely unwooded during the 13th - 14th centuries with a readily available peat source from the nearby peat fens. Many of the charred plant remains present in the samples are likely to have derived from this peat source rather than through other pathways. The complete absence of charred cereal remains or any associated arable weeds might suggest that the fires that generated the debris were unrelated to food processing or agricultural activities.

Nevertheless it would appear that there was some input of 'domestic' waste into the deposits since small quantities of animal bone, cockle and mussel shell are present and eggshell is particularly abundant in contexts 112 and 107. The absence of all fish but sticklebacks, *Gasterosteus aculeatus*, the latter possibly occurring naturally in the estuarine silts on the site, again suggests a limited domestic component in the deposits since marine fish can be expected to be relatively common at such a coastal site during the medieval period (see for instance the medieval saltern at Wainfleet St Mary – Locker in Rackham *et al* 1999).

The limited environmental evidence indicates that the silt mound upon which the deposits were dumped was probably vegetated but with areas of exposed ground, probably dune like in habitat.

Conclusion and recommendations

Although the samples have indicated that these layers largely comprise dumps of fire debris and peat ash, presumably from the salt processing they give us very little information on the actual processes involved. The fuel utilised is clearly peat and the processes reached temperatures sufficient to vitrify the organic tempered silt fabric of the hearths/structures. However the fact that in all cases the samples appear to reflect dumped material from these fires/hearths rather than any *in situ* processes prohibits useful interpretation on the processes involved. The secondary nature of the deposits in the possible filter bed also preclude interpretation of this feature from the sample evidence.

There is limited evidence for a domestic origin for a small component of each sample and it seems clear that the silt mounds became rapidly vegetated although probably always subject to erosion and exposure of the underlying silts.

A series of sub-samples were taken from the evaluation samples in case study for foraminifera was warranted. In the light of the results discussed here it is not felt that analysis of these would be useful.

The samples and stratigraphy would imply that the area of the evaluation was removed from where the salt extraction process was taking place, and that the silt waste mound was used only as a discard area. Archaeologically the most interesting areas on the site would be the working areas which might underly the mound or occur at the foot of the mound. Sampling of these may give a clearer picture of the processes that may have been involved in the operation of this medieval saltern.

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Bibliography

Cameron, R.A.D. and Redfern, M. 1976 *British Land Snails*. Linnean Soc. Synopses of the British Fauna No. 6

Ellis, A.E. 1951 Census of the distribution of British non-marine Mollusca. *J. Conch*. 23, 171-244

Ellis, A.E. 1969 *British Snails*. Clarendon Press

Evans, J.G. 1972 *Lands Snails in Archaeology*, Academic Press

Macan, T.T. 1977 *A Key to the British Fresh- and Brackish-water Gastropods*. FBA Scientific Publication No. 13.

Rackham, D.J., Godwin, M., Giorgi, J.A. and Locker, A. 1999 Palaeoenvironmental and palaeoeconomic analysis of the late medieval saltern at St Michaels Lane, Wainfleet St Mary (MLW98), Lincolnshire. Unpublished report for PCA Lincoln.

Waller, M. 1994 *The Fenland Project, No. 9: Flandrian Environmental Change in Fenland*, East Anglian Archaeology, 70.

Williams, D.1973 Flotation at Siraf, *Antiquity*, 47, 198-202

THE ENVIRONMENTAL ARCHAEOLOGY CONSULTANCY

Key to codes used in the cataloguing of animal bones and marine shells

SPECIES:

SPECIES CODE			SPECIES CODE	
MAN	human		DOVE	Dove species
EQU	Horse		FER	Feral dove
EQSZ	Horse size		PART	Partridge
BOS	Cattle		SWAN?	Swan?
BOSL	Cattle-large		WOOD	Woodcock
CSZ	cattle size		CURL	Curlew
SUS	Pig		WADE	wader
OVCA	sheep or goat		CROK	Crow or rook
OVI	Sheep		CORV	Crow or rook
CRA	Goat		JACK	Jackdaw
SSZ	sheep size		OWL	Owl indet.
FEL	Cat		BUZZ	Buzzard
CAN	Dog		GULL	Gull sp.
AUR	Aurochs			
AUR?	Aurochs?		TURD	Turdidae
CER	red deer		BIRD	Identifiable but not id'd
DAM	Fallow deer		PASS	Passerine
CLS	roe deer		LBIRD	Large bird
LEP	Hare		UNIB	Bird indet
ORC	Rabbit			
LAG	Lagomorph		FROG	Frog
CARN	Carnivore		FRTO	Frog or toad
FOX	Fox			
POLE	Polecat/ferret			
WEA	weasel		GAD	Gadid, cod family
BADG	Badger		LING	Ling
SEAL	seal		HADD	Haddock
SQU?	Squirrel?		RAY	ray
BEAV	Beaver		FISH	Fish
ROD	Rodent		UNIF	Fish indet
RAT	Rat			
AGR	Field vole		OYS	oyster
ARV	Water vole		COK	Cockle
MUS	House mouse		MUSS	Common Mussel
SORA	Common shrew		WHELK	Common whelk
MOLE	Mole		HEL	Helix aspersa
SMA	Small mammal		HELIX	Helix sp.
UNI	Unknown		HELN	Helix nemoralis
			SNAIL	snail
CHIK	Chicken			
CHKZ	Cicken size		FOSS	Fossil bone
GOOS	Goose, dom			
GOOS?	Goose, dom.?			
GSSZ	Goose size			
GSSP	Goose species			
GOSZ	Goose, poss. Wild			
DUCK	Duck, domestic sp.			
DUCK?	Duck?			
DKSP	Duck species			
DSP	Duck species indet			
MALL	Duck, dom.			
TURK	Turkey			

BONE ELEMENT:

BONE CODE		BONE CODE	
SKEL	skeleton	SCP	scapula
SKL	skull	HUM	humerus
ANT	antler	RAD	radius
ANT?	antler?	ULN	ulna
ATT	antler tine	RUL	radius and ulna
HC	horn core	C/T	carpus/tarsus
TEMP	temporal	C23	carpus 2+3
FRNT	frontal	CAR	carpus
PET	petrous	CPA	accessory carpal
PAR	parietal	CPI	intermediate carpal
OCIP	occipital	CPR	radial carpal
ZYG	zygomatic	CPU	ulnal carpal
NAS	nasal	MTC	metacarpus
PMX	premaxilla	MC1-5	metacarpus 1-5
MAN	mandible	MTP	metapodial
MNT	mandibular tooth	MPL	lateral metapodial
DLI	deciduous lower incisor	INN	innominate
DLPM1-4	deciduous lower premolar 1-4	ILM	ilium
LI	lower incisor (and 1-3)	PUB	pubis
LC	lower canine	ISH	ischium
LPM1-LPM4	lower premolar 1-4	FEM	femur
LM1-LM3	lower molar 1 - molar 3	PAT	patella
MAX	maxilla	TIB	tibia
DUI	deciduous upper incisor	FIB	fibula
UI	upper incisor (1-3)	LML	lateral malleolus
UC	upper canine	AST	astragalus
DUPM	deciduous upper premolar	CAL	calcaneum
DUPM1-4	deciduous upper premolar 1-4	CQ	centroquartal
UPM1-UPM4	upper premolar 1-4	TAR3	tarsus 3
UM1-UM3	upper molar 1 - molar 3	T4	tarsus 4
MXT	maxillary tooth	TAR	tarsus
TTH	indeterminate tooth	MTT	metatarsus
INC	incisor	MT1-5	metatarsus 1-5
HYD	hyoid	MTL	lateral metatarsus
ATL	atlas	SES	sesamoid
AXI	axis	PH1	1st phalanx
CEV	cervical vertebra (and 3-7)	PH2	2nd phalanx
TRV	thoracic vertebra (and 1-13)	PH3	3rd phalanx
LMV	lumbar vertebra	PHL	lateral phalanx
SAC	sacrum	LBF	long bone
CDV	caudal vertebra	UNI	unidentified
VER	vertebra		
STN	sternum	CLV	clavicle
CC	costal cartilage	COR	coracoid
RIB1	first rib (2 etc)	CMP	carpo-metacarpus
RIB	rib	CMC	carpo-metacarpus
		WPH1-3	wing phalanges 1-3
URO	urostyle	WPH	wing phalanx
		LSA	lumbosacrale
DENT	dentary		
CLEI	cleithrum		
RAY	fin ray		
SHELL	shell		
UV	upper valve		
VAL	valve		

NUMBER: number of fragments in the entry

SIDE: W = whole L = left side R = right side F = fragment

FUSION: records the fused/unfused condition of the epiphyses
P - proximal; D - distal; E - acetabulum; N - unfused; F - fused; C - cranial; A - posterior

ZONES: records the part of the bone present.
The key to each zone on each bone is on page 4

BUTCHERY: records whether a bone has been chopped (CH), cut (KN), worked (W), burnt (C)

GNAWING: records if a bone has been gnawed by dogs (DG), cats (FEL) or rodents (RG)

TOOTH WEAR - Codes are those used in Grant, A. 1982 The use of tooth wear as a guide to the age of domestic animals, in B.Wilson, C.Grigson and S.Payne (eds) *Ageing and sexing animal bones from Archaeological sites*, 91-108.

Teeth are labelled as follows in the tooth wear column:

Deciduous	Permanent
f ldpm2/dupm2	F lpm2/upm2
g ldpm3/dupm3	G lpm3/upm4
h ldpm4/dupm4	H lpm4/upm4
	I lm1/um1
	J lm2/um2
	K lm3/um3

MEASUREMENTS :Any measurements are those listed in A.Von den Driesch (1976*) A Guide to the Measurement of Animal Bones from Archaeological Sites*, Peabody Museum Bulletin 1, Peabody Museum, Harvard, USA

PATHOLOGICAL: A 'P' indicates that the bone fragment carries a pathology

COMMENTS: This may include a short description of the fragments, any pathologies, butchery or gnawing evidence

PRESERVATION: records the condition of the bone in the following manner

1- enamel only surviving
2- bone very severely pitted and thinned, tending to break up; teeth with surface erosion and loss of cementum and dentine
3- surface pitting and erosion of bone, some loss of cementum and dentine on teeth
4- surface of bone intact, loss of organic component, material chalky, calcined or burnt
5- bone in good condition, probably with some organic component

ZONES - codes used to define the zones on each bone

SKULL	1. paraoccipital process	METACARPUS	1. medial facet of proximal articulation, MC3
	2. occipal condyle		2. lateral facet of proximal articulation, MC4
	3. intercornual protuberance		3. medial distal condyle, MC3
	4. external acoustic meatus		4. lateral distal condyle, MC4
	5. frontal sinus		5. anterior distal groove and foramen
	6. ectorbitale		6. medial or lateral distal condyle
	7. entorbitale		
	8. temporal articular facet	FIRST PHALANX	1. proximal epiphysis
	9. facial tuber		2. distal articular facet
	0. infraorbital foramen		
		INNOMINATE	1. tuber coxae
MANDIBLE	1. Symphyseal surface		2. tuber sacrale + scar
	2. diastema		3. body of illium with dorso-medial foramen
	3. lateral diastemal foramen		4. iliopubic eminence
	4. coronoid process		5. acetabular fossa
	5. condylar process		6. symphyseal branch of pubis
	6. angle		7. body of ischium
	7. anterior dorsal acsending ramus posterior M3		8. ischial tuberosity
	8. mandibular foramen		9. depression for medial tendon of rectus femoris
VERTEBRA	1. spine	FEMUR	1. head
	2. anterior epiphysis		2. trochanter major
	3. posterior epiphysis		3. trochanter minor
	4. centrum		4. supracondyloid fossa
	5. neural arch		5. distal medial condyle
			6. lateral distal condyle
SCAPULA	1. supraglenoid tubercle		7. distal trochlea
	2. glenoid cavity		8. trochanter tertius
	3. origin of the distal spine		
	4. tuber of spine	TIBIA	1. proximal medial condyle
	5. posterior of neck with foramen		2. proximal lateral condyle
	6. cranial angle of blade		3. intercondylar eminence
	7. caudal angle of blade		4. proximal posterior nutrient foramen
			5. medial malleolus
HUMERUS	1. head		6. lateral aspect of distal articulation
	2. greater tubercle		7. distal pre-epiphyseal portion of the diaphysis
	3. lesser tubercle		
	4. intertuberal groove	CALCANEUM	1. calcaneal tuber
	5. deltoid tuberosity		2. sustentaculum tali
	6. dorsal angle of olecranon fossa		3. processus anterior
	7. capitulum		
	8. trochlea	METATARSUS	1. medial facet of proximal artciulation, MT3.
	9.		2. lateral facet of proximal articulation, MT4
	0.		3. medial distal condyle, MT3
RADIUS	1. medial half of proximal epiphysis		4. lateral distal condyle, MT4
	2. lateral half of proximal epiphysis		5. anterior distal groove and foramen
	3. posterior proximal ulna scar and foramen		6. medial or lateral distal condyle
	4. medial half of distal epiphysis		
	5. lateral half of distal epiphysis		
	6. distal shaft immediately above distal epiphysis		
ULNA	1. olecranon tuberosity		
	2. trochlear notch- semilunaris		
	3. lateral coronoid process		
	4. distal epiphysis		

Archive Catalogue of animal bone from Spalding Golf Club – SPGC01

site	cont	species	bone	no.	side	fusion	zone	butchery	gnawing	toothwear	path	comment	preservation
SPGC01	106	CSZ	RIB	1	L							PROX SHAFT- 2 PIECES-ERODED	2
SPGC01	240	BOS	MAN	1	L		12	C				ANT SYMPHSEAL FRAGMENT-CHARRED-SEVERAL PIECES	2
SPGC01	240	SSZ	RIB	1	L							PROX END	3
SPGC01	240	SSZ	RIB	1	F							SHAFT FRAGMENT	3
SPGC01	240	CSZ	UNI	5	F			C				INDETERMINATE CHARRED FRAGMENTS	2
SPGC01	240	CSZ	SKL	1	F			C				INDET	3
SPGC01	240	CSZ	FEM	1	F			CH	DG			SHAFT FRAGMENT-CHOPPED THRU AND CHEWED	3
SPGC01	240	CSZ	UNI	1	F							INDET	3
SPGC01	240	CAN	TRV	4	W	CFAF	12345				P	3 THOR AND 1 LUM VER FROM SAME SPINE-SLIGHT PATH ON POST VENTRAL EPI-POSS MODERN	4
SPGC01	251	BOS	SKL	1	L		2					OCCIPITAL CONDYLE	3

Assessment of the burnt clay artefacts from Spalding Golf Club, Surfleet Seas End

Alan Vince

Introduction

Evaluation of an extensive salt mound at Spalding Golf Club revealed a collection of burnt clay fragments. These are thought to have been associated with the salt extraction and have been assessed both to establish their composition and function.

The fragments are all constructed of silt had been subjected to a range of temperatures and conditions which have affected the colour, hardness and composition of the fragments.

Methodology

Each fragment was examined under a binocular microscope and by eye to study the fabric, the form of the original structure/artefact which the fragment came from and any evidence for subsequent alteration.

Fabric description

Under the binocular microscope all the fragments which have not been vitrified show evidence for abundant quartz silt, with smaller quantities of muscovite. There is no evidence for mixing of this silt with clay nor for tempering with a mineral temper. It is therefore concluded that the 'burnt clay' actually consists of burnt silt.

A sizeable proportion of the fragments is tempered however, with straw or similar organic matter. Several of the fragments preserve clear impressions of this straw and it would probably be possible to identify the species and part (s) of the plant utilised. The impressions often span the entire length of the fragment and were therefore not added as animal dung, which was often used as tempering.

Those fragments which did not have organic tempering were nevertheless pierced by numerous round-sectioned holes of varying diameters and characters. Observation of these suggested that they were a mixture of rootlet voids and animal burrows, such as might be found in the natural silt. Several of these fragments also had evidence for stratification. It is suggested that these fragments consist of natural silt which has either been burnt *in situ* or cut into bricks without further working.

A small number of fragments seem to consist of interconnected spheres of silt. Some have been fired to quite a high temperature and others have a conchoidal fracture which suggests that they are indurated, but whether by firing or cementation is unclear.

Function

There are no impressions from wattles or planks on any of the collected fragments. This suggests that the silt was not used as a plastering or coating on a timber structure. Some of the pieces are in excess of 120mm thick, which would also tend to discount any function as daub.

Several of the straw-tempered fragments have original flat surfaces, some of which have a texture which suggests they were snoothed with a tool (such as a trowel or wooden tool). None of the untempered fragments have such a finish. In a few cases, however, subsequent encrustation demonstrates that the original surface of the untempered fragment survives. In one case three flat surfaces, all approximately at right angles, survive, all with encrustation (context 251). This is moderately good evidence that the untempered silt objects were used as mud bricks, although it would be surprising if they could be shaped into bricks in a dry but unfired state.

In one case the straw tempering is uneven in distribution, which might suggest that straw and silt were mixed during use rather than beforehand (ie sheaves of straw may have been used together with tempered silt, rather than a silt/straw mix).

Several of the fragments were clearly saturated with brine. This has affected both the colour of the fired clay (producing shades with a white, yellow, green or purple tinge) and the nature of the fired clay. In several cases a salt glaze has formed, often associated with a vesicular slag. In one case this salt glaze had re-crystallised producing green acicular crystals.

The Spalding Golf Club salt works appears from the associated pottery to have been in use in the late 12th/early 13th centuries. Nevertheless, it is informative to compare the procedures carried out on the site with those found at Wainfleet St Mary a couple of centuries later, which themselves have been interpreted using a 17th-century account of salt extraction (McAvoy 1995, 139-142).

At the latter site 'bricks' of silt were used as stands for the lead pans in which the brine was boiled. This is probably the explanation of the untempered silt fragments found at Spalding Golf Club. The straw-tempered material may have formed the surfaces of the hearths, in which case the brine contamination would have been due to spillage from the lead pans. The alternative, that the straw-tempered silt was used to construct clay pans, is unlikely given the friable nature of the clay and the thickness of several of the fragments. McAvoy does suggest, however, that some of the burnt clay from Wainfleet might have been used to construct stands to support the boiling pans. If this had been the case at Spalding Golf Club, however, one might have expected to find some pieces with corners.

Recommendations

No further work is required on the existing samples. However, some of the suggestions as to their function could be investigated further through chemical analysis (which could be carried out through this consultancy) and through the collection of more samples, in particular looking for evidence to confirm or refute the idea that the straw tempered clay was used as hearth bases.

Bibliography

McAvoy, F (1995) Marine Salt Extraction: The Excavation of Salterns at Wainfleet St Mary, Lincolnshire *Medieval Archaeology* **XXXVIII**, 134-163

Appendix: Catalogue

Context	ID	Unworked silt?	Straw-tempered silt?	Contaminated with brine?	Other comments
262	1		2 frags		
262	2	10 frags			Some vitrified
U/S	1		3 frags		One vitrified
U/S	2	3 frags			One vitrified
107	1	2 frags		Salt glazed	Vitrified
107	2		1 frag		
206	1		3 frags		Carbon-rich
206	2		5 frags		Oxidized, some vitrified, some with flat faces
251	1	1 frag			Mineral encrusted on 3 faces
251	2	4 frags			
251	3		1 frag		Vitrified
240	1	1 frag		Yes	Several layers, multiple spillage?
240	2	1 frag		Yes	
240	3		1 frag	Yes	
240	4		2 frags		
240	5	1 frag			
254	1	11 frags			
205	1	9 frags			
112	1	3 frags			
112	2	2 frags		Yes	
112	3	1 frag		Yes (on surface)	
112	4		4 frags	Yes	Vitrified, some with flat faces