

No 904

A63 SELBY BYPASS

SUMMARY OF STAGE 3 FIELD INVESTIGATIONS COMPLETED TO DATE

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1 INTRODUCTION

1.1 Following a review and the updating of the existing archaeological information gathered for the above scheme (BHWB 1995), a total of 15 archaeological sites or areas were identified which might be affected by the construction of the proposed A63 Selby bypass

1.2 These sites, which are shown on figures 1 to 4, can be summarised as follows

Site	Description	Grade of importance	NGR
1	Former field boundanes between Hagg Lane and Field Lane	Local	SE56803070-SE57003055 centred
2	Disused army camp (ruins) south-west of Brayton Barff	Local	SE58153015 centred
3	Area of possible Mesolithic activity Brayton Barff	Distnct	SE5830 area
4	Former field boundanes and gravel pit south-west of Brayton Barff	Local	SE58602990 centred
5	Curvilinear cropmark (possible former field boundary) south-east of New Farm	Local	SE59302975 centred
6	Unclassified circular cropmark features, west and east of Doncaster Road	Distnct	SE59652970 SE60203000 centres
7	Former field boundanes and tracks (cropmarks), west and east of Doncaster Road	Local	SE59302950 SE59702965- SE60703000 centres
8	Course of former railway south of Brayton Hall	Local	SE60602990 centred
9	Course of the Selby Canal	Regional	(SE609301 centred)
10	Former field boundanes (cropmarks), east and west of Bawtry Road	Local	SE617304-SE625308 centred
11	Woodland and scrub and associated earthworks Staynor Wood	Distnct	SE62953099 centred
12	Former field boundanes (cropmarks) north of East Common Lane	Local	SE63503150 centred
13	Former field boundanes (cropmarks) and pansh boundary north-west of Newlands Farm	Local	SE636320 centred
14	Area of palaeo-environmental potential, Ouse valley	Regional	Ouse valley area
15	Former munitions complex, south-west of Osgodby	Distnct	SE635330 centred

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1.3 In order to help assess the impacts of the scheme, fieldwork strategies were prepared for six sites or areas (BHWB 1999) (see figures 5 to 7). A combination of fieldwalking and/or geophysical survey was proposed for some of the archaeological sites (sites 3 and 6), to be followed by intrusive trial trenching if the results were shown to be significant. A programme of palaeo-environmental survey was also carried out at the east end of the scheme, in the River Ouse floodplain (site 14). Some recommendations for the recording of the built environment were also made (sites 2 and 15), and further research was commissioned into site 15. All this recommended work was in accordance with the Stage 3 Archaeological Assessment as defined in the Department of Transport's Design Manual for Roads and Bridges, volume 11 "Environmental Assessment" (DMRB).

2 ADDITIONAL DESK-BASED RESEARCH

2.1 Introduction

2.1.1 One of the sites identified as a result of updating the archaeological data for the proposed bypass scheme was a former munitions complex near Barby, to the south-west of Osgodby (at NGR SE635330 centred). The site survives as a large building complex towards the north end of the scheme, and is marked as a "Poultry Farm" and "Piggery" on the modern Ordnance Survey maps (BHWB 1999, 3 and site 15, see figure 4). The road leading to the site from the west, which has been shortened by the construction of a new alignment of the A19 along the line of the former North Eastern Railway line, is called "Magazine Road" on the Ordnance Survey 1:10,000 map of 1982 (sheet SE63SW).

2.1.2 Little was known about the site although it was thought that it might be, or be associated with, a National Trench Warfare Factory known to have been built in or near Selby in 1915/16. Further desk-based research at the Public Record Office (PRO) was commissioned but relatively little information was forthcoming, and only scattered references to the Selby factory were found (Francis 1999). Subsequent local cartographic and documentary research was able to provide some additional information but many questions remain unanswered.

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2 2 Summary of Results

- 2 2 1 During the First World War, six National Trench Warfare Factories (NTWFF) were used as chemical shell-filling stations. These factories were located at Denaby (South Yorkshire), Enth (Greater London), Fulham, Watford No 1 and No 2, and Selby (Barlby Road), and all were either managed by companies who in peacetime already had experience with the manufacture of high explosives or, as in the case of the two sites at Watford, were managed by existing nationalised explosive factories. Trench Warfare Filling Factories were normally established in the immediate neighbourhood of the site of chemical manufacture, and the buildings were light temporary structures consisting of stores for receipt and dispatch, and magazines for explosives. Buildings were placed at some distance from each other and were properly heated and ventilated.
- 2 2 2 There are a considerable number of records in the PRO relating to five of the National Trench Warfare Filling Factories, and these include detailed histories and information on subjects such as building construction, buildings, production methods, output, costs, accidents and man-power. Unfortunately, the primary sources on the chemical filling station at Selby are preserved in very small numbers, and are scattered within other files and records.
- 2 2 3 The factory at Selby was established to produce phosgene and to charge this chemical into Russian-made shells, phosgene was the most effective of the WW1 lethal gases used in chemical warfare. Originally the site was managed by Ardol Limited, an edible oil manufacturer whose expertise lay in producing hydrogenated oils presumably for the food industry rather than the manufacture of lethal chemicals and charging shells. The factory at Selby therefore combined the manufacture of the chemical substance with the shell-filling operations.
- 2 2 4 On 23 June 1915, the Trench Warfare Supply Department (TWSD) within the Ministry of Munitions was formulated to increase output, control and oversee the development of weapons and ammunition for use in the trenches of the Allied campaign in France. During the winter of 1915/1916, the TWSD made arrangements with Ardol to utilise a considerable supply of 92% pure carbon monoxide for the manufacture of phosgene, the company had expected to produce carbon monoxide as a by-product from their new fat-hardening plant that they were installing as part of their normal production of edible oil and fats. Ardol received two contracts, one for chemical manufacture and the other for shell filling, and agreed to erect (at the ministry's expense), and operate on a separate site, sufficient plant to produce 15 tons of phosgene per week. For reasons unknown, the company was unable to complete their fat-hardening plant with the result that insufficient supplies of carbon monoxide were available and the agreed output was never reached.

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- 2 2 5 A shell-filling plant for 500,000 3" Russian shell was also installed at the factory. As the company could not provide sufficient quantities of phosgene, another external supply was made available, and this was mixed with the Selby produced chemical. However, outputs remained low and in the early autumn of 1917, Ardol's phosgene factory was nationalised under the Defence of the Realm Act (DORA) and taken over by the TWSD. Average employment during 1917 was 234 personnel. Eventually the plant was transferred elsewhere - it is not known exactly when this happened, but it may have been after the 500,000 shells had been charged and dispatched.
- 2 2 6 The magazine at Barby is first depicted on the 2nd edition Ordnance Survey 6" map of 1894 (sheet 221NE). A rectangular building, measuring c 22m by c 18m, is shown within a larger walled enclosure c 44m north-south by c 60m east-west, and both lie within a much larger sub-square enclosure measuring c 160m by c 120m. Two semi-detached buildings lie in the northwest corner of the complex, and a railway siding extends off from the main Selby to Bndlington railway line. The road access is from the west, off the Barby Road, along "Magazine Road". A number of boundary stones labelled "W D" (ie War Department) are depicted around the edge of the site, defining the extent of the military-owned land.
- 2 2 7 The site is also mentioned in the Kelly's Directories of the period "the Government is about to erect a magazine here, near to the River Ouse, with which it will be connected to a landing jetty, and to the North East Railway by a siding. The Contract for making a road and laying concrete foundations for the buildings has been completed" (Kelly's Directory for 1889, 324). Bulmer's Directory for 1892 records that the powder magazine was enlarged in the year after construction (ie in 1890), and again makes note of a landing stage on the river "for loading and discharging the inflammable cargoes". A further directory entry in 1897 makes no mention of the landing jetty, and none is shown on the 1894 Ordnance Survey map, suggesting that it was not actually built, this latter reference also notes that Thomas Scrimshaw was the Conductor in charge of the Government powder magazine (Kelly's Directory for 1897, 387). The complex is not then mentioned in any subsequent editions of any directory, presumably for reasons of national security.
- 2 2 8 The 1907/08 Ordnance Survey 1:2,500 scale maps (sheets 221/7 and 221/8) show the complex in more detail. The site essentially remains the same, a large central structure within a walled enclosure, but by now a series of other buildings had been constructed along the east and south sides, all linked by a network of railway or tramlines. The whole is surrounded by a wall and ditch, and a total of 17 numbered boundary stones define the extent of military land (see figure 8).

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- 2 2 9 The subsequent 1938 1:2,500 edition maps unfortunately only depict the east side of the complex, but this shows that the complex had been extended by some 40m to the east. Several isolated square and rectangular structures, joined to the internal railway network and surrounded by individual embankments, had been built in this newly created area. The 1963/64 1:2,500 scale maps (sheets SE6332 and SE6333) show a similarly sized extension to the north, with one or two new and isolated structures.
- 2 2 10 It is unclear exactly which factory (shell-filling or phosgene plant) was built during the winter of 1915/16, but it is clear from the cartographic evidence that the magazine complex is the much older part of the complex. Quite why a War Department magazine should be built near Selby during the late 19th century is unclear, but it was presumably used by Ardol and later by the TWSD to store the explosives that were utilised as initiator and burster charges in the chemical shells. It was also probably used as a storage facility for the filled shells before they were removed from site via the railway.
- 2 2 11 The precise locations of the shell-filling and phosgene plants also remain unclear, but they were presumably located on the river and well away from the centres of population. The cartographic evidence shows a large factory complex having been built at the right time to the south-west of the magazine, between Barlby Farm and Cherry Orchard Farm, and there is a railway connection from the magazine site to it via the Hull to Selby main line, although this is labelled as a "beet sugar plant" on the Ordnance Survey map of 1938 (sheet 221/7). There is also a small chemical works to the east of the magazine site, off the Barlby Road and near the Barlby railway junction, which is perhaps a better location, this site is now occupied by a Local Authority compound. However, further investigation of these two sites is beyond the scope of this study.
- 2 2 12 To date, it has not been possible to gain access to the magazine site itself, but the majority of the structures appear to survive relatively intact although they have been adapted to other, agricultural uses. The semi-detached two-storey houses in the northwest corner remain, apparently unoccupied and slightly dilapidated, but only a few of the War Department boundary stones could be identified.

3 ARCHAEOLOGICAL FIELDWALKING

3 1 Introduction

- 3 1 1 The previous BHWB 1999 report recommended that four areas within the proposed road corridor should be the subject of initial fieldwalking (see figures 5 and 6). Two of these areas lay to the west and south of Brayton Barff and comprised the southern half of field 0040 and the whole of field 5500. The total area covered some 17 hectares in extent and the work was designed to determine whether any Mesolithic activity, previously identified at Brayton Barff from records of a collected flint assemblage (NYCC SMR 9485), extended into the proposed road corridor.

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3 1 2 It was also recommended that two other areas either side of the A19 Doncaster-Selby road were walked, to identify any surface artefacts which might be associated with possible circular cropmark features identified here by previous desk-top surveys (LUAU 1991 and BHWB 1995, site 6), the sites of the cropmark features themselves lie just outside the proposed construction corridor. The fieldwork areas cover the southern half of a field to the west of the road and parts of fields 0087 and 3083 to the east, an area totalling some 10.5 hectares. It should be noted that the large field to the northeast had previously been walked in 1991 with no positive results (LUAU 1991, site 7, NGR SE604300).

3 1 3 Further fieldwalking was also considered in the area to the south-east and south of Staynor Hall, to determine whether any medieval or other deposits associated with a former monastic grange or some cropmarks of former field boundaries extended into the proposed construction corridor (BHWB 1999, site 10). At the time of making the Stage 3 recommendations (February 1999), the area was undergoing a separate programme of field investigation, and so it was decided to wait for these results before making any firm commitments.

3 2 Methodology

3 2 1 Initial fieldwalking is designed for the rapid coverage of large areas of archaeological potential in which specific archaeological sites are unknown or unlocated. Concentrations of artefacts, which could indicate the positions of buried archaeological features or deposits, are identified and recorded in sufficient detail to recover their positions and extent at a later date. This enables more detailed fieldwalking techniques to be employed over smaller discrete areas at a later date.

3 2 2 In areas allocated for initial fieldwalking, temporary site grids are laid out, consisting of parallel lines spaced 10m apart and marked at 50m intervals. Each line is then walked by one archaeologist who observes and records on pro-forma sheets any artefacts lying on the surface of the ground. No artefacts are collected unless they are individually significant items worthy of study and reporting in their own right, or are chemically unstable items likely to deteriorate if left on the surface of the ground.

3 3 Summary of Results

Brayton Barff Area

3 3 1 Despite strenuous efforts to meet available crop windows, the field to the northwest of Brayton Barff (field 0040) had been ploughed and re-planted with an arable crop by the time the survey work could be commissioned. The crop was too advanced to allow fieldwalking to take place, and so the work had to be abandoned in this area.

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3 3 2 The larger area to the south of Brayton Barff (field 5500, NGR SE586300 centred) was walked in October 1999 shortly after ploughing (Sherlock 1999) (NGR SE586300 centred) A north-south baseline was established and the field was walked at 10m intervals in bright and sunny conditions. A total of 250 artefacts were observed, falling into five artefact types: flint (seven pieces, all poor quality flakes), clay tobacco pipe (40 items, mostly stem fragments), modern pottery (184 sherds), brick and tile (15 fragments), and medieval pottery (four sherds). There were no specific concentrations of any artefact type within the field, although slightly more modern pottery was found near the south end of the field, adjacent to Gateforth New Lane. Two sherds of medieval green glazed pottery were found at the east side of the field, whilst the other two sherds were 200m away.

A19 Doncaster-Selby Road Area

3 3 3 Although most of these two areas were suitable for fieldwalking at the time of a previous archaeological assessment (BHWB 1995), and when the Stage 3 proposals were being formulated (February 1999), different cropping regimes had been established by the time the work was ready to be commissioned. The area to the west of the road was down to grass while the fields to the east were set-aside, the field to the south of the drain contained a mixture of beet and brassica interspersed with weeds up to 1m tall, and the field to the north was cereal stubble. Fieldwalking was therefore abandoned in these two areas.

Area Southeast and South of Staynor Hall

3 3 4 An earlier and separate desk-top assessment (Northern Archaeological Associates 1998) had established that the area to the south-east of Staynor Hall, between the Hall and Staynor Wood, was not of archaeological interest, cropmarks of ridge and furrow cultivation had been recorded here but this and adjacent areas had been part of Staynor Wood until relatively recently, and the area had been consistently ploughed since the early 1960s (NAA 1998, 7 and Site B).

3 3 5 Linear and curvilinear cropmarks, representing enclosures and double-ditched trackways aligned predominantly north-east/south-west, had been identified in the area to the east of the Bawtry Road (the A1041), immediately to the north of the proposed bypass corridor (NAA 1998, 6 and Site A). Most of these cropmarks could be correlated with former field and woodland boundaries recorded in the 19th century. Some initial fieldwalking was carried out by Northern Archaeological Associates, but no concentrations of archaeological significance were observed, the majority of the artefacts were very small fragments of brick and tile. It was considered that the majority of this material was derived from manure and the area seems to have been continuously cultivated since the medieval period (NAA 1999, 13).

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3 3 6 As a result of these findings, it was decided that no further fieldwalking was required along the line of the proposed bypass construction corridor, as part of the A63 Stage 3 assessment works

4 GEOPHYSICAL SURVEY

4 1 Introduction

4 1 1 It was proposed that two areas of geophysical survey should be earned out, either side of the A19 Doncaster-Selby road, to identify any features which might be associated with possible circular cropmarks identified just outside the proposed construction corridor by the previous desk-top surveys (LUAU 1991 and BHWB 1995, Site 6) A total of 1 4 hectares was surveyed on the west side of the road, and 2 6 hectares to the east (see figure 6)

4 1 2 Subsequent desk-based research (see above) also determined that further geophysical survey should be earned out within the proposed construction corridor in the area of the former National Trench Warfare Filling Factory near Barlby (NGR SE636346 centred), to try and identify any buried tanks, waste pits, dumps, wall footings or other debris possibly relating to the former factory or magazine complex An area covering just over four hectares was surveyed, north-west and south-west of the main building complex and either side of "Magazine Road" (see figure 7)

4 1 3 The geophysical survey work was earned out in September and October 1999, during appropriate crop windows, and was reported on in December 1999 (GeoQuest Associates 1999)

4 2 Methodology

4 2 1 In order to maximise any results, a combination of two geophysical survey techniques was used A geomagnetic survey, which measures small differences in the earth's magnetic field caused by buried archaeological features, was undertaken over both survey areas, while at Barlby an electromagnetic survey was also utilised to try and identify features at greater depth

4 2 2 The geophysical surveys utilised a grid of 20m squares, which was established over each of the survey areas Each grid square was then surveyed using traverses at 1m intervals, with a reading taken every 0 5m along each traverse, giving a total of 800 readings in each 20m square The grids were also tied into the Ordnance Survey National Grid and other survey stations Further details of the methodology, and subsequent plotting and interpretation, are included in the survey report (GeoQuest Associates 1999)

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4.3 Summary of Results (see figure 9)

Barlby Magazine Site (NGR SE636346 centred)

- 4.3.1 A buried ferrous pipe, characterised by high electrical conductivity and high magnetic susceptibility, was identified running along the east side of the existing A19 road. A second pipe was also seen running from the entrance to the former magazine southeast towards the railway line. To the north and south of Magazine Road a number of weak, diffuse and curvilinear branching anomalies are consistent with natural variations in drainage and subsoil character, and they are likely to represent buried and infilled palaeo-channels and ditches. A spread of brick and/or ferrous debris can also be seen on the south side of Magazine Road.
- 4.3.2 Of possible archaeological interest are a number of exceptionally weak and diffuse positive magnetic lineations which appear to form a rectilinear pattern in the north-east corner of survey area B2. They are probably soil-filled ditches that may comprise one of more enclosures. An intense magnetic dipole, suggestive of a buried fired structure, possibly a kiln or hearth, was also identified in the southeast corner of survey area B3.

A19 Doncaster-Selby Road Area (NGR 598298 centred)

- 4.3.3 On the west side of the A19, the geophysical survey revealed a spread of intense magnetic dipoles towards the west end of Survey Area S1, suggesting that the ground had been contaminated with brick rubble and metal debris. The other dipoles in this area are considered to represent more of the same, although a 20m length of ferrous pipe was also detected near the road. The area on the east side of the road and to the north of the drain (Survey Area S3) contained two buried pipes.
- 4.3.4 On 27 January 2000 three test pits were dug within part of the area thought to be contaminated with brick and rubble debris, to test the geophysical interpretation. In each pit, a well stratified sequence of topsoil, subsoil, sand/alluvium, and clay was identified, and the alluvium was seen to contain varying concentrations of iron staining inclusions and small iron nodules, together with some coal fragments, this deposit is known locally as "iron sand" and it was generally found at a depth of 0.5m below the ground surface. No archaeological deposits or features were encountered in any of the pits. It would appear that the patchy ironstone panning and coal deposits, together with the significant amounts of associated and localised microscopic iron fragments, provided sufficient contrast to the surrounding sand and alluvium to cause the geophysical anomaly in this area.

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- 4 3 5 The landowner also mentioned that the majority of the field on the west side of the A19 had previously been occupied by an army camp and searchlight battery, which helped to protect the large Second World War airfield at Burn. No real evidence for this complex can now be seen, although there is the occasional modern brick embedded into the surface of the field. No cartographic evidence has currently been found for this camp.
- 4 3 6 To the east of the road, the field to the south of the drain (Survey Area S2) contains several positive and negative magnetic lineations, which produce a "swirling" texture. These features are difficult to interpret, and it should be noted that the geophysical data may have been distorted by the difficult ground conditions experienced (set-aside with high weeds). However, the anomalies may represent fragments of square or circular enclosures and they may be of archaeological interest.

Previous Geophysical Surveys

- 4 3 7 It should be noted that, in addition to the above surveys undertaken in 1999, two other smaller areas along the proposed construction corridor were subject to geophysical survey in 1991 as part of a previous archaeological assessment (LUAU 1991). These areas were near Brayton Hall and near Staynor Hall.
- 4 3 8 The former area lay within the southeast corner of a large field, which was also the subject of initial fieldwalking by LUAU (Site 7 at NGR SE604300). An area measuring 100m by 40m was surveyed, with no positive results. The other site lay further to the east, immediately to the south of Staynor Hall (Site 9 at NGR SE624307), just beyond the area assessed by Northern Archaeological Associates in 1999. Once again, no features of archaeological interest were identified within the 60m by 40m survey area, although one very weak linear anomaly might correspond to a former field boundary.

5 PALAEO-ENVIRONMENTAL SURVEY

5.1 Introduction

- 5.1.1 It was known that the valley and floodplain of the River Ouse, at the east end of the proposed scheme, was an area of palaeo-environmental significance (BHWB 1999 site 14) but at the time the Stage 3 recommendations were produced, detailed and separate research was on-going in this area. The results of this work have now been published, and they comprise a major assessment of the archaeological and palaeo-environmental heritage of the whole of the Vale of York (Van de Noort and Ellis 1999).

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5 1 2 Using this material as background, a specialist study was commissioned to consider the palaeo-environmental importance of the Ouse floodplain area to the east of Selby, and to assess what impact the road proposals might have on this resource. This work was undertaken in November 1999 by the Centre for Wetland Archaeology at the University of Hull and a report was subsequently produced (Lillie 1999)

5 2 Methodology

5 2 1 Nine boreholes were excavated along the proposed bypass route across the floodplain, four to the south of the existing river and five to the north (see figure 7). These boreholes were placed in locations where previous geotechnical investigations, undertaken for the development of the scheme, had indicated there was some potential for the recovery of well stratified biogenic-rich sediments

5 2 2 The boreholes were driven by hand to depths of up to 10m, using a 70mm bucket augur and a 300mm x 1m open length gouge augur. Lithological characteristics of the floodplain sequences were recorded, together with the stratigraphy at each core location. A visual assessment of the preservation of any biogenic deposits was made during the field survey, and samples were taken for subsequent pollen and macrofossil analysis at the University of Hull. Sub-sampling for radiocarbon dating was not carried out at this stage

5 3 Summary of Results

5 3 1 The stratigraphy across the floodplain area in this location was found to reflect a range of depositional environments, from the high energy palaeo-channel, which occupies a similar position to the modern river, through to low energy floodplain margin peats. The Holocene (c 4000 cal BC to c AD 800-1000) sequences, where bottomed, were shown to overlie reworked sands of glacio-fluvial derivation

5 3 2 The borehole immediately adjacent to the south bank of the modern river (SE635315 03) revealed more than 9.10m depth of deposits in the palaeo-channel sequence. Beneath a layer of oxidised flood plain, these deposits were predominately of alluvium containing frequent fibrous material, wood and rootlets up to 5.12m depth. Beneath this were further peats and silt-clay alluvium with fibrous material throughout and organic material occurring in discrete horizons below 8.8m depth, these deposits were not bottomed in the borehole

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- 5 3 3 Deeply stratified sequences were also established on the north side of the river (at SE635320 01) where c 8 02m of Holocene sequences overlay reworked glacio-fluvial sands. Below a 1 3m depth of flood warp, oxidised alluvium again dominated the sequence, with fibrous inclusions and wood/twigs visible below 2 2m depth. Below 3 7m depth to the base of the core at 8 02m, the alluvium is occasionally peaty-rich and amorphous in nature with further wood and twigs. The top and base of this unit were sampled for palynological analysis and relative dating (see below).
- 5 3 4 As might be expected, the depositional sequences continue to shallow away from the main channel northwards to borehole SE633329 01, adjacent to the railway line, at which point they appear to fall away again. This might represent a junction between two floodplain areas associated with the north-south reach as opposed to the west-east reach, or may simply be a variation in the sub-surface topography, neither can be determined at present. Away from the main channel and floodplain areas, the alluvial sequences give way to more marginal low energy floodplain mire environments containing humified floodplain peats, palynological samples were taken from the top of this deposit (0 76m depth) and at the base of the underlying mixed alluvium and organic-rich alluvium (see below). The final deposits in borehole SE635326 01 comprise reworked glacio-fluvial sands with some mixing from the underlying Lake Humber silts.
- 5 3 5 To the north of the railway line (at SE633329 01 and 02), the overlying alluvium had thinned to 0 70m depth, and below this there were humified and woody fen-carri peats which contain occasional evidence for inundation episodes in the form of silt-clay-rich horizons. The base of this deposit comprises wet amorphous detrital muds (2 61-2 86m depth) overlying Lake Humber silts. Some reversion of the sequences, towards the alluvium-dominated deposits associated with the floodplain areas on the south side of the railway line, are evident in the northernmost borehole (SE633329 02) which, as mentioned above, might represent different floodplain areas.
- 5 3 6 Of the four samples taken for palynological analysis, only the uppermost peat horizon in borehole SE635326 01 located on the north side of the floodplain area contained pollen in abundance. Herb pollen dominated this assemblage, suggesting that sedges were growing locally during the period of peat formation, while reeds, bulrush and bogbean represent wetland communities. Tree and shrub cover was generally sparse, although birch and hazel scrub might have been growing in the vicinity. This sample can be tentatively dated to the later Holocene period, the low tree pollen counts indicate a post Elm decline (c 4000 cal BP) date, with any time up to the Roman period or later possible in this context, while the upper limit is probably the early medieval (c AD 700-1000) period.

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- 5 3 7 Lower concentrations of pollen were recovered from a sample taken at a depth of 3 08m in the same borehole. This showed alder as the most abundant taxa with some hazel, oak and pine also being recorded. Herb pollen is generally scarce, and the assemblage is likely to indicate the presence of an alder fen on the floodplain. Little open ground was apparently present, and trees such as hazel, oak and pine probably formed dryland arboreal communities. A tentative date within Pollen Zone VIIb, the Sub-Boreal at c 3800-700 cal BC, is suggested for this sample.
- 5 3 8 Pollen was also very sparse in a sample taken at 3 70m depth in borehole SE635320 01, on the north side of the river. Alder, hazel, pine and oak were all identified here, together with pre-Quaternary spores suggesting a degree of sediment re-working and/or re-deposition. Once again, interpretation can only be tentative but the assemblage is very similar to that of the previous sample and so a similar time bracket is suggested i.e. the Sub-Boreal period between c 3800-700 cal BC. A further sample from lower in the core (7 72m depth) proved to be unsuitable for the recovery of pollen, due to the re-worked nature of the deposits higher up in the sequence. These findings again serve to confirm the fact that the deeper, higher energy environments in close proximity to the main palaeo-channel area are insufficiently robust for use in palaeo-environmental reconstruction and dating.

5 4 Discussion

- 5 4 1 The lithological and palynological analysis has provided some insights into the development of the Ouse floodplain at Selby, although the palynological dating, as opposed to more detailed radiocarbon dating, can only provide a very broad temporal range for the borehole sequences. The results suggest that the wetlands in this area were forming some 1,000 years later than those seen further north near Ricall, where dates of around c 5000-3900 cal BC have been suggested (Lillie and Gearey 1999b, 49). Such a scenario actually reverses the general trend for paludification within the rivers of the region, whereby the earliest dates for wetland development should be seen in the lower reaches of the river (Lillie and Neuman 1998, Lillie and Gearey 1999a). It is therefore assumed that the recovered data from this current survey is not robust enough to provide an accurate picture of wetland development, primarily due to the considerable re-working of the floodplain sediments.
- 5 4 2 The borehole survey has shown that the Ouse has remained active, migrating and reworking the floodplain sequences for much of its history prior to embankment. In the main floodplain area the river has clearly been working in a wide, essentially unconsolidated alluvial floodplain throughout its history, with the pronounced meander sequence reflecting the actively migrating fluvial regimes. However, some lower energy fen-carr environments have been shown to occur at its margins, and the palaeo-environmental record at these locations has proven much more amenable to dating and environmental reconstruction.

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5 4 3 At the margins of the north side of the floodplain, a sequence of alder fen-carr through to sedge-reed swamp and possibly wet grasslands appears to have characterised the landscape from c 3800 cal BC onwards. The main problem with these deposits is the occasional paucity of pollen for both palaeo-environmental reconstruction and dating but, despite this, it appears possible that peat continued to form at this location into the post-Roman period. This latter part of the palaeo-environmental record is considerably under-represented in the immediate region, and throughout the Humber Lowlands as a whole (Lillie and Gearey 1999b), and the accurate dating and analysis of these deposits would provide an invaluable addition to the understanding and appreciation of Holocene vegetational developments in the region.

6 CONCLUSIONS AND RECOMMENDATIONS

- 6 1 Of the various Stage 3 investigations undertaken to date, the results from the initial fieldwalking were largely negative, and no concentrations of artefacts were identified within the areas walked. The work carried out by Northern Archaeological Associates near Staynor Hall also suggests that no areas of archaeological interest lie within this part of the proposed road corridor. No further detailed fieldwalking is therefore recommended in any part of the proposed route alignment, and no further archaeological investigation is currently proposed in either of these two areas (Sites 3 and 10) either in advance of, or during, construction work.
- 6 2 The geophysical surveys revealed a few anomalies of possible archaeological interest, just to the north-west of the former Barlby magazine complex and on the east side of the A19 to the north of the Selby Canal (see figure 9), both these sets of anomalies lie within areas of proposed new roundabouts. It is recommended that further, intrusive trial trenching is undertaken at both locations, to confirm the interpretation of the geophysical survey and to determine the date, depth and significance of any archaeological deposits and features which may be present. At the magazine site, a single trench 25m long by 2m wide and aligned north-east/south-west through the anomalies would suffice, with a further shorter trench to investigate the possible kiln-like anomaly to the south of the magazine complex. On the A19 site (Site 6), one north-south trench 50m long by 2m wide would investigate the curvilinear ditches and stony areas, and a second east-west trench 20m long by 2m wide would consider the curvilinear feature to the northeast.

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- 6 3 The palaeoenvironmental survey established that the area at the north end of the scheme, adjacent to and to the north of the railway line in the vicinity of boreholes SE635326 01 and SE633329 01-02, was of considerable importance. Preliminary palynological analysis suggests that there is the potential to recover detailed environmental data for the middle and more recent parts of the Holocene, possibly up to the earlier medieval period. As these deposits are covered by only thin alluvial sequences, they are the most susceptible to destruction by the proposed bypass, the alteration of the water table, the removal of the thin overlying alluvium, and the construction of the bypass and its associated embankments will quickly result in the desiccation and compaction of the peat deposits. The current study has shown that only a very broad temporal range can be inferred for these sequences and so it is recommended that further conng work be earned out, aimed at dating this discrete area of the floodplain environment. This can be achieved through higher resolution palynological study coupled with the radiocarbon dating of at least two locations relating to the base and top of the biogenic sequences.
- 6 4 The identification of a late 19th century magazine complex at the north end of the scheme is of considerable interest, and it should be noted that research into this site is still on going. However, it is recommended that a detailed visual inspection of the site be earned out as soon as possible, so that an accurate assessment of any remaining structures can be made. Depending on these findings, a building and/or photographic survey to an appropriate RCHME level may be required. As access into the site is currently withheld, it is recommended that appropriate notices be served to ensure that this inspection is not unduly delayed. The geophysical survey did not appear to identify any buned dumps of munitions or other matenal within the proposed road corndor.
- 6 5 These outstanding Stage 3 works should be undertaken well in advance of any construction, as their results, particularly the tnal trenching, will help to determine the impact of the scheme and whether any further mitigation works will be required. This process of staged evaluation is in accordance with the Department of Transport's Stages of Archaeological Assessment as defined in DMRB volume 11. It should also be noted that the above recommendations would need to be discussed and agreed with the North Yorkshire County Archaeologist in advance of any work being undertaken.
- 6 6 As noted in the previous BHWB report (1999, 15), the nature, date and importance of several of the other identified archaeological sites within the scheme corndor means that no pre-construction evaluation work is recommended, and the recording of any archaeological deposits affected by the scheme can be achieved by a watching bnef dunng initial ground works and top soil stnps.

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6 7 As a result of the Stage 3 investigations completed to date and the previous recommendations, the summary of table of mitigation works for all the identified archaeological sites given the previous BHWB report (BHWB 1999, 16) can be updated as follows

Site	Site name	Grade	Recommendations
1	Former field boundanes, between Hagg Lane and Field Lane	L	Watching bnef dunnng construction
2	Disused army camp (ruins), south-west of Brayton Barff	L	Stage 3 RCHME Level 1 building survey required
3	Area of possible Mesolithic activity Brayton Barff	D	Stage 3 fieldwalking complete No further action required
4	Former field boundanes and gravel pit south-west of Brayton Barff	L	No further action required
5	Curvilinear cropmark (possible former field boundary) south-east of New Farm	L	Watching bnef dunnng construction
6	Unclassified circular cropmark features, west and east of Doncaster Road	D	Stage 3 geophysical survey complete Tnal trenching required to assess results
7	Former field boundanes and tracks (cropmarks) west and east of Doncaster Road	L	Watching bnef dunnng construction
8	Course of former railway south of Brayton Hall	L	No action required
9	Course of the Selby Canal	R	No action required
10	Former field boundanes (cropmarks) east and west of Bawtry Road	L	No further action required
11	Woodland and scrub, and associated earthworks Staynor Wood	L	Watching bnef dunnng construction
12	Former field boundanes (cropmarks) north of East Common Lane	L	Watching bnef dunnng construction
13	Former field boundanes (cropmarks) and pansh boundary, north-west of Newlands Farm	L	Watching bnef dunnng construction
14	Area of Palaeo-environmental potential, Ouse valley	R	Initial Stage 3 investigations complete Additional, more detailed, work required in one specific area
15	Former munitions complex, south-west of Osgodby	D	Site visit to assess extent and importance of remains followed by other recording work as appropriate

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