



CARLISLE WASTEWATER TREATMENT WORKS, WILLOW HOLME INDUSTRIAL ESTATE, CUMBRIA

**Desk-Based
Assessment,
Walkover Survey and
Evaluation**



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SUMMARY

Following a proposal by United Utilities for the laying of new sewers in the Willowholme Industrial Estate, Carlisle, Cumbria (NY 38970 56450), as part of the Carlisle Flood Alleviation Scheme, a programme of archaeological investigation, including a desk-based assessment, walkover survey and field evaluation, was requested by Cumbria County Council's Historic Environment Service (CCCHES). The proposed works included the improvement of a number of existing sewers and the construction of a completely new sewer incorporating seven manholes. The new sewer was to run roughly north-west to south-east across the industrial estate, from the sewage works at the north-west corner of the estate (NY 38569409), to a junction with an existing sewer close to the Alexandra Sawmills (NY 39562101). A back-up option to run the sewer in a tunnel on a more direct line between these two points was also put forward. The work was to take place in an area of extremely high archaeological potential, immediately south of the line of Hadrian's Wall and within the boundary of the Hadrian's Wall World Heritage Site. This report presents the results of the three phases of the project, the desk-based assessment, the walkover survey, and the evaluation, which were undertaken by Oxford Archaeology North (OA North) between November 2007 and February 2008.

An outline of the topographical and historical background of the assessment area was produced, covering all periods, in order to provide a context for the results of the archaeological study. Unsurprisingly, Hadrian's Wall dominates the history and archaeology of the area, although remains relating to other periods are also known in the vicinity of the site. The desk-based assessment examined all relevant secondary and primary sources, including early maps of the area held in the Cumbria County Record Office (CRO) in Carlisle. Cumbria County Council's Historic Environment Record (HER) was also consulted. The walkover survey was undertaken in order to record any surface features of potential archaeological interest, to identify areas of potential disturbance and highlight any hazards or constraints to undertaking further archaeological work on the site. The walkover survey highlighted that development in the form of the Willowholme Industrial Estate was fairly extensive and there were few areas of open ground, both for areas to undertake further archaeological work and to enable identification of archaeological features. Thus only three further sites were identified. A possible relict field boundary (Site 27), part of Willowholme Leat (Site 20) and a section of part of the railway line that once served the nearby timber yard (Site 29). The sites identified during the course of the work were listed in a gazetteer and plotted onto a map of the study area.

In total, 28 sites were identified within the development area. Some 26 were located as a result of the desk-based assessment; while two were located by the walkover survey. Most of the sites (21) are post-medieval in date, although one prehistoric site and three of Roman date were also recorded. The remaining three sites are not closely dated, although two, and possibly all three, are likely to have been in existence by the medieval period at least. The study indicated that the greatest threat to archaeological deposits posed by the proposed works is potential damage or disturbance caused by the proposed new sewer to the Vallum and the Military Way to the south of the stone phase of Hadrian's Wall. These features must cross the development area, although their precise positions are not known. Similarly, although the line of the turf phase of Hadrian's Wall is not known within the Willowholme area, this feature must cross the site, so it too could be affected by the proposed new sewer. The line of the Stone

Wall itself is crossed by three existing sewers that are recommended for improvement, and the potential therefore exists for disturbance in these areas, dependent upon the precise nature of the proposed works. Several other sites of post-medieval date may also be affected by the sewer improvements. It is likely that the segment of the Willowholme Leat (20), and a relict field boundary (27), will be affected by the construction of the pipeline, whilst the former railway track bed serving the Alexandra Steam Saw Mills (28), will be affected if the course of the pipeline deviates from its intended course

An evaluation of the United Utilities Wastewater Treatment Plant at Willowholme, Carlisle was undertaken in order to ascertain if the proposed scheme of sewage refurbishment would have any impact on significant archaeological deposits, particularly the Vallum and military way associated with Hadrian's Wall. Subsequently, two evaluation trenches were excavated.

In both instances, the location of the trenches reduced the likelihood of unveiling any significant archaeological remains relating to Hadrian Wall, or its associated Vallum and Military Way. Both of the trenches overlay earlier sewage pipelines, so there was a high probability that the below ground deposits would show evidence of disturbance, which proved to be the case. Additionally, the finds encountered seemed to be a mixture of post-medieval pottery and glass, with particular emphasis on the twentieth century.

ACKNOWLEDGEMENTS

OA North would like to thank United Utilities for commissioning and funding the archaeological works. Thanks are also expressed to Jo Mackintosh at the CCCHER in Kendal and the staff of the CRO in Carlisle for assistance and information.

For OA North, John Zant carried out the desk-based assessment, the walkover survey was conducted by Jeremy Bradley, and Chris Ridings, with assistance from Rick Buckle undertook the evaluation. The report was written by John Zant with contributions by Jeremy Bradley and Chris Ridings, and the drawings were produced by Mark Tidmarsh. The project was managed by Alison Plummer, who also edited the report.

1. INTRODUCTION

1.1 CIRCUMSTANCES OF THE PROJECT

- 1.1.1 An application to carry out improvements to the sewer system on the Willowholme Industrial Estate, Carlisle, Cumbria (NY 38970 56450) (Fig 1), as part of the Carlisle Flood Alleviation Scheme, was made by United Utilities in 2007. The proposed works included the improvement of a number of existing sewers and the construction of a new sewer incorporating seven manholes (Fig 2). The new sewer was to run (with several dog-legged changes of course) roughly north-west to south-east across the industrial estate, from the sewage works adjacent to the River Eden in the north-west, to a junction with an existing sewer close to the Alexandra Sawmills. A back-up option to run the sewer in a tunnel on a more direct line between these two points was also put forward.
- 1.1.2 The development site lies, for the most part, immediately south of the line of Hadrian's Wall as depicted on the modern Ordnance Survey (OS) mapping. The international significance of Hadrian's Wall is reflected in its designation as a World Heritage Site, and in the statutory protection provided by its Scheduled Monument status (SM CU2819). However, the Wall itself was but one element (albeit the most important) in a complex frontier system, which included features situated north and south of the Wall (*Section 3.3.6*). The proposed works extend partly into the scheduled area (three of the existing sewer-runs that require improvement under the scheme cross the line of the Wall itself) (Fig 2), and the entire development site lies wholly within the Visual Impact Zone of the Hadrian's Wall World Heritage Site.
- 1.1.3 The whole area is clearly, therefore, of extremely high archaeological significance and, as a consequence, it was recommended by the CCCHES that a programme of archaeological investigation should be carried out prior to the commencement of any ground works. This was to consist initially of an archaeological desk-based assessment, to be followed firstly by a visual inspection (walkover survey) of the entire site and, subsequently, by the excavation of two evaluation trenches on the proposed line of the new sewer. A project brief was provided by CCCHES, in response to which OA North produced a project design for the required works (*Appendix 1*). Following the acceptance of this, OA North was commissioned to carry out the work in 2007. This report details the results of the project, namely the desk-based assessment, the walkover survey, and evaluation.

1.2 LOCATION, GEOLOGY AND TOPOGRAPHY

- 1.2.1 Carlisle lies on the Cumberland Plain approximately 8 km above the tidal limit of the River Eden and some 13 km upstream of the Solway Firth. The historic city is situated on the south bank of the Eden close to its confluence with the River Caldew. The settlement grew up on a promontory of land extending roughly north to south, bounded by the floodplain of the Eden to the north and north-east, and to the west by the scarp above the Caldew. The prominent bluff at the northern end of the scarp has been occupied by the

existing stone castle since the twelfth century. Willowholme Industrial Estate is located west of the historic settlement on the opposite bank of the River Caldew, directly across the river from the castle. As its name suggests, it occupies the southern part of the Willowholme, a large area of low-lying flood-plain situated in a loop of the River Eden west of its confluence with the Caldew.

- 1.2.2 The solid geology of the Carlisle area comprises soft, reddish Triassic St Bees sandstone of the Sherwood Sandstone Group, which lies above the Permian St Bees shales and is itself overlain and intercalated with the less extensive grey Kirklington sandstone (British Geological Survey 1982; McCarthy *et al* 1990, 1–2). At Carlisle itself the sandstone outcrops to form the roughly triangular-shaped bluff occupied today by the medieval castle. Over most of the modern city centre the sandstone is covered by a thick deposit of orange-pink boulder clay. To the north-east, however, east of the castle and just north of the medieval walled city, the southern edge of a pre-Roman channel of the River Eden was found in 1998, some 300 m south of the present river channel (OA North 2002a, 17). The precise course of the Roman river in this area is not known, although it probably lay much closer to the core area of settlement than is the case today.
- 1.2.3 West and north-west of the historic settlement, in the Willowholme area, the precise position of the main channels of the Eden and Caldew at any time in the past is difficult to determine, although in all likelihood the Eden lay further south than today and has gradually moved northwards through time, eating into the steep scarp of Etterby Scaur on the north bank and depositing a considerable depth of alluvial deposits to the south, over the Willowholme area (Ferguson 1888, 167-8). That the upper part of this sediment has accumulated since Roman times was demonstrated by excavations in 1886, where the foundations of Hadrian's Wall were found beneath eight feet (*c* 2.4m) of alluvium (*op cit*, 171; *Section 3.3.7*). Unsurprisingly, the whole of the study area is depicted as flood plain alluvium on modern geological maps (Ordnance Survey 1969). Judging by the modern topography it seems unlikely that the Caldew has ever lain very much further east than at the present day, although it could conceivably have flowed slightly closer to the castle rock in ancient times. However, there may have been more potential for movement north of the castle, at the confluence with the Eden, although there is no evidence to indicate how far, if at all, the Caldew has shifted its course in this area in historic times.
- 1.2.4 In addition to the two main rivers, three minor watercourses cross the study area. The first, known from at least the mid-eighteenth century as the Little Caldew (Site **19**), flows roughly south to north, west of, and broadly parallel to, the main channel of the Caldew, which it joins within the study area. From this confluence a second channel, known as Willowholme leat or simply The Cut (Site **20**), flows almost due west from the Caldew across Willowholme to join the River Eden west of the present sewage works. The origins of the Little Caldew are unclear, but it seems likely that it was extensively modified, if not actually created, by human agency, probably during the medieval period, in order to serve as a mill-race (*Section 3.5.7*). Willowholme leat is

certainly artificial, however, being created in the 1820s to provide the Carlisle Navigation Canal with additional water. The third watercourse is a small stream, known as the Parham Beck, which flows roughly south to north approximately 300m west of the Little Caldew before looping west to join the Eden only a few metres north of its confluence with the Little Caldew. The precise character of the Parham Beck is uncertain, but it is probably of natural origin.

2. METHODOLOGY

2.1 PROJECT DESIGN

2.1.1 A project design (*Appendix 1*) was submitted by OA North in response to a proposal by United Utilities for a programme of sewer improvement works on the Willowholme Industrial Estate, Carlisle, as part of the Carlisle Flood Alleviation Scheme. The project design was compiled following consultations with CCCHES. The work undertaken followed the method statement set out in the project design and complied with current legislation and accepted best practice, including the Code of Conduct and the relevant professional standards of the Institute of Field Archaeologists (IFA).

2.2 DESK-BASED ASSESSMENT

2.2.1 Several sources of information were consulted, in accordance with the project design. The study covered an area of approximately 500m radius centred on the Willowholme Industrial Estate. The principal sources of information included:

- ***Cumbria Historic Environment Record (HER)***: the Cumbria HER, held in Kendal, was consulted to establish which sites of archaeological interest are already known within the study area, and to assess their character and extent. The HER is a database of known archaeological sites within the county, and is maintained by Cumbria County Council. For each site a short descriptive note was obtained, which was added to the site gazetteer (*Appendix 2*) and marked on a plan (Fig 3), together with relevant sources and other information. Details of all Listed Buildings within the study area were also obtained but these were not included in the gazetteer as they were not at risk from the proposed works.
- ***Cumbria County Record Office (Carlisle) (CRO)***: the County Record Office in Carlisle was visited to consult primary and secondary records relating to the study area, including historic maps and plans. A number of plans of the city dating from the seventeenth century to the early twentieth century were consulted, including early Ordnance Survey maps. These allowed the historical development of the landscape to be studied through a process known as map regression analysis (*Section 3.6.9-22*).
- ***OA North Archive***: OA North has carried out a number of projects in and around Carlisle and the results of these were consulted. The company also holds a large collection of secondary sources relevant to the region.

2.3 WALKOVER SURVEY

2.3.1 The walkover survey covered an area of approximately 138,000m², as detailed in the project design (*Appendix 1*). For each site identified, a brief description was entered onto OA North's *pro-forma* sheets. An accurate location, with reference to the National Grid, was achieved for each site using a 1:2,000 scale map. A photographic record in digital, colour slide and monochrome formats was also compiled.

2.4 EVALUATION

2.4.1 The evaluation comprised two trenches in the area to the west of the United Utilities office buildings, which were excavated by machine under archaeological supervision. Both of the trenches were recorded using OA North's *pro-forma* sheets, whilst sketch plans and section drawings were deemed sufficient given the modern nature of the deposits encountered. Additionally, a photographic record in monochrome and colour slide 35mm was compiled, which was supplemented with high-resolution digital photography.

2.5 GAZETTEER OF SITES

2.5.1 Each site of archaeological interest identified within the study area was added to an overall gazetteer (*Appendix 2*) and is shown on a plan of the area (Fig 3).

2.6 ARCHIVE

2.6.1 A full archive has been produced to professional standards in accordance with current English Heritage guidelines (English Heritage 1991). The paper and digital archive will be deposited at the Cumbria CRO in Carlisle, and a copy of the report will be deposited with the Cumbria HER in Kendal.

3. ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

3.1 INTRODUCTION

3.1.1 The following section provides a summary of the historical and archaeological background of the City of Carlisle in general, and the Willowholme study area in particular. The summary has been compiled largely from secondary sources, and is intended to provide a context for the results of the archaeological works. It will be noted that there is a discrepancy in the spelling of *Willowholme* throughout the text. The area is correctly known as *Willowholme*, whilst the road is rendered as *Willow Holme*.

3.2 THE PREHISTORIC PERIOD

3.2.1 **Carlisle:** whilst a transient human presence during the late Mesolithic period is suggested by a small number of flints from the city centre (Caruana and Cherry 1994; Fell 1990, 96; Richardson 2000, 94), settlement at Carlisle appears to have commenced in the late Neolithic or early Bronze Age. Many stone artefacts attributable to this period, including a small number of Langdale axes, have been recovered from sites in the city (Fell 1990; in prep; Richardson 2000; Tolan-Smith in prep). With the exception of this material, however, physical evidence for prehistoric occupation remains sparse. At several sites, evidence for pre-Roman arable farming, in the form of shallow ard-marks scoring the surface of the natural subsoil, has been recorded (McCarthy 1990, 13-4; Charlesworth 1979; Caruana in prep; Zant in prep a). A cobbled track sharing the alignment of the ard-marks was also excavated at the northern Lanes (Zant in prep a). These features may represent the remains of an extensive system of arable fields and associated trackways situated close to a putative settlement. The relatively large flint assemblage suggests a late Neolithic or early Bronze Age *floruit* for the pre-Roman settlement, although the ard-marks have been interpreted by some as the remains of cord-rig cultivation, which is usually regarded as being a feature of the later Bronze Age or Iron Age (McCarthy 2002, 43). With the exception of an undated roundhouse of possible late Iron Age date excavated at the southern Lanes (McCarthy 2000, 17), there is currently little evidence for Iron Age activity in central Carlisle.

3.2.2 **Willowholme:** no evidence for prehistoric activity is known from Willowholme, which is perhaps unsurprising in view of the low-lying character of the area, its susceptibility to flooding even up to the present day, and the likelihood that any prehistoric levels that might exist lie buried beneath several metres of alluvium. It is conceivable, although there can be no proof, that the important ford at Etterby Wath (Site 21), which is recorded from the medieval period onwards (Jones 1976, 82), originated at a far earlier date, possibly even as early as prehistoric times (HER No.41754). The only discovery of prehistoric remains within the study area was made in the early 1990s at the Cumberland Infirmary, which occupies a low hilltop site at the south-west corner of the study area, south of Willowholme itself (Flynn and McCarthy 1993; McCarthy *et al* 1998, 4-5). Here, the remains of five

roundhouses, part of a settlement of Bronze Age or Iron Age date (Site 7) were exposed. Just outside the study area, recent excavations on the site of the Maltsters' Arms public house on John Street, c 200m south of Willowholme, recovered a neolithic Langdale axe fragment, a hammer stone and two pieces of flint debitage (North Pennines Archaeology 2004). All these items were, however, either unstratified or residual in later contexts.

3.3 THE ROMAN PERIOD

3.3.1 **Carlisle:** despite a long tradition of antiquarian interest in Roman Carlisle (*Luguvalium*), it has only been in recent years that additional information has become available regarding the origins, nature, and extent of Roman settlement in the city. The theory that the prominent bluff occupied by Carlisle Castle had been the site of a Roman fort was put forward as early as the mid-nineteenth century (Ferguson 1893a, 348–9), whilst subsequent analysis of the samian from the city pointed to an early Flavian military presence (Bushe-Fox 1913, 299–301). For many years, however, it was generally accepted that the fort lay south of the castle, in the vicinity of the medieval cathedral (Shaw 1924, 96–102; Simpson 1953, 234; Hogg 1955, 72; 1964, 58). In fact, the fort's precise location remained unclear until the Annetwell Street excavations of 1973–84, which identified what proved to be the south rampart and south gate of a turf-and-timber fort extending north under the castle (Charlesworth 1980). A possible annexe lay on the south side of the fort (McCarthy 1991; Caruana 1992).

3.3.2 Dendrochronological dating has proved that the first fort was constructed in the autumn or winter of AD 72–3 (Groves in prep). Tree-ring dating also indicates that the interior of the fort was extensively refurbished in the autumn/winter of AD 83–4 (Caruana in prep; Zant in prep b). The fort was demolished in the early second century but was rebuilt, again in turf and timber, c AD 105, after only a short break. The second fort was not abandoned in the AD 120s, when Hadrian's Wall and the presumed primary Wall-fort at Stanwix were constructed less than 1 km to the north, but continued in use to the beginning of the Antonine period (*ibid*). It was probably demolished as a consequence of the reoccupation of southern Scotland in the AD 140s, when the northern frontier was advanced to the Forth-Clyde isthmus. In the following 60–70 years, the fort site may have been occupied only intermittently; activity during this period has proved difficult to characterise, but it seems probable that the site was not used as a conventional fort at this time. Intensive occupation appears to have begun again in the early third century, when a rebuilding in stone occurred, although it is not clear if the new installation was a conventional fort or some other kind of military establishment. Thereafter, occupation continued to the end of the Roman period, which on the evidence of coins and pottery extended into the fifth century.

3.3.3 South of the fort, extramural timber buildings adjacent to the main road leading south were in use within a few years of the arrival of the Roman army (McCarthy 1990). During the course of the Roman period the settlement grew into a sizeable town extending south and east of the fort. A milestone

discovered near Penrith demonstrates beyond much doubt that the town had become the tribal capital of the Carvetii, the *civitas Carvetiorum*, by AD 223, and it seems likely that *civitas* status had been conferred on the town by Septimius Severus some years earlier (Edwards and Shotter 2005, 69). As in the fort, the first stone buildings appeared during the late second-early third century AD, and there is good evidence from a number of sites that intensive occupation within the town continued into the late fourth or early fifth century at least.

- 3.3.4 At certain times during the Roman period, quite extensive suburbs extended along the main roads leading north and south from the town, but there is currently only very limited evidence for Roman activity west of the River Caldew (North Pennines Archaeology 2004). The exact position of the Roman road bridge over the River Eden is not known. During the Roman period, the Eden is likely to have lain well to the south of the modern river channel, but the discovery of a Roman bridge stone in the modern river suggests that the road may have been carried across both the river and the adjacent alluvial flats on a long bridge of many arches, or a combination of causeways and arches (Caruana and Coulston 1987, 50). The principal cemeteries appear to have been situated south of the town, adjacent to a main road represented by modern Botchergate (Patten 1974), although burials are also known from sites to the west and north-east (Ferguson 1886, 318-20; 1893b, 373; Hogg 1961; Esmonde-Cleary 1994, 263).
- 3.3.5 **Stanwix:** the Hadrian's Wall fort at Stanwix (*Uxellodunum*, perhaps later known as *Petriana* (Breeze 2006, 341-2)) was situated less than 1 km north of Carlisle. The existence of a Hadrianic fort on the site seems probable, although little direct evidence has yet been found (Caruana 2000, 74-5). The stone fort, which was the largest on the Wall, is conventionally dated to the AD 160s, and was the base of the milliary *ala Petriana*. Hadrian's Wall itself ran south-west from the fort and is presumed to have been carried over the River Eden on a bridge situated close to the river's present-day confluence with the Caldew (Hogg 1952, 149-52). Large numbers of bridge stones were dredged from the river close to this point in 1951 (*op cit*; Breeze 2006, 347) and some are still to be seen on the riverbank.
- 3.3.6 **Willowholme:** at Willowholme, the archaeology of the Roman period is dominated by Hadrian's Wall (Site 2), which crossed the study area on an east-north-east to west-south-west alignment. The developmental history of the Hadrian's Wall frontier system is complex (Breeze 2006, 50-3), particularly so in its western sector, west of the River Irthing, where it was initially constructed of turf (why is still a matter for debate (*op cit*, 58-9)) and rebuilt in stone (often on a slightly different line) later. Furthermore, the Wall itself was only one element (albeit the most significant) of the frontier system; north of the Wall (in most areas at least) was a ditch (*op cit*, 62-3), whilst to the south, situated at widely varying distances from the Wall, lay the Vallum, an enigmatic earthwork comprising a flat-bottomed ditch flanked by mounds, the purpose of which also continues to excite debate (*op cit*, 86-7). Another linear element of the frontier system was a road, known as the Military Way. In many areas this ran along the north mound of the Vallum, but west of the

Irthing it frequently lay between the Wall and Vallum (*op cit*, 89). Work probably commenced on the Wall in AD 122–23 (Breeze and Dobson 2000, 66), although it is possible that the Turf Wall was begun slightly earlier (Shotter 2004, 75-9). With the exception of a break of no more than 20 years, when the northern frontier of *Britannia* was advanced to the Forth-Clyde isthmus during the reign of Antoninus Pius (AD 138-161), Hadrian's Wall remained in commission to the end of the Roman period. It would seem that the western sector of the Turf Wall, including the section in the Willowholme area, was not rebuilt in stone until the return from Scotland (Breeze 2006, 60), which probably occurred in the AD 150s according to current theories (Bidwell 1999, 23).

3.3.7 The line of the Turf Wall in the Willowholme area is not known, but it must presumably cross the study area somewhere in the vicinity of the Stone Wall. When excavated elsewhere, it has been found to be *c* 6m wide at the base and built of cut turves laid in courses (Breeze 2006, 58). In some places the rampart was placed on a cobble foundation up to 5.8m wide (*op cit*, 60), although this feature does not seem to have provided everywhere. There is evidence that in boggy ground the Turf Wall rested on a piled foundation (*ibid*). The Stone Wall (Site 2) was first seen at Willowholme in 1854 during the construction of a sewer (Ferguson 1888, 168; Simpson 1932, 149), and was exposed again in two places in 1886, close to the first site, in the angle formed by the main railway line from Carlisle to Glasgow and the branch line to Port Carlisle (*op cit*, 171-2). Here the Wall had been reduced almost to its foundation, which rested on river gravels, but enough survived to demonstrate that it had been 2.36m wide above foundation level. The remains of the Wall at this point were buried beneath 2.44m of alluvial silt (*ibid*). The Wall foundation was located again east of the main railway line and was found to be similarly preserved (*op cit*, 174). During the same excavation campaign, the Wall and Wall Ditch were located north of the Eden, on top of the steep bank above Hyssop Holme Well, and a search was made for traces of the bridge that carried the Wall over the river, but without success (Ferguson 1888, 172-3). In 1932, a further stretch of the Stone Wall several metres in length was found close to the site of the original (1854) exposure during the construction of a new sewer (Simpson 1932). Here the foundation was 2.69m wide and comprised a layer of rough sandstone flags *c* 100mm thick bedded in puddled clay and laid directly upon the natural gravel subsoil. Above foundation level only two of the northern facing stones remained, offset by *c* 163mm from the outer face of the foundation (*op cit*, 150). The depth at which the remains lay beneath the modern surface is not stated in the report, but the published photograph (*op cit*, fig 3) (Fig 4) indicates that the Wall lay beneath a thick deposit of alluvium.

3.3.8 On the evidence of spacing, Milecastle 67 should lie just west of the study area, close to the south end of the Waverley Viaduct (now long disused) that once carried the Carlisle to Edinburgh railway line across the Eden. Whilst no trace of Milecastle 67 has been found, Roman coins were unearthed west of the viaduct in 1861 and a gold necklace of probable second century date was found a short distance further west in 1860, on the site of the former canal engine shed (OS First Edition map; Cumb. XXIII.3). Turrets 66a and 66b

should also lie somewhere in the Willowholme area (Milecastle 66 was located north of the Eden, on top of the steep bank above Hyssop Holme Well), but whilst the approximate positions of these structures can be calculated on the evidence of spacing (Fig 5), their precise locations are unknown. Neither the Wall Ditch, the Vallum, or the Military Way have been seen at Willowholme, though all presumably cross the area, buried deep, like the Wall itself, beneath alluvial silts. On the 1937 edition of the OS 25-inch map (Cumb. XXIII.3) a line labelled 'probable course of Vallum' is shown crossing Willowholme a little over 70m south of, and parallel to, the line of the Wall, but this is not based on archaeological evidence. North of the Eden, the north mound of the Vallum is depicted on the 1966 edition of the OS 1:1250 map (NY 3956 NE) as lying c 56m south of the Wall, but there can be no guarantee that this is reflected in the Willowholme area. Traces of the Vallum have, however, been observed west of the study area, on the higher ground at Davidson's Banks, where it lay just south of the Wall.

- 3.3.9 With the exception of Hadrian's Wall itself, few Roman remains are known from within the study area, a notable exception being the rural settlement (Site 8) that was excavated at the Cumberland Infirmary, which occupies a low hilltop site at the south-west corner of the study area, c 300m south of Hadrian's Wall. Here, where several roundhouses of Bronze Age or Iron Age date were also discovered (Section 3.2.2), part of a multi-phase Roman settlement was exposed, comprising rectilinear timber buildings and cobbled surfaces associated with palisaded and ditched enclosures (Flynn and McCarthy 1993). Dating evidence suggested a *floruit* for this site in the late first-second century AD. The only other record of Roman material from within the study area is of a small fragment of samian pottery (Site 9), found in 1976-7 on the south-west edge of the modern sewage works, close to the line of Hadrian's Wall.

3.4 THE EARLY MEDIEVAL PERIOD

- 3.4.1 *Carlisle*: the nature of settlement at Carlisle in the earlier post-Roman period is difficult to determine. In view of its long history as a Roman administrative centre and its position at the hub of a system of roads, the town is unlikely to have been completely abandoned, although it seems likely that the settlement contracted considerably at the end of the Roman period. During the sixth century Carlisle probably lay within the British kingdom of Rheged (Kirkby 1962, 79), but archaeological and historical evidence at this time are almost entirely lacking. During the first half of the seventh century the region was absorbed into the Anglian kingdom of Northumbria and from this period onwards occasional historical references to Carlisle survive. By the late seventh century the settlement formed the centre of a royal estate 15 miles in circumference, which the Northumbrian king Ecgfrith gave to St Cuthbert, bishop of Lindisfarne, in AD 685 (Summerson 1993, 10). Cuthbert, in turn, used the grant to establish and endow a nunnery. That a monastic presence endured until the later ninth century is suggested by the presence of Eadred, described as a former abbot of Carlisle, in the group of monks who journeyed across northern England between AD 875 and AD 883, searching for a resting place for St Cuthbert's remains (Tudor 1984, 68-9). During Cuthbert's visit to

Carlisle in AD 685, he was shown the town walls (possibly the fort defences, since there is as yet no evidence that the town itself was walled) and a working Roman fountain, by Waga the reeve (*praepositus*) and other citizens (Webb 1998). The 'British' name Waga, and the use of the old Roman title *praepositus*, together with the civic pride evident in Cuthbert's guided tour, suggest a surviving connection with Carlisle's Roman past at this time.

- 3.4.2 By the late ninth century, control of Carlisle and its region passed from Northumbria to the British kingdom of Strathclyde or Cumbria, which itself owed allegiance by this time to the king of the Scots (Summerson 1993, 1). Scandinavian political influence at this time is debatable, although it is clear that the 'Great Army' under Halfden made a determined attempt to conquer Northumbria in 875. Some sources suggest that he sacked Carlisle, although physical evidence for this has not been found (Higham 1986, 308). In the eleventh century the region came under increasing English control, in the form of the Earls of Northumbria, but was recovered by Malcolm Canmore in the 1060s (Summerson 1993, 14–15), after which it remained technically in Scottish hands until the arrival of the Norman king William II in 1092 (Earle and Plummer 1892).
- 3.4.3 During the twelfth century the chronicler John of Worcester claimed that by the late eleventh century Carlisle had been deserted for 200 years following its destruction by the Danes. This assertion is not, however, supported by the archaeological evidence, which proves that occupation persisted throughout the early medieval period, with a principal focus of occupation in the vicinity of the medieval cathedral, where excavations have revealed evidence for a tenth-century cemetery (Gaimster *et al* 1989, 174; Keevil 1989).
- 3.4.4 **Willowholme:** there is no evidence for early medieval activity or occupation within the study area. It is conceivable that the important medieval ford at Etterby Wath (Site 21), which crossed the Eden from Willowholme on the south to Etterby on the north (Jones 1976, 82), was already in use in the pre-Norman period (and indeed much earlier; *Section 3.5.5*), which would imply that a road or track leading to the ford across Willowholme, and which subsequently developed into Willowholme Road (*Section 3.6.21*), was also in existence, although there can be no proof of this.

3.5 THE LATER MEDIEVAL PERIOD

- 3.5.1 **Carlisle:** the Anglo-Saxon chronicle records that in the year 1092 William II led an army north to Carlisle (Earle and Plummer 1892) and drove out a certain Dolfín, whose presence in Cumberland has been taken to show that the region was part of the kingdom of the Scots prior to 1092 (Summerson 1993, 47). William, it is said, constructed a castle and brought settlers from the south to inhabit the re-established town (Earle and Plummer 1892). No trace of this early castle has been found, but it was almost certainly built of earth and timber and may have occupied the site of the present stone keep (McCarthy *et al* 1990, 11, 28).

- 3.5.2 The Norman hold on Cumberland was consolidated by Henry I, who visited Carlisle in the autumn of 1122 (Sharpe 2006, 52). At this time the position of the Anglo-Scottish border remained ill-defined, as is illustrated by a contemporary Scottish description of Carlisle as lying ‘between England and Scotland’ (Kennedy 1973, 96). During his stay Henry took measures to strengthen Carlisle’s position within his kingdom, providing money for the construction of ‘walls and towers’, a probable reference to the town defences, and for the foundation of the Augustinian priory of St Mary’s (Summerson 1993, 25). The priory subsequently became a cathedral with the creation of the see of Carlisle in 1133 (Perriam 1987, 127). It was probably also during Henry’s reign that construction work began on the stone castle.
- 3.5.3 As a consequence of the unsettled conditions that prevailed in England following Henry I’s death in 1135, large parts of the northern English counties, including Carlisle, came under Scottish control (Kapelle 1979). However, the city reverted to English rule in 1157 and probably received its royal charter from Henry II in the following year (Summerson 1993, 58). During the comparatively stable period from the mid-twelfth to late thirteenth centuries, the story of Carlisle is one of sustained, if not spectacular, growth, although for the English kings its primary function remained that of a border fortress. By the later twelfth century suburbs had developed outside all three of the city gates, on Botchergate to the south, Rickergate to the north, and Caldewgate to the west. Little archaeological work has been undertaken within Carlisle’s medieval suburbs, but recent excavations on John Street, some 200m south of the study area, revealed an extensive metalworking complex of fourteenth-century date (North Pennines Archaeology 2004). Several medieval documentary sources attest to the existence of a water-course beneath the city’s west walls, which probably developed into the post-medieval mill-race known as the Corporation Dam, which ran through the eastern part of Willowholme (Hutchinson 1794; Jones 1985, 187–9). Three water-powered corn mills, the Borough Mill, Abbey Mill and Castle Mill, were operated by the city during the medieval period (Perriam 1992, 34) and other mills followed later.
- 3.5.4 By contrast with the preceding 150 years, the last decade of the thirteenth century heralded the beginning of a disastrous period of unrest for Carlisle and the wider region. Destruction of much of the city by fire in 1292 was followed four years later by the onset of the Anglo-Scottish wars, during which it was attacked or besieged on a number of occasions. A fragile peace negotiated in the 1320s had broken down a decade later, leading to several centuries of warfare, raiding, and skirmishing in the border region. The city was impoverished for much of this period and there are frequent references to the citizens being relieved of their obligations for the payment of taxes and subsidies (Summerson 1993, 265). Intermittent warfare continued for the rest of the medieval period, although in general these wars were less catastrophic than those of the fourteenth century. However, extremely unsettled conditions continued to prevail across the entire Border region until after the Union of the Crowns in the early seventeenth century. Consequently, the city appears to have remained underpopulated and relatively impoverished well into the post-medieval period.

- 3.5.5 **Willowholme:** it is during the medieval period that the first references to Willowholme appear in contemporary documents. The name of the area is believed to derive from the personal name Gueri; the Pipe Roll of 1130 refers to Gueri the Fleming, who owned land and houses in Carlisle (Jones 1976, 82), and whilst there is no direct documentary proof, it is thought highly probable that part of Gueri's holding was at Willowholme, which in the Middle Ages was known as Weryholme (*ibid*). The *-holme* element of the place name probably derives from the Old Norse *holmr*, which was adopted into late Old English and used in a general sense to denote flat or low-lying ground, or a river-meadow (Mills 1976, 45; Gelling 1984, 50-2). Gueri's land lay adjacent to the southern end of Etterby Wath (Site 21), an important ford across the River Eden, and it is likely that he, together with his contemporary Etard (who gave his name to the village of Etterby on the north bank of the river) were given their lands in order to secure both ends of this crossing (Jones 1976, 82). The allocation of these estates across the wath was part of a wider policy to safeguard the approaches to Carlisle in the early Norman period by the creation of the baronies of Burgh and Liddell and the introduction of new tenants to the important local lordships of Scaleby, Rickerby and Botcherby (*ibid*).
- 3.5.6 During the medieval period Willowholme formed part of the socage manor of Carlisle, some 1,300 acres of arable, meadow and pasture land forming part of the revenue of the Crown (Spence 1984, 65-6). On a plan of the manor produced in 1611 (*op cit*, pl II) the Willowholme portion is estimated at 111 acres (*op cit*, 67) and its boundaries are shown (*Section 3.6.8*), but whether this reflects the situation in the medieval period is not known. From 1376 the manor, together with the castle and other royal demesnes, was committed to the custody of the sheriff of Cumberland at an annual rent (*op cit*, 74). From this date farming-out of parcels of land for rent became increasingly common, although documentary sources suggest that this had begun earlier, and by the early post-medieval period Willowholme, like other parts of the manor, was held by a large number of different tenants (*Section 3.6.8*). In the aftermath of the Black Death of 1349, the income paid to the sheriff from socage tenants in Willowholme was around a third less than previously (*op cit*, 281), which provides an indication of the possible level of mortality in the city. Some of the city's leading burgesses used their position to obtain grants of the royal demesnes once these began to be farmed out. One such was John de Blenkinsop, who in 1377 received a 13-year lease of lands in Weryholme; this grant was subsequently renewed twice (*op cit*, 368). The clerical poll tax returns of 1379 and 1380 for Carlisle deanery record that Gilbert Grout, an unbeneficed chaplain, briefly held the farm of the royal demesne of Weryholme (*op cit*, 306). The canons of the Priory of St Mary's in the city had acquired holdings in the area by *c* 1220 and possibly considerably earlier (*op cit*, 71-2), although later documents suggest the Priory held much of its land in the socage manor as freehold.
- 3.5.7 With the probable exception of what is now the Bridge Street/Church Street frontage to the south, it is unlikely that many buildings were erected in the Willowholme area during the medieval period. No medieval maps of Carlisle exist, but cartographic depictions from the seventeenth century show the

whole area as open fields, with limited ribbon development extending west along the road leading from the west gate of the city (*Section 3.6.11-12*). In view of its location, on a low-lying flood plain at the confluence of two rivers, it seems likely that the area was given over largely to pasture and meadowland rather than arable cultivation, although evidence is lacking. That the area was subject to severe (and presumably frequent) inundation is indicated by a documentary reference of 1401, when John de Blenkansop, a former mayor (presumably the same individual recorded in 1377; *Section 3.5.6*), requested a reduction in the rent of his land at Weryholme, which had been ruined by floods and by frequent Scottish raids (Summerson 1993, 396). Early in the same year, the castle demesnes at Weryholme were said to be ‘in great part diminished, and diminished from day to day, by the frequent flood of water around there’ (*op cit*, 397). No medieval sites are known within the study area, although the Little Caldew (Site 19) may be of medieval origin, perhaps originating as a mill-race to supply the medieval corn mill at Denton, which lay south of the study area (HER No.41077).

3.6 THE POST-MEDIEVAL PERIOD

- 3.6.1 **Carlisle:** during the sixteenth and seventeenth centuries Carlisle began the slow process of recovery from the period of warfare and plague that had prevailed during the later Middle Ages. From 1560 a state of peace existed between England and Scotland, although the Border region remained unsettled throughout the sixteenth century and this is likely to have had a detrimental effect on trade and commercial activity. One of the most significant historical events to occur during this period was the Dissolution of the Monasteries in the 1530s, which in Carlisle led to the disappearance of both friaries and the refoundation of St Mary’s Priory as a cathedral with dean and chapter. A major refurbishment of the castle was undertaken during the reign of Henry VIII and the Citadel was constructed at the opposite (southern) end of the city’s defensive circuit. Changes to the topography of the city were not always due to the works of Man, however, for in 1571 a ‘disastrous flood’ caused the Eden to divide into two main channels (Hogg 1952, 137).
- 3.6.2 Within a few years of the accession of James VI of Scotland to the English throne (as James I) in 1603, the era of Border raiding came to an end (McDonald Fraser 1971) and both Carlisle and the wider region enjoyed a period of peace and comparative prosperity. However, during the English Civil Wars the threat of trouble returned once more, and in 1644 the royalist stronghold of Carlisle was besieged by the Scots. The city surrendered in June 1645 but changed hands once more three years later in the second outbreak of fighting, and was surrendered again, this time to Cromwell in person.
- 3.6.3 The century following the end of the Civil Wars was a time of slow development for Carlisle. Even as late as the beginning of the eighteenth century, many of the buildings within the city would have been constructed of timber, but from the late seventeenth or early eighteenth century the use of stone in both public and private buildings became increasingly common. One of the first to be built was the Old Town Hall, constructed in 1669 and later extended. Little is known about the private residences of this period as few

have survived, notable exceptions being a number of houses on Abbey Street, including that of Thomas Tullie, Dean of Carlisle Cathedral, which was built in 1689 (McCarthy 1993, 109). During the first half of the eighteenth century, the city walls were so ruinous that the citizens themselves demolished certain stretches that had become unsafe. In 1745 the parlous state of the defences was brought into sharp focus during the Jacobite uprising, when it was found that parts of the eastern curtain wall had been demolished and that the castle defences were much decayed. After a short siege the Jacobite army took possession of the city in November 1745 but surrendered it the following month following bombardment by the Duke of Cumberland (McCarthy *et al.* 1990, 214-19).

- 3.6.4 In the second half of the eighteenth century, most of Carlisle's population, estimated at *c* 4–5000 people, continued to live within the medieval defences, where ample space was still available, although the Rickergate, Botchergate, and Caldewgate suburbs continued to develop during this period. By the time of the 1801 Census, however, the population had risen to approximately 10,000 and the city walls were beginning to be viewed as a hindrance to expansion, redevelopment, and the free movement of traffic in and out of the city. Extensive demolition of the curtain wall along what became West and East Tower Streets on the north and Lowther Street on the east occurred during the early nineteenth century and was largely complete by 1815 (Perriam 1976). The medieval Scotch (north) Gate was demolished in February 1815 and its remains were thrown into a raised causeway associated with the new Eden Bridge, which was under construction at the time (MacDonald 1971, 256); during construction of this bridge the south channel of the river was permanently blocked.
- 3.6.5 Census records indicate that Carlisle's population continued to rise sharply during the first half of the nineteenth century, reaching 35,000 by 1841. However, cartographic sources show remarkably little evidence for significant expansion of the built-up area during this period. Indeed, even as late as 1850, Carlisle covered an area not much bigger than that of the medieval city, although the population was of course many times larger than it had been several hundred years earlier. That this led to chronic overcrowding in some parts of the city is clear from a report of 1850 produced by the Carlisle Sanitary Association, which records families living 20 to a room 'adjacent to the filthiest privies and dunghills' (McCarthy 1993, 90).
- 3.6.6 By the time the Ordnance Survey (OS) first edition map of Carlisle was produced in 1865, the city had at last begun to expand significantly beyond its medieval boundaries and this growth continued apace during the second half of the nineteenth century and into the twentieth century. The size of all the suburbs increased greatly and the built-up area extended well to the east of Lowther Street, which had itself been laid out on the line of the medieval eastern defences. North of the river, the construction of new housing and business premises began the process of transforming Stanwix from a small village into a city suburb. No single factor can explain this rapid growth, although improved communications and transport networks are likely to have been significant. In response to the needs of Carlisle's industrialists, the

Carlisle Navigation Canal was constructed in the early 1820s, providing a link between the city and the Solway coast (Ramshaw 1997). In Carlisle, the canal basin was located at Caldcotes on the south-western edge of the study area. However, whilst the canal allowed for some industrial growth it was not the catalyst for the rapid expansion of the city. Of greater significance were the arrival of the railway in 1836 and the subsequent development of the rail network in the region. The Newcastle to Carlisle railway was fully opened in 1838 and by 1845 the Carlisle to Maryport line was providing a rail link to the Irish Sea coast (Marshall and Davies-Sheil 1977, 188–9). This, together with the silting-up of the Solway and the gradual increase in ship sizes, had killed off the canal by the early 1850s. During the nineteenth century, Carlisle became the leading industrial and commercial centre in the county. As early as the 1720s a mill for the manufacture of broad cloth was built on the mill-race adjacent to the River Caldew (Jones 1985, 186–191), and from the second half of the eighteenth century textile manufacture became increasingly important in the city. Clock making, brick making, ironworking, tin-plate manufacture, and the production of biscuits also developed into significant industries during the nineteenth century and remained so well into the twentieth century.

- 3.6.7 **Willowholme:** at Willowholme, the early post-medieval period probably saw little change, with the area doubtless continuing to be used largely for pasture and meadow. That this was the case is suggested by a documentary reference to the construction of a siege-work west of Carlisle during the Parliamentary siege of the city in 1644–5. The work was constructed on the top of Catcoates Bank, from where it ‘commanded the Willowholme, and rendered it useless to the garrison as a grazing ground’ (Ferguson 1891, 112).
- 3.6.8 During the sixteenth century it would appear that much of the socage manor of Carlisle, of which Willowholme formed part, had, for a variety of reasons including political expediency and laxness on the part of the Exchequer, slipped from the control of the Crown (Spence 1984, 79). In the early seventeenth century steps were taken to remedy this situation. Two detailed Exchequer surveys conducted in 1608 and 1611 recorded a large number of tenants and landholders, from the Dean and Chapter of the Cathedral to members of the aristocracy and local traders and craftsmen, many of whom claimed to hold their land freehold or by customary tenure, and who therefore paid no rent to the Crown. Willowholme, as shown on a plan produced to accompany the 1611 survey (*op cit*, 67) comprised 111 acres of demesne land. In the same year a sixty-year lease on the manor, demesnes and castle was granted to Francis Clifford, Earl of Cumberland, who undertook prolonged legal proceedings to reclaim manor lands from those who claimed freehold or customary tenure over them. These proceedings, which continued through the 1620s and 1630s, demonstrated that many tenants had no permanent claim on their holdings, which remained the property of the Crown. By December 1630, 42 acres in Willowholme had been recovered and it was recommended that the land should be enclosed, but this was not done (*op cit*, 76). However, other lands in Willowholme continued to be held by important Carlisle citizens, some of whom were summoned before the Council of the North at York to answer the Cliffords’ complaints that they had refused to quit their

holdings (*op cit*, 77). One of the few landholders to succeed in their legal claim to manor land was Thomasine Tullie, widow of George Tullie, who kept her land at the Saucerries (east of the River Caldew) because the Court decided that it was really part of her freehold in Willowholme but had been separated from that holding by a change in the river's course (*ibid*).

- 3.6.9 For the later post-medieval period, the development of the Willowholme area is best illustrated through the study of historic maps and plans dating from the seventeenth century to the twentieth century. This method, known as map regression analysis, allows for the historical development of the landscape to be charted chronologically, although the few maps of Carlisle that were produced prior to the eighteenth century are of little value to the present study except to demonstrate that the Willowholme area was largely open land at this time.
- 3.6.10 **Tudor plan of Carlisle, c 1560:** the earliest surviving detailed plan of Carlisle, produced c 1560 and now in the British Library (BL *Cotton Ms, Aug I, i, 13*; reproduced in Lysons 1815) does not depict anything outside the city walls, and is therefore of no value to the present study.
- 3.6.11 **John Speed, 1610:** the plan of Carlisle produced by John Speed as an inset to his map of Cumberland (Fig 6) does show the immediate environs of the walled city, including the eastern edge of the Willowholme area. However, the depiction is clearly highly stylised and cannot be regarded as an accurate representation. No development of any kind, not even field boundaries, is shown within the study area.
- 3.6.12 **James Richards, 1684-5:** Richards' map, which was itself based on a plan produced in 1682 (Ferguson 1895) shows limited ribbon development along the road leading from the city's west gate, but the built-up area lies wholly east of the, outside the study area. The south-east corner of the study area appears on the map but is shown as open ground; no field boundaries or other topographic features are shown, with the exception of the Little Caldew mill-race (its earliest cartographic depiction) (Site 19).
- 3.6.13 **George Smith, 1746:** Smith's plan (Fig 7) depicts the siege of Carlisle in December 1745, when the Jacobite garrison were besieged by the Duke of Cumberland. Most of the study area was occupied at that date by a system of large fields, probably pasture or meadowland, defined by hedgerows. Buildings are shown fronting Caldewgate on the south, with a series of smaller fields or garden plots, mostly narrow and rectangular in plan, to the rear. The Little Caldew mill-race (Site 19) is shown issuing into the main channel of the River Caldew within the study area.
- 3.6.14 **Hodgkinson and Donald, 1771:** this plan, surveyed in 1771 but first published as an inset to a map of Cumberland in 1783, is rather stylised but shows increasing development on the Caldewgate frontage.
- 3.6.15 **William Hutchinson, 1794:** the first significant development north of the Church Street/Bridge Street frontage is depicted on William Hutchinson's plan of 1794, where a few buildings are shown well to the north of Caldewgate, adjacent to the west bank of the Little Caldew mill-race (Site 19).

The street frontage itself appears increasingly built-up, and large, formal gardens are shown to the rear of many of the buildings, with hedged fields beyond. Some of the fields are described as 'Print Fields', which are known from other sources to have been associated with Donald's dye and print works (Site 23), established in 1768 (HER No.42047). Although not identified as such, buildings that are known from later maps to have been owned by the Donald family, and which therefore probably formed part of their works, are depicted adjacent to the Little Caldew mill-race. An unnamed structure situated on the Little Caldew, close to its confluence with the main river channel, can be identified from later maps as Willowholme mill (Site 17). Originally part of Donald's print works, it was converted to a corn mill in the late eighteenth century (HER No.41054). A gap in the street frontage buildings close to the Little Caldew may mark the position of a lane that subsequently developed into Willow Holme Road (Site 24). The lane is first depicted on Cole and Roper's plan of 1801 (see below), and is first named on John Wood's map of 1821 (*Section 3.6.17*). Whilst not depicted as such on these early maps, it is possible that Willow Holme Road originated as a track leading to Etterby Wath (*Section 3.6.21*).

- 3.6.16 **Cole and Roper, 1801:** the plan of Carlisle produced by G Cole and J Roper is notable in terms of the present study principally for its depiction of Willow Holme Road (or at least its southern part), which is shown as an unnamed track or lane running north-north-west from Bridge Street (Site 24). The print fields depicted on Hutchinson's map are also shown, their association with Donald's print works (Site 23) now explicit in the name 'Donalds Print Field'.
- 3.6.17 **John Wood, 1821:** generally speaking, Wood's plan of Carlisle (Fig 12) is more detailed than any earlier map and names the owners of many properties within the city. Away from the main street frontage, development of the area during the early nineteenth century continued to be largely confined to the west bank of the Little Caldew (Site 19), on either side of Willow Holme Road (Site 24). Donald's premises (Site 23), depicted on earlier plans (*Section 3.6.15-16*), are named, as is Willowholme corn mill (Site 17) (*Section 3.6.15*). Also shown for the first time is the canal basin at the terminus of the Carlisle Navigation Canal (Site 6), together with a row of six coal and lime vaults on the east (Site 25) and a large building at the southern end of the canal basin that can be identified from later maps and other sources as a four-storey bonded warehouse (Site 15) built in the same year that Wood produced his plan (Ramshaw 1997, 56; HER No.41052). Work on the canal began in 1820 (Ramshaw 1997, 12) and it was opened in 1823 (*op cit*, 25), reaching the sea at Port Carlisle. It was hoped that the canal would fill with water naturally, but at the Carlisle terminus additional water was required, which led to the cutting of the Willowholme leat (Site 20; also known as The Cut (HER No.10202)) in 1825. This leat fed water west from the River Caldew to a sixteen-foot overshot water wheel that in turn worked a pumping engine (Site 5), situated on the south bank of the River Eden, which raised water to the canal (*op cit*, 17-18). Initially the canal was successful, but competition from the railways, together with other factors, led to its decline and eventual closure in the early 1850s.

- 3.6.18 **Carlisle Board of Health plan, 1853**: the canal and canal basin, together with a timber dock (Site 3) constructed in 1838 immediately north of the basin (Ramshaw 1997, 17), and two bonded warehouses are shown on this map, which was produced by R Asquith in 1853 (Fig 8). The most southerly warehouse (Site 15), which was located at the south end of the canal basin, was built in 1821 (it appears on Wood's plan of that year) and was demolished in 1974 (Ramshaw 1997, 56); the other (Site 12) (HER No. 41015) was built in 1832 on the east side of the canal basin, on a site occupied in 1821 by six coal and lime vaults (Site 25). The plan also provides the earliest cartographic depiction of Willowholme leat (Site 20), and indicates that the whole of the northern part of Willowholme was 'land liable to be flooded'. The Carlisle and Newcastle railway, full opened in 1838, is shown looping south of the city to a terminus adjacent to the canal.
- 3.6.19 **OS First Edition map, 1865**: by the time the first edition OS map (Cumb. XXIII.3) was produced in 1865 (Figs 9), the disused canal basin (Site 6) had become the site of a coal depot and general railway yard (HER No.13502) for the Carlisle and Silloth section of the North British Railway, which had opened in 1854. The Canal Station (Site 11), situated at the junction of this railway with the Newcastle and Carlisle railway, was also located adjacent to the old canal basin, as was the Customs House (Site 10), built in 1832 (Ramshaw 1997, 69). The two bonded warehouses shown on the Board of Health map (Sites 12, 15) are also depicted. To the north-west, adjacent to the River Eden, was a bone manure works; this was constructed c 1832 above the pumping engine (Site 5) that was built to serve the canal in 1825. It was initially powered by that engine (*op cit*, 66), but a steam engine was inserted in 1839 (HER No.10202). This was subsequently removed in 1855 but the mill continued in use, using water power once again, until 1906. South-east of this facility was a varnish works (Site 4) situated immediately north of the junction of the Carlisle-Silloth and Carlisle-Edinburgh branches of the North British Railway. The Carlisle to Glasgow railway line (the modern west coast main line), opened in 1847, bisected Willowholme from north-west to south-east, and a branch from this line looped south-westwards to link with the North British Railway. Also depicted are the Alexandra Saw Mills (Site 16), situated north-east of the canal basin, which originated as a steam sawmill but continues in business today, and the Canal Saw Mills and timber yards (Site 14) south-west of the basin. The latter, situated on the east side of Infirmary Street, were in existence by 1836 (HER No.41019), but most of the buildings shown on the 1865 map had gone by the early twentieth century. West of Infirmary Street was the Cumberland Infirmary itself (Site 1), opened in 1832 and much extended subsequently. The original building, though altered later, still stands, as does Crozier Lodge (Site 13), a house situated north-west of the original infirmary building, that was converted to a House of Recovery during the nineteenth century and later became a fever hospital.
- 3.6.20 Adjacent to the west bank of the Little Caldew were a number of business premises, including an alabaster works (Site 18; also shown on the Board of Health plan, 1853) with a warehouse (Site 22; marked as a dyehouse on the Board of Health plan) to the north. Willowholme corn mill (Site 17) continued in use at the north end of the Little Caldew mill race (Site 19), and new streets

of terraced housing had also been laid out on the southern part of the study area, north of Church Street/Bridge Street.

3.6.21 Etterby Wath (Site 21) is also shown, and it seems clear from this map that Willow Holme Road (Site 24) made directly for the ford, albeit on a slightly meandering course. The road itself is shown terminating abruptly a little over 200m short of the river Eden, but what must be the line of the track is marked by a field boundary that runs directly from the end of the road to the wath. How long into the post-medieval period the ford continued to be used is not clear. Since Willow Holme Road did not extend as far as the ford in 1865, it may have gone out of use sometime before that date; in 1899 the wath is described by Ferguson (1899, 130-1) as being ‘dangerous and probably impracticable’, although it is still marked on the OS fourth edition map of 1846 (HER No.41754).

3.6.22 *OS second and third edition maps, 1899 and 1925*: further infilling continued to take place on the southern part of the study area, adjacent to Church Street/Bridge Street, during the late nineteenth and early twentieth centuries. A sewage disposal works (Site 26) was also built further north, on the site of the modern sewage plant, in 1908. Willowholme corn mill (Site 17) had gone by 1925 (Figs 10), as had the bone manure works (Site 5) beside the River Eden and most of the nineteenth century industries adjacent to the Little Caldew (Site 19). Other sites, however, such as the railway yards on the site of the canal basin, and Alexandra Saw Mills (Site 16), survived and had clearly continued to develop since the production of the first edition map some sixty years earlier.

3.7 PREVIOUS ARCHAEOLOGICAL INTERVENTIONS

3.7.1 The earliest recorded archaeological observations made in the Willowholme area occurred in 1854, when the stone rebuild of Hadrian’s Wall (Site 2) was seen during the construction of a sewer (Ferguson 1888, 168; Simpson 1932, 149). The Stone Wall was exposed again in three places in 1886; two of the exposures occurred close to the first site, in the angle formed by the main railway line from Carlisle to Glasgow and the branch line to Port Carlisle (*op cit*, 171-2), whilst the third was situated east of the main railway line. The levelled remains of the Wall were found to be sealed beneath *c* 2.44m of alluvial silt (*Section 3.3.7*). The sites of all four exposures were marked with inscribed stones (*op cit*, 174; Simpson 1932, 149). In 1932, a further stretch of the Stone Wall several metres in length was found close to the site of the original (1854) exposure during the construction of a new sewer (Simpson 1932). Here too, the Wall foundation was buried beneath a thick accumulation of river deposits (*Section 3.3.7*).

3.7.2 No further archaeological work was undertaken in the Willowholme area until 1988, when the Central Excavation Unit (CEU) excavated a trial trench 40m long and 2m wide across the presumed line of Hadrian’s Wall, on the site of a proposed tarmac batching plant at NY 338750 556460 (HER No.13662). A deposit of modern ash and clinker 0.5m deep was found to overlay clean alluvial sand and no trace of the Wall was found.

- 3.7.3 The most extensive archaeological excavation undertaken within the study area took place in 1992-3 on the site of the Cumberland Infirmary, south-west of Willowholme, in advance of the proposed redevelopment of the site. There, the remains of a prehistoric settlement of possible Bronze Age or Iron Age date (Site 7) (Sections 3.2.2 and 3.3.9), were overlain by extensive Romano-British occupation levels (Site 8). (Flynn and McCarthy 1993; McCarthy *et al* 1998, 4–5). Further phases of evaluation and excavation occurred on the same site in 1997-8.
- 3.7.4 On Willow Holme itself, a watching brief was maintained in 2005 during the erection of a telephone mast at a site adjacent to Willow Holme Road (Martin 2005), very close to the site where Hadrian's Wall was located in 1886 in the angle between the railway lines (Section 3.3.7). In spite of its location, however, the mast was found to have been sited on an artificial bank composed of modern overburden and rubbish up to 3m thick. No archaeological deposits were recorded. Similar deposits were also encountered during archaeological evaluations conducted elsewhere in the industrial estate in 2007, in connection with the Carlisle City Flood Alleviation Scheme. In the first phase of works, three trenches were excavated, one immediately beside the main West Coast railway line at the point where the railway bisects the line of Hadrian's Wall, the other two further to the south-west, next to the Parham Beck (The Archaeological Practice 2007a). In the former trench 1.5m of modern debris, possibly levelling material, was found to overlie a level that may have been associated with the old railway sidings. Since the Stone Wall in this area (Site 2) is known to lie *c* 2.44m below the level of the nineteenth century ground surface (Section 3.3.7), it was concluded that today the remains of the Wall are likely to lie at least 3.9m below ground. In the trenches next to Parham Beck, nineteenth century debris was removed to a depth of 1.55m below the modern surface, after which excavation ceased. The second phase of evaluation took place close to the north end of the Little Caldew (Site 19) (The Archaeological Practice 2007b). There, modern levelling debris and twentieth century alluvial deposits were found to overlie nineteenth century rubbish deposits that in turn sealed a possible stake-built fence adjacent to the south bank of the Willowholme leat (Site 20), which is known to have been cut in 1825 (Section 1.2.4). No earlier deposits were encountered.

4. WALKOVER SURVEY

4.1 INTRODUCTION

4.1.1 The walkover survey aimed to determine both the survival of above ground remains of sites recorded during the rapid desk-based assessment and also to identify previously unrecorded sites along the proposed pipeline route. The entire course of the pipeline was confined within the Willowholme Industrial estate. This resulted in several complications during the course of the survey. Firstly, the level of development in the area meant that surface visibility over much of the proposed route was very limited. Access was also limited, since many of the small industrial units or the allotment gardens were not accessible. However, a fairly good network of public footpaths exists within the industrial estate, thus allowing much of the course of the pipeline to be visible if not inspected on the ground.

4.2 RESULTS

4.2.1 In total, only two new sites were located, whilst the course of a third (Site **20**) was more accurately recorded during the course of the survey. The first lay along the northern edge of the playing field and formed the southern edge of the allotments as a low earthen bank aligned approximately east/west. This feature was thought to be a relict field boundary (Site **27**) and it is certainly comparable with a field boundary depicted on the First Edition OS map of 1865 (Fig 9). A further linear earthwork (Site **20**) was identified running along the northern edge of the allotments and marking the course of the Public Footpath. This bank, which extended for some 150m, was 3-5m wide and up to 1.5m high, was a surviving part of the Willowholme Leat (Fig 9) that was built in 1825 to provide the Carlisle Navigation Canal with additional water, sourced from the River Eden. Finally, part of the railway track bed (Site **28**) was seen to be preserved west of the course of the pipeline adjacent (east) of the north/south branch of the Public Footpath (see Fig 9). This was a branch line allowing railway access to the nearby timber yard.

5. SIGNIFICANCE OF THE REMAINS

5.1 INTRODUCTION

5.1.1 In total, 26 sites were identified within the study area during the desk-based assessment. A further two sites were identified during the walkover survey. Some 23 of these sites had been recorded in the CCCHER (Sites **1-2, 4-23, 26**), whilst the remaining three DBA sites were identified through the study of historical maps (Sites **3, 24, 25**). There is one prehistoric site (Site **7**) within the study area, and three of Roman date (Sites **2, 8, 9**), by far the most significant of these being the stone phase of Hadrian's Wall (Site **2**). No early or later medieval sites were identified; Etterby Wath (Site **21**) is first recorded in the medieval period but may have originated far earlier, and for this reason it is considered to be not closely dated. Willow Holme Road (Site **24**) is first recorded only in the post-medieval period, but spatial evidence suggests it may have originated as a track leading to the wath, and it therefore could conceivably be earlier. The Little Caldew mill-race (Site **19**), though likely to be of medieval origin, is also not closely dated. The remaining 19 sites are attributable to the post-medieval period (Sites **1, 3-6, 10-18, 20, 22-23, 25, 26-28**). As the proposed works consist of improvements to existing sewers and the construction of a new sewer run, consideration of the long-term visual impact of the scheme on the setting of archaeological and historic sites is not relevant to the present study.

5.1.2 There is one Scheduled Ancient Monument within the study area, namely Hadrian's Wall and the Vallum (SAM CU2819) (Site **2**). There are also two listed buildings within the study area, the original nineteenth century Cumberland Infirmary building (Site **1**) and the former fever hospital at Crozier Lodge (Site **13**). All of the sites are summarised in *Table 1* below.

Period	No of Sites	Sites
Prehistoric	1	7
Romano-British	3	2; 8; 9
Post-medieval	19	1; 3-6; 10-18; 20; 22-23; 25; 26, 27, 28
Not closely dated	3	19; 21; 24
Total	28	

Table 1: Chronological distribution of sites within the study area

5.1.3 Of the 28 sites identified within the study area, it is estimated that the proposed sewer improvement works have the potential to impact upon at least eight (Sites **2, 6, 19, 20, 24, 26-28**), and the proposed new sewer is likely to affect only two sites, namely Hadrian's Wall itself (Site **2**) and the 1908 sewage treatment works (Site **26**). Improvements to existing sewers have the potential to impact upon the Carlisle Navigation Canal basin (Site **6**), The Little Caldew mill-race (Site **19**), the Willowholme leat (Site **20**), Willow Holme Road itself (Site **24**), a relict field boundary (Site **27**) and part of a former railway track bed, which served the nearby saw mill (Site **28**). although the extent of any impact will be dependent upon the precise nature of the improvement works. In addition, it is thought possible that some of the sewers subject to proposed improvement could impact upon other sites associated with the canal basin, such as the Timber Dock (Site **3**), the Custom

House (Site **10**), the bonded warehouses (Sites **12**, **15**) and the coal and lime vaults (Site **25**).

5.2 CRITERIA

- 5.2.1 The archaeological and historic significance of the sites potentially affected by the proposed works (*Section 4.1.3*) was assessed using the criteria employed for scheduling ancient monuments, which are included as Annex 4 of Planning Policy Guidance Note 16 (Department of the Environment 1990). These are: Period, Rarity, Documentation, Group Value, Survival/Condition, Fragility/Vulnerability and Potential. The results of the assessment are detailed below.
- 5.2.2 **Period:** the only Roman site identified as at potential risk from the proposed development is Hadrian's Wall itself (Site **2**) and its associated features. The only potentially medieval site is the Little Caldew mill-race (Site **19**), although the track or lane running across Willowholme to Etterby Wath, which developed into Willow Holme Road (Site **24**) during the post-medieval period, could conceivably be medieval (or even earlier) in origin. All the other sites are post-medieval; most relate to the Carlisle Navigation Canal (Sites **3**, **6**, **10**, **12**, **15**, **20**, **25**, **27** and **28**), although the early twentieth century sewage treatment works (Site **26**) may also be affected.
- 5.2.3 **Rarity:** by far the most important monument within the study area is Hadrian's Wall (Site **2**), the unique significance of which is reflected in its World Heritage Site status and the statutory protection offered by its designation as a Scheduled Ancient Monument. Individually, none of the other sites can be regarded as being particularly rare nationally, although the structures associated with the Carlisle Navigation Canal in particular (Sites **3**, **6**, **10**, **12**, **15**, **20**, **25**) can be regarded as being of regional significance. Sites **20**, **27** and **28** are rare due to their survival.
- 5.2.4 **Documentation:** there are of course no contemporary documentary records pertaining to Hadrian's Wall (Site **2**). All the post-medieval monuments are depicted on contemporary maps and the majority are also recorded in contemporary documents.
- 5.2.5 **Group Value:** Hadrian's Wall and its associated features, whilst regarded as a single site for the purposes of the present study (Site **2**), do in fact represent a group of features that together have the potential to shed light on the origins and development of one of the most complex frontier systems of the Roman Empire. The post-medieval sites associated with the Carlisle Navigation Canal have considerable value as a group of monuments relating to the development and use of the canal basin during the nineteenth century.
- 5.2.6 **Survival/Condition:** where exposed during the nineteenth and earlier twentieth centuries, the stone phase of Hadrian's Wall (Site **2**) was found to have been levelled virtually to its foundation course in the Willowholme area. The present condition of the below-ground remains of the sites associated with the canal (Sites **3**, **6**, **10**, **12**, **15**, **25**) is not known. The Little Caldew mill-race (Site **19**) and the Willowholme leat (Site **20**) survive as watercourses

to the present day. Part of the railway track bed (Site **28**) and the relict field boundary (**27**) are rare survivals of upstanding features within the modern industrial landscape.

5.2.7 **Fragility/Vulnerability:** during the late nineteenth and earlier twentieth centuries, the foundation for the stone phase of Hadrian's Wall (Site **2**) was found to be buried beneath 2.44m of alluvial silt in the Willowholme area (Section 3.3.7). Limited archaeological fieldwork undertaken in recent years suggests that rubbish dumping and levelling in the nineteenth and twentieth centuries may have increased the depth of overburden in some areas to almost 4m (Section 3.7.4). In these areas, only the very deepest modern intrusions are likely to impact upon the remains of the Wall, although it cannot necessarily be assumed that the whole length of the Wall within the study area is protected by a similar depth of material. Since the Vallum, Turf Wall and other associated features have not been seen at Willowholme their condition, and the depth to which they lie buried beneath the modern ground surface, are not known. For the most part, the potential vulnerability of the other sites cannot be determined, in view of the lack of data pertaining to their condition and the depth to which their remains lie buried. For the most part, it might be expected that the remains of the sites associated with the canal are especially vulnerable to disturbance, since they are likely to lie at a relatively shallow depth below the present ground surface. The development of Willowholme Industrial Estate in recent years, together with earlier works, is likely to have caused damage or disturbance to at least some of these sites, but the impact on the buried remains cannot presently be determined. The survival of Sites **20**, **27** and **28** are all fragile and vulnerable to the depredations of modern development since they only exist in an incomplete form.

5.2.8 **Potential:** the greatest potential for unknown sites in the Willowholme area is with regard to features associated with Hadrian's Wall (Site **2**), such as the Vallum, the Military Way, the Wall Ditch and the Turf Wall, all of which must cross the area but have never been observed. In view of the low-lying nature of Willowholme and its susceptibility to flooding, it seems likely that little human activity, with the exception of animal pasturing and, possibly, activities associated with drainage, occurred there at any time from prehistory to the early post-medieval period. It would therefore seem that there is little potential for the discovery of new sites, other than those associated with Hadrian's Wall or the occasional stray artefact. For the later post-medieval period, it is probable that most sites of archaeological or historic interest appear on maps and plans of the area, and that few new sites await discovery.

5.3 SIGNIFICANCE

5.3.1 Table 2 summarises the levels of significance attributed to generic site-types, together with guideline recommendations for appropriate mitigation strategies in each case.

Significance	Examples of Site-type	Mitigation
National	Scheduled Monuments (SMs), Grade I and II* Listed Buildings	To be avoided

Significance	Examples of Site-type	Mitigation
Regional/County	Conservation Areas, Registered Parks and Gardens (Statutory Designated Sites), Grade II Listed Buildings, sites recorded in the County HER	Avoidance recommended
Local/Borough	Sites with a local or borough value or interest for cultural appreciation Sites so badly damaged that too little remains to justify inclusion into a higher grade	Avoidance not envisaged
Low Local	Sites with a low local value or interest for cultural appreciation Sites so badly damaged that too little remains to justify inclusion into a higher grade	Avoidance not envisaged
Negligible	Sites or features with no significant value or interest	Avoidance unnecessary

Table 2: Summary of significance according to site-type and appropriate mitigation

5.3.2 The national and international significance of Hadrian's Wall and its associated features (Site 2) is reflected in its designation both as a World Heritage Site and a Scheduled Ancient Monument. In addition to the Wall, 22 other sites within the study area (Sites 1, 4-23, 26) have been included in the Cumbria HER, which suggests a regional or county-level significance. A further two sites have been assessed as being of local/borough significance (Sites 3, 25), and three of low local significance (Sites 24, 27 and 28). This assessment is based on the current state of knowledge; the subsequent discovery of additional features or evidence relating to these sites could alter their assessed levels of significance.

6. IMPACT ASSESSMENT

6.1 IMPACT

6.1.1 Planning Policy Guidance Note 16 advises that archaeological remains are a continually diminishing resource and ‘*should be seen as finite, and non-renewable resource, in many cases, highly fragile and vulnerable to destruction. Appropriate management is therefore essential to ensure that they survive in good condition. In particular, care must be taken to ensure that archaeological remains are not needlessly or thoughtlessly destroyed*’ (Department of the Environment 1990). It has been the intention of this study to identify the archaeological potential of the study area, and to assess the impact of the proposed development, thus allowing the advice of the DoE to be enacted upon. Assessment of impact has been achieved by the following methods:

- assessing any potential impact and the significance of the effects arising from redevelopment;
- reviewing the evidence for past impacts that may have affected sites of archaeological interest;
- outlining suitable mitigation measures, where possible at this stage, to avoid, reduce or remedy adverse impacts on sites of archaeological significance.

Scale of Impact	Description
Substantial	Significant change in environmental factors; Complete destruction of the site or feature; Change to the site or feature resulting in a fundamental change in ability to understand and appreciate the resource and its cultural heritage or archaeological value/historical context and setting.
Moderate	Significant change in environmental factors; Change to the site or feature resulting in a significant change in ability to understand and appreciate the resource and its cultural heritage or archaeological value/historical context and setting.
Slight	Change to the site or feature resulting in a small change in our ability to understand and appreciate the resource and its cultural heritage or archaeological value/historical context and setting.
Negligible	Negligible change or no material changes to the site or feature. No real change in our ability to understand and appreciate the resource and its cultural heritage or archaeological value/historical context and setting.

Table 3: Criteria used to determine scale of impact

6.1.2 The impact is assessed in terms of the sensitivity or importance of the site to the magnitude of change or potential scale of impact during future redevelopment scheme. The magnitude, or scale of an impact is often difficult to define, but will be termed as substantial, moderate slight, or negligible, as shown in Table 3.

6.1.3 The interaction of the scale of impact (Table 3) and the importance of the archaeological site (Table 2) produce the impact significance. This may be calculated by using the matrix shown in Table 4.

Resource Value (Importance)	Scale of Impact Upon Archaeological Site			
	<i>Substantial</i>	<i>Moderate</i>	<i>Slight</i>	<i>Negligible</i>
National	Major	Major	Intermediate/ Minor	Neutral
Regional/County	Major	Major/ Intermediate	Minor	Neutral
Local/Borough	Intermediate	Intermediate	Minor	Neutral
Low local	Intermediate / Minor	Minor	Minor/ Neutral	Neutral
Negligible	Neutral	Neutral	Neutral	Neutral

Table 4: Impact significance matrix

6.1.4 The extent of previous disturbance to buried archaeological levels is an important factor within the assessment of archaeological significance. Unfortunately, in most cases the level of previous disturbance to those sites that are potentially affected by the proposed sewer improvement works has proved extremely difficult to assess, due to the lack of archaeological work in the Willowholme area (*Section 3.7*). The stone phase of Hadrian's Wall (Site **2**) is known to have been robbed of its stone virtually to foundation level, at least in those places where it has been observed, although it cannot necessarily be presumed that a similar degree of robbing occurred along its entire length within the study area. The fact that the Wall foundation was buried beneath 2.44m of alluvial silt (*Section 3.3.7*) suggests that the robbing took place long ago, perhaps during the medieval period if not before. Deposition of rubbish and levelling deposits in some parts of Willowholme in modern times may have buried the Wall beneath an even greater depth of material, so that its remains, in some places at least, may now lie up to 4m below ground, well beyond the reach of all but the deepest modern intrusions. It is possible that the Vallum, Turf Wall and other features associated with the Wall lie similarly deeply buried, but this has not been demonstrated archaeologically and the precise location of these features is not known. The extent to which the below-ground remains of sites associated with the Carlisle Navigation Canal (Sites **3, 6, 10, 12, 15, 25**) have been damaged by subsequent works, particularly those associated with the construction and development of the railways and the development of the modern industrial estate, is not known, although it seems highly probable that some disturbance has occurred, in view of the likely shallow depth to which these remains lie buried. The Little Caldew mill-race (Site **19**), and Willowholme leat (Site **20**) survive as watercourses to the present day, whilst Sites **27** and **28** survive as upstanding features within the landscape of the Willowholme Industrial Estate.

6.1.5 Following on from the above considerations, the scale of impact on the present condition of those sites potentially affected by the sewer improvement works has been determined, based on the present understanding of the nature of the proposed development. The results are summarised in *Table 5*, although these would require review should there be any changes to the proposed works.

Site	Name/Type	Nature of Impact	Significance	Scale of Impact	Impact Significance
2	Hadrian's Wall and associated features	Disturbance by groundworks	National	Moderate	Major
3	Timber dock, canal basin	Disturbance by groundworks	Regional/County	Negligible	Neutral
6	Canal basin, Carlisle Navigation Canal	Disturbance by groundworks	Regional/County	Moderate	Major/Intermediate
10	Custom House, canal basin	Disturbance by groundworks	Regional/County	Negligible	Neutral
12	Bonded warehouse, canal basin	Disturbance by groundworks	Regional/County	Negligible	Neutral
15	Bonded warehouse, canal basin	Disturbance by groundworks	Regional/County	Negligible	Neutral
19	Little Caldew mill-race	Disturbance by groundworks	Regional/County	Negligible	Neutral
20	Willowholme leat	Disturbance by groundworks	Regional/County	Negligible	Neutral
24	Willow Holme Road	Disturbance by groundworks	Low local	Slight	Minor/Neutral
25	Coal and lime vaults, canal basin	Disturbance by groundworks	Regional/County	Negligible	Neutral
26	Sewage treatment works	Disturbance by groundworks	Low local	Slight	Minor/Neutral
27	Relict field boundary	Disturbance by groundworks	Low local	Slight	Minor/Neutral
28	Railway track bed	Disturbance by groundworks	Low local	Slight	Minor/Neutral

Table 5: Assessment of the impact significance on sites potentially affected by the proposed development

6.2 CONCLUSIONS

6.2.1 Construction of the proposed new sewer may have the potential to impact upon two of the sites identified within the study area, the 1908 sewage treatment works (Site 26) and Hadrian's Wall itself (Site 2). The latter represents by far the most archaeologically significant monument known from the Willowholme area, being designated both as a World Heritage Site and a Scheduled Ancient Monument. The proposed sewer does not cross the line of the Stone Wall itself, nor does it extend into the scheduled area, but it seems highly likely that it will cross the line of the Vallum on the south side of the Wall, and could conceivably also impact upon the Turf Wall and the Military Way, both of which should be situated somewhere in the vicinity of the Stone Wall. It should, however, be noted that the precise locations of the Vallum, Turf Wall and Military Way are not known at Willowholme. The degree to which the sewer may impact upon the Vallum and other putative features associated with Hadrian's Wall will be in large part dependent upon the depth of the sewer trench and the depth to which sensitive archaeological remains lie buried beneath the modern ground surface. These issues will be addressed by the field evaluation that forms the third element of the current project.

6.2.2 The proposed improvements to existing sewers have the potential to impact upon at least seven of the sites within the study area (Sites 2, 6, 19, 20, 24, 27 and 28), although the extent of such impact will be dependent upon the

precise nature of the improvement works. The stone phase of Hadrian's Wall (Site **2**) is crossed by existing sewers in three places; several other sewers run broadly north to south across the industrial estate, and may therefore cross the line of other features associated with the Wall, such as the Vallum, the Military Way and perhaps even the turf phase of the Wall itself. At least one existing sewer crosses the site of the canal basin (Site **6**) and could conceivably impact upon other sites associated with the canal (for example, Sites **3, 10, 12, 15, 25**). Other sewers cross the Little Caldew mill-race (Site **19**), Willowholme leat (Site **20**), Willow Holme Road itself (Site **24**), a relict field boundary (Site **27**) and a former railway track bed (Site **28**).

7. EVALUATION RESULTS

7.1 INTRODUCTION

7.1.1 An evaluation of the Wastewater Treatment Plant at Willowholme, Carlisle was undertaken in order to ascertain if the proposed scheme of sewage refurbishment would have any impact on significant archaeological deposits, particularly the Vallum and military way associated with Hadrian's Wall. Subsequently, two evaluation trenches were excavated at the site (Fig 11) and the results of these interventions are outlined below.

7.2 TRENCH ONE

7.2.1 Trench One (Plate 4) was excavated within the lawned area that lies to the east of the office buildings at the treatment plant, and adjacent to the main gate. The trench measured 4.2m long, 2.7m wide and 1.2m deep, was aligned north-east/south-west, and was excavated by mini-digger using a ditching bucket. Beneath the mid-brown, coarse-grained, clay-silt topsoil (**101**) (0.18m deep) there was a layer of lighter reddish-brown, clayey-silt (**102**) (0.18- 0.5m deep), that contained few inclusions. The deepest layer of the trench comprised a light reddish-brown compacted clay-silt deposit with tarred gravel inclusions (**103**). From the mixture of unstratified post-medieval pottery, glass and miscellanea, it was evident that these underlying layers were redeposited following the laying of earlier sewage pipes, a fact that was confirmed by United Utilities personnel (Caroline Brumwell pers comm).

7.3 TRENCH TWO

7.3.1 Trench Two (Plate 5) was excavated on the lay-by of Willow Holme Road outside the main gate of the treatment plant. In light of its proximity to a public highway, the confined area in which to safely deposit spoil, the presence of man-hole covers, and the propinquity of several service cables, the position and extent of the trench was amended to that which was specified in the project design.

7.3.2 The trench was similarly excavated by mini-digger using a ditching bucket, following the removal of the top tarmac layer (**201**) using a circular saw, pecker and toothed bucket. It was excavated to 5m long, 1.65m wide and to a maximum depth of 1.4m, and was broadly aligned north/south. Beneath the modern, greyish-black tarmac (**201**) (0.11m deep), there was a make-up layer of moderately-sorted, coarse-grained, greyish-black, sandy gravel (**202**) (0.39m deep), which in turn overlay a compact, mid reddish-brown silt-clay (**203**). In the east section of the trench, there was a coarse-grained, dark greyish-black layer of clayey-silt with charcoal and coal (**204**). This appeared to be the fill of a cut [**206**] through (**203**), which was only visible in this section, suggesting it may have been cut as a refuse pit or similar. Certainly, the miscellaneous finds encountered were of twentieth century provenance only. At the south end of the trench, there was a pile of red brick and red sandstone fragments (**205**) that measured 1.25m by 0.6m. Despite its apparent dog-leg shape, it appeared to be little more than a dumping layer

within (203) rather than the corner foundation of a structure. No full bricks were present, nor was any mortar or regular coursing visible, which would also exclude the possibility of it being either a collapsed or partially-collapsed structure. At the base of the north end of the trench, there was a further deposit (207), which again appeared to cut [208] through (203). This was very similar to (204), although there was a markedly greater clay consistency.

- 7.3.3 As was the case with Trench One, the finds recovered were a mixture of materials that dated to the post-medieval period, with a significant proportion of these relating to the twentieth century. As the trench also lay on the route of a previous sewage pipeline, its potential for archaeology was always limited at best.

7.4 DISCUSSION

- 7.4.1 In both instances, the trenches were not located in the most propitious of locations, as far as the uncovering of significant remains was concerned. Both of the trenches overlay earlier sewage pipelines, so there was a high probability that the below ground deposits would show evidence of disturbance, which proved to be the case. Additionally, the finds encountered seemed to be a mixture of post-medieval pottery and glass, with particular emphasis on the twentieth century.

8. DISCUSSION

8.1 INTRODUCTION

8.1.1 The proposed refurbishment scheme lies to the south of the line of Hadrian's Wall and the sewage works extend partly into its scheduled area, whilst the entire development site lies wholly within the Visual Impact Zone of the Hadrian's Wall World Heritage Site. Subsequently, the entire area is clearly of extremely high archaeological significance, and this has necessitated this programme of desk-based assessment, walkover survey and evaluation.

8.2 CONCLUSION

8.2.1 The desk-based assessment indicated that the greatest threat to archaeological deposits posed by the proposed works is potential damage or disturbance caused by the proposed new sewer to the Vallum and the Military Way, which lie to the south of the stone phase of Hadrian's Wall. These features must cross the proposed development area, although their precise positions are not known. Similarly, although the line of the turf phase of Hadrian's Wall is not known within the Willowholme area, this feature must also cross the site, so it too could be affected by the proposed new sewer. The line of the Stone Wall itself is crossed by three existing sewers that are recommended for improvement, and the potential therefore exists for disturbance in these areas, dependent upon the precise nature of the proposed works.

8.2.2 Several other sites of post-medieval date may also be affected by the sewer improvements. The desk-based assessment in conjunction with the walkover survey has highlighted three features in particular. It is likely that the segment of the Willowholme Leat (20), and a relict field boundary (27), will be affected by the construction of the pipeline, whilst the former railway track bed serving the Alexandra Steam Saw Mills (28), will be affected if the course of the pipeline deviates from its intended course.

8.2.3 The evaluation trenches that were excavated along the line of the new sewer at the Wastewater Treatment Plant at Willowholme, Carlisle, encountered made ground and services, and despite the results of the desk-based assessment no archaeology was observed. The dominant presence of twentieth century pottery and glass amongst the finds uncovered, affirmed that the deposits were makeup layers overlying the existing sewage system.

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10.2 LIST OF PLATES

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Plate 4: General view of Trench One, facing south-west

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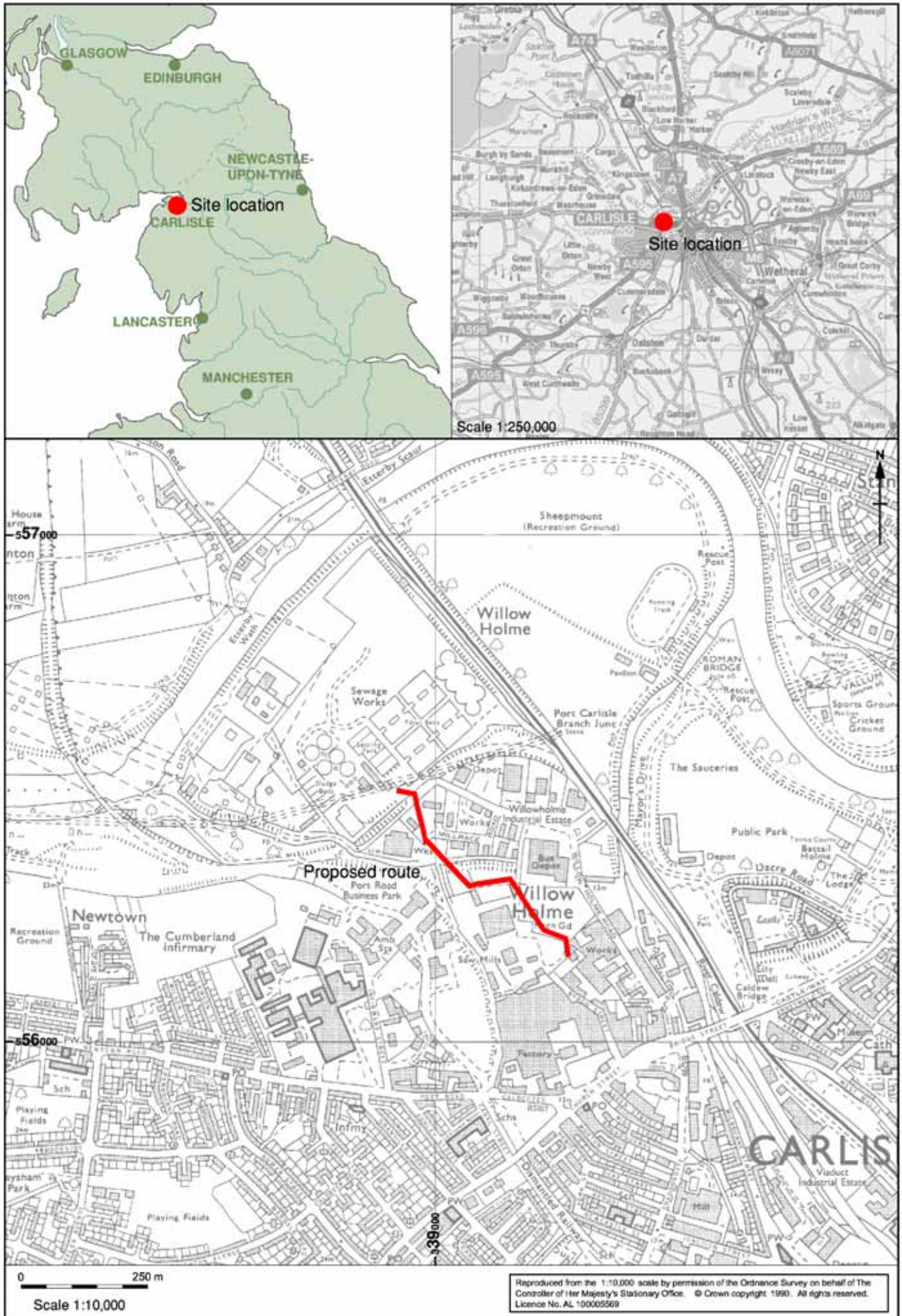
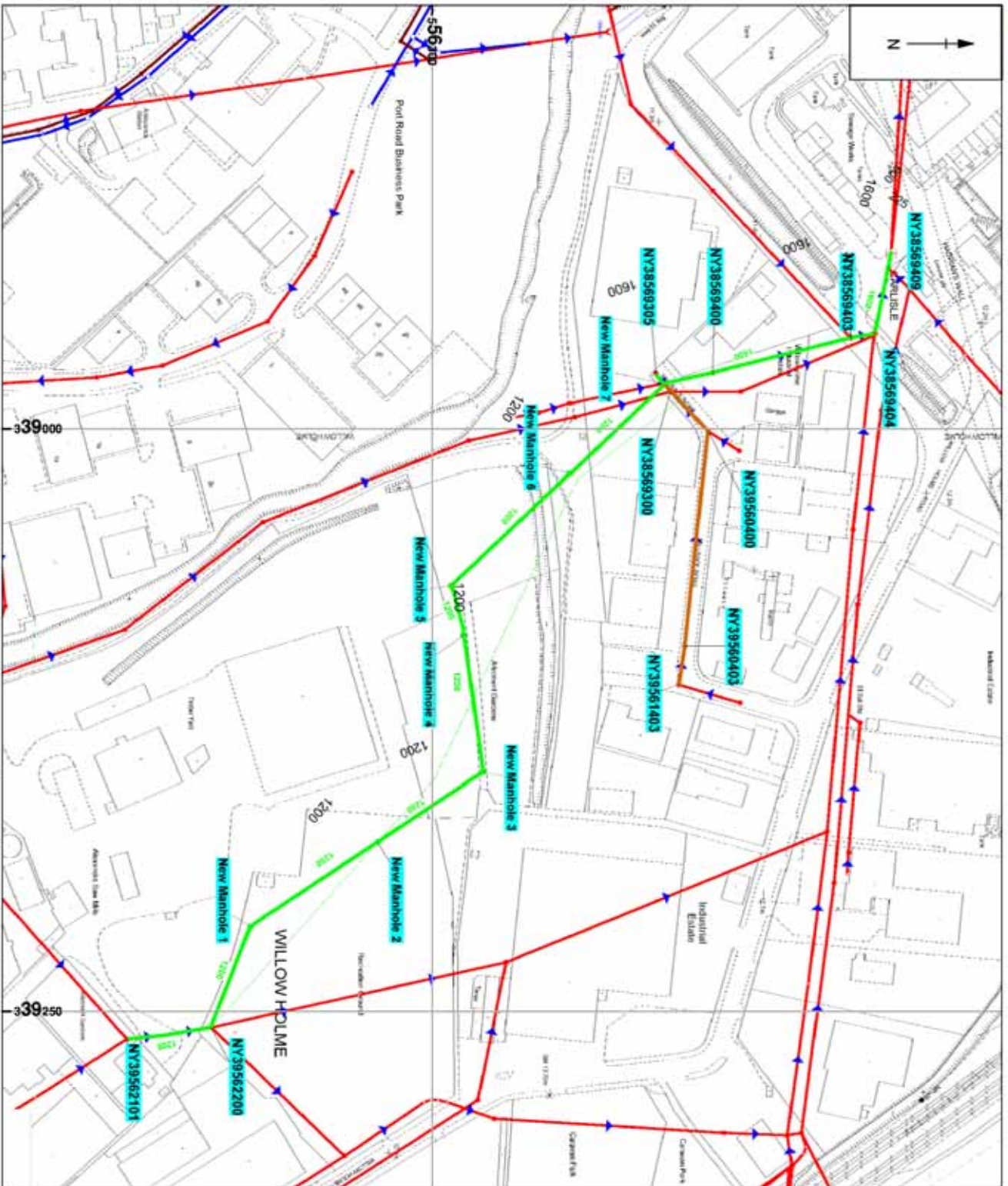


Figure 1: Site Location



Key:

- Proposed Sewer Improvements to resolve McVities area problems
- Alternative Tunneling Option (consider as back up only)
- Proposed Sewer Improvements to resolve Millrace Road Industrial Estate problems

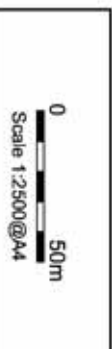


Figure 2: Location of proposed sewer improvement works

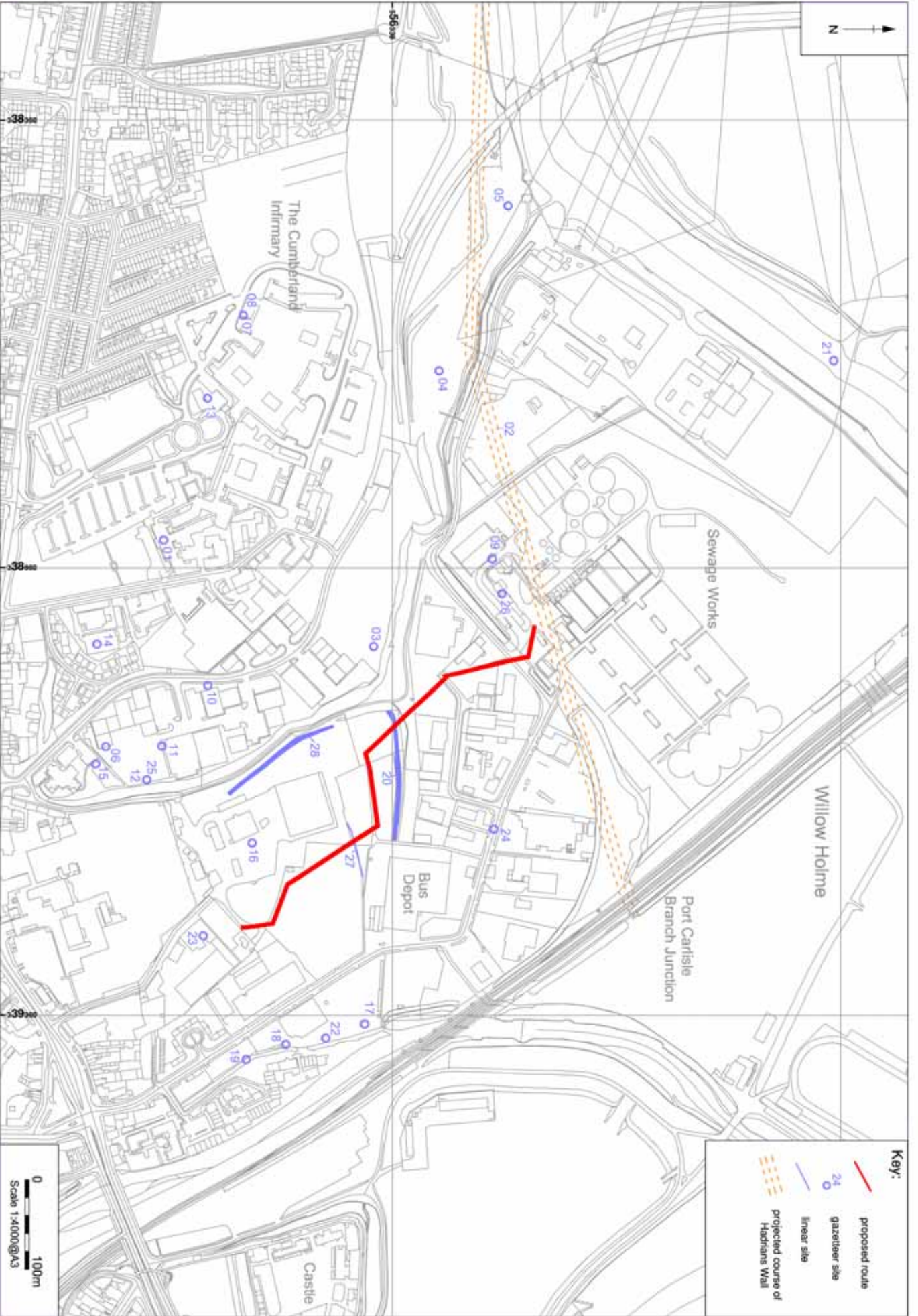


Figure 3: Location of gazetteer sites



Figure 4: Hadrian's Wall exposed at Willow Holme

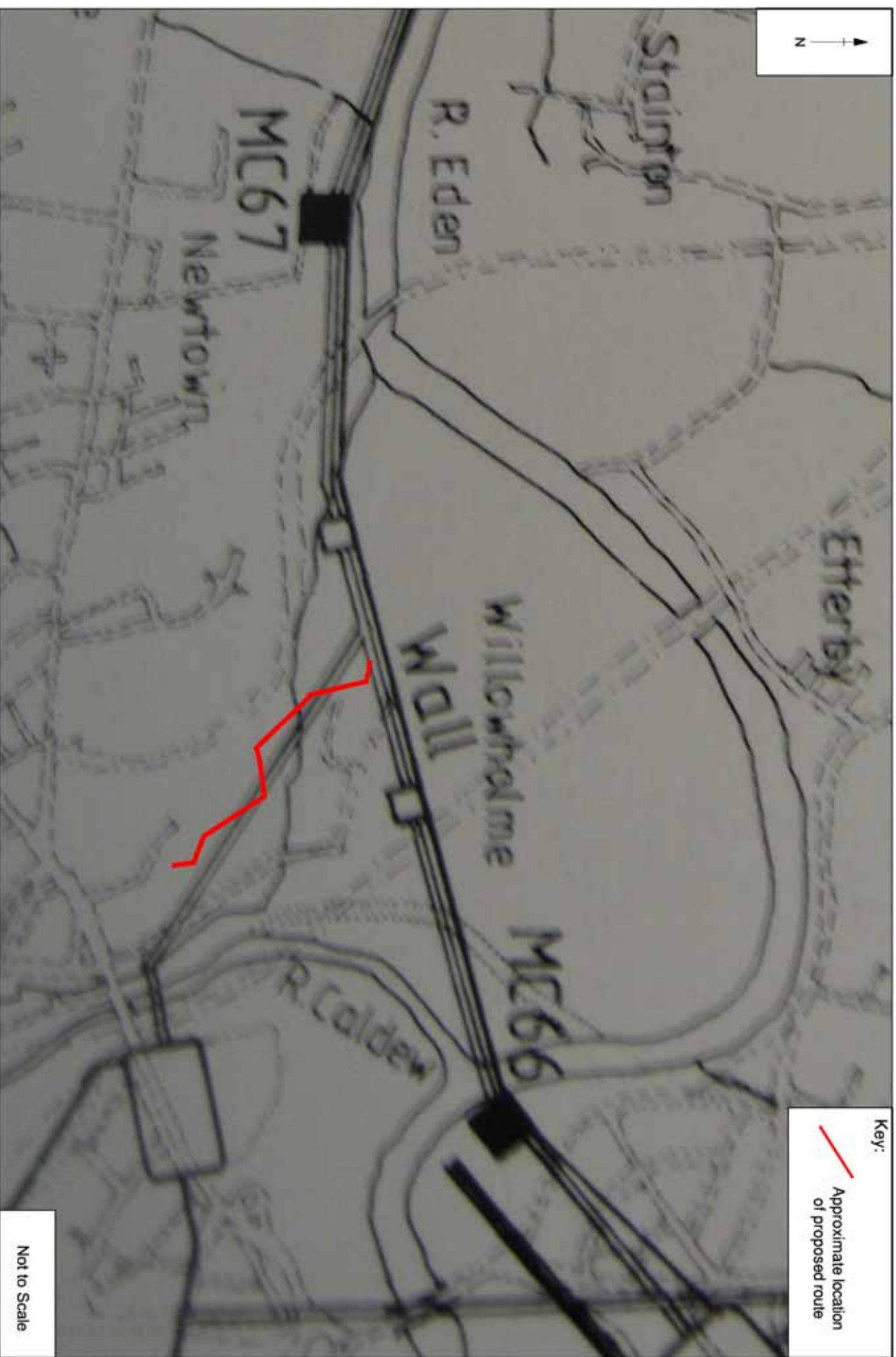


Figure 5: Estimated position of Hadrian's Wall Turrets 65a and 65b at Willow Holme

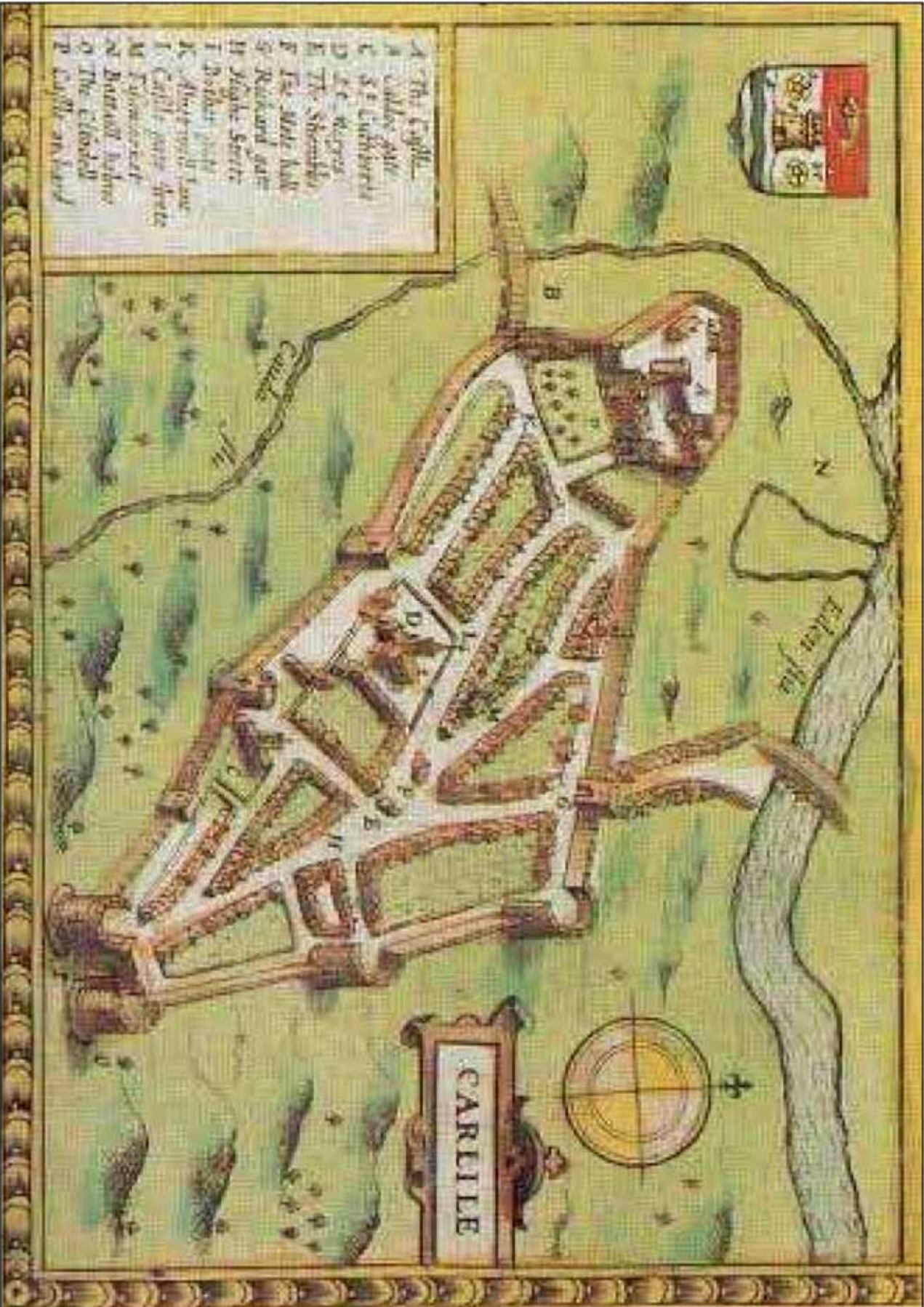


Figure 6: John Speed's map of Carlisle, 1610

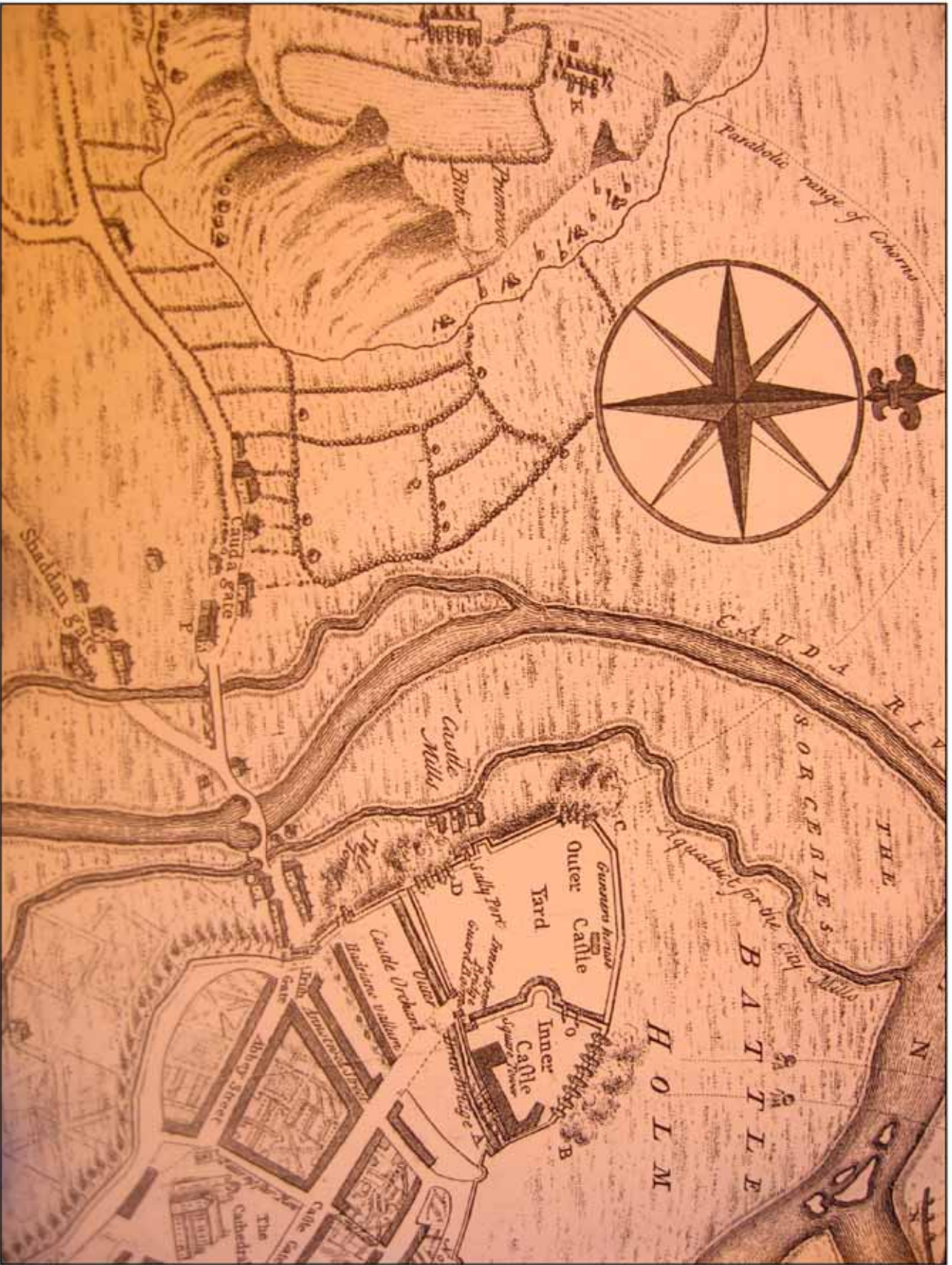
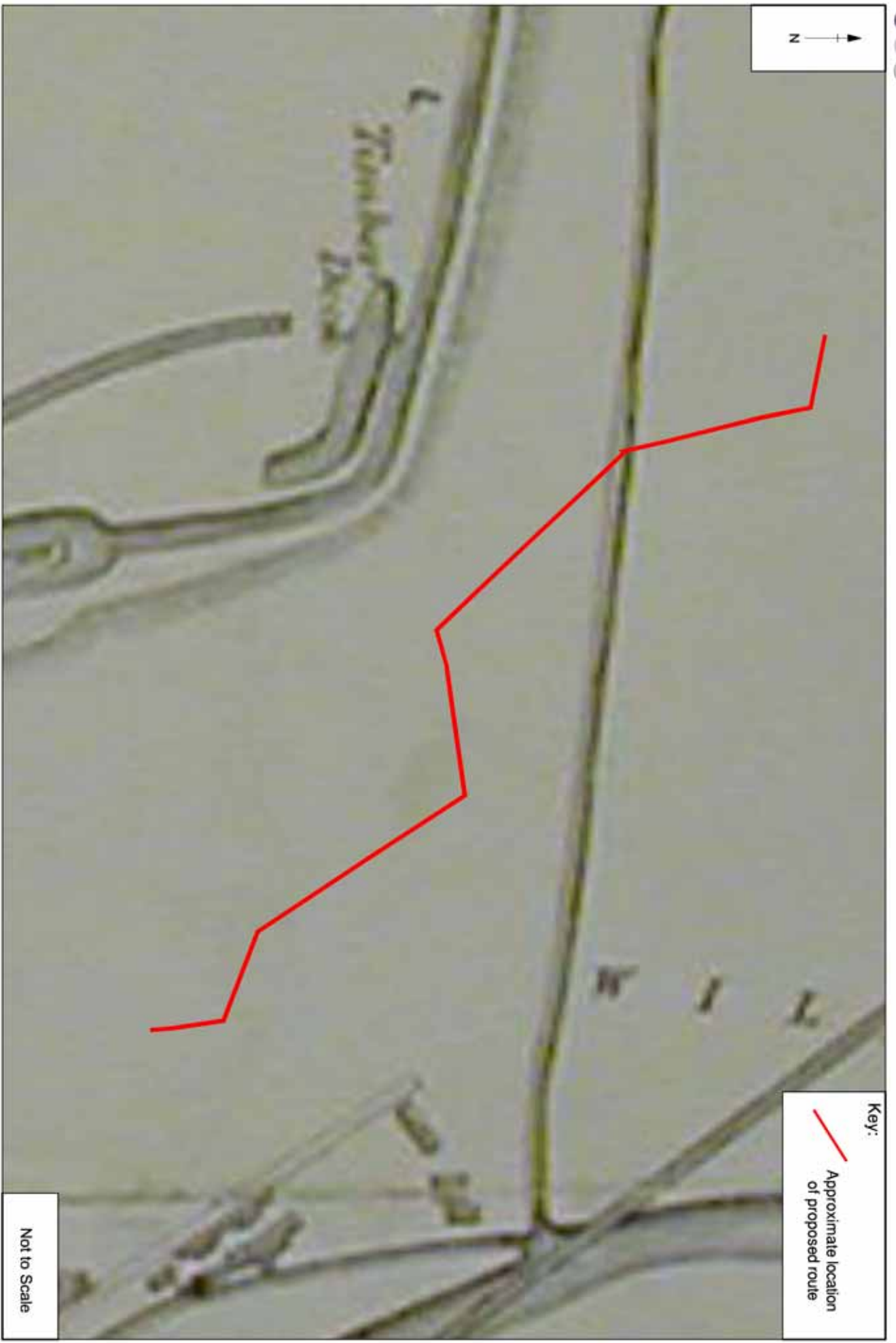



Figure 7: Detail from George Smith's plan, 1746



Key:

 Approximate location of proposed route

Not to Scale

Figure 8: The Carlsle Board of Health plan, 1853

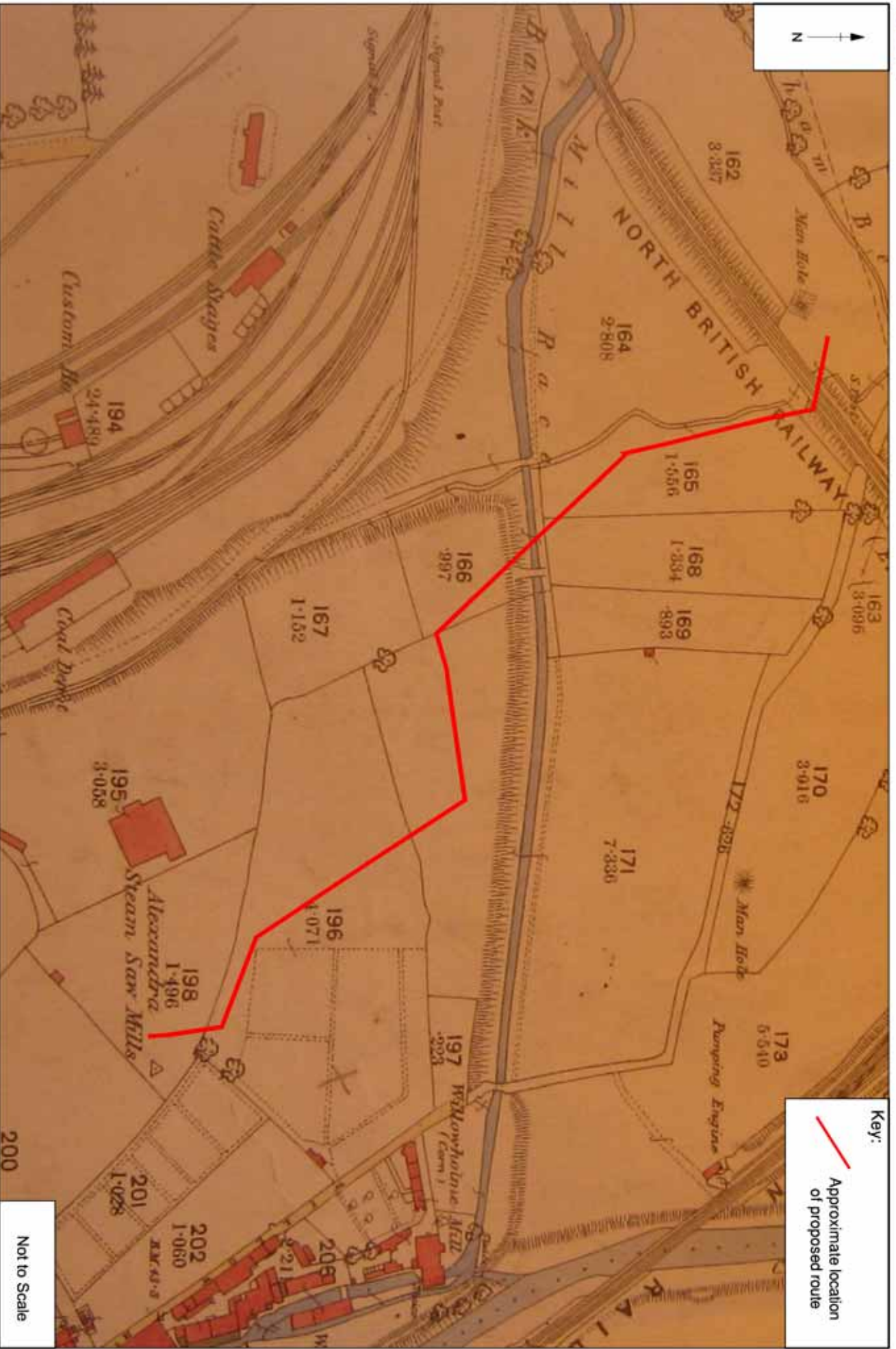
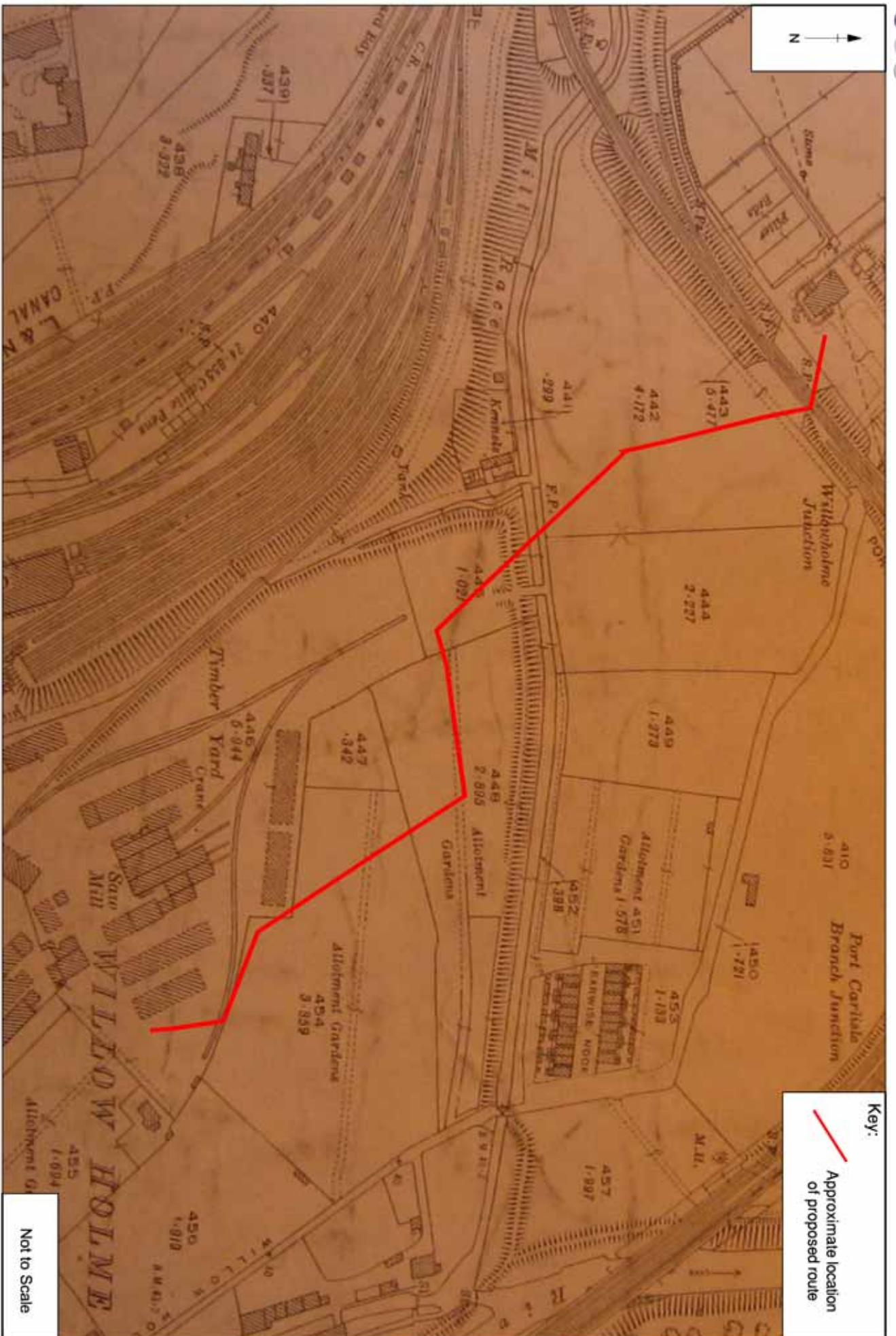


Figure 9: Detail from OS First Edition map of 1865



Key:
— Approximate location
of proposed route

Not to Scale

Figure 10: Detail from OS map of 1925

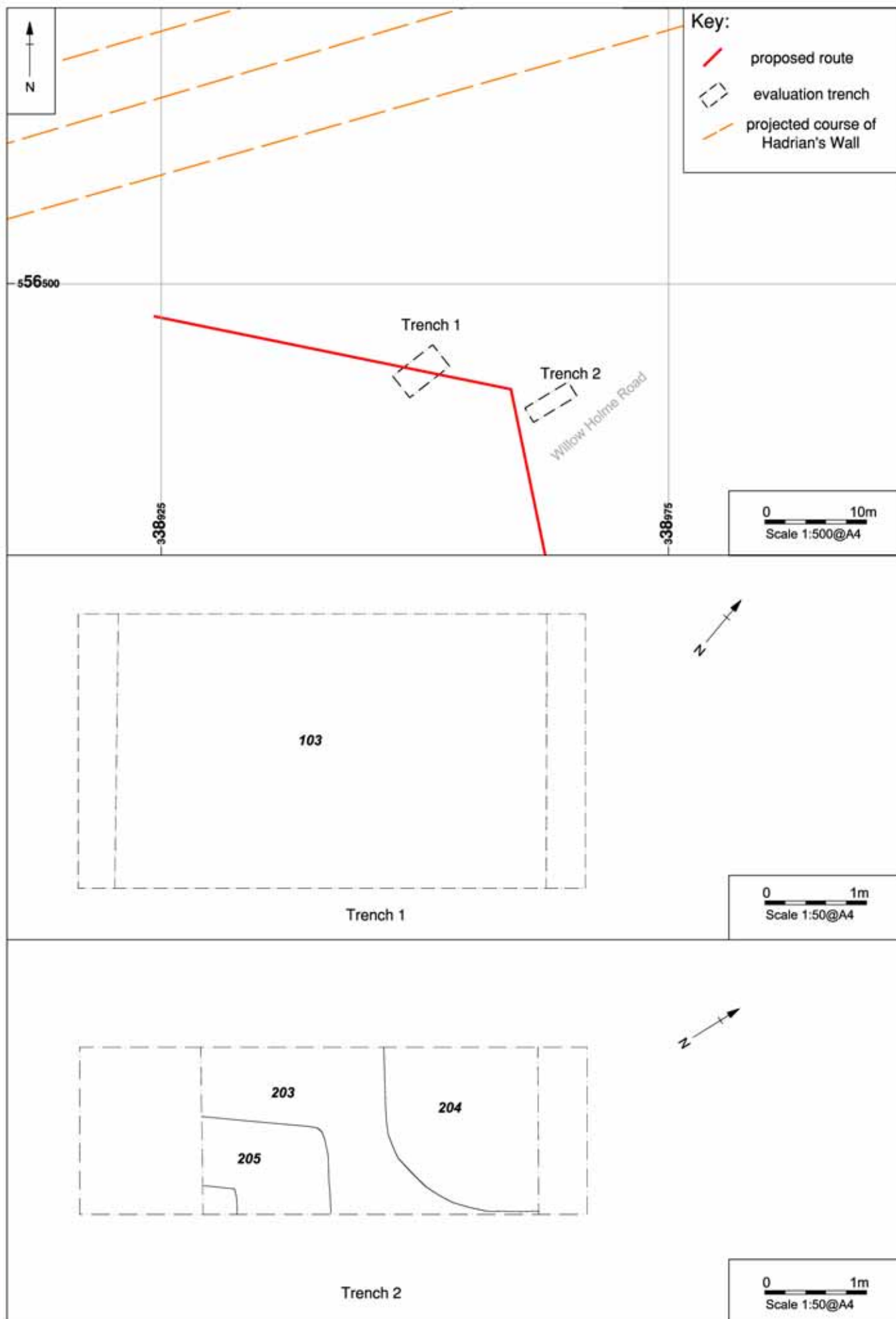


Figure 11: Evaluation trench plan



Plate 1: The route of the pipeline through the recreation field, viewed toward the north-west.



Plate 2: The route of the pipeline through the allotment gardens, viewed toward the west



Plate 3: The disused railway line (Site **28**) which once served the saw mills (Site **16**)



Plate 4: General view of Trench One, facing south-west



Plate 5: General view of Trench Two, facing south

APPENDIX 1: PROJECT DESIGN

APPENDIX 2: SITE GAZETTEER

Site Name Cumberland Infirmary
Site Number **01**
NGR NY 38829 56083
SMR No 25653
Site Type Hospital
Period Post-medieval
Source Cumbria HER; OS 1865

Description

Hospital, 1830-2, with early twentieth century alterations and additions. Limestone/sandstone ashlar on chamfered plinth. Graduated greenslate roof. Originally two storeys with basement, 11 bays, third storey added in 1933. Interior extensively altered. Grade II* Listed.

Assessment

The site lies outside the proposed development area and will not be affected

Site Name Hadrian's Wall and Vallum
Site Number **02**
NGR NY 38706 56449
SMR No **5782**; SM CU28196
Site Type Frontier works
Period Roman
Source Ferguson 1888; Simpson 1932; Breeze 2006

Description

Hadrian's Wall (stone phase) and Vallum in the Willowholme area. Observed in 1854, 1886 and 1932. Found to be 2.36m wide (on a 2.69m foundation) and to have been robbed virtually to the level of its sandstone flagged foundation. The remains were buried by up to 2.44m of alluvial silt. No trace of the Vallum, Military Way, Wall Ditch or the Turf Wall have been recorded in the Willowholme area, though all these features very probably cross the study area. On the Stone Wall, Turrets 66a and 66b should be located at Willowholme but have not been located. Hadrian's Wall is designated as a World Heritage Site and a Scheduled Ancient Monument.

Assessment

The site is crossed by the proposed new sewer and some of the existing sewers ear-marked for improvement, and may therefore be affected by the development

Site Name Timber Dock
Site Number **03**
NGR NY 38948 56317
SMR No -
Site Type Canal dock
Period Post-medieval
Source Asquith 1853; Ramshaw 1997

Description

The site of a timber dock, built in 1838 to the north of the basin of the Carlisle Navigation canal.

Assessment

The site lies close to the proposed development and may be affected

Site Name Willowholme Varnish Works
Site Number **04**
NGR NY 38640 56390
SMR No 10201
Site Type Varnish Works
Period Post-medieval
Source OS 1865

Description

The site of a varnish works depicted on the OS First Edition map of 1865.

Assessment

The site lies outside the proposed development area and is unlikely to be affected

Site Name Newton Engine House/Bone Manure Works
Site Number **05**
NGR NY 38436 56484
SMR No 10202
Site Type Engine House/Bone Manure Works
Period Post-medieval
Source OS 1865; Ramshaw 1997

Description

The Newton Engine House was built in 1824 to supply water to the Carlisle Navigation Canal. A bone manure mill, powered by the engine, was built above it in 1832. Originally powered by a water wheel, a steam engine was installed in 1839 but removed again and sold in 1855, when the canal closed. The mill continued in use, again powered by water, until 1906, and survives today as a ruin.

Assessment

The site lies outside the proposed development area and is unlikely to be affected

Site Name Canal Basin, Carlisle Navigation Canal
Site Number **06**
NGR NY 39060 56020
SMR No 13502
Site Type Canal basin
Period Post-medieval
Source Wood 1821; Asquith 1853; Ramshaw 1997

Description

The basin at the Carlisle terminus of the Carlisle Navigation Canal, which opened in March 1832 and closed in 1853, when it was infilled and turned into a coal store and general railway yard for the North British Railway.

Assessment

The site lies close to the proposed development and may be affected

Site Name Prehistoric Settlement, Cumberland Infirmary
Site Number **07**
NGR NY 38550 56150
SMR No 15239
Site Type Settlement
Period Prehistoric
Source Flynn and McCarthy 1993; McCarthy *et al* 1998

Description

Remains of a prehistoric settlement excavated at the Cumberland Infirmary in 1992-3, with further work in 1997-8. The principal discovery comprised the remains of five roundhouses. Date uncertain, but presumably either Bronze Age or Iron Age. A few flint flakes were recovered from the site as a whole, but these were not necessarily associated with the excavated structures. The prehistoric settlement was superseded by a Romano-British settlement (Site **08**) on the same site, but it is not clear if occupation was continuous or if a break occurred between the two episodes.

Assessment

The site lies outside the proposed development area and will not be affected

Site Name Romano-British settlement, Cumberland Infirmary
Site Number **08**
NGR NY 38578 56172
SMR No 15239
Site Type Settlement
Period Roman
Source Flynn and McCarthy 1993; McCarthy *et al* 1998

Description

Part of a Roman-British rural settlement was excavated at the Cumberland Infirmary in 1992-3, with further work in 1997-8. The remains included rectilinear timber buildings and cobbled external surfaces associated with two phases of enclosure, the first palisaded the second ditched. The *floruit* of the settlement, which occupied the same site as a prehistoric settlement (Site 07) was the late first-second centuries AD.

Assessment

The site lies outside the proposed development area and will not be affected

Site Name Samian pottery findspot
Site Number 09
NGR NY 38850 56450
SMR No 17963
Site Type Findspot
Period Roman
Source HER

Description

A small, extremely thin fragment of decorated samian ware was found at Willowholme in 1976-7, allegedly from a hole on the south-west edge of the sewage works, close to the line of Hadrian's Wall. Tullie House Museum Accession No.125-1983.3.

Assessment

The site lies close to the proposed development area but is unlikely to be affected

Site Name Custom House
Site Number 10
NGR NY 38992 56132
SMR No 41006
Site Type Custom House
Period Post-medieval
Source OS 1865; Ramshaw 1997

Description

Custom House situated adjacent to the canal basin of the Carlisle Navigation Canal. Foundation stone laid in 1832. It was built of polished white stone and consisted of three offices on the ground floor and a large room with offices behind on the second floor. Map evidence indicates it was still standing in 1937-8/

Assessment

The site lies close to the proposed development area and may be affected

Site Name Canal Goods Railway Station
Site Number 11
NGR NY 39060 56082
SMR No 41014
Site Type Railway goods station
Period Post-medieval
Source OS 1925; HER

Description

Goods station built on the site of the canal basin (Site 06) for the LNER (Carlisle and Silloth Branch) Railway.

Assessment

The site lies close to the proposed development area and may be affected

Site Name Bonded Warehouse, canal basin
Site Number 12
NGR NY 39097 56066
SMR No 41015
Site Type Warehouse

Period Post-medieval
Source Asquith 1853; OS 1865; Ramshaw 1997

Description

A large bonded warehouse, built on the east side of the canal basin in 1832, on a site occupied in 1821 by a row of coal and lime vaults (Site 25).

Assessment

The site lies close to the proposed development area and may be affected

Site Name Crozier Lodge Fever Hospital

Site Number 13

NGR NY 38670 56132

SMR No 41018

Site Type Hospital

Period Post-medieval

Source OS 1865; HER

Description

Former house, later a fever hospital; now part of the Cumberland Infirmary. 1820s with later additions. Sandstone ashlar with chamfered plinth. Greenslate mansard roof. Two storeys, three bays. Thomas McAdam lived here in 1828; it became a House of Recovery in 1847, and later still a fever hospital. Grade II listed.

Assessment

The site lies outside the proposed development area and will not be affected.

Site Name Canal Sawmills, Byron Street

Site Number 14

NGR NY 38944 56009

SMR No 41019

Site Type Sawmill

Period Post-medieval

Source HER; OS 1865

Description

Sawmill built in 1836 and closed after an extensive fire in 1929. Archaeological evaluation in 2007 found surviving floors and walls.

Assessment

The site lies outside the proposed development area and will not be affected.

Site Name Bonded Warehouse, canal basin

Site Number 15

NGR NY 39078 56006

SMR No 41052

Site Type Warehouse

Period Post-medieval

Source Wood 1821; Asquith 1853; OS 1865; Ramshaw 1997

Description

Large, four-storey warehouse constructed at the southern end of the canal basin in 1821. Demolished in 1974.

Assessment

The site lies close to the proposed development area and may be affected.

Site Name Alexandra Steam Saw Mills

Site Number 16

NGR NY 39167 56182

SMR No 41053

Site Type Sawmill

Period Post-medieval

Source OS 1865; HER

Description

A steam saw mill is depicted on the OS First Edition map of 1865 and a sawmill is listed in the area in 1861. The Alexandra Saw Mills continue in business today.

Assessment

The site lies outside of the proposed development area and is unlikely to be affected.

Site Name Willowholme Corn Mill
Site Number 17
NGR NY 39370 56309
SMR No 41054
Site Type Corn Mill
Period Post-medieval
Source Wood 1821; Asquith 1853; OS 1865; HER

Description

Willowholme corn mill is first shown on Wood's map of 1821, but was built by the Donald family in 1768 as part of their dye and print works (see Site 23). It became a corn mill at the end of the eighteenth century and from 1846 it was used to grind gypsum for alabaster (see Site 18). It is, however, marked as a corn mill on the OS First Edition map of 1865, although other sources suggest it had been destroyed by fire in 1861.

Assessment

The site lies outside of the proposed development area and is unlikely to be affected.

Site Name Alabaster Works
Site Number 18
NGR NY 39393 56221
SMR No 41056
Site Type Alabaster Works
Period Post-medieval
Source OS 1865; HER

Description

An alabaster works is shown on the Carlisle Board of Health map (Asquith 1853) and the OS First Edition map of 1865. Its origins lie in Donald's dye and print works (Site 23) established in 1768, but its origins as an alabaster works date from 1846, when the original works were let to John Rushton for the grinding of gypsum.

Assessment

The site lies outside of the proposed development area and is unlikely to be affected.

Site Name Little Caldew Mill-Race
Site Number 19
NGR NY 39409 56175
SMR No 41077
Site Type Mill-race
Period Medieval?
Source Richard's map, 1685 (Ferguson 1895); Smith 1746; Hodgkinson and Donald 1783; Hutchinson 1794; Cole and Roper 1801; Wood 1821; HER

Description

North to south aligned mill-race located west of the main channel of the river Caldew. Cut from the Caldew to supply the medieval corn mill at Denton (located south of the study area). In the post-medieval period, a number of other water-powered industries were established along its course.

Assessment

The site lies close to the proposed development area and may be affected.

Site Name Willowholme Leat
Site Number 20
NGR NY 39097 56367
SMR No 41078

Site Type	Leat
Period	Post-medieval
Source	Asquith 1853; OS 1865; Ramshaw 1997 Walkover Survey 4/12/07

Description

An east to west aligned leat, known as The Cut, was built in 1825 to provide the Carlisle Navigation Canal with additional water, sourced from the River Eden. The leat fed a 16-foot overshot water-wheel which worked a pumping engine (Site **05**) to raise water to the canal. Part of the leat still exists as an east/west aligned adjacent (north) of the allotment gardens. The bank extends for some 150m and is 3-5m wide and up to 1.5m high.

Assessment

The site is crossed by the proposed new and may therefore be affected by the development.

Site Name	Etterby Wath
Site Number	21
NGR	NY 38629 56829
SMR No	41754
Site Type	Ford
Period	Unknown (medieval or earlier)
Source	OS 1865; Jones 1976; HER

Description

The site of a ford, one of the ancient and traditional crossing points of the River Eden. First recorded in the medieval period, but could conceivably be far earlier, possibly even of prehistoric date. On the OS First Edition map of 1865, Willow Holme Road (Site **24**) is shown making directly for the wath, which suggests that it might also be of ancient origin. The wath is still shown on OS maps produced in 1946 (HER), but at the end of the nineteenth century it is described by Ferguson (1899) as 'dangerous and probably impracticable'.

Assessment

The site lies outside the proposed development area and will not be affected.

Site Name	Warehouse, Willowholme
Site Number	22
NGR	NY 39386 56265
SMR No	42010
Site Type	Warehouse
Period	Post-medieval
Source	OS 1865; HER

Description

Warehouse adjacent to the west bank of the Little Caldew mill-race (Site **19**), depicted on the OS First Edition map of 1865. What appears to be the same building is marked as a dye house on the Carlisle Board of Health map (Asquith 1853).

Assessment

The site lies outside the proposed development area and is unlikely to be affected.

Site Name	Donald's Dye and Print Works
Site Number	23
NGR	NY 39271 56127
SMR No	42047
Site Type	Dye and print works
Period	Post-medieval
Source	Hutchinson 1794, Cole and Roper 1801; Wood 1821

Description

The Donald family established a dye and print works adjacent to the Little Caldew mill-race (Site **19**) in 1768. In 1807, Donald, Carrick, Shaw and Co. still occupied the site, when there were c 50 tables, three printing presses, a dye house for eight dye coppers, a bleaching house with three boilers, a large dry house, a callender, an indigo mill, an alum mill, plus other buildings and equipment.

Assessment

The site lies outside the proposed development area and is unlikely to be affected.

Site Name Willow Holme Road
Site Number 24
NGR NY 39152 56451
SMR No -
Site Type Road
Period Unknown
Source Cole and Roper 1801; Wood 1821; Asquith 1853; OS 1865

Description

The modern road known as Willow Holme Road may have its origins in a track or lane leading to Etterby Wath (Site 21), an important ford across the River Eden that was in use from at least the medieval period and possibly far earlier. The road is first depicted on Cole and Roper's map of 1801 and is first named on Wood's plan of 1821, but its likely association with the ford suggests its origins may lie much further back.

Assessment

The site lies within the proposed development area and is likely to be affected.

Site Name Coal and Lime Vaults, canal basin
Site Number 25
NGR NY 39097 56066
SMR No -
Site Type Coal and lime stores
Period Post-medieval
Source Wood 1821

Description

A row or terrace of six structures named as coal and lime vaults are depicted on Wood's map of 1821, on the east side of the canal basin. These structures were demolished in or before 1832, when a bonded warehouse (Site 12) was erected on the site.

Assessment

The site lies close to the proposed development and may be affected.

Site Name Sewage Treatment Works
Site Number 26
NGR NY 38890 56460
SMR No 13667
Site Type Sewage treatment works
Period Post-medieval
Source OS 1925; Simpson 1932; HER

Description

The modern sewage treatment works at Willowholme occupies the site of the original works, constructed in 1908.

Assessment

The site lies within the proposed development area and will be affected.

Site Name Relict Field Bank
Site Number 27
NGR NY 39176 56297
SMR No
Site Type Relict field boundary
Period Post-medieval
Source Walkover Survey 4/12/07
OS First Edition map, 1865

Description

East-north-east/west-south-west aligned bank. Partially forming the southern boundary of the allotment gardens. The feature is 2-3m wide, 0.5m high and extends for some 50m. The bank would appear to be a survival of a field boundary noted on the first edition OS map.

Assessment

The site is crossed by the proposed new and may therefore be affected by the development

Site Name	Railway track bed
Site Number	28
NGR	NY 39064 56216
SMR No	
Site Type	Railway track bed
Period	Post-medieval
Source	OS third Edition map, 1925 Walkover Survey 4/12/07

Description

Relict north- north-west/south-south-east aligned railway track bed. The feature was terraced into the side of the west to east sloping bank and can be identified as a part of branch-line serving the Alexandra Steam Saw Mills (Site 16).

Assessment

The site is crossed by the proposed new and may therefore be affected by the development

APPENDIX 3: EVALUATION CONTEXT INDEX

Context	Category	Maximum Depth (m)	Description
101	Layer	0.18	Mid-brown, coarse-grained, clay-silt.
102	Layer	0.5	Light reddish-brown, deposit of compacted clay-silt. No inclusions.
103	Layer	1.2	Light reddish-brown, compacted, clay-silt deposit with tarred gravel inclusions
201	Layer	0.11	Modern, greyish-black tarmac
202	Layer	0.39	Coarse-grained, greyish-black sandy gravel, which is moderately sorted. Foundation layer beneath modern tarmac
203	Layer	0.75	Compact, mid-reddish-brown, silty-clay
204	Deposit/ Fill	0.68	Coarse-grained, dark greyish-black, clay-silt with 50% charcoal and coal inclusions
205	Layer	-	Dumping layer of red brick and two small fragments of red sandstone. No full bricks were present, nor was there any visible coursing or mortar. Only rough half bricks were present.
206	Cut	-	Cut visible in east section of trench. Cuts through (203). Shallow V shape in section with flattened base.
207	Deposit/ Fill	1.4	Coarse-grained, dark greyish-black silty clay. 5 % charcoal and coal inclusions
208	Cut	1.4	Cut visible in north section of the trench. Cuts (203). Filled by (207)