# Wessex Archaeology

## Arkwright's Mill, NCP Car Park, Miller Street, Manchester

Archaeological Evaluation and Assessment of Results


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## Archaeological Evaluation and Assessment of Results

Prepared on behalf of
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### Summary

In September 2005 an archaeological evaluation was undertaken by Channel 4's Time Team in the Shudehill area of Manchester (centred on NGR 398984 384390) to investigate the site of Richard Arkwright's first cotton mill. The evaluation took place within what is currently an NCP car park and comprised five trenches.

The primary aim of the evaluation was to identify the position of the original mill and the different phases of building and alterations which occurred during its lifetime, and to establish the position of major features such as the mill wheel pit. The project also aimed to investigate the nature of the housing which existed along the south side of Angel Street to the north of the mill building.

The evaluation successfully located the main mill building and enabled the identification of features associated with the original 1780-82 construction by Richard Arkwright. A further five phases of alterations were identified, associated with the introduction of new technologies, the replacement of failed machinery with old tried and tested methods, and rebuilding following a devastating fire in 1854. The final phase was associated with the use of the mill prior to its destruction during the Blitz in 1940.

Historical documentation had suggested that the mill was widened by a distance of 3m from 9m to 12m following the rebuilding in 1854, but the evaluation was able to show that no widening had taken place and that the original 1780s mill had been 12m wide and not the 9m originally thought.

The evaluation also investigated one of the small cellar dwellings occupied to the north of the mill. It was clear that what had once been a small, two-roomed dwelling had been divided into two separate one-room dwellings, most probably in the mid 19$^{th}$ century, a process seen across Manchester at this time to accommodate the increasing migration of people to work in the booming cotton mill industry.

**Acknowledgements**

This programme of post-excavation and assessment work was commissioned and funded by Videotext Communications Ltd, and Wessex Archaeology would like to thank the staff at Videotext, and in particular Michael Douglas (Series Editor), Melinda Smith (Production Manager), Oliver Twinch (Assistant Producer), Kate Edwards (Researcher) and Jenny James (Production Coordinator) for their considerable help during the recording and post-excavation work.

The geophysical survey was undertaken by John Gater, Jimmy Adcock and Clare Stephens of GSB Prospection. The field survey was undertaken by Henry Chapman (University of Hull). The excavation strategy was formulated by Francis Pryor and Mike Nevell (University of Manchester Archaeology Unit). The on-site recording was co-ordinated by Steve Thompson, assisted by Matthew McMurray, both of Wessex Archaeology.

The excavations were undertaken by Time Team's retained archaeologists, Phil Harding (of Wessex Archaeology), Raksha Dave, Kerry Ely, Matt Williams, Ian Powlesland and Brigid Gallagher with help from Maria Duggan, Phil Cooke, Steve Bell, Liz Murry, Hayley Richardson, Lee O'Hara and Mike Higgins of the University of Manchester Archaeology Unit, and Simon Askew and his volunteers from Dig Manchester. On-site finds identification was undertaken by Helen Geake (University of Cambridge) and Ruth Garrett (University of Manchester Archaeology Unit).

The archive was collated, and all post-excavation assessment and analysis undertaken by Wessex Archaeology. This report was compiled by Steve Thompson, with specialist reports prepared by Lorraine Mepham (finds). The illustrations were prepared by Rob Goller. The post-excavation project was managed on behalf of Wessex Archaeology by Lorraine Mepham.

The work also benefited from discussion on site with Mike Nevell, Industrial Archaeology Specialist. Thanks are also due in this respect to Phil Harding and Bob Davis of Wessex Archaeology, and Robina McNeil, County Archaeologist, Greater Manchester County Council.

Thanks are also extended to NCP and Manchester City Council for granting permission to investigate the Site.

# Arkwright's Mill, NCP Car Park, Miller Street, Manchester

## Archaeological Evaluation and Assessment of Results

## 1 INTRODUCTION

### 1.1 Project Background

1.1.1 Wessex Archaeology were commissioned by Videotext Communications Ltd to undertake a programme of archaeological recording and post-excavation work on an archaeological evaluation undertaken by Channel 4's 'Time Team' on the site of the former cotton mill of Sir Richard Arkwright, Miller Street, Manchester (hereafter the 'Site') (**Figure 1**).

1.1.2 This report documents the results of archaeological survey and evaluation undertaken by Time Team, and presents an assessment of the results of these works, along with recommendations for further analysis and dissemination.

### 1.2 The Site

1.2.1 The Site is located within an open plan NCP car park centred on NGR 398984 384390, close to Victoria Station and Shudehill. The Site is bounded by Miller Street to the south and Angel Street to the north with Rochdale Road to the east and Dantzic Street to the west. The Site consists of four levels of car park, the upper level under private ownership and the remaining three belonging to NCP. The factory is believed to occupy the upper level of the NCP car park; no remains survive above ground.

1.2.2 The Site occupies a position on rising land to the east and above the Rivers Irk and Irwel at a height of approximately 45m above Ordnance Datum (aOD) (OS 2004) with the underlying geology consisting of boulder clay (BGS 1924-27).

### 1.3 Historical Background

1.3.1 Prior to 1780 the Site had been in the possession of one John Pickford, who had used the site for the position of his brick works and yard. On his death an advert appeared in the *Manchester Mercury* in 1780 stating '*to let, all that Close of Field, situated at the Top of the Shude-hill in Manchester Late in the Occupation of John Pickford, deceased, containing upwards of two Acres, and used as a Brick Yard, in which there is now a fine Breast of Clay upwards of two yards high, and Plenty of Water.'*

1.3.2 Richard Arkwright (1732-92) leased the land, and with his partners William Brocklebank, John Whittenbury, John Simpson and Samuel Simpson constructed sometime between 1780 and 1782 a '*brick built and slated mill'* 52.2m (171 ft) long by 9.1m (30ft) wide and five storeys high for the production of cotton textile (Champness 2004, 1; Videotext 2005, 2).

1.3.3 It has been suggested that Arkwright initially attempted to power the mill engines solely using steam power generated by an atmospheric Newcomen engine supplied by Hunt, but it appears that this experiment failed (Videotext 2005, 2).

1.3.4 The failure of the atmospheric Newcomen engine to power the mill machinery resulted in 1783 in the construction of two large water reservoirs, an upper and a lower pond and a 9m (30ft) diameter and 2.4m (8ft) wide waterwheel to drive the machinery. The waterwheel was fed by water flowing down from the upper pond through the wheel into the lower pond. A steam engine, perhaps Hunt's atmospheric engine re-employed, drove two pumps, each with a cylinder of 0.78m (31 inch) diameter with a 2.36m (93 inch) stroke, working at 11-12 strokes a minute and burning five tons of coal a day to pump the water from the lower back to the upper pond. The pump was described in 1788 as of '*old construction'* (Champness 2004, 1).

1.3.5 In 1784 Arkwright sold the mill, now insured for £3000 and £1000 for utensils by The Royal Exchange Assurance Company to his son Richard. In 1785 it was insured for £5000 by the same company and a year later, in 1786, the younger Richard withdrew from the partnership with John and Samuel Simpson.

1.3.6 In 1789, John and Samuel Simpson, with their partner John Barton began negotiations with Boulton and Watt of Birmingham to supply and erect a steam engine at the mill in Manchester. In September 1790 a six-horsepower, double acting sun and planet engine was ordered from Boulton and Watt and installed in January 1791 in the new engine house. The new rotative engine was intended to drive the mill machinery directly (Champness 2004, 2-4).

1.3.7 The sun and planet mechanism was patented by Watt in 1781 and allowed for the development of the rotative steam engine. The mechanism comprised a large gearwheel fastened to the output shaft of the engine (the sun), around which a smaller gearwheel (the planet) rotated, held in mesh with the sun by an arm. The planet wheel was fixed to the end of the engine connecting rod, and as the piston rod moved in and out of the cylinder, the planet wheel described a circular path around the sun wheel, causing it to rotate. The configuration caused the sun wheel to make two rotations for every cycle of the engine, thus giving the output shaft a speed twice that of the engine (Jones 1996, 376).

1.3.8 In November 1791, when the mill was running 4000 spindles, the mill manager on behalf of the mill-owning partnership met with Peter Ewart, the Boulton and Watt representative in Manchester to discuss the replacing of the old Newcomen engine and the waterwheel with a new 40-horsepower engine to drive the mill machinery and so increase the number of spindles. In 1792, then, a 40-horsepower double acting sun and planet engine was ordered from Boulton and Watt and installed sometime that year.

1.3.9 In 1796 the firm owning the Manchester mill became John Simpson and Co., and in 1796 the company leased properties along Angel Street to the north. A map of Manchester and Salford by Green (dated 1794) shows the factory,

labelled as '*Mr Simpson's Cotton Works*' (**Figure 2**). In 1799 a 30-horsepower Boulton and Watt double acting sun and planet engine was erected (Champness 2004, 8).

1.3.10 In 1854 'The Old Factory', as Arkwright's construction was then known, was badly damaged during a fire. The *Manchester Guardian* dated 3rd May 1854 recorded that '*the first large mill having been erected in Manchester, having been built in the year 1780 by Sir Richard Arkwright and was for many years occupied by him as a cotton mill. The mill, it should be stated, was a very extensive one being five storeys high, upwards of 200 feet long and 30 feet wide. In the centre of the mill, on the outside was a wooden staircase affording communication with each story. The rooms were not partitioned off, but extended the whole length of the building. Of late years it had been occupied for miscellaneous purposes, principally as cotton waste warehouses, its width not being sufficient for the modern machinery. The building belonged to Mr Richard Simpson. It was not insured. His loss was £5000.'* By 1888 the reservoir had been filled in and the mill was rebuilt (Champness 2004, 14).

1.3.11 In October 1892 Baxendale and Co., a firm of engineers and plumbers' merchants took over and redeveloped the site. They described '*the structure, the mill, was massive brickwork with very heavy wooden floors supported by corbels in the walls*.' By 1908 the main building was subdivided and the building at the north divided in two (**Figure 3**).

1.3.12 At the time of the Second World War Greater Manchester was the great industrial centre of the north-west; it was vital for the war effort, and its canals and docks were of high strategic importance. It was therefore likely to be subject to attacks from the German Luftwaffe. These began in September 1940, increasing in intensity towards the end of December and continued to June 1941, then more sporadically until March 1945 (Webb and Duncan 1990, 119-25). On 23rd October 1940, a direct hit completely destroyed Arkwright's Mill (Champness 2004, 15-16), and the site remained derelict until it became a car park in the 1980s (**Figure 4**).

### 1.4 Previous Archaeological Work

1.4.1 There has been no formal survey or excavation carried out on the Site although the history of the mill is well documented and has been extensively researched by the Manchester Regional Industrial Archaeological Society (Videotext 2005, 3; Champness 2004).

## 2 METHODS

### 2.1 Introduction

2.1.1 A project design for the work was prepared by Videotext Communications Ltd (Videotext 2005), providing full details of the research aims and methods. A brief summary is provided here.

## 2.2 Aims and Objectives

2.2.1 The project provided the opportunity to undertake an archaeological evaluation within the centre of Manchester, on a site where no previous excavation had taken place, and to test a number of hypotheses concerning the first cotton mill in Manchester. The project aimed to ascertain the location, date, character, and extent of the underlying archaeology, using historical documentary research, geophysical survey and archaeological evaluation.

2.2.2 The mill marks the beginning of the industrial urbanisation of the city and was potentially the first mill in Britain to attempt to use steam power to drive the machines. The project hoped to investigate how the mill was first powered, how it employed steam power and how the water systems serviced the changing nature of the mill.

2.2.3 The project also sought to investigate the housing along the south side of Angel Street, to the north of the mill, which would have been occupied by industrial workers.

2.2.4 The key questions posed can be summarised as follows:

1) Where was the original mill?
2) Was steam originally intended to directly power the mill machinery?
3) Where was the mill wheel, and was a steam engine run in tandem with this in the earliest stages of the mill's operation?
4) How was water circulated at the mill and how was it used to feed the water wheel and later cool the rotary steam engines?
5) How did the leat system between reservoirs work, from the lower to upper reservoir and to the wheel?
6) Where and what kind of engine was used to pump water from the lower to upper reservoirs?
7) Where were the later steam engines positioned following the initial steam engine failure?
8) What was the nature of the housing on the south side of Angel Street?
9) How did the construction of Arkwright's first cotton mill in Manchester affect the urban development of the Shudehill area and Manchester as a whole?

## 2.3 Fieldwork Methodology

2.3.1 A combination of geophysical survey and archaeological evaluation was concentrated within the upper level of the NCP car park, with a wider landscape survey being carried out in the surrounding area.

2.3.2 Prior to the excavation of evaluation trenches, a geophysical survey was carried out across the Site using a combination of Magnetic survey and Ground Penetrating Radar (GPR). Full details and results of the geophysical survey are contained within GSB Prospection's report, which forms part of the project archive (GSB 2005).

2.3.3 Five evaluation trenches of varying sizes were excavated after consultation between the on-site director Francis Pryor and Industrial Archaeology specialist Mike Nevell and other specialists. The precise trench locations were determined following examination of the cartographic evidence and anomalies identified within the geophysical survey (**Figure 1**).

2.3.4 All the trenches were excavated using a back-hoe excavator under constant archaeological supervision and ceased at the identification of significant archaeological remains, or where natural geology was encountered first. When machine excavation had ceased all trenches were cleaned by hand and archaeological deposits investigated.

2.3.5 All archaeological deposits were recorded using Wessex Archaeology's *pro forma* record sheets with a unique numbering system for individual contexts. Trenches were located using a Trimble Real Time Differential GPS survey system. All archaeological features and deposits were planned at a scale of 1:20 with sections drawn at 1:10. All principle strata and features were related to the Ordnance Survey datum.

2.3.6 A full photographic record of the investigations and individual features was maintained, utilising colour transparencies, black and white negatives (on 35mm film) and digital images. The photographic record illustrated both the detail and general context of the archaeology revealed and the Site as a whole.

2.3.7 At the completion of the work, all trenches were reinstated using the excavated material, and new car park surfaces laid.

2.3.8 A unique site code was agreed prior to the commencement of works. The code is AMM 05. All artefacts were transported to the offices of Wessex Archaeology in Salisbury where they were processed and assessed for the purposes of this report. The work was carried out on the 13th –16th September 2005.

# 3 RESULTS

## 3.1 Introduction

3.1.1 Details of individual excavated contexts and features, a full geophysical report (GSB 2005) and results of the artefact analysis are retained in the archive. Detailed summaries of the excavated sequences can be found in **Appendix 1**, and a summary of the results of the geophysical survey is presented here.

## 3.2 Geophysical Survey

3.2.1 The geophysical survey was unsuccessful in the identification of any features or structures of the mill or the housing along Angel Street. This was due to the lack of contrast between the brick structures of the buildings (walls and floors) and the backfilled brick rubble sealing them. The survey was only able to confirm the presence of large areas of high magnetic enhancement,

indicating that large areas of brick rubble were present. No clear footprint of the mill building or the dwellings along Angel Street could be interpreted from the results; but the areas of high magnetic enhancement did correspond with the known position of the structures as identified from the cartographic evidence.

### 3.3 Archaeological Evaluation

*Trench 1*

3.3.1 Trench 1 was machine excavated, 22.5m long by 4.60m wide and 0.40m deep and aligned NE-SE. It was positioned perpendicular to the alignment of the factory to reveal the whole width of the building (**Figures 1 & 5**).

3.3.2 Following the removal of tarmac and gravel levelling (101), demolition/levelling deposits were revealed. Deposits (105) and (107) were a mix of demolished material from the 1940s air raids, used to level the area after the bombings. This material overlay the *in situ* archaeology of the mill.

3.3.3 The width of the building was revealed to be just over 12m (approximately 39 ft) by the identification of the two outer walls of the mill. Wall (104) was the westernmost of the two roughly NNE-SSW aligned walls and was recorded for a length of 4.60m. It was 0.62m wide and one brick course in height. Wall (104) was constructed of machine cut bricks (*c.* 0.22m by 0.11m by 0.07m), and bonded with a dark grey ashy charcoal rich mortar. The eastern face of the wall was constructed of stretchers, with the western face and internal core of headers. It is possible that (104) represents the upper course of the foundation of the wall, the upstanding wall having been demolished following the bombing in 1940. The depth of the foundation was not revealed.

3.3.4 The eastern NNE-SSW aligned wall of the mill (117) was recorded for 4.60m in length, 0.60m wide, with again only a single brick course upstanding. This upper course of bricks was bonded with a dark grey ashy charcoal rich mortar. The bricks were machine cut and of similar dimensions to wall (104). A sondage was excavated to investigate the thickness of the foundation of (117), which was shown to be of nine brick courses. The bricks were of an irregular bond, remained unmortared and had been tightly packed into the construction cut (124) of the wall.

3.3.5 Analysis of the bricks and the dark grey ashy charcoal rich mortar indicated that the two outer walls of the mill dated to the mid 19$^{th}$ century and were not part of Arkwright's original construction. It would appear that walls (104) and (117), and the remainder of the archaeology identified within Trench 1, belonged to the period of rebuilding following the 1854 fire.

3.3.6 A slightly earlier period of building, although contemporary with the mill walls, were the two north-south aligned external road-ways, positioned on either side of the mill.

3.3.7 The westernmost road (102) ran alongside wall (104), and was constructed of roughly rectangular limestone setts (on average 0.27m by 0.17m by 0.13m),

laid end to end and set into (109), a bitumen and cinder bedding layer. An area of 6m by 4.6m was uncovered of this road, but it could be seen to extend to both north and south, where it was partially covered in tarmac, and to the west. This was a hard wearing road used to gain access to the mill.

3.3.8 Positioned in between road (102) and wall (104) was kerb (103), constructed of setts of similar size to those of (102) and laid in the form of stretchers. The kerb sat slightly proud of the road, to keep water away from the wall (104).

3.3.9 Cutting through (103) and (102) and in place before the construction of wall (104) was drain cut (110), with a metal grill and ceramic pipe (111). The setts removed from the kerb for construction of the drain had been replaced, but at a slightly different angle, but no disturbance to wall (104) could be seen – the wall must therefore be later than the drain. The ceramic pipe could be seen to protrude beneath floor surface (106), where it had been damaged by cut (122).

3.3.10 On the eastern side of the building and appearing to butt wall (117) were a series of similar sett constructions to those positioned on the western side. Road (120) was constructed in a similar fashion to (102), and butted or was butted by another sett construction (119), associated with a second sett structure (118) and forming a possible gutter or drainage channel to draw water away from wall (117). Both (118) and (119) were constructed from rectangular limestone setts.

3.3.11 Between walls (104) and (117) was (106), the main floor surface of the factory, constructed of machine-made bricks and laid as a single course of headers. An area approximately 5.80m by 4.60m was uncovered. In the western portion of the floor was a large area missing brickwork (3.9m by 2m), where it appeared a structure of some kind had been removed, damaging the surrounding brick surface. The natural geology (123) was exposed below this.

3.3.12 The eastern area of the floor surface was covered by concrete layer (113). A modern CCTV cable cut through the concrete surface and a sondage into this cable trench revealed that the brick floor did not extend across the full width of the building but had been replaced with a layer of crushed brick and cinder (126), over which the concrete surface had been laid. The brick work of the floor dates to the mid 19$^{th}$ century, with the later concrete overlay likely to be 20$^{th}$ century in date.

3.3.13 At the eastern end of the concrete slab (113), was a concrete channel (116) which butted up against the internal edge of wall (117), probably contemporary with (113), and presumably for internal drainage of some kind. The channel was filled with (121), a cinder deposit containing abundant fragments of glazed wall tiles.

3.3.14 Trench 1 revealed the alignment and full width of the mill at the southern end, but the structures and surfaces revealed all dated to the 19$^{th}$ century or later. No evidence of the 18$^{th}$ century construction of Arkwright was located.

*Trench 2*

3.3.15 Trench 2 was 5.1m long by 2.5m wide and 0.20 deep and aligned NNE-SSW. It was positioned in order to locate the southern east-west aligned wall of the factory (**Figures 1 & 6**).

3.3.16 Following the removal of the current car park surface, a modern CCTV cable trench (214) was revealed. The tarmac also sealed significant archaeological remains.

3.3.17 The earliest structure identified with Trench 2 was (204/211), a short section of wall constructed from unfrogged bricks, bonded with light yellow lime mortar and of English or English Garden bond. The wall was recorded for a length of 2.65m by 0.67m wide, two brick courses in height.

3.3.18 The wall was built within construction cut (209/219), which cut through what appears to be the natural clay geology (218). A mortar-rich deposit (210) was packed down between the construction cut and the edge of the wall.

3.3.19 Structure (204/211) is likely to be the upper foundation course for a now demolished wall. It was cut through by a number of later intrusions of 19th and 20th century construction. These later intrusions, and the nature of the bricks and mortar within 204/211 indicated that this was the foundation for the southern wall of the 18th century mill.

3.3.20 Butting against wall (204/211) was sett-built road (202), which was of identical construction to roads (102) and (120) in Trench 1. The whole southern end of the mill and the western and eastern sides would have been surrounded by this sett-built road of 19th century date.

3.3.21 Construction (208) comprised a series of east-west aligned limestone setts butting road (202) and partially overlying (211). This is possibly of 19th century construction, perhaps marking the position of a later doorway into the southern wall of the mill, but this is by no means clear.

3.3.22 Cutting through (204/211) was (213), the construction cut for a brick built pillar base. This was built of frogged bricks, measured 0.37m by 0.66m wide, and is possibly of 20th century date.

3.3.23 Cutting the natural (218) at the northern end of the trench and extending beyond the northern and western limits of excavation was (220), the construction cut for the placing of a large sandstone pad-stone (207). The pad-stone was approximately 0.94m square, its thickness unknown as unexcavated. The upper surface of the pad-stone had a circular indentation cut into it, to take the flange for a cast iron column. Several other sandstone column bases with circular cut outs were exposed in Trench 3 and were interpreted as supports for the roof or upper floors in the 18th century mill (see below).

*Trench 3*

3.3.24 Trench 3 was 16.1m long by 15.2 wide and 0.40m deep. It was positioned across the factory in an attempt to locate the wheel pit (**Figures 1 & 7**).

3.3.25 Following the removal of the current car park surface (301), a large demolition/levelling deposit (302) was revealed, containing abundant fragments of brick and cinder and charcoal. This deposit overlay the *in situ* archaeology.

3.3.26 Following the removal of the overburden it was clear that there were several phases of building and rebuilding within the mill, and due to time constraints these phases could not be clearly interpreted. Many of the earlier phases of construction have been removed or radically altered by later activity and so the their function is difficult to determine. Several phases could be seen to be of 19th century date but could not be more closely dated, although stratigraphic phases could be determined. The dates of the phases as given below are approximate and are related to known events within the mill's history.

Phase 1: Pre-1780

3.3.27 The earliest feature within Trench 3 appears to be (353), observed in the south-eastern corner of the trench (**Figure 7**). This feature cut through the natural clay, but its true shape, dimensions and function are unknown. It was backfilled with (307), which contained several sherds from ceramic saggars, containers used to protect fine glazed pottery during kiln firing. Saggars were used as early as the 15th century, although cylindrical saggars such as those recovered from (307) are more likely to be 18th century in date.

3.3.28 Feature (353) was only partially revealed while investigating later structures of the mill. It potentially dates to a period before the construction of the mill and may relate to the earlier brick works and yard. It may, for example, be a quarry for the extraction of clay for the bricks. The recovery of saggar fragments indicates pottery production in the vicinity, but not necessarily on the site itself.

Phase 2: *c*. 1780-2 (**Figure 8**)

3.3.29 Following the backfilling of (353), the second phase of activity on the site was the first major construction phase for Arkwright's mill, dated on documentary evidence to 1780-2. This early construction included structural elements necessary for the internal support of the building as well as elements relating to the activity taking place within the building. These elements were modified and altered considerably in the later years of the mill's use.

3.3.30 The only remains of the actual mill structure revealed in Trench 3 was a series of three large sandstone pad-stones running centrally down the length of the building at a distance of 6m from each of the outer walls. These would have formed the bases for columns supporting the internal floors of the mill. None were completely exposed, but all three appeared to be identical to pad-stone (207) in Trench 2. The pad-stones were set into a single construction cut (331) which was cut directly into natural underlying clay geology (373).

3.3.31 The southernmost pad-stone (328) was placed directly upon a small brick levelling construction (329) built of two irregular courses of brick bonded with lime mortar. The central pad-stone (326) was set upon a brick levelling

construction (327) similar to (329). It was unclear if the northernmost pad-stone (325) was set upon a levelling construction as it was not fully excavated.

3.3.32 Each of the pad-stones had a circular indentation in the upper surface into which a cast iron column would have been set and had been cut off flush with the pad-stones when the area was altered in later phases.

3.3.33 As for internal structures, a rectangular brick-built tank (Group 354, comprising walls 340, 341, 342 and 343) was identified on the western side of the building against the later wall (304). This tank dates to the 18th century and is likely to relate to the initial mill construction.

3.3.34 The tank was built within construction cut (351), excavated directly into the natural clay geology (373) to a depth of at least 1.36m. The tank consisted of four brick-built walls with lime mortar which were recorded to a height of 1.36mm. The northern wall (340) was bonded at its eastern end to the northern end of wall (341), and at its western end to wall (342). The southern wall (343), beneath later wall (311), was bonded to (342) (west end) and (341) (east).

3.3.35 The tank had been lined with a waterproofing layer of bitumen, but whether this occurred soon after the structure was built or was related to 19th century activity is unclear. The nature of the brick construction does imply an 18th century date for construction of the tank. The tank would have held water, but for what function is uncertain, possibly in order to feed the atmospheric engine provided by Hunt (see above, 1.2.3), put in place during Arkwright's initial construction, and therefore part of the initial attempt to power the mill solely using steam (M. Nevell *pers. comm.*).

3.3.36 Revealed beneath a later deposit (349) was a roughly east-west aligned structure (347). Recorded for 2.40m in length and 0.11m wide, the true height not revealed as it was only exposed in plan, it was constructed from bricks bonded with lime mortar in stretcher bond and was only a single brick wide. The function of this structure is unknown.

Phase 3: *c*. 1782-90 (**Figure 9**)

3.3.37 After the failed attempt to power the machinery of the mill using only steam power there was a need to find an alternative mode of driving the looms, and so the factory resorted to the tried and tested water wheel. The next phase of building within the factory therefore relates to this period of alteration, with the construction of a wheel pit and associated structures.

3.3.38 The wheel pit was identified towards the eastern side of the mill and housed within the main building itself. The water wheel was described as 30 ft long by 8 ft wide (9.15m by 2.40m) (Videotext 2005, 2). The wheel pit was only partially exposed to a length of 1.80m; the width was 2.40m and so the wheel would have fitted tightly within it. The pit was excavated to a depth of over 3m.

3.3.39 The main northern wall of the wheel pit was (336), recorded as 2.20m long by 0.85m wide and surviving for 28 courses to a depth of 3.08m. It was constructed of bricks bonded with lime mortar in stretcher bond. There was a clear door way towards the western end of (336) where the bricks of the wall had been chamfered off to create a rounded corner. The door way led on to platform (338) which extended around the western side of the wheel pit. The eastern side of the door way to gain access to platform (338) was positioned where (338) and (336) were bonded.

3.3.40 Wall (336) was bonded at its eastern end to the northern end of wall (335), at the north-east corner of the wheel pit. Wall (335) was recorded for a length of 1.20m and a width of 0.25m (it was not fully exposed), and to over 3m in depth. It was of similar construction to (336). A gap within the wall at the eastern end was later filled; the purpose of the gap is unknown, but could have provided access to the wheel. The western wall of the wheel pit, (338), was of the same construction type as (336) and (335) and was used as a platform to gain access to the water wheel. Wall (338) was seven courses shorter in height than wall (336). The three exposed walls of the wheel pit had been lined with a waterproofing layer of bitumen.

3.3.41 The remains of an archway extending across the width of the wheel pit was identified by the remains of the springers bonded and keyed into walls (338) and (335). Archway (339) was 0.50m wide and positioned 0.30m to the south of, and running parallel to wall (336). It probably acted as a load-bearing retaining arch for structures associated with the transport of water to the wheel, and the presence of this archway perhaps implies that an overshot wheel was in place.

3.3.42 Brick structure (315) is also probably associated with this construction phase of the factory. It is positioned in alignment with wall (336) and extends away from it to the west. It represents the remains of a load bearing arch which had been truncated by later activity. The archway overlies the position of unknown feature (353), and was probably put in place so that structures or perhaps machinery could be placed over the pit, without fear of it sinking into the backfilled feature. An archway would have been necessary to spread the weight of any overlying structure.

Phase 4: *c*. 1790-99 (**Figure 10**)

3.3.43 The excavation of the wheel pit and installation of the wheel in the 1780s marked a major change in how the machinery of the mill was powered. This was the second power source which had been tried, following the failed attempt to use only steam power. However, during the following period, with the development of new Boulton and Watt engines steam power again became the chosen form to power the mill, replacing the water wheel. The atmospheric engines used to transport water from reservoir to reservoir were also deemed obsolete (Videotext 2005, 3).

3.3.44 Archaeological evidence within Trench 3 demonstrated the preparation of the site prior to the installation of the three new Boulton and Watt engines, and this phase saw the removal of machinery and structures associated with the water wheel and the backfilling of the wheel pit.

3.3.45 As access to the wheel pit was no longer required, the doorway through wall (336) on to platform (338) was blocked, by the construction of infilling brickwork (333). This was recorded as 1.40m long by 0.80m by wide and 0.95m high and was constructed of eight brick courses in English bond with charcoal rich mortar. The gap in wall (335) was also sealed by (370), of similar construction to (333).

3.3.46 Following the blocking of access, the wheel pit was backfilled with a mixed deposit (361), apparently derived from waste material from the mill, such as coal waste from the furnaces and the mortar removed from dismantled brick work, before the bricks were reused. The deposit was rammed down filling the pit. At this time the retaining arch (339) is likely to have been dismantled, and the bricks reused, potentially providing a small amount of the backfill material. The backfill deposit also contained abundant brick rubble, though the origin of the remainder of the deposit is unknown.

3.3.47 The retaining arch (315) which spanned the wheel pit was not removed during this phase but may have been partially altered. It is unclear when the damage to this archway occurred, but its presence would still have been required for any further construction work in this area.

3.3.48 No structures were identified which could be associated with the arrival of the three Boulton and Watt engines, the first in 1790, the second in 1793 and the third in 1799; all that was clear was the removal of earlier structures which were now obsolete.

Phase 5: *c*. 1799-1854 (**Figure 11**)

3.3.49 There followed a period of alteration to the factory which cannot be dated more closely than within the broad date range of 1799 to 1854, although stratigraphic phases can be discerned.

3.3.50 The removal of the cast iron columns set into pad-stones (325), (326) and (328) may have occurred at this time, although the reason why is unknown. The columns were cut down to be flush with the tops of the pad-stones and later walls constructed over them.

3.3.51 Each of the pad-stones was overlain by a roughly north-south aligned wall (323). Wall (323) was recorded for a length of 6m by at least 0.46m in width and a height of 0.24m. The wall survived for two courses of brick stretchers bonded with charcoal rich mortar. The lower course, 0.05m wider than the upper course, indicates a stepped foundation.

3.3.52 Butting against wall (323) and also overlying pad-stone (325), was east-west aligned wall (324), which was recorded for 0.82m in length and 0.24m in width and which survived as a single brick course. The hand-made bricks were bonded with charcoal rich mortar, and appear to be built in stretcher bond. Wall (324) extended into an area of modern disturbance but continued to the north where it was recorded as (372).

3.3.53 Wall (372) was only partially revealed within the limits of excavation and could be seen to have suffered later truncation. It was however clearly seen to be the continuation of wall (324), where it overlay the backfilled wheel pit.

3.3.54 The function of walls (323), (324) and (372) is unknown, yet it was deemed necessary to remove the supporting columns which sat on the pad-stones for these walls to be built.

3.3.55 A series of possible column bases or machinery bases was identified across Trench 3; the true date of their installation is unclear but they may possibly date from this period of alteration.

3.3.56 Two rows of pads were identified aligned along the long axis of the building, positioned either side of the central line of the factory where the 18th century pad-stones were installed. Four pads or the remains of pads (364), (365), (366) and (367) were positioned to the east of the central line at a distance of 1.9m. A second alignment of pads (363) and (346) were positioned on the western side of the central line at a distance of 2.5m.

3.3.57 The two lines of pads are not equidistant from the central line and therefore were unlikely to have been put in place to support the internal floors following the removal of the earlier cast iron columns. They are possibly machinery bases.

Phase 6: *c*. 1854-88 (**Figure 12**)

3.3.58 The majority of the structures and features which survived in Trench 3 are likely to date to this period of the mill's life, and belong to the major period of rebuilding and alteration following the fire of 1854 which badly damaged the mill.

3.3.59 The two outer walls of the mill probably belong to this phase of rebuilding. The western wall (304) was recorded for 15.2m in length, 0.56m wide and 0.75m in height. It survived for five brick courses set in English bond with charcoal rich mortar, and was set upon a two-course, brick-built stepped foundation, also in English bond. This wall equates to wall (104) identified in Trench 1, and has suffered considerable truncation in the south-west corner of the trench.

3.3.60 The wall butts or is butted by road-way (303), a large sett-built road equivalent to (102) in Trench 1 and also likely to belong to this phase of construction.

3.3.61 The eastern wall (319) (equivalent to wall (117) in Trench 1) was recorded for 2.5m in length and 0.50m wide, but the height is not known as no elevation was recorded. The wall incorporates a section of wheel pit wall (335: see **Figure 9**) and can be seen partially to overly it. There is a large gap of some 3.30m in the eastern wall implying an entrance way into the building from road way (322) which runs alongside the eastern wall of the factory. Nothing remained of any entrance way structures except for the gap itself, but the photograph of the south and east elevations of the mill from sometime between 1892-1940 when it was owned by Baxendales shows a

doorway on the eastern side, below a possible hoisting window, with a gas lamp above it similar to the lamp on the southern elevation (**Figure 3**).

3.3.62 Road-way (322), revealed at the eastern end of the trench, is the same as (120) identified in Trench 1 and butts or is butted by sett construction (320/321), a possible gutter/drainage channel equivalent to (118/119). Both (321) and (320) were built of rectangular limestone setts.

3.3.63 Road-way (322) was constructed over levelling deposit (352), which in turns overlies the backfill deposit sealing ceramic pipe (375) in cut (374). The construction cut (374) was backfilled with the excavated natural and no dateable finds were recovered.

3.3.64 Following the 1854 fire a series of new floor surfaces were installed. In the south-west corner of the trench was floor surface (305), a single brick thick, made of mixed hand-made and machine-made bricks set in stretcher fashion. The bricks were bonded with a charcoal rich mortar, which was probably mixed with the remains of occupation debris overlying the floor surface. Floor surface (305) overlay make-up layer (335), a mixed silty clay deposit which butted and overlay wall (323).

3.3.65 A small section of the floor was removed close to wall (304) to investigate the possibility of earlier structures below it, but it was seen to lie directly over the natural clay geology (373). The stratigraphic relationship between floor surface (305) and wall (304) was unclear as there had been considerable truncation.

3.3.66 At the junction where floor surface (305) butted retaining archway (315), a small wall was constructed which butted against (315) and was set upon (305). Wall (376) was recorded as 2.80m long by 0.24m wide and a single brick in height (0.07m), constructed in irregular bond with reused bricks and charcoal rich mortar. Its function is unknown, but it was probably an internal wall dividing areas of the factory.

3.3.67 In the south-east corner of the trench were the remains of a floor surface a single brick thick (369), which either butted or was butted by wall (319). The floor had been extensively truncated.

Phase 7: *c*. 1888-1940 (**Figure 13**)

3.3.68 Potentially the last phase of building within the factory saw the earlier bitumen lined water tank (354) being reused and the construction of two load bearing retaining arches above it. It is possible these were put in place to hold an engine to pump water from the tank.

3.3.69 The two retaining arches were laid upon two wooden beams, temporary lintels ((345) below (311) and (344) below (312)), which rested upon the existing water tank walls (341) and (342) (see above, Phase 8).

3.3.70 Arch (311) was 2.80m long by 0.36m wide and 0.85m high and constructed of reused machine-made bricks bonded with charcoal rich mortar, and laid in three courses of stretchers and three courses of headers side on, with an

upper course of headers. The arch was bonded into buttress (313) at the eastern end, from which the arch could spring, and could be seen to butt against the earlier wall (304) at the western end. Buttress (313) was 1.15m long by 0.50m wide, recorded to a height of 0.54m and constructed from reused machine-made brick bonded with charcoal rich mortar, laid in English bond. The buttress sat upon a four-course stepped foundation consisting of two steps each of two bricks laid in stretcher bond.

3.3.71 Arch (312) was constructed in an identical fashion to (311) and was of the same dimensions. It did not spring from a separate buttress but continued to the east where it merged into a wall. This was recorded as 2.40m long by 0.36m wide and 0.85m in height, constructed of three courses of stretchers set on a six-course stepped foundation consisting of three steps of two bricks. Arch (311) also butted earlier wall (304) at the western end and was bonded and keyed into contemporary wall (314) at its eastern end.

3.3.72 Wall (314) was roughly NE-SW aligned and was recorded as 3.10m long by 0.40m wide with a height of 0.85m. The construction was identical to that of the wall section of (311). Wall (314) butted against the earlier retaining arch (315), but was not bonded to it. Bonded to the east side of (314) was a small wall structure (357) constructed of reused brick bonded with charcoal rich mortar and laid in English bond.

3.3.73 What was positioned above tank (354) is unclear, but it may have been an engine pump for the movement of water.

3.3.74 Drain (359) was ceramic and contained within construction cut (358) which cut into the natural clay (373). The drain lay below 19th century wall (304) and was sealed beneath deposit (349) which filled feature (350).

3.3.75 Feature (350) was observed in the north-west corner of Trench 3 as a large square cut with a small slot cutting through wall (304). The function of this feature is unclear but it may once have held a large piece of machinery which fed through the slot cut through the outer wall. Its date is also unknown.

*Trench 4*

3.3.76 Trench 4 was 'L' shaped, 7.90m long by 6.70m wide and 1.60m deep and was positioned to target some of the 18th century housing along the south side of Angel Street (**Figures 1 & 14**).

3.3.77 Following the removal of the current tarmac car park surface (401), large scale rubble deposit (402) was revealed, a very mixed deposit containing considerable amounts of cinder, charcoal and brick rubble, which overlay the *in situ* archaeological structures within Trench 4.

3.3.78 Deposit (402) was shown to be the deliberate backfill of a cellar, and contained material dating from the 18th century through to the 20th century, including a halfpenny of George III (dated 1775) contained within a fragment of mortar. The building had most probably been demolished as a result of the Blitz in 1940, and the demolished material used to level the ground. Following the removal of (402) it was clear this was in fact a cellar dwelling

of a type similar to those inhabited by the mill workers and their families. Such cellars were originally built to relieve the damp in the jerry-built workers' housing of the late 18th and 19th centuries, but inevitably became dwellings for subtenants. Whole families, or more, might share a single cellar dwelling in extremely insanitary conditions.

3.3.79 This dwelling measured approximately 5.40m by 4.30m and comprised two rooms. There were possibly other associated rooms to the east but these were not exposed due to time constraints. It could be seen that there had been at least three phases of construction, building and alteration to the dwelling before its final demolition in the 1940s.

Phase 1: 1775 or later

3.3.80 The earliest phase of construction is likely to have been the initial build in the 18th century, as represented by walls (403), (404), (405), (407) and (412), floor surfaces (410) and (411) and two possible hearths (408) and (409). A possible construction date of 1775 or later is suggested from the recovery of a 1775 halfpenny from deposit (402).

3.3.81 The main walls of the structure - (403) (western wall, 3.90m long by 1.35m high) and (405) (eastern wall, 5.40m long by 1.55m high) – were both bonded at their southern ends to wall (404) (4.34m long and 1.40m high). These three walls enclosed the main area of living space, with a fourth wall which would have fronted onto Angel Street to the north; this wall was not exposed within Trench 4.

3.3.82 Walls (403), (404) and (405) were constructed of hand-made bricks bonded with lime mortar and in English Garden bond. Walls (404) and (405) showed considerable signs of damage and were very unstable, but the bond of (403) was clear. Wall (403) survived for 15 courses of brick in English Garden bond consisting of three courses of stretchers, a course of headers, four courses of stretchers, a course of headers and five courses of stretchers followed by a course of headers. These walls were only seen in elevation; the trench did not reveal the upper surfaces of the walls and so the width of each of the outer walls of the dwelling are unknown. Within wall (404) was a possible skylight which had been blocked at a later date.

3.3.83 At the northern end of wall (405), was wall (412), possibly the same wall as (405), but highly damaged and showing signs of later repair.

3.3.84 The area of living space was divided into two rooms by internal wall (407). This wall was 3.46m long by 0.30m wide and survived to a maximum height of 0.62m, constructed of hand made bricks bonded with lime mortar. The bond of the bricks was unclear but appeared to be stretcher bond. Wall (407) was keyed into and bonded to wall (412). The erection of this wall created two rooms within the dwelling, with Room 1 to the north and Room 2 to the south. The two rooms were connected through a doorway at the western end of wall (407), and marked by a stone flag step in Room 2; the northern side of the doorway was not visible due to later alterations.

3.3.85 Room 1 was the smaller of the two exposed rooms, floored with large stone flags (410), the larger Room 2 being floored with randomly laid bricks (411). The floor has seen much alteration and relaying of bricks, with some basket-weave and herring-bone patterns discernible.

3.3.86 Interpretation of the function of the rooms is unclear as both rooms have the remains of hearths (structure (409) in Room 2 and (408) in Room 1). Both (408) and (409) were considerably damaged and were identified as hearths through the considerable amount of charcoal and ash residue in and around the structures.

3.3.87 Hearth (408) was positioned in the north-east corner of Room 1, bonded to wall (412), but was highly damaged. In Room 2 the hearth (409) was positioned against the eastern wall but again little remained except for the northern edge of a possible chimney wall which survives for 11 courses of lime mortared, irregularly bonded brick.

Phase 2: mid 19th century

3.3.88 It is unclear how long the dwelling remained in its initial form before the second phase of building began. This second phase has been tentatively dated to the mid 19th century, and saw the construction of two north-east – south-west aligned walls (413) and (414). Wall (414) appears to have been an addition to strengthen wall (403), but had been completely demolished and only remains as a maximum length of two bricks at the northern end of wall (403). Wall (413) survived for a height of 1.20m, comprising 14 courses. The bricks were of English bond and mortared with an ashy and charcoal rich mortar indicative of a 19th century build.

3.3.89 North-east – south-west aligned wall (413) is butted at its southern end to the northern side of wall (407), and reduced the size of Room 1 by approximately 1m. This formed a corridor which led to the north from the doorway between Rooms 1 and 2. The reasoning behind this alteration is unclear but by the addition of wall (413) there was no longer an obvious means (i.e. a doorway) of going from room to room. This may indicate that what was once a two-room dwelling was divided into two dwellings each consisting of a single room.

Phase 3: ?later 19th century

3.3.90 The third phase of alteration saw the blocking of the corridor created by the addition of wall (413). A NNW-SSE aligned wall (415) was constructed across the doorway between walls (413) and (414). This was a single machined brick thick and of stretcher bond, mortared with an ashy and charcoal rich mortar. This wall survived to a height of 1.31m, comprising 14 courses. The third phase also saw the blocking of the skylight within wall (404) with wall (417), built of machined bricks bonded with ashy and charcoal rich mortar.

3.3.91 This final phase of alteration would appear to seal off Room 2, and thus prevent further access to it. The reasoning behind this is unclear and it is possible there was still away of accessing the room which was not revealed in Trench 4, but with the blocking of the light source into the room the

dwelling may have been abandoned. It is still uncertain when these dwellings were abandoned and in what form they survived when the Site was bombed and levelled in the 1940s.

*Trench 5*

3.3.92 Trench 5 was an irregularly shaped trench roughly 4.7m long by 3.6m wide and 0.20 deep, orientated NNE-SSW and positioned to target the south-west corner of the mill (**Figures 1 & 15**).

3.3.93 Following the removal of the current tarmac car park surface, the cut of a CCTV cable (506) was observed, the continuation of cable trench (214) from Trench 2. It cut through levelling deposit (502), probably the result of demolition following the Blitz, used to level the car park surface.

3.3.94 Below (502) were two walls. Wall (503) was 2.80m long by 0.50m wide and recorded for 0.32m high, three courses in stretcher bond, bonded with lime mortar with a broken brick rubble core. This is the continuation of the southern wall of the factory (204) as identified in Trench 2 (see above).

3.3.95 The second wall was (504), recorded only in plan, for a length of 1.20m long by 0.50m wide. The upper course was of stretchers with a rubble core bonded with lime mortar. The two walls would have been bonded together at right angles but the corner had been truncated by the CCTV cable trench.

3.3.96 Wall (504) was the western wall of the mill, identified as (104) in Trench 1 (see above). However, examination of the bricks and mortar suggested that they dated to the 18th century and belonged to Arkwright's initial mill construction phase, whereas the wall foundations in Trench 1 were 19th century. It is clear that the southern end of the mill building has seen little alteration since it was constructed in the 1780s.

3.3.97 Abutting wall (503) was sett-built road way (505), identical to road (202) in Trench 2 and contemporaneous with (102) and (120) in Trench 1.

# 4 FINDS

## 4.1 Introduction

4.1.1 Finds were recovered from four of the five trenches excavated (no finds were recovered from Trench 5). The majority of the finds appear to relate to the later use of the factory site in the 19th and 20th centuries – the most closely datable material comprises pottery and glass vessels, including transfer-printed tea wares and embossed beer bottles. Materials relating to the factory structure were also recovered, largely from rubble deposits within Trench 3 which post-date the final destruction of the factory during the Blitz, including window glass, bricks, glazed wall tiles and salt-glazed drainage pipes. Internal fixtures and fittings include gas taps, ceramic insulators, wooden furniture fragments, a decorative metal ventilator grating, a sprinkler valve and an electrical connector, while personal items are represented by clay tobacco pipes and leather shoes.

4.1.2 Of particular interest amongst the finds assemblage are seven fragments from cylindrical, flat based vessels, possibly saggars, made from coarse, heavily grogged, calcareous clay, found in feature (353) in Trench 3, potentially the earliest feature excavated on the site, pre-dating the first mill structure of the late 18th century. The use of saggars dates back to the later 15th century, when they were introduced into the process of pottery production, acting as protective containers for fine glazed wares during kiln firing, but they became ubiquitous from the early 18th century with the introduction of biscuit and glost firings in the manufacture of fine earthenwares. In the 18th century saggars were usually cylindrical (Barker 1990, 122-6).

4.1.3 Important for the purposes of dating was a halfpenny dated 1775, recovered from the demolition/cellar backfill deposit within Trench 4. The coin was contained within a fragment of mortar and was possibly deliberately placed during the initial construction of the building as a token of good luck.

4.1.4 A full tabulation of the finds by context is presented in **Appendix 2**, which classifies the finds by category (structural, domestic, etc) and by material type.

### 4.2 Potential and further recommendations

4.2.1 The finds have little potential for further analysis. Little can be ascribed to the construction or use of the earliest mill structure. The possible saggars, however, warrant brief mention (and possibly illustration) in any publication text, as indicative of possible pottery manufacture on the site prior to the mill's construction.

4.2.2 Subject to the recommendations of the recipient museum, the finds could be subjected to selective disposal prior to archive deposition.

## 5 DISCUSSION

### 5.1 Introduction

5.1.1 The evaluation largely achieved its stated aims. Providing a greater understanding of the state of preservation and extent of the underlying archaeology of Arkwright's mill, it did, however, raise more questions than it answered concerning the development of the site and the phasing of the many different periods of building and alterations which occurred within the structure. Time constraints also meant that a number of the specific research questions could not be investigated.

### 5.2 The position of the original mill

5.2.1 Several pieces of cartographic evidence show the position of the mill, but its true position was lost following its complete demolition following the bombing of 1940.

5.2.2 It was initially believed that very little evidence of the original mill would have survived the numerous alterations and new phases of building which

occurred, especially following the 1854 fire when it was recorded that the mill was almost completely destroyed and had to be virtually rebuilt from scratch. It became clear, however, that evidence for the original foundations and thus the original dimensions of the building were identified within Trenches 1, 2, 3 and 5.

5.2.3 The original width of Arkwright's mill had been documented as 30ft (9.1m), whereas Trench 1 revealed the actual width to have been 39ft (12m). It was believed that after the fire of 1854 the building was widened, and so it would appear to have been, by 3m. However, close examination of the photograph of the south-eastern corner of the mill building taken sometime between 1892 and 1940 (**Figure 3**) and the southern elevation sketch from 1912 (**Figure 16**) indicate that a section of the southern wall where it joins the eastern wall belonged to the original Arkwright construction. Therefore, if the mill was widened, it would have been widened by 3m on its western side, meaning that the original foundation trench for the western wall of Arkwright's mill would have been located 3m to the east of the 19th century rebuild. This was shown not to be the case. Three metres east of wall (104) was a large gap within floor surface (106) (see **Figure 5**), but no foundation cut for an earlier building. Investigation of the deposit exposed within the gap in the bricks identified it as *in situ* natural geology.

5.2.4 In Trench 5, 3m east of wall (504), there was likewise no evidence of a brick foundation trench butting 18th century wall foundation (503) (see **Figure 15**). Also, wall (504) was clearly identified as belonging to the original construction phase of the mill through analysis of the bricks and mortar.

5.2.5 It appears, therefore, from the photographic evidence, elevation drawing and the excavation of Trenches 2 and 5, that the whole southern end of the mill survived the fire and was incorporated into the post-1854 building. Arkwright's original mill was therefore 12m (39ft) wide and not 9.1m (30ft) wide as previously believed. The building was not widened following the 1854 fire, but walls were rebuilt on old foundations.

5.2.6 Further supporting evidence comes from internal features within Trench 3. Some of the earliest structures in this trench were the three large sandstone pad-stones (328), (326) and (325) which once held cast iron columns (see **Figure 8**). These are equidistant from both NNE-SSW external walls, i.e. aligned centrally down the longitudinal axis of the building, which must therefore have been 12m wide at the time of their insertion.

### 5.3 Steam power versus water power

5.3.1 Was the mill originally powered solely by steam? When the mill was being built it was recorded that a Newcomen atmospheric steam engine was supplied by Hunt to be used at Manchester. No definite evidence for the location of the atmospheric engine within the mill structure was identified, but within Trench 3 one feature may have been associated with the earliest steam engine on the Site. Brick built tank (354) was identified as being constructed of 18th century materials and potentially used for the holding of

water to feed Hunt's atmospheric engine (M. Nevell *pers. comm*.). This is, however, purely speculative.

5.3.2 The project aimed to find the location of the mill wheel which was installed following the failure of the Newcomen atmospheric engine, and to determine whether a steam engine was run in tandem with the wheel to power the machinery.

5.3.3 It was initially believed that as the water wheel was a secondary addition it would have been positioned outside the original mill building. However, the mill wheel pit was identified within Trench 3 inside the original structure (see **Figure 9**). The northern wall of the wheel pit was located approximately 38m north of the inside of the southern mill wall, with the eastern wall of the pit formed by a section of the eastern external wall of the mill. The pit was only revealed for a length of 1.8m, although it was previously recorded as having held a wheel with a diameter of 30ft (9m) and a width of 8ft (2.4m) (Champness 2004, 1). If these previously recorded dimensions for the wheel are correct, it would have fitted very tightly within the pit, which had a width of 2.4m. The wheel pit was excavated to a depth of 3m, but not bottomed.

5.3.4 There was no archaeological evidence to suggest that the atmospheric engine which had failed to run the machinery on its own was used in conjunction with the wheel to power the mill machines, but it seems likely, as the engine was already set up to do so. However, if it failed so dramatically to power the machines, it is possible that the engine was put to another use, that of pumping water from the lower reservoir to the upper reservoir once it had passed through the water wheel.

5.3.5 No evidence was found to explain how water was moved about within the mill, how it fed the water wheel or how it was used to feed the steam engines. It is possible that the water wheel was a type of overshot wheel (the water flowing onto the wheel, just over the centre of the wheel and driving the wheel in the direction of the flow). Alternatively, it could have been a pitch back wheel, where the water drops on to the paddles from above and turns the wheel in a reverse direction to the water flow, or a breast wheel, where the water flows in at the height of the axle (Jones 1996, 41, 263, 277 and 422). These three types of feed for the wheel would leave little in the archaeological record as they would have been elevated above the level of the factory floor. Only bases for the water channels would remain, and no such bases were identified. Load bearing arch (339) which spanned the width of the wheel pit at the northern end may have held structures associated with feeding the water wheel, but this is by no means clear.

5.3.6 The water wheel would have been fed from the northern end of the pit, with the water flowing out of the southern end, as it was clear there was no way for the water to flow out at the northern end. Moreover, the upper reservoir was situated at the northern end of the building (**Figure 2**).

5.3.7 A further aim had been to attempt to locate the position of the steam engine used to pump the water from the lower to the upper reservoir once it had powered the water wheel, and to investigate the leat system between the two

ponds. As the reservoirs were situated to the north of the mill building the pump is likely to have been positioned towards that end of the Site. This area was not investigated.

## 5.4 The Boulton and Watt engines

5.4.1 The first Boulton and Watt engine erected at the mill in January 1791 was not situated within the main mill building but located to the east in a separate building (see **Figure 2**) and was brought in to drive the machinery directly. As this engine was positioned outside the mill, potentially for safety reasons but also for reasons of space, it is possible that the mill wheel would have been used in conjunction with the new Boulton and Watt engine (Champness 2004, 2-7). The believed position of the 1791 engine was not investigated.

5.4.2 When the second engine was installed in 1792 this would also have been placed outside the mill. This engine replaced the waterwheel and the Newcomen engine, and the corresponding changes on the Site can be seen in the dismantling of the wheel frame and the backfilling of the wheel pit in Trench 3. A third Boulton and Watt engine was installed in 1799; this was also situated outside the main mill building. No evidence of these engines was identified as the area outside the main building was not investigated.

## 5.5 Living in Angel Street

5.5.1 Despite the prosperity brought by trade and commerce, the working people of Manchester lived and died in conditions of the utmost poverty. These appalling conditions were not, of course, unique to the industrial city of Manchester, but were unusual in being highlighted by several 19th century luminaries, including the poet Robert Southey and the social scientist Friedrich Engels (who wrote *The Condition of the Working Class in England* in 1844, based on the underclass of Manchester).

5.5.2 The dwelling revealed in Trench 4 appeared typical of the many structures that were home to the thousands of workers and families employed in the cotton industry in Manchester. At the end of the 18th century increased industrial development led to the large-scale building of cottages for new cotton workers. The structure investigated in Trench 4 was possibly built in 1775 or later (dating evidence from a halfpenny encased in mortar, recovered from the cellar backfill). In the 1820s, when development and industry increased at a phenomenal rate and the population of Manchester increased by nearly 50 per cent, homes were urgently required for the flood of immigrant workers. In 1801, 45 per cent of historic Lancashire's population lived and worked in town, with 24 per cent living in just two urban centres, Liverpool and Manchester (Phillips and Smith 1994, 135-6).

5.5.3 This urgency of home building led to increasingly cramped conditions as small, two-storey houses with cellars were constructed, and homes also made within the cellars which had originally been dug to alleviate the damp conditions caused by jerry-building. Such building was subject to no control or regulation. The increasing need for individual homes for families was demonstrated in Trench 4 where what was once a two-room dwelling was

divided into two single-room dwellings by the insertion of a corridor. Such dwellings would have had no water or services, and no privacy; one family or more would share a single room, and up to 100 houses shared a single privy (www.manchester2002-uk.com/history/victorian/Victorian1.html). The increasingly crowded and insanitary conditions led to major outbreaks of disease such as cholera in 1831 and 1849. Despite these conditions these homes were occupied well into the 20th century (Roberts 1999, 4-6).

### 5.6 Arkwright's legacy: urban growth in Manchester

5.6.1 The completion of the Bridgewater Canal in 1765 enabled Manchester to develop as an inland port, providing it with improved access to raw materials and outlets for its products - and so the growth of Manchester began. The construction of the first cotton mill in Manchester by Richard Arkwright in the early 1780s led to the construction of up to 60 further mills in Manchester in the 40 years that followed (Williams and Farnie 1992, 48), characterising the city as a commercial centre, and the huge scale of mills built within Manchester and the county of Lancashire reflected the importance of the textile industry in north-west England. (www.liverpoolmuseums.org.uk/liverpoollife/archaeology/arf/documents/INDUSTRIALANDMODERNASSESSMENT.pdf)

5.6.2 When Greater Manchester was formed as a separate county in 1974, a county that stretched to Wigan in the west, Rochdale in the north, Tameside in the east and Stockport in the south, an area measuring approximately 25 miles north to south by 30 miles east to west contained over 2,400 mills and cloth finishing works (Williams and Farnie 1992, 48). This explosion of development which had begun just over 200 earlier was led by the innovations of men such as Richard Arkwright, Thomas Newcomen and James Watt, leading forces in the Industrial Revolution.

5.6.3 The mill at Shudehill was part of the beginning of an age when technology took over from manual work, leading to increased productivity. However, increased productivity led to increasing competition between rival mills, which led in turn to poorer conditions for the mill workers, both at work and at home. There could be no impetus for better conditions when there were so many people looking for work, with mass migrations of people to the north-west.

5.6.4 The Manchester Mercury records that '*at a meeting of the Muslin, Cotton Manufacturers and Cotton Spinners in 1791, they resolved unanimously that the cotton and muslin manufacturers are of the greatest consequence to this kingdom giving employment to near half a million of his Majesty's subjects'* (Champness 2004, 5).

## 6 ARCHIVE

6.1.1 The excavated material and archive, including plans, photographs and written records are currently held at the offices of Wessex Archaeology in Salisbury under the project code 59473 and site code AMM 05. It is intended that the

archive will ultimately be deposited with The Museum of Science and Industry in Manchester.

# 7 RECOMMENDATIONS

7.1.1 This report will be submitted to the Greater Manchester Textile Mill Archive, and to the Greater Manchester Sites and Monuments Record (SMR). A short article, of between 7000 and 8000 words, with up to eight supporting illustrations, based on the results and discussion presented in this report, in the *Industrial Archaeology Review* is suggested as an adequate level of publication. This would comprise a brief introduction detailing the circumstances of the project and aims and objectives; a results section detailing the structural remains recorded; and a brief discussion of the results, with reference to the original aims and objectives.

## 8 REFERENCES


Barker, D., 1990, *William Greatbatch: a Staffordshire Potter*, London: Jonathan Horne

Champness, B., 2004, 'A history of Simpson's Mill, Shudehill, Manchester'. *Manchester Regional Industrial Archaeology Society*

Geological Survey of England and Wales, 1874 (resurveyed 1924-7), Sheet 85 D

GSB Prospection, 2005, *Manchester*, unpub. report for Time Team

Jones, W., 1996, *Dictionary of Industrial Archaeology*

Loudon, J., 1916, 'Manchester Memoirs', *The Royal Exchange Assurance Magazine*

Phillips, C.B. and Smith, J.H., 1994, *Lancashire and Cheshire from AD1540*, London: Longman

Roberts, J., 1999, *Working Class Housing in Nineteenth Century Manchester, John Street, Irk Town, 1826-1936*

Videotext Communications Ltd., 2005, *Proposed Archaeological Evaluation at Arkwright's Mill, NCP, Miller Street, Manchester, M4 4DY. NGR SJ 842 990. Project Design*

Webb, E. and Duncan, J., 1990, *Blitz Over Britain*, Kent: Spellmount Ltd

Williams, M. and Farnie, D.A., 1992, *Cotton Mills in Greater Manchester*, RCHME & Greater Manchester Archaeological Unit

**Internet sources:**
www.liverpoolmuseums.org.uk/liverpoollife/archaeology/arf/documents/INDUSTRIALANDMODERNASSESSMENT.pdf

www.manchester2002-uk.com/history/victorian/Victorian1.html.

## APPENDIX 1: TRENCH SUMMARIES

Trench 1

| | Max Depth: 0.40m | Length: 22.5m | Width: 4.60m |
|---|---|---|---|
| **Context No.** | **Type** | **Description** | |
| 101 | *Layer* | Current tarmac surface of the car park, overlies deposits (107) and (105). | |
| 102 | *Road way* | Yellow sandstone sett constructed road, set into cinder and bitumen (109), positioned down the western side of the factory, road edged by kerbstones (103). | |
| 103 | *Kerb* | Sandstone sett kerb of roadway (102), cut through by drain (110). | |
| 104 | *Wall* | NNE-SSW aligned brick built wall, single course of 19th century dated bricks, from a period of rebuilding post dating 1854. Outer wall of the factory. | |
| 105 | *Layer* | Levelling deposit of mid-light reddish yellow sand, levelling for car park. | |
| 106 | *Surface* | Internal brick surface of the factory, probably 19th century in date, butts wall (104) and is overlain by, and replaced at the eastern end of trench by concrete layer (113). | |
| 107 | *Layer* | Levelling deposit, following demolition of site in the 1940s, used for car park levelling. | |
| 108 | *Deposit* | Mixed mid yellow brown and very dark red black rubble deposit of broken brick and cinder, filling cut (122). | |
| 109 | *Layer* | Bitumen deposit below road way (102), into which the setts are set. | |
| 110 | *Cut* | Construction cut for a 19th century drain, which cut through kerb stones (103) and road (102), filled with (111). | |
| 111 | *Fill* | Fill of drain cut (110), including the ceramic drain pipe, metal grill and the replaced area of kerb (103). | |
| 112 | *Layer* | Very dark grey brown black silty loam deposit which overlies (106) and (113), possibly occupation deposit, but most likely result of bombing and demolition. | |
| 113 | *Layer* | Series of thin concrete slabs which overly brick surface (106), early 20th century in date. | |
| 114 | *Cut* | Cut of modern CCTV cable, cuts (105), and visible cutting (113). | |
| 115 | *Fill* | Modern CCTV cable and backfill of (114). | |
| 116 | *Structure* | Concrete channel which is bonded to (113), and overlies (126). Unknown function but filled with (121) which contained possible bathroom tiles. Possibly latrine-related. | |
| 117 | *Wall* | Eastern north NNE-SSW aligned wall of the factory, within construction cut (124). Wall foundation seen to be 9 courses of unmortared irregularly bonded bricks. 19th century in date. | |
| 118 | *Kerb* | Line of setts which butt against wall (117) and form a slight slope away from the wall to gutter (119). Overlies rubble (124). | |
| 119 | *Sett gutter* | Deposit of sandstone setts which form a possible drainage channel or gutter down the eastern side of the factory, butts (120). | |
| 120 | *Roadway* | Yellow sandstone sett constructed road, set into cinder and bitumen, positioned down the eastern side of the factory, road edged by kerbstones (118). | |
| 121 | *Fill* | Fill of concrete channel (116), dark grey brown cinder and charcoal rich silt, containing a lot of broken tile. | |
| 122 | *Cut* | Cut for the removal of a possible structure set into floor surface (106), but unclear of what that might have been. Filled with (108). | |
| 123 | *Natural* | Natural clay. | |
| 124 | *Cut* | Construction cut for wall (117), recut along the original alignment of the 18th century mill. | |
| 125 | *Deposit* | Rubble deposit of broken brick work used as levelling below kerb (118) and roadway (120). Revealed following sondage into (117). | |
| 126 | *Deposit* | Levelling deposit below concrete (113), crushed brick and cinder deposit. | |

## Trench 2

| | Max Depth: 0.30 | Length: 5.1m | Width: 2.5m |
|---|---|---|---|
| **Context No.** | **Type** | **Description** | |
| 201 | *Layer* | Current tarmac surface of the car park. | |
| 202 | *Raod way* | Road way of yellow sandstone setts, part of road around the southern end of the factory, contemporary with (102) and (117) in Trench 1. | |
| 203 | *Structure* | Remains of a frogged brick pillar base within construction cut (213), 20th century in date. | |
| 204 | *Wall* | Roughly east west aligned, southern wall of the factory, constructed of unfrogged bricks, possibly 18th century, original part of Arkwright's mill. | |
| 205 | *Layer* | Light yellow silty with brick flecks, large demolition layer. | |
| 206 | *Layer* | Modern concrete make-up layer. | |
| 207 | *Structure* | Large sand stone pad stone, once held a cast iron column, part of Arkwright's original build. | |
| 208 | *Structure* | Series of limestone setts cemented into (202). | |
| **209** | ***Cut*** | **Construction cut for 18th century mill wall (204).** | |
| 210 | *Structure* | Light yellow white silty sand, packing deposit around mill wall. | |
| 211 | *Structure* | Identical to (204). | |
| **212** | ***Cut*** | **Modern disturbance.** | |
| **213** | ***Cut*** | **Construction cut for (203).** | |
| **214** | ***Cut*** | **Cut of modern cable trench .** | |
| 215 | *Fill* | Fill of modern cable trench. | |
| 216 | *Structure* | Area of possible flooring lost in to section. | |
| 217 | *Structure* | Small iron disc set into roadway setts. | |
| 218 | *Natural* | Natural brickearth. | |
| **219** | ***Cut*** | **Construction cut for (211), equivalent to (209).** | |
| **220** | ***Cut*** | **Construction cut for (207).** | |

## Trench 3

| | Max Depth 3.50 | Length: 16.1m | Width: 15.2m |
|---|---|---|---|
| **Context No.** | **Type** | **Description** | |
| 301 | *Lyaer* | Tarmac surface of car park. | |
| 302 | *Layer* | Rubble deposit directly below (301), dark grey brown black loose silty clay, demolition and levelling deposit. | |
| 303 | *Structure* | A single layer of setts forming 19th century roadway, identical to (102) in Trench 1. | |
| 304 | *Structure* | Brick constructed 19th century outer wall of the mill equal to (104) in Trench 1. | |
| 305 | *Floor* | Brick constructed floor surface of hand-made and machine made bricks, 19th century in date. | |
| 306 | *Structure* | Small stump of wall which overlies floor (305). | |
| 307 | *Fill* | Backfill deposit of mixed yellow brown silty clay and dark brown silty clay fill of unknown feature (353). | |
| 308 | *Layer* | Levelling mortar deposit in south east corner of Trench 3. | |
| 309 | *Layer* | Dark brown black rubble deposit below (308). | |
| 310 | *Layer* | Deliberate dump of mixed mid yellow, reddish brown and black silty clay loam which fills water tank Group (354), and fills void between retaining arches (311) and (312). | |
| 311 | *Structure* | Retaining arch, partner to (312), which is positioned over water tank Group (354). (311) rests upon a timber support (345). Load bearing archway. 19th century. | |
| 312 | *Structure* | Retaining arch, partners (311), overlies timber support (344). 19th century. | |
| 313 | *Structure* | Buttress at the end of retaining arch (311). 19th century. | |

| | | |
|---|---|---|
| 314 | *Structure* | Brick built wall, bonded on northern end to the eastern end of (312). 19th century. |
| 315 | *Structure* | Partly demolished brick built archway potentially 18th century and associated with the wheel pit of the mill. |
| 316 | *Structure* | Remnant of (304). |
| 317 | *Structure* | Remnant of (304). |
| 318 | *Layer* | mid to dark brown black rubble make-up deposit, below road way (322). |
| 319 | *Structure* | Brick built eastern outer wall of the mill, equal to (117) in Trench 1, 19th century in date. |
| 320 | *Structure* | Granite sett kerb, which butt wall (319), slightly sloping away from wall to aid water drainage. |
| 321 | *Structure* | Granite sett drainage channel which is contemporary with (320), water would flow off (320) and into (321) away from the building. |
| 322 | *Structure* | 19th century granite sett constructed road on the eastern side of the mill, equal to (120) in Trench 1. |
| 323 | *Structure* | Brick built wall which overlies 3 sandstone pad stones, which have had the cast iron columns removed this wall has then been built upon by (305), brick floor surface. |
| 324 | *Structure* | Small section of brick built wall which overlies pad stone (323). |
| 325 | *Structure* | 18th century sandstone pad-stone which once held a cast iron column. |
| 326 | *Structure* | 18th century sandstone pad-stone which once held a cast iron column. |
| 327 | *Structure* | Granite flags which have been used as levelling for pad stone (326). |
| 328 | *Structure* | 18th century sandstone pad-stone which once held a cast iron column. |
| 329 | *Structure* | brick structure used as levelling below pad stone (328). |
| 330 | *Layer* | Dark grey brown black cinder rich clay deposit fill of (331), packing around pad-stones. |
| **331** | ***Cut*** | **Construction cut for the insertion of pad-stones (325), (326), (328), long slot excavated for placement of all stones.** |
| 332 | *Structure* | Brick wall constructed at 45° angle to wall (324), function unknown. |
| 333 | *Structure* | Irregular bonded brick built wall which fills doorway through wall (336) onto platform (338), erected following abandonment of and backfilling of wheel pit. |
| 334 | *Layer* | Mixed mid grey brown and dark brown black silty clay with common stone and cbm fragments, deliberate backfill/levelling deposit against western edge of wall (323), sealed below floor (305). |
| 335 | *Structure* | Main north south aligned brick built wall of the wheel pit, built upon by (319), and bonded to (336). |
| 336 | *Structure* | Main east west aligned wall at the northern end of wheel pit. Did have a door way through it leading on to platform (338), this was filled with (333). |
| 337 | *Layer* | Limestone mortar lining of the wheel pit. |
| 338 | *Structure* | Brick constructed platform which is bonded to wall (336), platform to gain access to the wheel within the wheel pit. |
| 339 | *Structure* | A retaining archway over the wheel pit, potentially for holding superstructure associated with feeding the wheel, demolished when the pit went out of use. A later addition to the wheel pit. |
| 340 | *Structure* | Northern east west aligned wall of the bitumen lined tank Group (354). |
| 341 | *Structure* | Eastern north south aligned wall of the bitumen lined tank Group (354). |
| 342 | *Structure* | Western north south aligned wall of the bitumen lined tank Group (354). |
| 343 | *Structure* | Southern east west aligned wall of the bitumen lined tank Group (354). |
| 344 | *Wood* | Wooden supporting plank which overlies tank Group (354), used in the construction of retaining archway (312). |
| 345 | *Wood* | Wooden supporting plank which overlies tank Group (354), used in the construction of retaining archway (311). |
| 346 | *Structure* | Irregular laid pad of bricks, probable later pillar base. |
| 347 | *Structure* | Single course of stretchers, possibly associated with tank Group (354), but unclear. |
| 348 | *Structure* | Area of brick wall, 2 courses of stretchers revealed in section of sondage investigating Group (354). |

| | | |
|---|---|---|
| 349 | *Layer* | Very dark brown black cinder rich silt, fill of feature 350, deliberate dump of cinder material, nature of feature unknown. |
| **350** | ***Cut*** | **Cut of unknown feature.** |
| **351** | ***Cut*** | **Construction cut for water tank Group (354).** |
| 352 | *Layer* | Very dark grey brown black cinder rich silt deposit, which underlies (322). |
| **353** | ***Cut*** | **Cut of possible earliest feature on site, shape and function unknown, filled with (307), and had (315) constructed over it.** |
| 354 | *Structure* | Group number for water tank constructed from (340), (341), (342), and (343). |
| 355 | | VOID |
| **356** | ***Cut*** | **Construction cut for buttress (313).** |
| 357 | *Structure* | Brick built wall same build as (312) and (314). Unclear function. |
| **358** | ***Cut*** | **Cut for a 19th century ceramic drain (359).** |
| 359 | *Layer* | Fill of (358), ceramic drain and construction cut. |
| **360** | ***Cut*** | **Construction cut for wall (319).** |
| 361 | *Layer* | mid to light grey mortar rich silty clay deliberate backfill of wheel pit Group (362). |
| 362 | *Structure* | Group number for wheel pit constructed of (336), (338), (335). |
| 363 | *Structure* | Brick built pillar base for possibly holding machinery. |
| 364 | *Structure* | Sandstone slab, machinery base. |
| 365 | *Structure* | Possible pad stone, levelling layer of cinder. |
| 366 | *Structure* | Brick pad of machinery base. |
| 367 | *Structure* | Sandstone pad for machinery. |
| 368 | *Structure* | Patch of brick work of unknown function. |
| 369 | *Structure* | Area of brick flooring adjacent to wall (319), possibly contemporary with (305). |
| 370 | *Structure* | Area of brick wall infilling gap in wall (335). |
| 371 | *Layer* | Deliberate fill of wheel pit overlies (361). |
| **372** | ***Cut*** | **Continuation of wall (324), overlies backfilled wheel pit.** |
| 373 | *Natural* | Natural clay. |
| **374** | ***Cut*** | **Cut of 19th century ceramic drainage pipe, identified below (352), below roadway (322).** |
| 375 | *Layer* | Ceramic pipe and backfill clay material of (374). |
| 376 | *Structure* | Probably an internal wall dividing areas of the factory, recorded as 2.80m long by 0.24m wide and a single brick in height (0.07m), constructed in irregular bond with reused bricks and charcoal rich mortar. Function is unknown. |

## Trench 4

| | | | |
|---|---|---|---|
| | Max Depth: 1.60m | Length: 7.9m | Width: 6.7m |
| **Context No.** | **Type** | **Description** | |
| 401 | *layer* | Gravel surface, current car park. | |
| 402 | *Layer* | deliberate backfill deposit, result of demolition and levelling rubble deposit. | |
| 403 | *Structure* | Western wall of cellar dwelling. | |
| 404 | *Structure* | Southern wall of cellar dwelling. | |
| 405 | *Structure* | Eastern wall of cellar dwelling. | |
| 406 | *Void* | VOID | |
| 407 | *Structure* | East west aligned wall which separates dwelling into two individual rooms. | |
| 408 | *Structure* | Possible hearth/fireplace installation in wall (412). | |
| 409 | *Structure* | Possible hearth/fireplace installation in wall (405). | |
| 410 | *Floor* | Stone flagged floor surface. | |
| 411 | *Floor* | Brick floor surface, irregular patterns, incorporating herringbone and basket weave. | |
| 412 | *Structure* | North south aligned wall, continuation of (405). | |
| 413 | *Structure* | Brick built wall. Later addition creating corridor into brick floored room, making flagged room smaller. | |
| 414 | *Structure* | Addition to wall (403), widening and possible strengthening. | |

| | | |
|---|---|---|
| 415 | *Structure* | Brick built blocking wall, in corridor formed by (413) and (414). |
| 416 | *Layer* | Dark grey brown levelling deposit below floor surfaces.<br>Brick wall added to strengthen wall (404). |

Trench 5

| | Max Depth: 0.25 | Length: 4.7m | Width: 3.6m |
|---|---|---|---|
| **Context No.** | **Type** | **Description** | |
| 501 | *Layer* | Tarmac, current car park surface, overlies (502). | |
| 502 | *Layer* | Dark grey brown black rubble rich silty clay which overlies walls (503) and (504), levelling deposit, mixed with demolition rubble. | |
| 503 | *Structure* | Roughly north south aligned brick wall foundation, 18th century build. | |
| 504 | *Structure* | Roughly east west aligned brick wall foundation, 18th century build. | |
| 505 | *Structure* | Granite sett constructed road on the western side of the building. | |
| **506** | ***Cut*** | **Cut of modern CCTV cable, destroys junction of walls (503) and (504).** | |
| 507 | *layer* | Fill of (506), cable and backfill. | |

## APPENDIX 2: LIST OF FINDS BY CONTEXT

CBM = ceramic building material

| Context | Category | Material | Number | Description |
|---|---|---|---|---|
| 106 | structural | stone | 1 | roofing slate (vitrified surface) |
| 108 | uncertain | iron | 4 | 2 bars (?handle), 2 ?nails |
| 121 | structural | CBM | 102 | wall tiles (decorative and plain) |
| Tr 1 unstrat | domestic | glass<br>pottery | 2<br>1 | bottle/jar, dark blue stirring rod<br>refined whiteware |
| Tr 1 unstrat | fixtures & fittings | iron<br>copper alloy<br>pottery | 5<br>3<br>1 | various fittings<br>(?gas) tap<br>porcelain insulator |
| Tr 1 unstrat | implements | iron | 2 | implements |
| Tr 1 unstrat | personal | clay pipe | 2 | pipe stems |
| Tr 1 unstrat | structural | CBM | 24 | wall tiles (decorative and plain); 2 lumps concrete with porcelain insulators embedded |
| Tr 2 unstrat | uncertain | iron | 2 | 1 sheet, 1 fitting |
| 301 | domestic | pottery | 1 | refined whiteware (transfer printed) |
| 301 | decorative | CBM | 1 | path edging slab |
| 302 | domestic | pottery<br>glass | 1<br>15 | refined whiteware<br>bottle/jar |
| 302 | fixtures & fittings | copper alloy<br>pottery | 3<br>1 | small (?gas) tap, decorative drawer handle<br>stoneware insulator |
| 302 | personal | clay pipe | 1 | pipe stem |
| 302 | structural | CBM<br><br>glass | 20<br><br>1 | wall tiles (decorative and plain); some burnt<br>wall tile |
| 305 | structural | CBM | 2 | 2 bricks (215 x 105 x 70mm), unfrogged, burnt |
| 307 | industrial | ?plaster | 7 | cylindrical saggar-like vessel(s) |
| 309 | domestic | animal bone | 3 | |
| 309 | domestic | pottery<br><br>glass | 19<br><br>3 | redware, refined whiteware (transfer printed), stoneware, creamware<br>bottle/jar |
| 309 | personal | clay pipe | 5 | 4 stems, 1 bowl fragment |
| 309 | structural | CBM<br>glass | 11<br>1 | wall tiles (plain); one heavily burnt<br>window |
| 309 | uncertain | copper alloy | 1 | disc |
| 310 | fixtures & fittings | wood | 4 | pulley wheel & housing; ?furniture leg |
| 310 | personal | leather | 1 | shoe |
| 310 | domestic | animal bone | 2 | |
| 310 | domestic | pottery | 28 | redware, pearlware, stoneware (stamped bottle, J PRATT & SON, MANCHESTER), refined whiteware (transfer printed, banded) |
| 310 | implements | iron | 1 | pliers |
| 310 | personal | clay pipe | 18 | 16 pipe stems, 2 pipe bowl fragments |
| 310 | structural | CBM<br><br><br><br>glass | 3<br><br><br><br>1 | salt-glazed drainpipe; 2 small, chamfered yellow bricks, stamped ADAMAN / 880812 / CLINKER REG and AD MANTINE<br>window |
| 318 | structural | CBM | 1 | |
| 330 | fixtures & fittings | iron | 2 | large iron fittings |

| | | | | |
|---|---|---|---|---|
| Tr 3 unstrat | domestic | animal bone | 5 | |
| Tr 3 unstrat | domestic | pottery<br><br><br><br>glass | 45<br><br><br><br>7 | redware, creamware (cabled dec), stoneware (inc. insulator), refined whiteware (transfer printed)<br>bottle/jar |
| Tr 3 unstrat | fixtures & fittings | copper alloy<br>iron | 1<br>1 | electrical connector (early 20th C type)<br>sprinkler valve (19th C type) |
| Tr 3 unstrat | personal | clay pipe | 2 | stems |
| Tr 3 unstrat | structural | CBM<br>glass | 1<br>3 | wall tile (decorative)<br>reinforced window |
| 402 | personal | leather | 3 | shoes |
| 402 | domestic | animal bone | 4 | |
| 402 | domestic | pottery<br><br>glass | 17<br><br>13 | redware (late slipped kitchen ware bowl); stoneware, refined whiteware<br>embossed beer bottles (W…HWELL / NEWTONHEATH; J. PRATT & SON, MANCHESTER); small bottle for ?oil (labelled '[for] bicycles, clocks, perambulators…') |
| 402 | fixtures & fittings | iron | 1 | decorative ventilator (incorporating letters SINC…) |
| 402 | personal | clay pipe | 4 | 3 stems, 1 bowl (C19+) |
| 402 | structural | CBM<br><br>glass<br>stone<br>plaster | 8<br><br>2<br>1<br>4 | salt glazed drainpipe; part circular slab; wall tiles<br>wall tiles<br>roofing slate<br>painted plaster on mortar |
| 402 | uncertain | copper alloy | 3 | |




| | | | |
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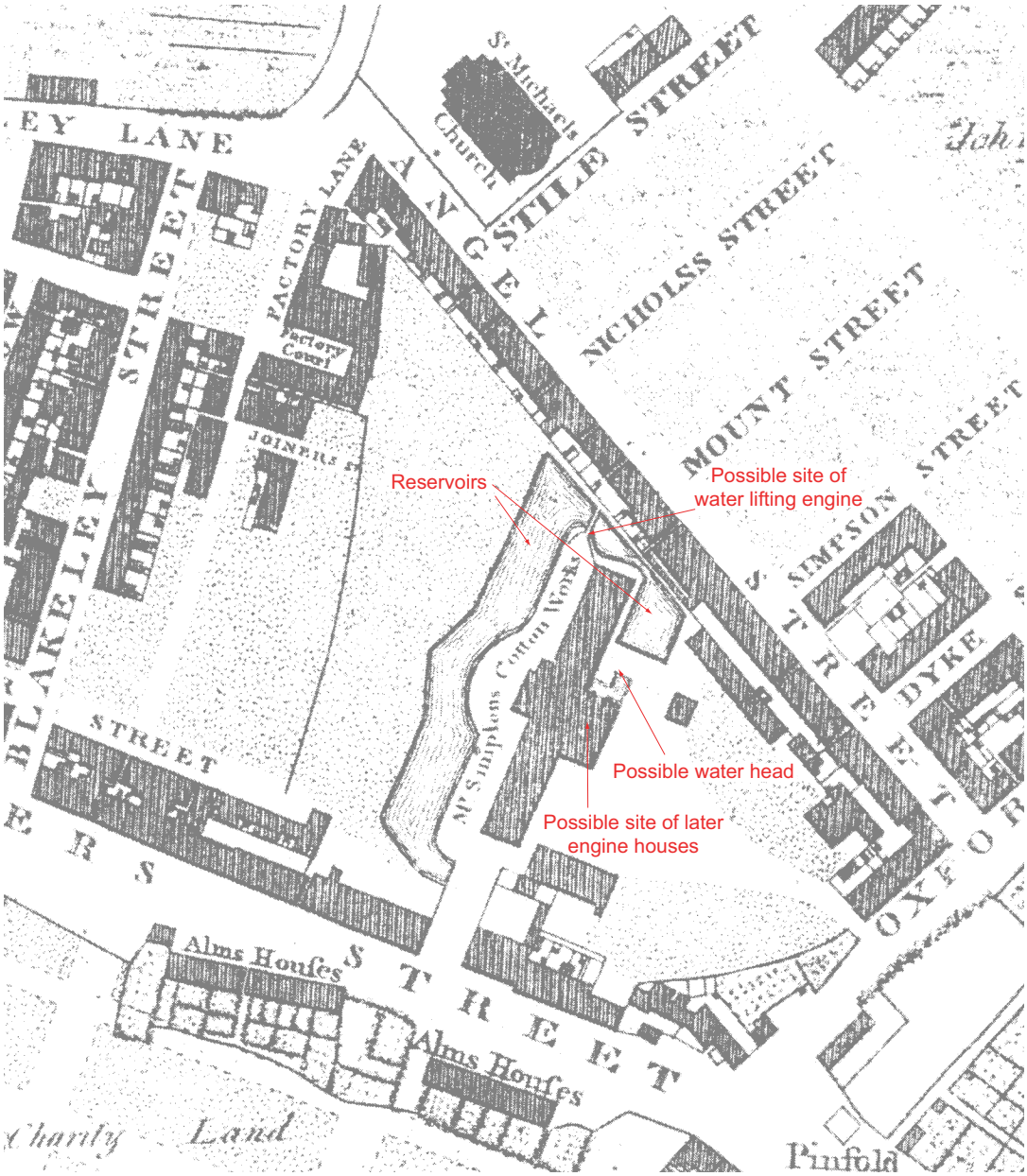
Wessex Archaeology

Site and trench location

Figure 1



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Wessex Archaeology

Green's map of the Site 1794, showing reservoirs to the west and north of the mill

Figure 2




| | | | |
|---|---|---|---|
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Wessex Archaeology

Photograph of the southern and eastern elevations of Arkwright's Mill, following the takeover by Baxendales. Figure 3
The post-1854 addition of two upper floors can be clearly seen, also a possible entrance in the eastern wall.

Miller Streeet area c.1941 (126/7 DPA, Neg: G23/19, catalogue ref 126) Courtesy of the Greater Manchaester County Record Office.


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Wessex Archaeology

Photograph of the site of Arkwright's Mill following the Blitz in 1940. Figure 4


Trench 1 from the west

Trench 1 from the east

Wessex Archaeology

Key:

- Brick
- Granite
- Brick continuation (not planned)
- Granite continuation (not planned)
- Concrete
- Excavation limits

0 5m



| | |
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| Scale: | 1:100 |
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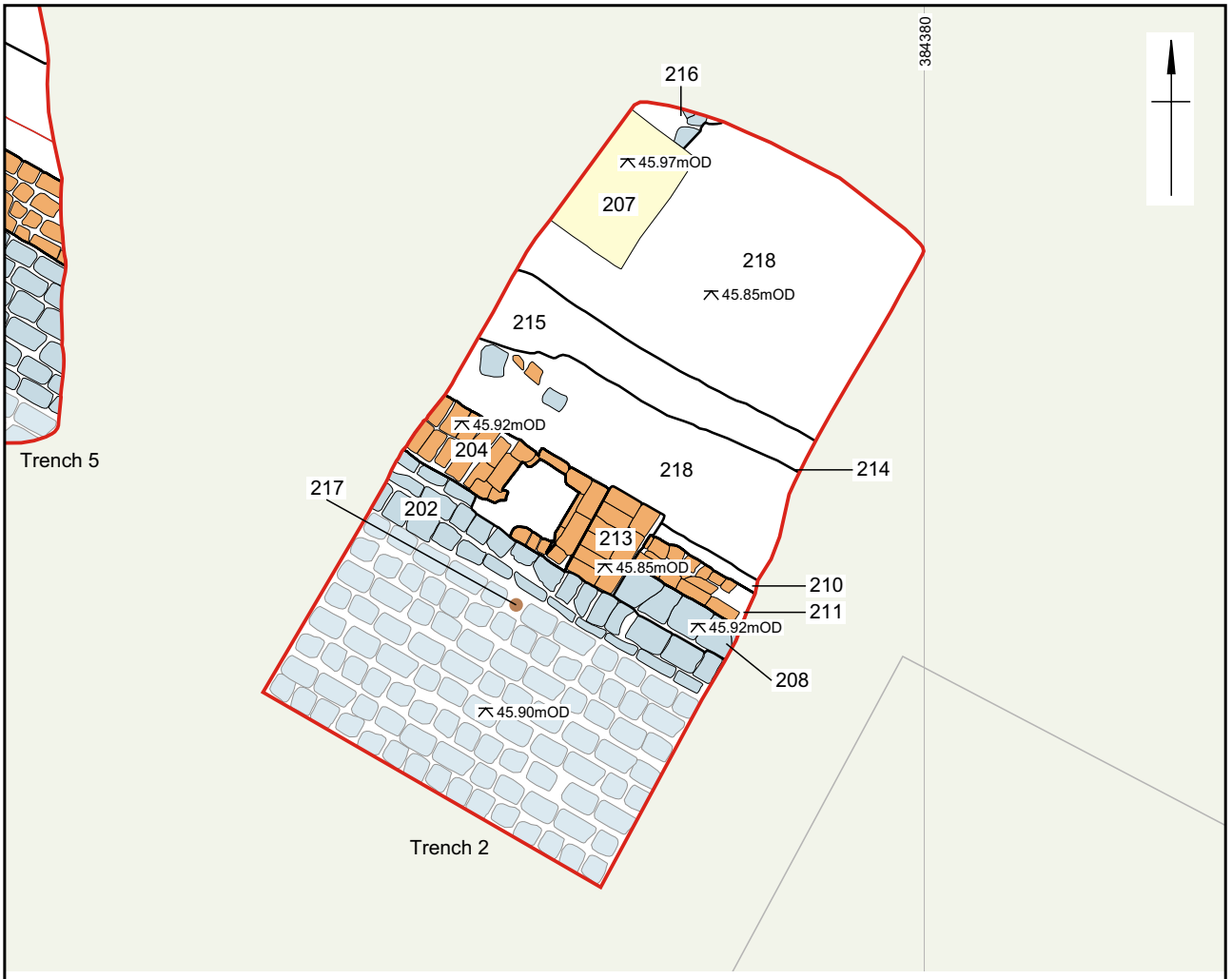
| | \06_01_23\master.dwg |

Trench 1

Figure 5




Trench 2 from the south

Key:

- Brick
- Granite
- Granite continuation (not planned)
- Sandstone
- Excavation limits

0 1 2m



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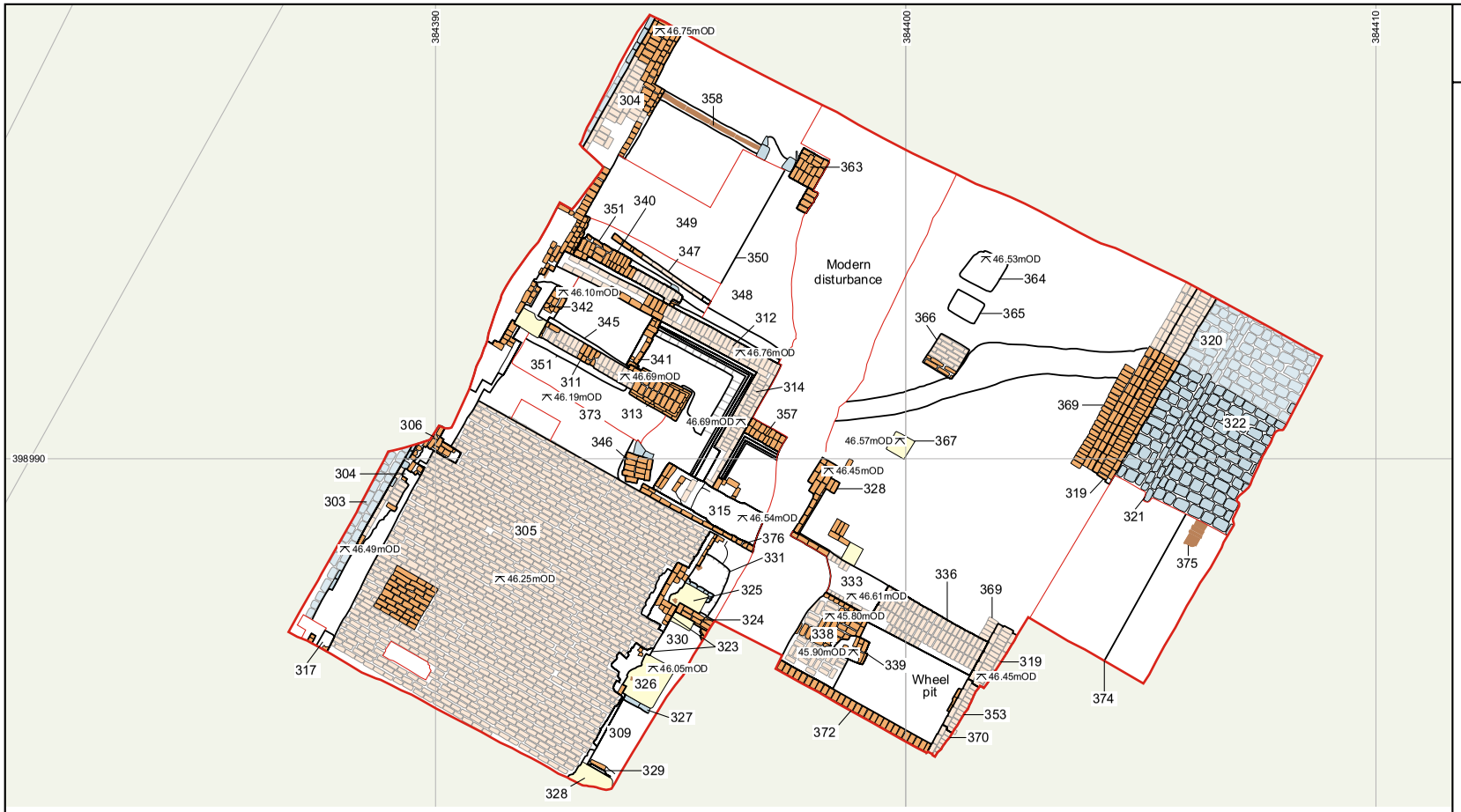
Trench 2

Figure 6




Trench 3 from the south east

Trench 3, showing all features

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Key:

- Brick
- Granite
- Brick continuation (not planned)
- Granite continuation (not planned)
- Concrete
- Excavation limits

0 5m



| | |
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| Revision Number: | 0 |
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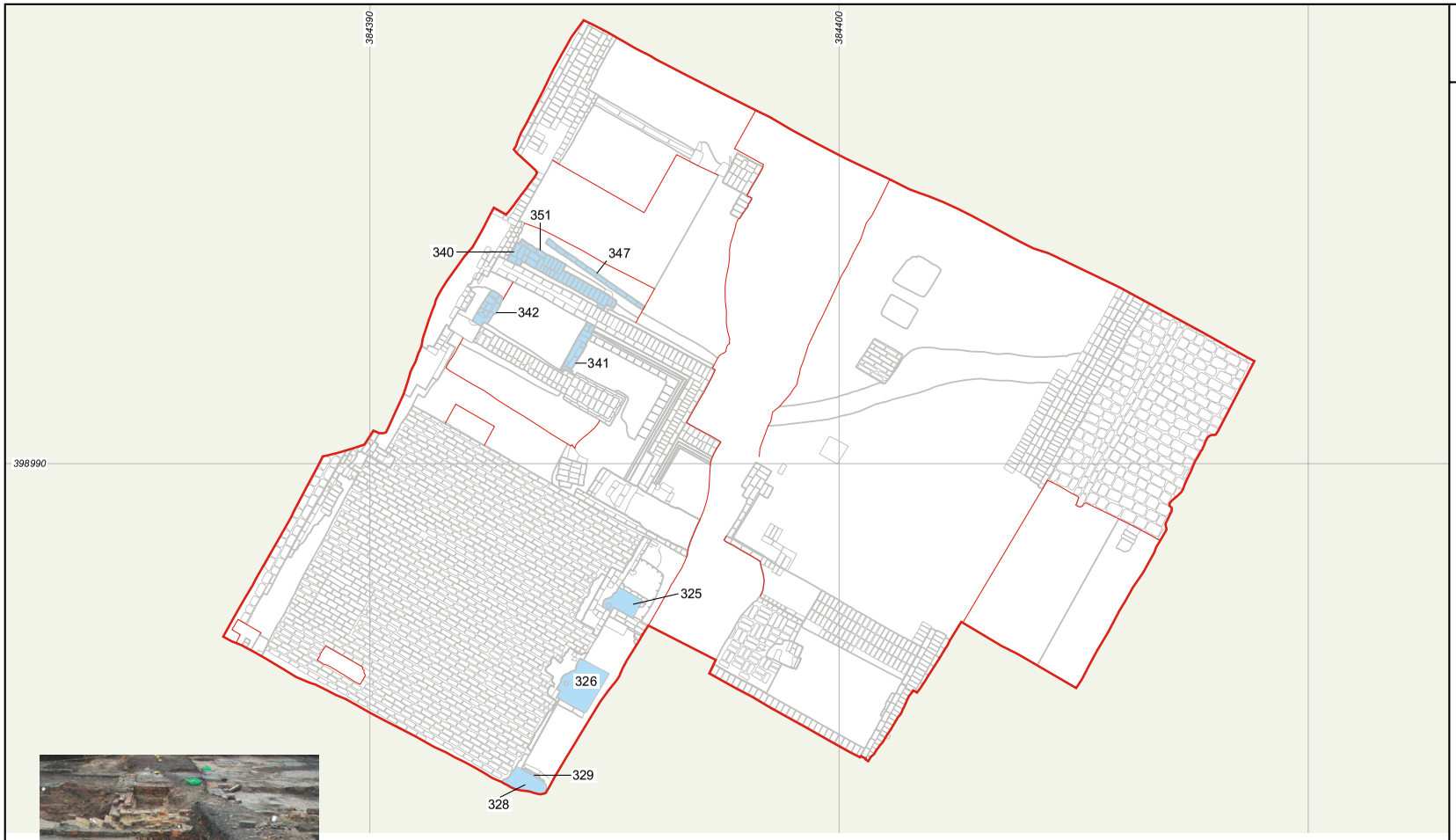
Figure 7




18th century sandstone pads from the south

Excavation of 18th century tank group (354), below later retaining arches (311) and (312), from the east

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0 5m



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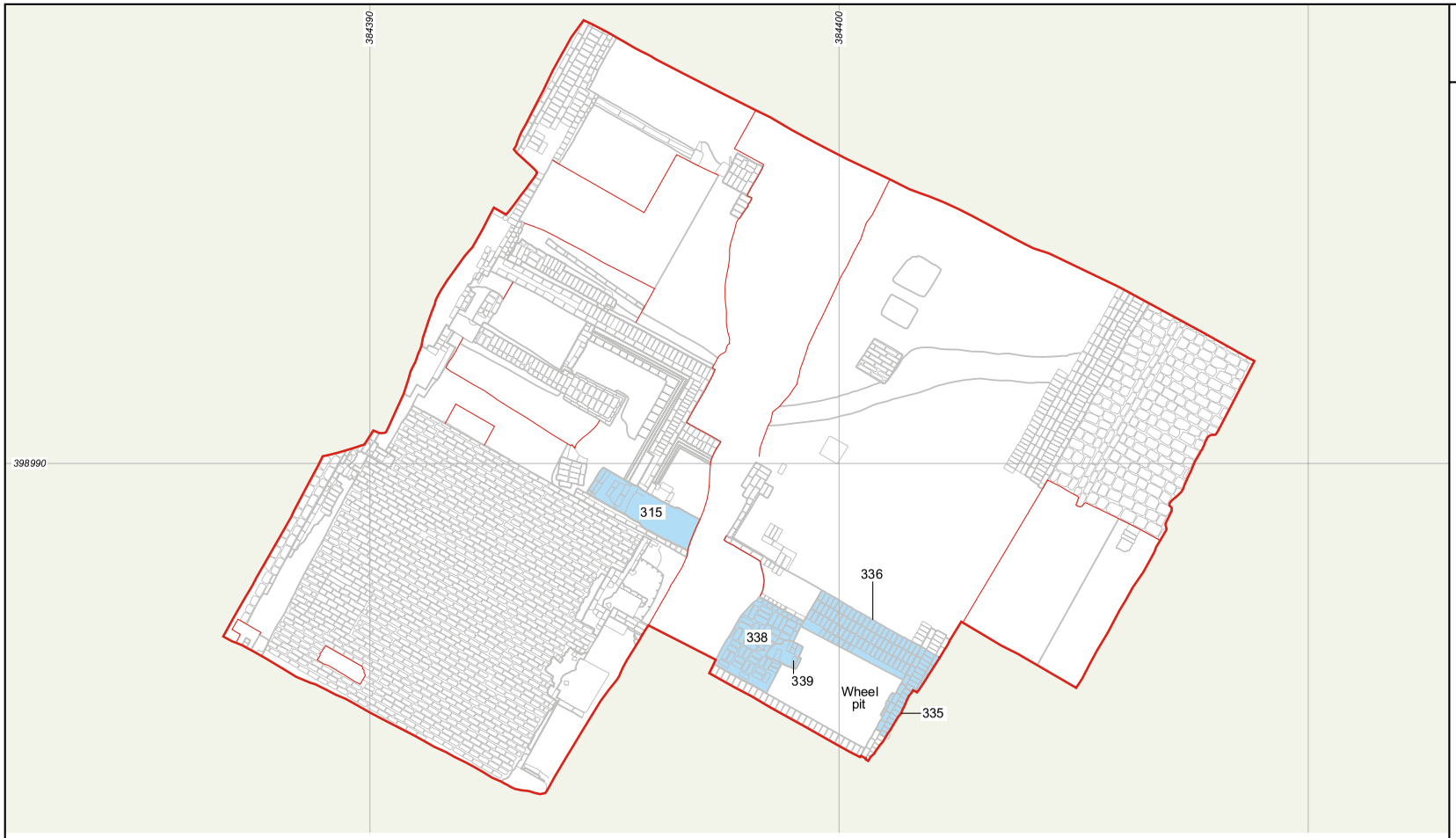
| Path: | Y:\...\59471\...\...\timeteam\ |
| | 06_01_23\trench3_phased.dwg |

Trench 3, with phase 2 features highlighted

Figure 8




Wheel pit showing walls (336) and (335), platform (338), retaining arch springer (339) , from the south

Wheel pit from the east

Wessex Archaeology

0 5m



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| Date: | 03/02/06 |
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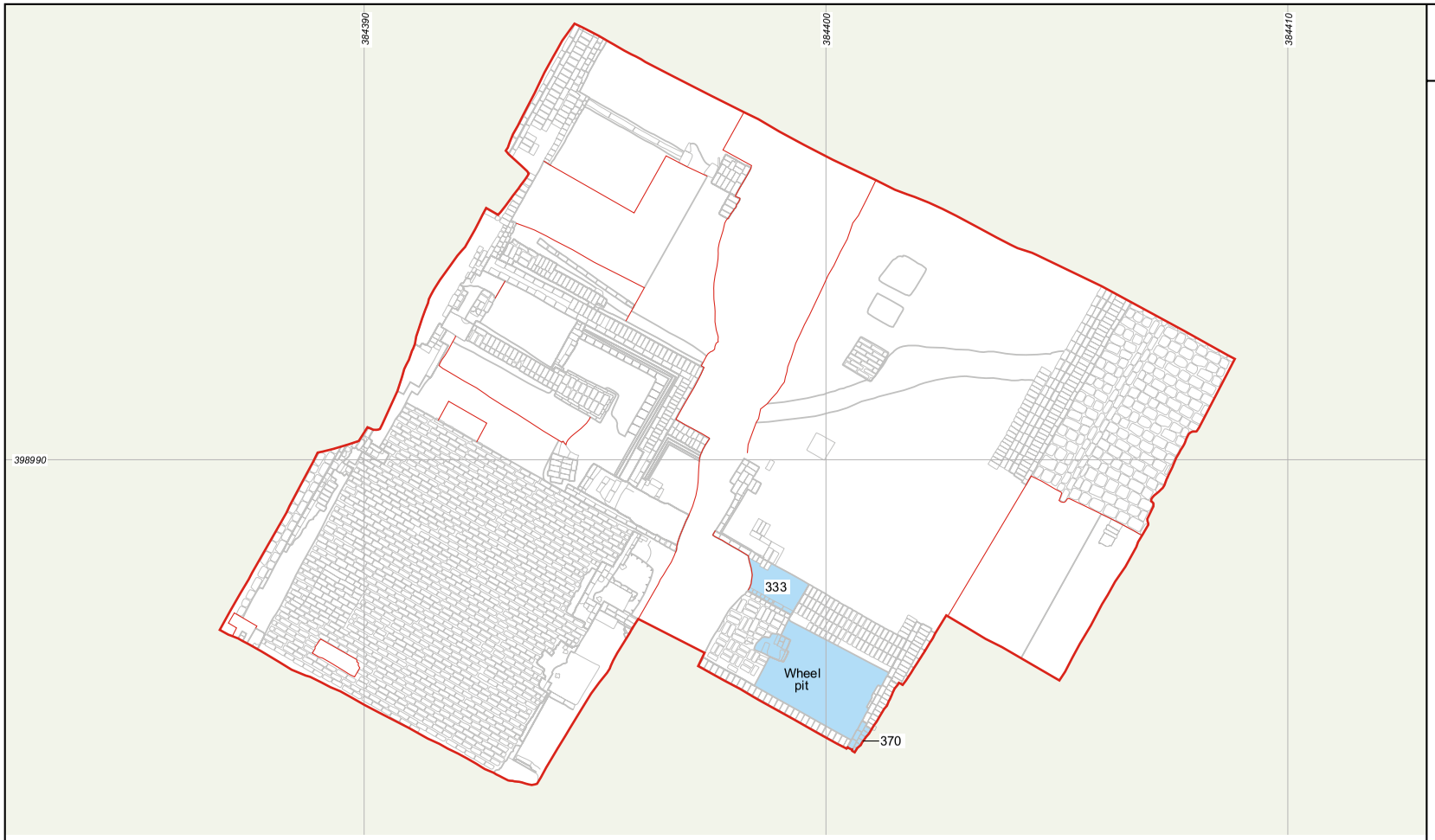
| Path: | Y:\...\59471\...\...\timeteam\ |
| | 06_01_23\trench3_phased.dwg |

Trench 3 with phase 3 features highlighted

Figure 9




Wheel pit and doorway blocking wall (333), from south

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0 5m



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| Date: | 03/02/06 |
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| | 06_01_23\trench3_phased.dwg |

Trench 3 with phase 4 features highlighted

Figure 10


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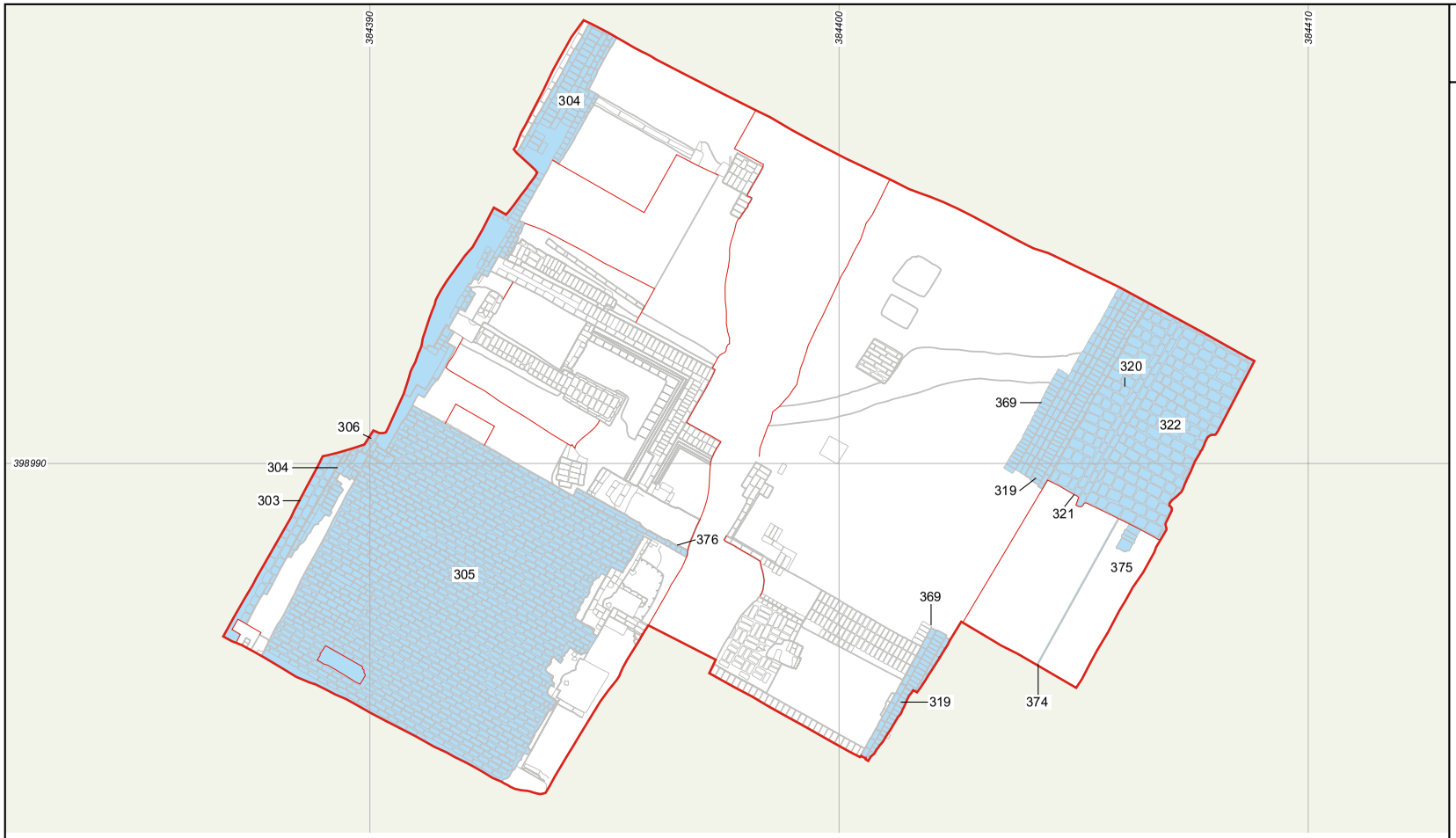
| | 06_01_23\trench3_phased.dwg |

Trench 3 with phase 5 features highlighted

Figure 11




Post 1854 brick floor (305)

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0 5m



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| Path: | Y:\...\59471\...\...\timeteam\ |
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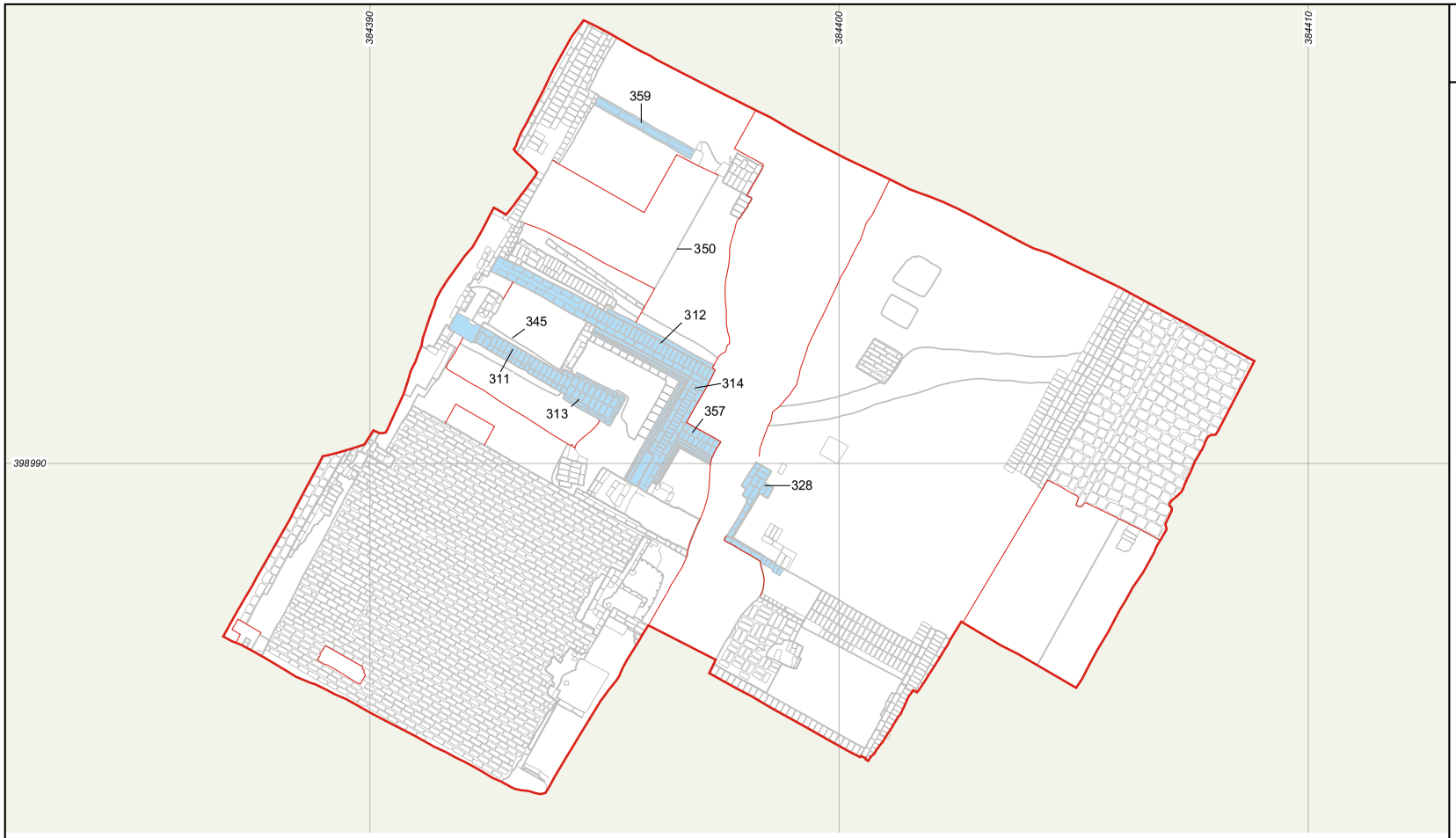
Trench 3 with phase 6 features highlighted

Figure 12




Retaining arches (311) and (312), and associated structures, from the north west

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0 5m



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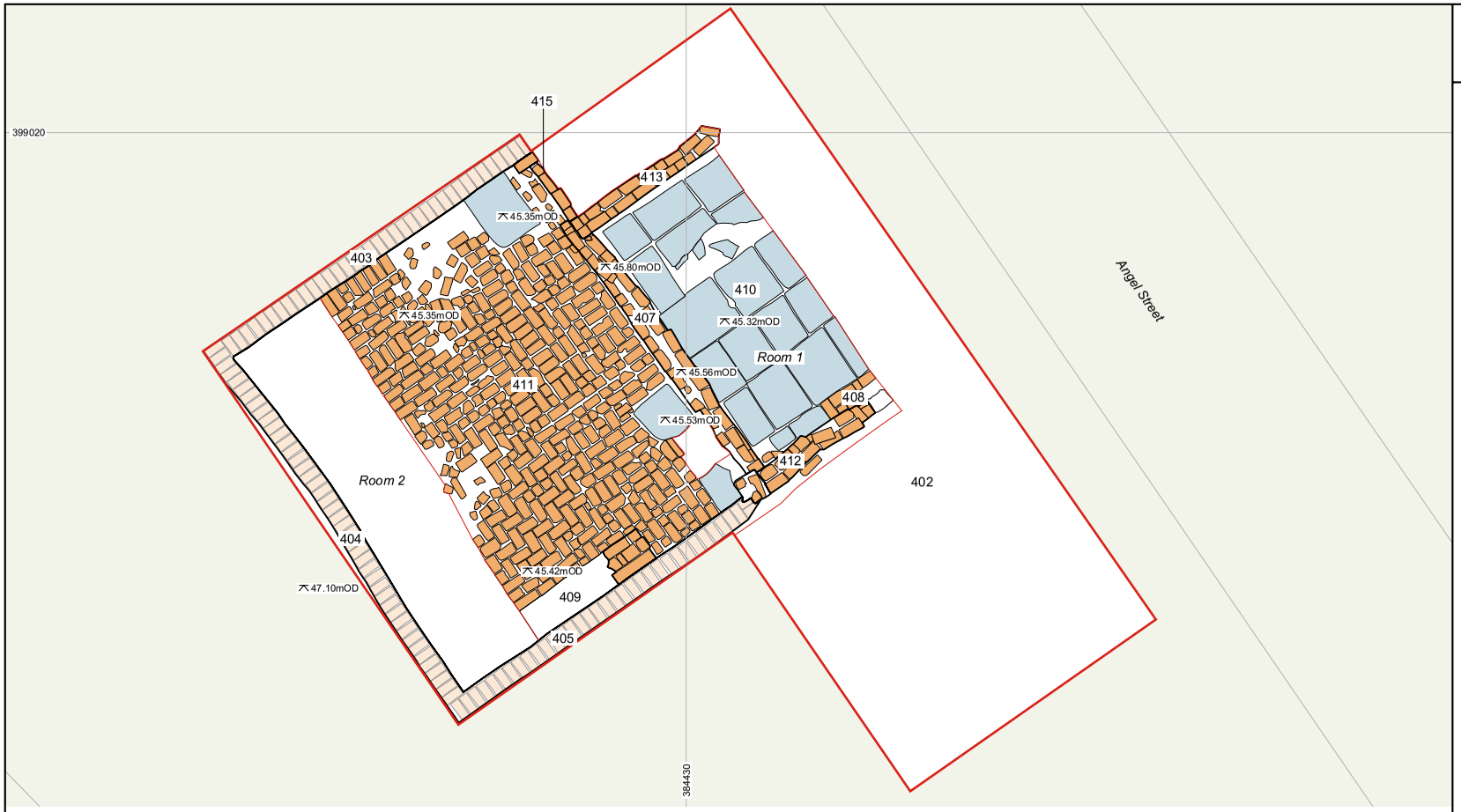
| | 06_01_23\trench3_phased.dwg |

Trench 3, phase 7 features highlighted

Figure 13

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Key:

- Brick
- Granite
- Brick continuation (not planned)
- Excavation limits

0 1 2m

Trench 4 from the east

Trench 4 from the west



| | |
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Trench 4

Figure 14


Trench 5 from the east

Key:

- Brick
- Granite
- Granite continuation (not planned)
- Concrete
- Excavation limits

0 1 2m



| | | | |
|---|---|---|---|
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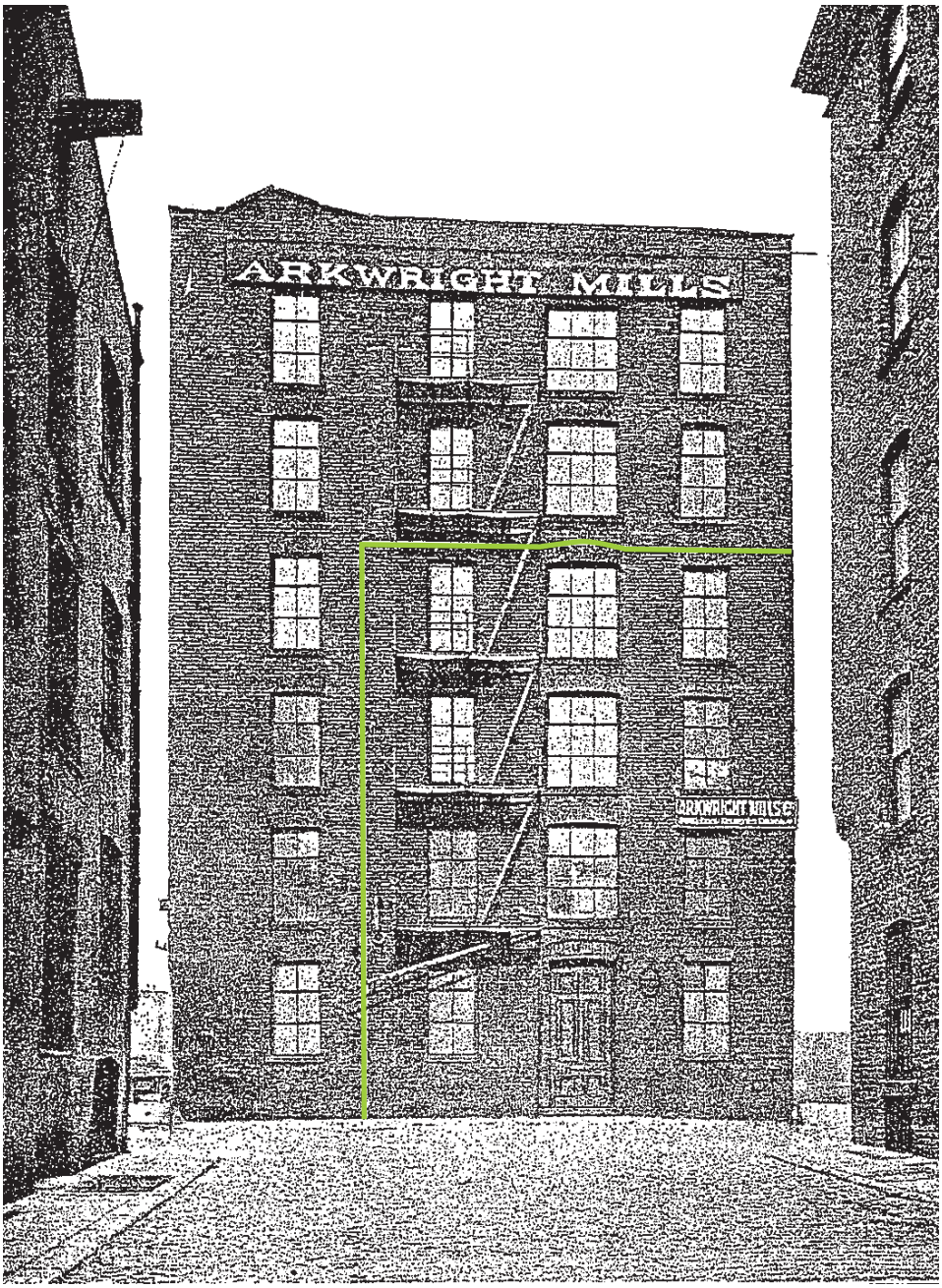
Trench 5

Figure 15




Taken from Loudon.1916 p.133.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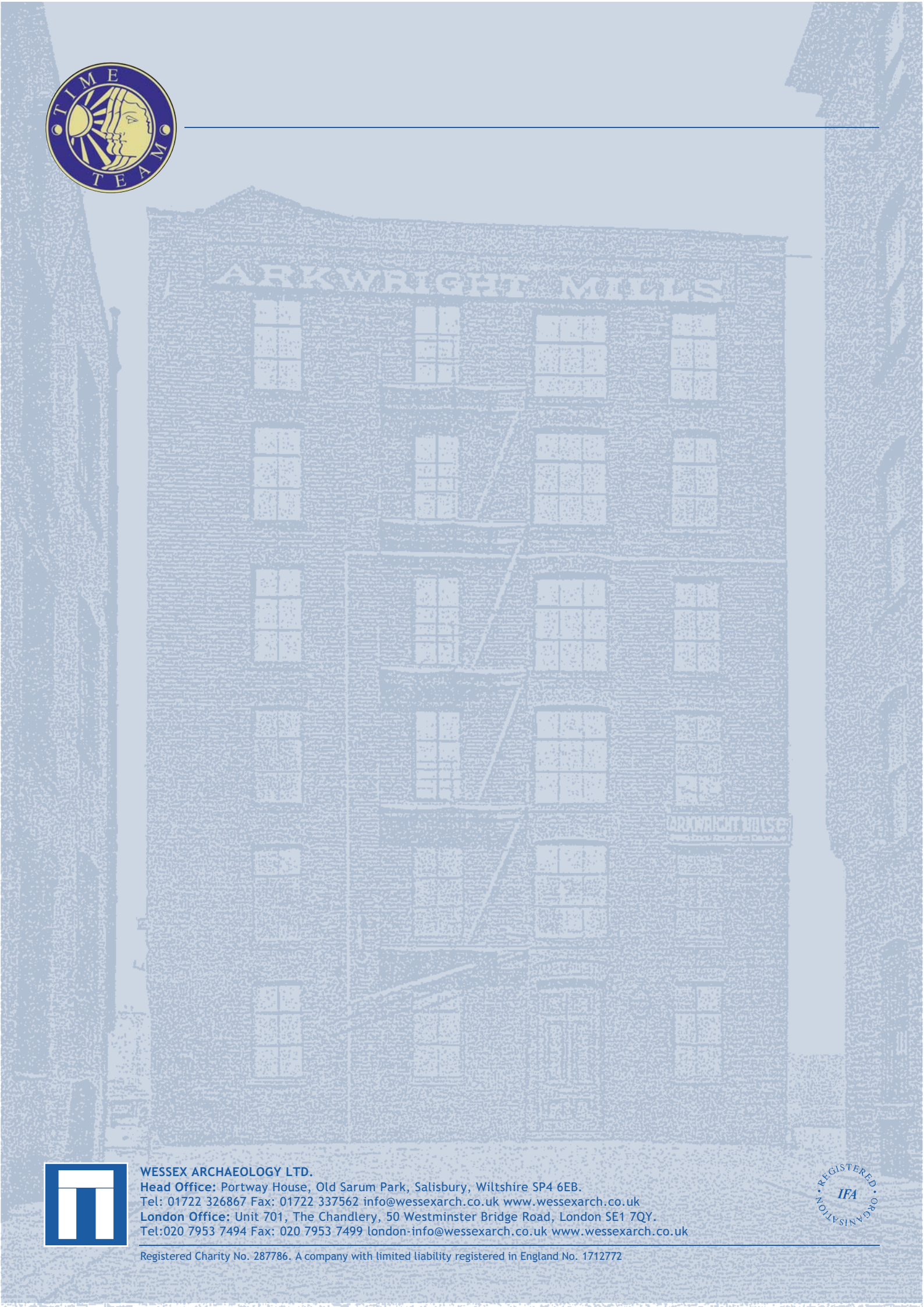
Southern elevation of Arkwright's Mill following Baxendale's takeover. The green line outlines the four storeys of the original mill with later additions following the 1854 fire.

Figure 16

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