OTLEY MILLS, ILKLEY ROAD, OTLEY, WEST YORKSHIRE LS21 1QS

ARCHAEOLOGICAL STRUCTURAL WATCHING BRIEF

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On behalf of

Andrew Hillas Properties Ltd
Otley Mills
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EXECUTIVE SUMMARY

In October 2019, Ed Dennison Archaeological Services Ltd (EDAS) were commissioned by Andrew Hillas Properties Ltd, through their planning consultant Mr Robert Beal of Plan B Planning and Design Ltd, to undertake an archaeological structural watching brief prior to and during the demolition of parts of the Otley Mills complex, Ilkley Road, Otley, West Yorkshire (NGR SE 19189 45190 centred). The project involved a targeted archaeological and architectural survey of the former engine house, the economiser house, and the boiler house and chimney, all located at the south-west corner of the mill complex, as well as the former warehouse/office structure on the Ilkley Road frontage (Unit G) and the weaving shed to the rear (Unit C). This was achieved through a photographic, drawn and descriptive record, augmented by a basic level of documentary research and a targeted watching brief during demolition, all brought together in a survey report. The fieldwork was undertaken between November 2019 and January 2020, and the project was funded by Andrew Hillas Properties Ltd.

The weaving shed and the earliest associated ancillary buildings were erected in c.1857. The shed housed power looms, which represented an early development to supplement the worsted spinning, which had been undertaken elsewhere within the mill complex since the early 19th century, with worsted weaving. This created an integrated mill, the most common type of mill seen in Yorkshire by the 1870s.

There were several different phases of development at the Otley complex, mostly between c.1857 and 1916, but also after 1935. The weaving shed was of a standard form, concealed behind the warehouse/office range fronting the Ilkley Road. The earliest power source for the looms in the shed was provided by a steam engine located in the southern engine house attached to the shed's external south-west corner. This engine house preserved evidence for what may be the original stone engine bed, various other internal arrangements, and the remnants of an early decorative painted scheme to the first floor. The general arrangement of the building suggests that a vertical engine, rather than a beam engine, was present, and power was transferred to a main east-west drive shaft on the south wall of the weaving shed, and from this to the looms via bevel wheels to countershafts or line shafts. The original boiler house for the southern engine house must have stood to the west, between it and the free-standing chimney; there may or may not have been an associated economiser house. Subsequent alterations had removed much of the original boiler house, although it is possible that parts of it could be seen in the north gable of the later, recorded, structure.

At a later date, but before 1891, another engine house was built onto the north end of the southern engine house, and possibly partly over the east wall of the earlier boiler house. The size of the northern engine house might suggest that a tandem-compound style horizontal steam engine was installed. It is not known if it initially assisted the engine in the southern engine house, or if it replaced it as the sole power source. Once again, power was transferred to the weaving shed via a bearing box in the north engine house's east wall. After the northern engine house had been built, but again before 1891, the boiler house was enlarged, most probably by raising it in height and extending to the north. Although later alterations make any detailed interpretation difficult, it is likely to have contained two parallel Lancashire boilers, aligned north-south, with coal brought to fuel the boilers via the south end of the building; the recorded south gable was built after 1908 and results from a later extension of the boiler house to the south. The later boiler house also had an economiser house at its north end by 1891. The post-1891 economiser house underwent several modifications between 1891 and 1935, although the surviving structural evidence related to two main phases.

The horizontal steam engine in the northern engine house was eventually replaced by electrical power, probably during the early 20th century. The engine was removed from the building, and a first floor inserted. The boilers and associated equipment were also subsequently removed from the boiler house, and it was given over to other functions.

1 INTRODUCTION

Reasons and Circumstances for the Project

1.1 In October 2019, Ed Dennison Archaeological Services Ltd (EDAS) were commissioned by Andrew Hillas Properties Ltd, through their planning consultant Mr Robert Beal of Plan B Planning and Design Ltd, to undertake an archaeological structural watching brief prior to and during the demolition of parts of the Otley Mills complex, Ilkley Road, Otley, West Yorkshire (NGR SE 19189 45190 centred) (see figure 1). The project involved a targeted archaeological and architectural survey of the former engine house, the economiser house, and the boiler house and chimney, all located at the south-west corner of the mill complex, as well as the former warehouse/office structure on the Ilkley Road frontage (Unit G) and the weaving shed to the rear (Unit C) (see figure 2). The work was achieved through a photographic, drawn and descriptive record, augmented by a basic level of documentary research and a targeted watching brief during demolition, all brought together in a survey report.

1.2 The survey work was made a condition of full planning permission approving the partial demolition of the mill complex, granted by Leeds City Council on 5th September 2019 (planning consent 19/01633/FU). The relevant planning condition (number 8) stated:
"*No development shall take place/commence until a written scheme of archaeological investigation (Wintertree Software Inc.) [sic] has been submitted to and approved by the local planning authority in writing. For land that is included within the Wintertree Software Inc. [sic], no development shall take place other than in accordance with the agreed Wintertree Software Inc. [sic], which shall include the statement of significance and research objectives, and:*
- the programme and methodology of site investigation and recording and the nomination of a competent person(s) or organisation to undertake the agreed works.
- The programme for post-investigation assessment and subsequent analysis, publication & dissemination and deposition of resulting material. This part of the condition shall not be discharged until these elements have been fulfilled in accordance with the programme set out in the Wintertree Software Inc.[sic]. In order to secure a programme of archaeological recording."

1.3 It is assumed that the references to 'Wintertree Software Inc' above should read 'Written Scheme of Investigation'.

1.4 The scope of the archaeological structural watching brief was defined by a specification prepared by the local archaeological curator, the West Yorkshire Archaeology Advisory Service (WYAAS), dated October 2019 (see Appendix 2). This was submitted to Leeds City Council as being the 'Written Scheme of Investigation' on 10th November 2019, but had not yet been approved at the time of writing (application number 19/07144/COND). The majority of the fieldwork was undertaken periodically by EDAS in November 2019, with additional visits during demolition on 20th December 2019 and 14th January 2020. The project was wholly funded by Andrew Hillas Properties Ltd.

Site Location, Description and Designations

1.5 The buildings subject to the archaeological structural watching brief represent part of the former Otley Mills, a sprawling complex of mill structures situated along Ilkley Road, some 1.17km south-west of the centre of Otley in West Yorkshire. The

complex is situated between the road and the river Wharfe, and developed in a number of different phases between the mid 18th century and the second half of the 20th century (see figures 1 and 2). Initially based around cotton spinning, from the early 19th century worsted spinning formed the main business on the site, augmented by worsted weaving from around c.1860. Spinning continued until 1983 when the mills closed, with some subsequent demolition taking place for housing, although other parts have been converted to a business centre. Access to the site is from Ilkley Road.

1.6 None of the buildings under consideration are Listed as being of Special Architectural or Historic Interest, although parts lie within the Otley Conservation Area. This was extended and designated in December 2003, and was subject to a Conservation Area Appraisal at the same time (Leeds City Council 2003). This shows that those parts of the mill complex within the Conservation Area are considered to be 'positive buildings', within the Wharfebank/Ilkley Road/Piper Lane Character Area; the structures within the Conservation Area correspond to Units D, E, F and G, and the engine house, boiler house and chimney.

1.7 A Heritage Assessment for the site undertaken in 2019 by Archaeological Services WYAS (ASWYAS) previously concluded that the mill complex had elevated evidential value and moderate historical value, but only limited setting value and no communal, aesthetic or artistic values (Govier 2019, 17-18); the report concluded that the mill complex was considered to be a heritage asset of low significance, with the available categories being high, medium, low, none and unknown (Govier 2019, 20).

1.8 As part of the planning application for demolition of the various buildings, structural reports on the boiler house and chimney were prepared (J B Langley Associates 2019; Access Maintenance Solutions 2019), and information contained within them was used, where appropriate, for this report.

1.9 A more recent planning application to vary condition 4 of the previously approved planning permission was submitted to Leeds City Council on 16th April 2020, and is still under consideration (application 20/02101/FUL); the original condition 4 required the retention and refurbishment of the boiler house and chimney, and the requested variation is to retain the chimney but to reduce its height by c.5m and to allow the demolition of the boiler house, primarily due to their poor and dangerous structural condition. More recently, the front (south) gable of the boiler house has collapsed, and the remainder of the structure (but not the chimney) was demolished for health and safety reasons, after appropriate notification to the Council.

Aims of the Project

1.10 In accordance with the WYAAS specification (see Appendix 2), the primary aim of the archaeological structural watching brief was to identify and objectively record those elements of the mill complex due to be demolished. This was to be undertaken by means of photographs, selected measured drawings and detailed descriptive text, noting and recoding any significant archaeological and architectural features and evidence for their original and subsequent historical form and functions.

1.11 A secondary aim of the project was to place the resulting report and archive in the public domain by depositing it with the West Yorkshire Historic Environment

Record and West Yorkshire Archives, both located at Nepshaw Lane South, Morley, Leeds LS27 7JQ.

Survey Methodology

1.12 As noted above, the scope of the project was defined by a specification prepared by WYAAS, the local archaeological curators (see Appendix 2). The specification required those buildings which were to be demolished to be the subject of an archaeological structural watching brief (targeted archaeological and architectural photographic and drawn recording) prior to and during demolition. The resulting survey conforms to a Level 2/3 descriptive and analytical survey as described by Historic England (2016, 26). Additional advice and guidance published by the Chartered Institute for Archaeologists, in relation to the survey of standing buildings (CIfA 2019) was also followed.

1.13 Specifically, the parts of the mill to be recorded were:

- the Ilkley Road façade (part of Unit G) and the setting of the mill in the Wharfe valley (external photographs and description only);
- the ancillary buildings (engine house, economiser house, boiler house and chimney) (photographs, measured drawings and description, subject to access);
- evidence of power transmission from the engine house to the weaving mill (photographs, measured drawings and description);
- the development of the engine house, including the engine bed, during strip out and demolition (photographs, measured drawings and description).

1.14 The initial on-site photographic and drawn recording was undertaken in early November 2019. A subsequent visit to record the interior of the engine house after stripping out was carried out on the 19th November 2019, with subsequent watching brief visits during demolition on the 20th December 2019 and 14th January 2020.

Documentary Research

1.15 The WYAAS specification stated that a copy of the previous Heritage Assessment produced by Archaeological Services WYAS (Govier 2019) should be obtained prior to the commencement of the fieldwork, and that no other documentary research was required. However, EDAS undertook a small amount of additional research at Otley library, principally consulting a previous study of the development of the Otley Mills complex (Laurence 2015). A full list of primary and secondary sources used in the preparation of this report is given in the bibliography (Chapter 6) below.

Drawn Survey

1.16 The WYAAS specification noted that existing plans and elevations of the complex, produced by Plan B Planning and Design Ltd, could be used for any annotation relative to the photographic record. Although these were suitable for the general photographic record, there were no detailed plans of the engine house, economiser house and boiler house, and so a new ground floor plan of these parts, including the south-west corner of the adjacent weaving shed, was made at a scale of 1:50. A first floor plan of the north part of the engine house was also produced at a scale of 1:50. In addition, a 1:50 long-section through the engine house was constructed; the originally specified scale of 1:20 would produce a very

large drawing with little detail. The drawings show all significant details such as inserted or blocked openings, original fixtures and fittings, and details of items relating to original and subsequent uses.

1.17 The information for the drawn record was captured using both traditional hand-held and remote measurement techniques. Final inked drawings were then produced by hand to publication standard, and are presented in this report as reduced versions of the full sized field drawings using conventions established by Historic England (2016, 35-39).

Photographic Recording

1.18 The photographic record was achieved using an SLR digital camera which has 12 mega-pixel resolution, using RAW format files for image capture and converted to both JPEG and TIFF files for archive purposes; the latter was as an uncompressed 8-bits per channel TIFF version 6 file of not less than 25Mbs, including embedded metadata. The guidelines produced by Historic England (2015; 2016) were followed and each photograph was provided with a scale where appropriate.

1.19 External photographs were taken, as far as is possible, at a right angle to the external elevations, whilst the interior coverage aimed to produce a record of all significant spaces and individual details (subject to access). Artificial lighting and tripods were used where necessary, again subject to practicalities and access. The resulting photographic record (see Appendix 1) includes a catalogue detailing the location and direction of each shot. The various plans of the buildings have also been used to identify the position and direction of each shot. A number of good quality copies of the digital photographs are also reproduced in the report as plates.

Written Record

1.20 Sufficient detailed notes and observations were made in the field to allow a detailed descriptive record of the buildings forming the subject of the survey to be prepared.

Watching Brief

1.21 Two watching brief visits were undertaken during the demolition works. On the first, the remains of the economiser house were examined immediately following demolition, which had exposed the previously hidden lower part of the north gable of the boiler house. The previously drawn record was amended, adding the new structural information that was revealed and the photographic record was also extended. At the same time, the west wall of the northern engine house had been demolished, along with part of the north gable. The interior was again photographed, although it was not possible to approach the walls closely due to overhanging and unsupported masonry.

1.22 The second watching brief visit took place during the demolition of the engine bed in the southern engine house. In order to create access for the large tracked excavator used to undertake the demolition, the south gable and south ends of the east and west walls had been demolished and the roof removed. The breaking up of the engine bed was achieved using a large jack-hammer/pecker mounted on the excavator. Due to the demolition methodology, and the unsupported walls which made detailed access unsafe, the amount of new structural information revealed was limited.

Survey Products

Survey Report

1.23 This report forms a detailed written record of the buildings to be demolished within the general Otley Mills complex, prepared from the sources of information set out above, and analyses their form, function, history, and sequence of development, as far as is possible using the previously gathered information. The buildings are also placed within their historical, industrial and economic contexts, where possible using the available documentary and secondary evidence.

Project Archive

1.24 A fully indexed project archive has been prepared, ordered and indexed according to the current professional standards (e.g. Brown 2011; CIfA 2014) (EDAS site code OMO 19). The archive comprises primary written documents, field notes, documentary material, a copy of the report, and an index to the archive, and this was deposited with the Leeds Office of the West Yorkshire Archive Service on completion of the project. Copies of the digital photographs and both a hard and digital copy of the report were deposited with the WYAAS, while the digital photographs and report were also deposited with the Archaeology Data Service (ADS) in York. Finally, as EDAS supports the Online Access to Index of Archaeological Investigations (OASIS) project, appropriate project information and a copy of the report were uploaded to the archaeological grey literature library.

2 HISTORICAL BACKGROUND

Introduction

2.1 As has already been noted above, a Heritage Assessment for the Otley Mills complex as a whole was previously undertaken by Archaeological Services WYAS (Govier 2019), and no further documentary research was required as part of the current project. However, additional contextual information on the development of the mill complex is provided by Laurence (2015) and so relevant details have also been included below. The mill buildings lie within a complex archaeological and historical landscape, but for the purposes of this report, only the most relevant parts of the post-medieval history are described in detail.

Historical and Archaeological Background

2.2 During the early post-medieval period, the economic base of Otley remained largely agricultural in nature, with tanners, curriers and other trades reliant on the cattle market supplying much of the employment in the town. Later, the town became a finishing centre for woollen, worsted and linen cloth. Cotton and woollen mills were established in Otley in the late 18th century, whilst linen dressers and weavers are known to have been working in the town from the beginning of that century (Govier 2019, 8).

2.3 The genesis of what was to become the Otley Mills complex lay with water engineering works undertaken before the middle of the 18th century. At some point before 1749, the local course of the river Wharfe was modified, a weir was created and new water channels or goits were cut through a field known as 'Harbour Holme'. These works were undertaken by the joint owners of the land, the Fairbank and Whitehead families, but the first known mill erected on the site was constructed and presumably paid for by Jonas Bates, a local maker of glazed boards used in the finishing processes of the cloth-making trade. This was built in c.1753, but soon afterwards, perhaps shortly before 1759, a leather dressing mill was erected immediately adjacent to the first building, with associated outbuildings and sheds (Laurence 2015, 1-4).

2.4 In c.1786, a much larger structure (which was to become known as the Old Mill) was built adjoining the two earlier mills, almost certainly by John Fairbank; all these mills lay to the east of the current site. The new structure was almost 70 feet (c.23m) in length and stood four storeys in height, and was driven by an 18 feet (5.49m) diameter waterwheel positioned at its east end. The mill had been carefully constructed to enable the installation of Richard Arkwright's cotton-spinning machinery, and was one of 50 such mills built in Yorkshire by 1790, the greatest concentration being in the Keighley area. The Old Mill appears to have become operational in 1789, with the first tenants taking up occupation in this year, but leather working continued in one of the adjacent earlier mills. In 1810, a new tenancy commenced by Craven and Briggs, marking the beginning of worsted yarn manufacture on the site (Laurence 2015, 5-8).

2.5 In 1817, the Old Mill was leased by William Ackroyd, who had established a worsted spinning plant in Ellar Ghyll, on the borders of Otley and Menston, in 1815. Under the terms of the lease, Ackroyd also occupied the land known as 'Harbour Holme' and 'Peg Holme'. In 1830, he had the opportunity to purchase the land to the south of the mid-18th century mill goit, and the year afterwards erected a second large mill, known as the New Mill, to the east of the Old Mill. The New Mill straddled the goit and doubled the worsted spinning capacity on the site (Laurence

2015, 9-12). The Otley township tithe map of 1835 appears to be the first to show the layout of the complex in any detail. At this date, the land upon which the buildings under consideration for this report were later to be built formed Plot 111. The land was owned by William Ackroyd and the plot is named 'Peg Holm' in the accompanying 1845 tithe apportionment; landuse at that time was 'grass' or pasture. The north-east and north-west boundaries of the plot were formed by the L.B. District Boundary (Otley), whilst the north-east side of the plot was bound by the mill race from the river Wharfe leading to the mill complex to the east. The north-west side was formed by a stream feeding into the mill race, with the south side bound by the Ilkley Road and the east by Plot 119, named 'Field west of side of dryhouse' (Govier 2019, 9).

2.6 In 1834, Ackroyd went into partnership with his son-in-law John Rawson and Thomas Duncan, a Scottish draper who had settled in Otley during the early 1820s. Rawson took no active part in the business, but Duncan was much more involved, and in 1834 Ackroyd built Mill House on Ilkley Road for the Duncan family. The business underwent very considerable expansion between 1840 and 1860. Significant additions were made to the buildings, with a engine house built at the east end of the New Mill during the 1840s to accommodate a steam beam engine which replaced the waterwheel as the source of power; a second engine house replaced the waterwheel at the Old Mill. Duncan's three sons, James, Thomas and John, also joined the business during the same period (Laurence 2015, 15- 21). Many of the new buildings are shown on the 1851 Ordnance Survey 6" to 1 mile map, where the complex is named as "Ackroyds Mill (Worsted)" (see figure 3A). However, the site of the buildings under consideration by this report remained undeveloped and appeared much the same as in 1835.

2.7 In 1853, Ackroyd entered into a new business partnership with James Duncan, Thomas Duncan's eldest son, and also William Barraclough, a cloth manufacturer from Leeds. It was the intention of the new partnership to begin worsted weaving at the mill complex, in addition to the worsted spinning already taking place. It is not known exactly where power looms were first installed on the site, although it is suggested that they may have been housed in a large shed adjacent to a third engine house which had been recently erected (Laurence 2015, 24). However, from 1857, they appear to have been moved westward into a newly constructed single-storey shed (Laurence 2015, 24-25), built on a greenfield site and lying at the centre of the buildings under consideration in this report. Laurence (2015, 28) states that in c.1865 single-storey weaving sheds were built to the west of the earlier complex, but it is not clear if this refers to the buildings in the current site; they are described as the first buildings on the site to be built of brick, whereas the surviving structures are largely of stone.

2.8 In 1865, William Ackroyd died, and James Duncan and William Barraclough bought his shares in the weaving side of the business, changing the name of the company to 'Duncan, Barraclough and Company'. They specialised in the weaving of material known as 'Huddersfield fancy worsted cloth'. Slightly later in the same year, Ackroyd's shares in the worsted spinning part of the company were also acquired by the Duncan family. From 1888, the firm specialised in the manufacture of cloth for menswear (Laurence 2015, 30 & 33). In 1889-90, a further major expansion took place with the building of the Pegholme building, a multi-storey mill housing further worsted spinning machinery designed by the architectural partnership of Milnes and France, who were well-known for their warehouses in the 'Little Germany' district of Bradford. It was initially intended to power the machinery by water turbines, but these proved ineffective and so in 1891

another engine house was built to provide the power source (Laurence 2015, 28-29).

2.9 The buildings forming the subject of this report are first shown on the 1891 Ordnance Survey 25" to 1 mile map, where both they and the former Ackroyds Mill to the east are named as “Otley Mills (Worsted)” (see figure 3B). In 1891, the western complex comprised a large square structure set back from the Ilkley Road, with attached ancillary buildings and chimney to the south-west corner, the whole set on a slight north-east/south-west alignment. A pair of semi-detached structures at the south-west corner of the ancillary buildings appear to have been cottages; they are clearly shown on aerial photographs taken in 1926 and c.1960 (Laurence 2015, 60) (see figure 4A), and were sold to their tenants during the 1960s (Wolfe, in Laurence 2015, 39). In 1891, the large square structure (corresponding to Unit C) would have formed a single-storey weaving shed housing power looms, with a long rectangular range fronting the road (Unit G) most likely used as offices and stores. Along the rear, north-facing, elevation of the weaving shed, there is a small, centrally located projection, possibly indicating a porch or rear entrance. However, the main access appears to have been along the east elevation, running off the Ilkley Road, and there are also tracks or roads linking the building with the rest of the complex to the east.

2.10 By the time that the next edition of the Ordnance Survey 25" map was published in 1908 (see figure 3C), a supplementary square weaving shed and additional rooms along the frontage had been added to the southern half of the east side of the original weaving shed. The newly-built weaving shed (Unit D and part of Unit F) had a glazed roof over an east-west aligned internal passageway. In addition, a small extension had been built to the rear of the original weaving shed at the west end of the north elevation. Finally, since 1891, a small rectangular building had been constructed, fronting the Ilkley Road close to the ancillary buildings at the south-west corner.

2.11 Further considerable expansion had taken place by 1921 (see figures 3D and 4A). Large additions had been made to the east and rear of the secondary weaving shed (part of Unit F and Unit E) with a second glazed internal passageway, aligned north-south, between this shed and the eastern addition. The entrance to this glazed passageway off the Ilkley Road has a surviving keystone dated ‘1916’, thus dating the east addition more closely, with the faint legend “OTLEY MILLS DUNCAN, BARRACLOUGH & Co. LTD.” above; the firm was re-formed as a private limited company in the same year (Laurence 2015, 33). A booklet published in 1922 appears to indicate that this extension was made for woollen spinning connected with wartime business (Laurence 2015, 58). Also by 1921, the addition to the west end of the north elevation of the original weaving shed, shown in 1908, had been further extended to the west (part of Unit B). Finally, some small additions had been made to the north-west end of the ancillary buildings at the complex’s south-west corner.

2.12 Between 1921 and 1935, an extension was built to the west side of the original weaving shed (Unit H) (see figure 4B); this is shown as being extant on the 1926 aerial photograph (see figure 4A). Like many other enterprises, the business entered a period of depression in the mid-1930s. A restructuring was undertaken in 1935, when the spinning and weaving sides of the business were once again separated, and Duncan, Barraclough and Company went into receivership shortly afterwards. At the outbreak of the Second World War, new contracts were gained to spin yarns for uniforms, whilst in 1941 a 19th century combing and winding shed

was requisitioned by the Ministry of Aircraft production on the site and re-roofed as a result.

2.13 By the 1960s, the market for worsted yarns was contracting due to the advent of man-made fibres, whilst production was moving to other parts of the world, although the introduction of new spinning machinery to Otley Mills in 1968 allowed the business to remain competitive. Nevertheless, spinning finally ceased at the site in 1983 and the internal contents, including the machinery, were auctioned off (Wolfe, in Laurence 2015, 35-44). The Old Mill was destroyed by fire in 1982 (Laurence 2015, 5), whilst the Ordnance Survey map of 1988 shows that the pair of cottages at the south-west corner of the ancillary buildings had been demolished by this date (Govier 2019, 10) (see figure 4C). Other parts of the complex that had been built in the mid 19th century were then demolished in 2007 to make way for housing. However, the large 1889-90 Pegholme building, within the original mill complex to the east of the current site, has been re-developed as Wharfebank Business Centre and is now occupied by a diverse range of firms (Wolfe, in Laurence 2015, 44-45).

2.14 On the basis of primarily cartographic evidence, ASWYAS produced a map regression analysis which identified five phases of development of the mill complex (Govier 2019, figure 12) (see figure 5).

3 ARCHAEOLOGICAL AND ARCHITECTURAL DESCRIPTIONS

Introduction

3.1 Those elements of the mill complex recorded by this project are described below, beginning with their location and plan form, then proceeding to external elevations and the interior circulation. In terms of both the exterior and the interior, only those parts affected by the proposed demolition works are described in detail. In order to aid description (and to reflect apparent historical development), the engine house has been split into two parts, the northern engine house and the southern engine house. In addition, as outlined in Chapter 2 above, it appears that some of the recorded buildings were built soon after 1857, and so to distinguish them from other later structures, they are referred to as being built 'c.1857'.

3.2 When reading the following text, reference should be made to the various floor plans (figures 6 and 7), and to the photographic record which appears as Appendix 1. The colour digital photographs are referenced in the following text in italic type and square brackets, the first digit representing the date of photography and the following digits indicating the image number e.g. [*11759, 2335*]. Many, but not all, of the colour digital photographs are shown as plates; it should be noted that the image number does not necessary equate with the plate number, especially when several photographs were taken of the same feature.

3.3 The recorded buildings are actually set on either slight north-west/south-east or north-east/south-west alignments but, for ease of description, they are considered to be aligned either north-south or east-west. Unless otherwise noted, the terms used to describe historic roof structures are taken from Alcock *et al* (1996) and Campbell (2000). Where possible, specific architectural terms used in the text are as defined by Curl (1977). In the following text, 'modern' is used to denote features or phasing dating to after c.1945. As most of the structures were to be demolished as part of the proposed re-development of the site (to a larger or lesser degree), the archaeological and architectural description is written in the past tense.

The Ancillary Buildings (see figures 6 and 7)

Locations and Plan Forms

3.4 Prior to their demolition, the ancillary buildings were located at the south-west corner of the c.1857 large weaving shed, and comprised the northern and southern engine houses, the boiler house and economiser house, and the chimney (see figure 2). As was common practice, the engine houses were placed between the weaving shed and the boiler house. With the exception of the economiser house, which ran east-west, all the other ancillary buildings were aligned broadly north-south and were rectangular in plan.

3.5 The southern engine house originally had maximum external dimensions of c.9.30m north-south by 6.80m east-west, prior to later alterations. It was of contemporary construction with the adjacent weaving shed (Unit C), and therefore dated to c.1857. The north and east walls were on average 0.60m wide, with the south and west walls slightly narrower. It was of two storeys with a pitched roof, which was once covered with large Welsh slates although most had been removed by the time of the survey. The northern engine house was added to the north end of the south engine house at some point between c.1857 and 1891. It had maximum external dimensions of 11.50m north-south by 6.80m east-west, the walls being on average 0.54m wide. The north engine house was also of two

storeys with a pitched roof, although the apex of the roof was set slightly lower than the southern engine house (see figure 7 - section); again, it was once covered with large Welsh slates. A wooden vent with a pyramidal roof and wooden finial rose above the common rafters of the roof structure.

3.6 The boiler house to the west had clearly developed in a number of different phases, some probably undertaken before 1891 but others during the early 20th century. At the time of the survey, it had maximum external dimensions of 18.20m north-south by 8.00m east-west, the walls being on average 0.40m wide. It was of a tall single storey with a pitched roof, covered with modern corrugated sheeting. The economiser house was placed at the north end of the boiler house. Map evidence suggests that some kind of economiser was in place here by 1921, and it is shown in place on the 1926 aerial photograph (see figure 4A) although the recorded structure was probably largely later than this. The recorded economiser house was a rectangular structure, aligned east-west across the north end of the boiler house. It was of two storeys, built largely of machine-made bricks, with a single pitch roof, sloping downwards from south to north. The stone chimney on the west side of the boiler house is assumed to have been part of the original construction and so to date to c.1857. It was almost certainly once freestanding, with the octagonal shaft rising from a 3.30m square pedestal.

External Elevations

1) the Boiler House

3.7 The principal elevation (the south gable) of the boiler house faced south towards the Ilkley Road, and it broke forward from the rest of the original c.1857 frontage of the southern engine house and the warehouse/office building (Unit G) to the east [*11756, 11765, 11862*] (see plate 1). On the 1891 Ordnance Survey 25" map (see figure 3B), the projecting south end of the boiler house is shown in a different colour to the rest of the complex, with a thick line denoting the principal elevation of the c.1857 buildings passing behind it. This may denote that at this time, it had a canopy or similar structure, rather than the present gable. This feature is again shown as a separate element in 1908 but not in 1921 or 1926 (see figures 3C and 3D, and figure 4A), perhaps suggesting that the present gable dates from this period.

3.8 The gable was built of neatly coursed and squared tooled sandstone. To the ground floor, there were two large openings, infilled with modern brickwork and blockwork, divided by a central wooden pier with mouldings to the head and foot, and with wooden fielded panels to the upper part of each opening [*11759, 11771*] (see plate 2); there was an inserted door at the east end of the elevation, blocked with sheeting at the time of the survey. There was a moulded cornice above the openings, with ashlar quoins to either side. It is noticeable that the majority of the quoins to the west side were rather roughly finished and were almost certainly later replacements, and they were poorly tied-in to the rest of the structure; this movement may also have been affected by the roots of a large tree adjacent to the gable. These quoins were presumably put in place when the attached two cottage structures to the west, already present by 1891, were demolished after 1960. Above the openings, there was a further moulded string course, and moulded coping to the gable. The apex of the pointed gable was pierced by a circular vent with a dressed stone surround. The short part of the east elevation that was externally visible had a modern inserted garage door [*11752*].

3.9 The west elevation of boiler house was divided into two parts, either side of the attached chimney [*11772, 11778*] (see plate 3). Both parts were built of the same neatly coursed and squared tooled sandstone as the south gable, rising to eaves formed by a plain block cornice. At the south end of the elevation, there was a large, inserted opening with a steel lintel, which was filled with horizontal planks at the time of the survey. A metal pipe emerged from the top of the elevation and angled around the opening to run down the wall face. This pipe appeared to have vented fumes from the interior, but at a low level, a much older and corroded pipe emerged from the base of the wall; this may have formed an outlet for excess steam from the boilers, or for blowing down the boilers to remove an accumulation of solids, a process carried out at regular intervals (Richard Lamb, *pers. comm.*). There were also several small openings through the wall of unknown purpose. The central part of the elevation, as far as the chimney pedestal, showed the scar of a now-demolished single storey structure with a single pitch roof, sloping downwards from east to west [*11768, 11774, 11775*] (see plate 4). This structure, or one in the same position, and extending along the full length of this part of the elevation, was already in place by 1891 and is shown on several of the later editions of the Ordnance Survey maps.

3.10 To the north of the chimney, the west elevation of the boiler house had a single, tall window, with stone lintel and sill, closed with plyboard [*11797*] (see plate 7). The former north gable was obscured by the later economiser house, but a very small part of the east elevation could be seen in the narrow gap between it and the north engine house; it did not contain any features of interest.

2) the Chimney

3.11 The chimney pedestal was built of rock-faced ashlar, set with a lime mortar. Between 1891 and 1935, a short L-shaped range of buildings ran west from the chimney (see figures 3B to 3D and figure 4B). Their function is unknown, but they may have been outbuildings associated with the demolished pair of cottages to the south rather than with the boiler house itself; their removal left no scar on the pedestal's stonework. A structure is again shown to the immediate west of the chimney on an aerial photograph taken in c.1960, possibly comprising a corrugated sheeting superstructure on a brick base (Laurence 2015, 60), but this had been demolished by the time of the survey.

3.12 There was a low inserted opening, closed with blockwork, in the north side of the chimney pedestal [*11789*] (see plate 5). This lined up with a concrete base and the remains of brick walls (visible in plan only) which emerged from the west elevation of the economiser house and then curved around to run south; there was also a triangular area of concrete adjacent to the north-west corner of the pedestal. An angled structure in the same approximate position as the curving concrete base and walls is first marked here in 1921 (see figure 3D), and it is likely to have been associated with an earlier economiser, pre-dating the recorded building. The curving base and walls did not appear to be particularly early, but they almost certainly mark the position of a flue taking gases from the economiser into the chimney. The pedestal of the chimney rose to a large moulded cornice, above which was the octagonal stone stack. The stack was tapered towards the top, and retained metal bonting (painted red) for its full height; it also had a smoke hood [*11781, 11784, 11860*] (see plate 6).

3) the Economiser House

3.13 The economiser house was set at the north end of the boiler house, and was clearly a later addition or alteration to the original structure. It was built largely of machine-made bricks, but preserved evidence for several different phases of construction [*11787*] (see plate 7). For example, at the base of the north-west corner, there were two courses of stonework, apparently left over from an earlier structure which the economiser replaced and possibly that shown in 1891 (see figure 3B). Map evidence shows that the 1891 structure was partly demolished between 1908 and 1921; a rectangular structure was built out from its former north-west corner, with the gap to the south between it and the chimney infilled (see figures 3C and 3D). This later rectangular structure was itself demolished after 1935, and so it is assumed that the economiser house which remained at the time of the survey was, at least in part, later still.

3.14 The west elevation of the economiser house was built from deep red hand-made bricks (average dimensions 230mm by 70mm by 105mm) set with a cement mortar and laid in a variation of English Garden Wall bond (five stretcher courses to each header course). It is possible that these bricks were either re-used, or rejected as being of first quality; many of them were either over-fired or vitrified to the surface, and all had a very coarse fabric. The south end of the elevation had a blocked doorway with a steel lintel to the ground floor (see also plate 7). Above the doorway, there were approximately 17 courses of the deep-red brickwork noted above, and then the lighter brickwork seen in the north elevation.

3.15 The north elevation was built of light-red machine made bricks (average dimensions 220mm by 70mm by 150mm) set with a cement mortar but laid in a rather irregular bond; there were mixed header/stretcher courses, and approximately every seven courses, a course of headers set on end. Towards the base, some stretchers set on edge were stamped “ARMITAGE”. They were manufactured by the Armitage Brickworks in Woodkirk, near Leeds (*http://www.brocross.com/Bricks/Penmorfa/Pages/england3.htmbegan*). Quarrying began on the Woodkirk site in the later 19th century, and in 1864 a brick works was established to exploit the blue shale or marl which was found along with the sandstone (*https://newwoodlesford.xyz/stone-quarries/george-armitage-sons/*). The elevation rose from a shallow plinth, above which there were three low openings, blocked at the time of the survey (see plate 7). The openings were flanked by scars left when walls of a single brick’s width that once extended to the north were removed. At first floor level there was a doorway, flanked by a tall window or other opening to the east, and a smaller window to the west; all were covered with blue-painted plyboard. A similarly-painted steel beam was set into the wall beneath the three features. It was not clear how the doorway was accessed externally [*11795*].

3.16 The east elevation was just visible in the narrow gap between it and the northern engine house. Like the west elevation, the lower part was built of deep-red over-fired bricks and the upper part of the light-red machine-made bricks previously noted, but there were no other features.

4) the Southern Engine House

3.17 The south gable of the southern engine house formed the west end of the c.1857 original Ikley Road frontage (Unit G - see below) (see figure 8). The gable rose from a chamfered stone plinth, and was built from neatly coursed and squared sandstone with strong horizontal tooling, set with a lime mortar. The gable was two bays in width [*11749, 11754*] (see plate 8). To the ground floor, there was a flat-headed window to each bay, each with a projecting stone sill. To the first floor,

there was a moulded string course, and then a pair of key-stoned round-headed windows with rusticated jambs, moulded impost blocks and rusticated voussoirs. All the openings were covered with plyboard at the time of the survey. The pointed gable, which rose above the rest of the frontage to the east, had moulded kneelers and plain coping.

3.18 The other external elevations of the southern engine house were largely obscured by surrounding structures within the wider complex, but a rooftop walkway along the west side of the c.1857 weaving shed provided a valuable viewpoint. From here, it could be seen that the eaves of the east elevation were formed by a moulded cornice, and that the north gable was clearly once external [*2397, 2398*] (see plate 10).

5) the Northern Engine House

3.19 Like the southern engine house, the former external elevations of the northern engine house were largely obscured by surrounding structures within the wider complex. However, the north end of the west elevation remained visible beyond the economiser house [*11791*] (see plate 9). It rose from a chamfered stone plinth and was built of neatly squared and coursed sandstone with strong tooling marks, set with a lime mortar; like the west elevation of the boiler house, the eaves comprised a plain block cornice. To the ground floor, three shallow concrete steps rose to an inserted, flat-headed doorway, covered with corrugated sheeting at the time of the survey. Above, there was a large inserted window opening with a steel joist lintel; the wooden window frame was obscured by corrugated sheeting. The window opening was apparently once taller, as a blocking was visible beneath it. The insertion of the opening had disturbed a plain string course set approximately two thirds of the way up the elevation. This plain string course continued to the south, into the interior of the boiler house, showing that part of the internal east wall was actually once external, and that the north end of the boiler house was later than the north engine house.

3.20 The aforementioned rooftop walkway also provided a view of the north gable of the northern engine house [*11804, 11805*] (see plate 11). The plain string course visible at the north end of the west elevation was carried around the gable, essentially acting as the impost blocks for the head of the tall key-stoned round-headed window. The window had been blocked with modern brick, but the bottom and projecting stone sill remained visible from within the western extension to the c.1857 weaving shed built between 1921 and 1935 (Unit H) [*11696, 11697*] (see plate 12). There was a clear horizontal break in the visible stonework of the northern engine house's east elevation, where the plain block cornice and two courses beneath had been built over the top of the parapet of the west wall of the c.1857 weaving shed. A wooden vent with a pyramidal roof and wooden finial rose above the common rafters of the roof structure [*11786*] (see plate 13).

Circulation

1) the Boiler House and Economiser House

3.21 At the time of the survey, the only access to the interior of the boiler house was through an east-west passage running across the south end of the southern engine house (see below); this led into the south end of the boiler house. The boiler house was floored with concrete, and the internal walls were whitewashed. The north and east walls were of coursed and squared sandstone, but the west

and south walls are lined with machine-made red bricks (average dimensions 220mm by 100mm by 70mm) set with a lime mortar.

3.22 The south wall of the boiler house was partly obscured by a large, modern blockwork tank or storage bunker which extended the full height of the elevation. To the east of this, there was an inserted doorway set within the blocking of the two former ground floor openings to the south gable [*11816*] (see plate 14). At the south end of the east wall, there was the large, modern garage doorway which provided vehicle access from the exterior of the building. Moving north, the doorway to the passage forming the south part of the engine house had a stone lintel and beyond this, a line of joists holes set at c.1.50m above floor level indicated that there was once a raised floor or platform on this side of the interior. Approximately three-quarters of the way along the east wall, there were two straight joints in the stonework, set 0.50m apart and rising almost the full height of the wall, which coincided with the north wall of the southern engine house [*11821, 11825*] (see plate 15); the stonework between the straight joints was butted by that to either side. To the north of the straight joints, the plain string course of the former west external elevation of the northern engine house remained visible, demonstrating that the north end of the boiler house at least partly post-dated the northern engine house.

3.23 The north wall of the boiler house had a number of later blockwork and brickwork structures abutting it [*11823*] (see plate 15). The earliest of these appeared to be at the east and west ends. At the east end, a brick plinth, c.2.50m long by 1.80m wide by 1.20m high, had a number of smaller brick structures projecting from its upper surface, including a short brick pier with a flagstone cap. The earlier structure had been extended west using blockwork, and a tall brick wall built running off it to the south; steel joists ran between the top of the wall and the boiler house's east wall. At the west end, two brickwork walls in the north-west corner of the boiler house were once part of a larger structure which had been partially demolished [*11834*] (see plate 16); a blocked opening in the same area of the north wall was revealed externally during the demolition watching brief (see below). In the approximate centre of the north wall itself, at the upper level, there was what appeared to be an original window, blocked at the time of the survey, with a wooden lintel; this was also revealed externally during the demolition watching brief (see below). To the east of this window was another blocked opening with a steel lintel forming a doorway leading though into the upper part of the economiser house.

3.24 The west wall of the boiler house was dominated by the large opening placed off-centre to the north, in which the east side of the chimney pedestal was exposed [*11829, 11830*] (see also plate 16). This side of the pedestal appeared once to have been external, whilst the jambs of the opening were crudely cut back, suggesting that this part of the boiler house at least post-dated the chimney. It is possible that this part of the west wall was cut away to allow the insertion of a large diameter oval metal flue into the base of the chimney pedestal; the flue was surrounded by concrete. The removal of this part of the west wall resulted in structural instability, with the result that the opening had to be 'framed' using two upright steel joists with a horizontal steel joist across the top; the horizontal joist supported the west end of two of the roof trusses which had formerly been set into the wall. To the north of the large opening, there was a window opening with a wooden lintel, retaining a four-light wooden frame, at the same height as the window in the north wall [*11828*] (see plate 16).

3.25 The interior of the boiler house was crossed by five east-west aligned softwood roof trusses, all of the same king-post form [*11831*] (see plate 17). The ends of each tie-beam were set into the east and west walls, rather than resting on wall plates. Each king-post had a slightly joggled foot, bolted through the tie-beam, and a slightly splayed head. There were raking struts to the principal rafters, each of which supported a pair of trenched purlins. The plank ridge piece and most of the common rafters were also of softwood, and appeared to be of a similar date to the trusses. With the exception of the southernmost truss, the trusses were numbered using incised Roman numerals; from south to north, the numbering was 'II', 'V', 'III' and 'IV'. The fact that the numbering was not sequential may indicate that the trusses had been re-set at some point, or perhaps had been re-used from an earlier phase of the boiler house, although they may of course have been erected out of sequence to begin with. Two timbers, each supporting a pulley, ran between the northernmost truss and the north wall of the boiler house [*11832*].

3.26 There was no access to the interior of the economiser house, either internally from the boiler house or externally from the surrounding area, due to openings being boarded or blocked up.

2) the Southern Engine House

3.27 At the time of the survey, the main access into the interior of the southern engine house was through the doorway at the west end of the weaving shed's (Unit C) south wall. This led into a short north-south aligned cross-passage, set across the west end of the c.1857 warehouse building set along the Ilkley Road frontage (Unit G). This 1.0m wide passage was floored with worn flagstones. The east wall was a later brickwork insertion, but the stone west wall was original [*11808*] (see plate 18). There was a c.2m wide opening to the centre of the west wall, filled with a plank and batten partition. A short stone pier projected from the wall below the opening, whilst to the north of the opening, a small bearing box (now blocked) once held the west end of an east-west line shaft passing into the c.1857 warehouse building (Unit G); there was no clear evidence for this on the inside of the southern engine house.

3.28 At the south end of the passage, two stone steps rose to a doorway in the west wall, leading into an east-west aligned passage across the south end of the southern engine house [*11810*] (see plate 19). This was also floored with worn flagstones, with match boarding to the south wall which continued into the ground floor window jambs. The lower c.1m of the north wall was coursed and squared stone, with concrete capping, which had been used as a base for a modern partition. Above the centre of the passage, between the windows to the top of the south wall, there was a curved cast-iron bracket bolted onto the match boarding wall covering [*11813*]. At the west end of the passage, a flight of five stone steps [*11815*] rose c.1m to the north to give access into a modern corridor running along the west side of the southern engine house's ground floor; although the corridor was a modern creation, the west wall retained earlier match board lining, whilst there was also a board floor [*11836*] (see plate 20).

3.29 To the east of the modern corridor, a room had been created to house cabinets containing modern switch gear; the room had a concrete floor, which is described in more detail below. All four walls were lined with match boarding to a greater or lesser extent. The south wall retained match boarding to its full height, including wooden plyboard to the tall first floor round-headed windows [*11838, 11840*] (see plates 21 and 22). Just below the first floor windows, a line of vertical metal plates, each with five short projecting rods, were fixed to the match boards [*11839*] (see

plate 22); these may have been used to secure horizontal electrical cabling. The match boarding also rose the full height of the west wall [*11843*], but was only present to the first floor of the north wall; it had presumably been removed so that a large doorway (subsequently filled with blockwork) could be inserted at ground floor level [*11845*] (see plate 23). The match boarding had also been removed from much of the ground floor of the east wall, exposing the blocked main bearing box used to transfer power from the south engine house to the adjacent weaving shed [*11846, 11850*], although it survived above [*11847*] (see plate 28 below); there was a considerable amount of oil staining below the bearing box. The ceiling of the south engine house (effectively the first floor ceiling) was also fully lined with match boarding, and it contained only a single small vent or hatch to the centre of the west side [*11848, 11849*] (see plate 24).

3.30 Following the initial recording work, the switch gear cabinets, the match board lining and all other material was removed from the interior of the southern engine house. This revealed that the stonework visible at the base of the north wall of the east-west passage formerly running across the south side of the interior represented the original engine bed; this stood c.0.80m high [*2387*] (see plate 25). At a later date, a second bed or base had been cast over the first in concrete, and this may have been associated with the conversion of the mill from steam to electric power [*2381*] (see plate 26). This second base included a large raised rectangular plinth at the north-east corner of the bed, running north-south and measuring 3.75m long. To the west, there was an area of the bed, located centrally to the plinth, which appeared to have been backfilled, and it was also noticeable that the plinth itself was located centrally to the main bearing box in the east wall of the south engine house. There was a narrow slot or recess to the east of the plinth which ran the full length of the bed, and which appeared at least in part to belong to the original engine bed. To the south-west of the raised plinth, the concrete bed retained evidence for a rectangular base, measuring c.2.70m by 1.80m, which preserved four different fixing points [*2382, 2385*]. To the south-east of this, two narrow parallel channels ran east-west across the south-east corner of the concrete bed [*2386*].

3.31 In terms of the internal elevations, the removal of the match boarding and the modern north-south passage confirmed that there had been a first floor to all or part of the southern engine house, running along the west wall, as indicated by a line of blocked joist holes [*2335, 2337, 2343, 2357*] (see plate 27). This floor had been set c.2.70m above the level of the original stone engine bed, and above the floor, the west wall had been originally plastered before the later match boarding was added [*2342, 2361*]. Towards the south end of the west wall, a small 0.40m wide bearing box formerly held a line shaft which crossed the southern part of the engine bed to a similar box located in the east wall [*2362*]; there were two cast-iron wall ties with circular plates above the western bearing box [*2364*] (see also plate 27).

3.32 Blocked joist holes suggested that the first floor evidenced to the west wall was also partly present to the east wall [*2370, 2373*]. The east wall's first floor was again originally plastered before the later match boarding was added, and the boarding also obscured a first floor doorway at the south end of the wall (see figure 7 - section); the timber frame of the doorway has been badly charred at some point, although no wider evidence for a fire within the engine house was noted. To the north, the former position of the main bearing box used to transfer power from the south engine house to the adjacent weaving shed was fully revealed; the 0.80m square opening was blocked with brick [*2378*] (see plate 28). Above and to either side of the box position, a faint scar had been left on the wall by a pulley or

other wheel with a diameter of c.2.50m. Although the large ground floor opening in the east wall had machine-made brick jambs, showing it to be a later insertion, beneath a skin of concrete the base of the opening appeared to comprise a large stone block, with at least one threaded bolt projecting from the surface [*2379*].

3.33 The south wall appeared to have been plastered to both the ground and first floors before the later match boarding was added; the removal of the match boarding also revealed that the two ground floor windows had brickwork to their inside jambs [*2369*] (see plate 29). The level of disturbance caused to the ground floor of the north wall by the insertion of a large opening with a steel lintel is clearly visible. This opening (subsequently blocked with blockwork) has areas of brickwork to either side [*2354*]. There was formerly a flat-headed window with a wooden lintel centrally placed to the first floor of the north wall, which was subsequently blocked with stone [*2352*] (see plate 30). The plaster of the first floor retained evidence of an early decorative scheme, where lines were painted onto the plaster so as to resemble ashlar [*2393, 2394*] (see plate 31).

3.34 The roof trusses of the southern engine house were not clearly visible from the interior during the survey work. However, they could be partially seen from the rooftop walkway of the adjacent weaving shed. The roof structure comprised a pair of east-west aligned trusses, dividing the attic into three bays of equal size (see figure 7 - section). The roof trusses were apparently of the same, relatively light-weight, softwood king-strut form as those surviving to the c.1857 warehouse range on the south side of the weaving shed.

3) the Northern Engine House

3.35 At the time of the survey, the ground floor of the northern engine house was accessed through a doorway in the north-east corner, which passed through the west wall of the c.1857 weaving shed (Unit C). The ground floor was a relatively modern creation, the south and west walls being plastered and painted, and the floor carpeted [*11800, 11801*] (see plate 32). A blockwork partition had been inserted at the north end of the room to house a modern wooden staircase rising to the first floor. The walls had been plastered and painted, apart from the east wall which was only painted, and a brick-blocked opening, 0.90m square, marking the former position of the main bearing box which transferred power from the north engine house into the adjacent weaving shed remained visible adjacent to the doorway [*11803*] (see plate 33).

3.36 The first floor of the northern engine house could be reached either via the modern staircase rising from the north end of the ground floor, or via steps placed at the north end of the southern engine house (see plate 20). These latter steps were stone at the base, but then wooden at a higher level; the first floor of the northern engine house was placed c.1.75m above the ground floor of the southern engine house, but the ground of the former is set 1.10m below that of the latter (see figure 7 - section). The first floor had a floor of narrow, east-west aligned softwood boards. As on the ground floor, all the walls were plastered and painted, apart from the east wall which was only painted, revealing neatly coursed and squared sandstone with strong tooling marks, as well as the top lintel of the main bearing box [*11852, 11853*] (see plate 34). To the north end of the west wall, the opening which was visible externally was fitted with a wooden window frame to the south half, comprising four lights, and two-leaf plank and batten doors to the north half [*11854*]. The north wall had a large centrally-placed round-headed arched window which extended down to ground floor level [*11851*] (see plate 35), already noted

externally (see plate 11). The window was blocked with brick, but retained the original moulded wooden lining to the jambs and head.

3.37 The main feature of interest to the first floor is the ceiling. The room is crossed by three east-west aligned ceiling beams, not quite set out at equal centres, all with stop-chamfered soffits (see figure 7 - section); the central and southern beams were reinforced with a metal plate bolted to one face. Between the beams, the four ceiling panels all have coving around their edges, with match boarding running diagonally across the panels; the match boarding within each panel is set at an opposing angle to that within the adjacent panel, creating a decorative effect [*11859*]. A small rectangular ceiling opening close to the southernmost beam led to the wooden vent with the pyramidal roof which rises through the roof structure. There were also five lifting eyes to the ceiling, formerly used to facilitate maintenance of a steam engine below [*11855*] (see plate 36). The southern ceiling beam had a pair of large lifting eyes to the soffit, set 1.55m apart [*11857, 11858*] (see plate 37). The central ceiling beam again had a pair of lifting eyes to the soffit (a larger example to the west and a smaller to the east), set 2.70m apart. Finally, between the central beam and the northern beam, a single large round eye is set into the ceiling panel [*11856*].

3.38 The roof trusses of the northern engine house were not clearly visible from the interior during the survey work. However, they could be partially seen from the rooftop walkway of the adjacent weaving shed. The roof structure comprised three east-west trusses, dividing the attic into four bays of slightly unequal size; all trusses were of the same king-post form. The ends of each tie-beam were set into the east and west walls, rather than resting on wall plates. Each king-post had a slightly joggled foot, and a slightly splayed head. There were raking struts to the principal rafters, each of which supported a single trenched purlin. The plank ridge piece and most of the common rafters were also softwood, and appeared to be of a similar date to the trusses. The wooden vent with the pyramidal roof rose through the roof structure close to the north side of the southernmost roof truss.

4) the Weaving Shed (Unit C)

3.39 The WYAAS specification stated that one of the aspects of the Otley Mills that should be investigated by the survey was to identify any surviving evidence for how power was transferred from the engine house into the south-west part of the c.1857 weaving shed (Unit C) (see Appendix 2). A description is therefore given of this part of the mill complex. This structure is not due to be demolished as part of the current proposals, but will be converted into three separate units divided by north-south walls.

3.40 The west and south walls of the weaving shed are built from neatly coursed and squared sandstone with prominent tooling marks, most of which have been painted white at some point in the past. The west wall rises from a shallowly projecting plinth, and towards the south end, at c.2.50m above floor level, a large brick-blocked opening marks the former position of the main bearing box which transferred power from the northern engine house into the weaving shed; the blocked opening itself is c.1m square, with a head and lintel formed by large dressed stone blocks [*11692*] (see plate 38). Further south, there may be an area of rebuilding or disturbance c.7.0m long and placed between c.1.80m and 3.80m above floor level [*11689, 11691*]. Due to later painting and whitewashing of the wall, this area of disturbance was difficult to define exactly, but it appeared to equate broadly with the length of the northern engine house. At the south end of the wall, again set at c.2.50m above floor level, a blocked opening marks the

former position of the main bearing box which transferred power from the southern engine house into the weaving shed [*11690*].

3.41 In the south wall of the weaving shed, there is a deep ashlar course placed at approximately the same height as the bearing box from the southern engine house, which bears scarring left by the removal of brackets or similar features. This ashlar course, and associated brackets, would have been used to secure the main drive shaft running along the shed's south wall, which would then have transferred power through bevel wheels to countershafts or line shafts set at right-angles to the wall [*11694*] (see plate 39); the original means of support for these counter or line shafts has since been removed. A single, square, cast-iron bracket survives to the weaving shed's south wall, towards the west end [*11695*] (see plate 40). At the top of the south wall, and also the north wall, is a row of paired corbels formerly supporting the ends of the saw-tooth profiled north light roof structure (see also plate 39). The weaving shed retained its saw-tooth profiled north light roof until at least c.1960, as it appears on an aerial photograph of about this date (Laurence 2015, 60). Examination of the former west external elevation of the weaving shed to the north of the northern engine house (i.e. from within Unit H) shows that it underwent a number of alterations, mostly likely when Unit H was built up against it between 1921 and 1935 (see figures 3D and 4B) [*11703*]. It is interesting to note that the c.1857 weaving shed (Unit C) had a plain string course externally, similar to that surviving to the external elevations of the northern engine house.

5) the Ilkley Road frontage building (Unit G)

3.42 Only an exterior description and photographs were required of the Ilkley Road frontage building, and so the following description provides no details of the interior. The facade of Unit G, as well as the engine house to the west, has since been demolished as part of the approved planning permission; the facade of Unit D to the east has been retained. Also, as previously noted, the boiler house was demolished following the collapse of the south gable. The exterior, which has been drawn as part of the approved planning application (see figures 8 and 9), is described from west to east.

3.43 The Ilkley Road frontage comprised three main phases, all built largely from coursed and squared sandstone of the Local Millstone Grit group, perhaps specifically Kinderscout Grit (Govier 2019, 10) [*11866, 11867*] (see plate 41). Unless otherwise noted, all door and window openings were boarded up at the time of the EDAS survey.

3.44 The earliest phase of the frontage, and the largest surviving element, was formed by the boiler house, the southern engine house, and the warehousing/office building fronting the large worsted weaving shed built in c.1857 (Unit C) (see figure 8). At the west end, the south gable of the boiler house broke forward from the rest of the c.1857 frontage. As has been described in more detail above, this gable was not original and related to a later expansion of the boiler house. To the ground floor, there were two large openings, infilled with modern brickwork and blockwork, divided by a central wooden pier with mouldings to the head and foot, and with wooden fielded panels to the upper part of each opening (see plate 1). There was a moulded cornice above the openings, with ashlar quoins to either side. Above the openings, there was a further moulded string course, and moulded coping to the gable. The apex of the pointed gable was pierced by a circular vent with a dressed stone surround. Where the gable returned to the north

at its east end, the short part of the boiler house's east elevation that was externally visible had a modern inserted garage door.

3.45 To the east of the boiler house, the south gable of the southern engine house was clearly contemporary with the rest of the c.1857 frontage. The gable rose from a chamfered stone plinth, and was two bays in width (see plate 8). To the ground floor, there was a flat-headed window to each bay, each with a projecting stone sill. To the first floor, there was a moulded string course which was continuous across the whole of the c.1857 frontage, and then a pair of key-stoned round-headed windows with rusticated jambs, moulded impost blocks and rusticated voussoirs. The pointed gable, which rose above the main body of the c.1857 frontage to the east, had moulded kneelers and plain coping.

3.46 The main body of the frontage, forming the warehouse and office building (Unit G) was two storeys in height and 21 bays in length, rising from a chamfered plinth [*11717, 11722, 11740*] (see plate 42). Apart from the central bay, all the bays contained a four-light window, although the 1926 aerial photograph suggests that those in the fourth and sixteenth bays may well have been doorways originally (see figure 4A), and there were some straight joints with newer stonework blocking below the later windows. The eighth, ninth and tenth bays from the west end broke forward slightly to frame the principal ground floor entrance, although this was not sufficient to be shown on the historic mapping (see figure 3B to 3D). The entrance had an Egyptian-style door surround, and the three bays were set beneath a pediment with cornice and cornice returns, which rose to the same height as the south gable of the southern engine house [*11735, 11737*] (see plate 43). The bays either side of the entrance doorway had a flat-headed window opening with a projecting sill. Above the windows, a moulded string course continued across the whole of the frontage, apart from where it was broken by two first floor loading doors, positioned in the fourth [*11744*] and sixteenth [*11732*] bays from the engine house (see plate 44). The western loading door retained an early plank and batten door, and a projecting timber above supporting a pulley [*11747*]. There was a single first floor window at the very east end of the c.1857 frontage but this was a later insertion.

3.47 The western end of the frontage was obscured from the Ilkley Road by a single storey structure built to the immediate south; it was erected between 1891 and 1908 (see figures 3B and 3C). The structure was aligned east-west, with the south elevation built of stone; it was largely blank, with the exception of an inserted louvered opening towards the west end and an intermittent scar set c.1.50m above ground level [*11727*]. The other three elevations had all been rebuilt in brick, whilst the single-pitch roof, sloping downwards from south to north, had a modern covering. The function of this structure is unknown.

3.48 The second phase of the frontage, forming the south wall of Unit D, was built between 1891 and 1908 as an additional weaving shed (see figures 3B and 3C). It is set forward from the c.1857 frontage to the west, and is of a single storey and twelve bays in length [*11716*] (see figure 9) (see plate 45). The 1926 aerial photograph shows three equally-spaced chimneys along the elevation (see figure 4A), although they are no longer visible. The central two bays are emphasised by flanking ashlar piers with a semi-circular coped pediment over; the pediment has a slightly raised diamond-shaped block to the centre [*11726*] (see plate 46). With the exception of the easternmost bay, where there is a later inserted window, each bay contains a window with an ashlar architrave, an individual hoodmould over and a small square vent below. The short return at the west end contains a doorway with a canopy over and a window to the south [*11729*].

3.49 A third phase to the frontage, forming the south wall of Unit E, was added to the east between 1908 and 1921, according to the map evidence (see figures 3C and 3D); other documentary, and structural evidence, indicates that it was built in 1916, possibly to house woollen spinning connected with wartime business (Laurence 2015, 58). This third phase stretches from the east end of Unit D to the break in the frontage formerly giving access to the central part of the Otley Mills complex (see figure 9); in plan, it steps inwards a number of times from west to east to accommodate the curve of the Ilkley Road [*11705*] (see plate 47). The west end of this phase is formed by a cart entrance with a gauged head of ashlar voussoirs and a date stone reading "AD 1916"; the jambs are also of ashlar. Above the entrance, an ashlar panel once bore the lettering "OTLEY MILLS DUNCAN, BARRACLOUGH & Co. LTD" but this has since been removed, leaving only an outline [*11713, 11872*] (see plate 48). To the east of the cart entrance, there is a single storey gable end, four bays in length. The western bay contains a doorway while each bay to the east contains a tall window; both doorway and windows have the same detailing as noted to the windows in the second phase of the frontage. Above the windows, there is an ashlar band, with the apex of the gable pierced by a circular vent like that seen to the south gable of the boiler house; the pointed gable has plain coping [*11708*]. The gable returns to the north for a short distance at its east end, where there is a small attached outshut which appears to be contemporary. The eastern end of the third phase of the frontage is of relatively plain appearance. There are three windows with flat heads and projecting sills, with a smaller inserted louvered opening at the east end and a small area of repair at the west end [*11876*].

4 RESULTS OF THE WATCHING BRIEF

4.1 As noted above in Chapter 1, two watching brief visits were undertaken during the demolition of different parts of the mill complex.

The Economiser House (see figure 6)

4.2 The first watching brief, on 20th December 2019, examined the remains of the economiser house immediately following demolition. The structure contained no metal pipes or other parts relating to the economiser itself, and so it is concluded that these had been stripped out at an earlier date. The external walls of the economiser house were all brick built, as described in Chapter 3 above, and had an average width of 0.24m.

4.3 The demolition work also exposed the north gable of the boiler house, which had previously been hidden from view [*3621*] (see plate 49). The very east end of the gable could be seen to form a 'proper' corner with the west wall of the northern engine house. This was slightly puzzling, as the internal structural evidence from the boiler house (as described above) suggested that the west wall of the northern engine house was once external, with the north end of the boiler house built against it at a later date. A partial explanation may be provided by an inset to the boiler house's north gable, set approximately two-thirds of the way up its height. The upper part of the gable was clearly a later addition, and so it is possible that the northern engine house was built partly over a smaller, lower boiler house; in such a scenario, the upper part of the northern engine house's west wall would still have been external. Subsequently, the boiler house was heightened and re-roofed, so that former external part of the north engine house's wall became internal.

4.4 At a low level, the east end of the boiler house's north gable is pierced by a semi-circular headed opening, c.1.2m high, and with splayed jambs passing through the thickness of the wall [*3622*]. The opening appeared to have been inserted into the stonework here, with both the head and the west jamb built of firebricks. The inner face of the opening was fitted with a door, made of two (wrought-iron?) plates joined together using hexagonal nuts. At the top of the door, a vertical bolt, held in place by four square nuts, could be drawn upwards from the inside of the boiler house to open the door [*3632-3634*] (see plate 50). The door opened into the large brick plinth at the north-east corner of the boiler house's interior, and so could not be observed internally.

4.5 The angle of the west side of the semi-circular headed opening was continued by the west end of a panel of brickwork which had been added to the north gable of the boiler house, and which was once internal to the economiser house. This panel rose to first floor level, and was built from light red machine-made bricks (average dimensions 240mm by 105mm by 70mm) laid in a variation of English Garden Wall bond (five stretcher courses to each header course) and set with a lime mortar; the surface of the brickwork was very sooty. Some of the bricks were stamped "ARMITAGE", as noted to the north external elevation of the economiser house [*3624-3626, 3644*] (see also plate 49). A number of other bricks were seen bearing the stamp "MIDLAND BRICK CO NCB" [*3643*]. Many bricks such as these have a name beneath, denoting the colliery brickworks where they were made. Although the Otley bricks are not named, they must date to after 1947 when the National Coal Board (NCB) came into being. The Midland Brick Company operated several brickworks in Nottinghamshire, Leicestershire and Staffordshire, but also acquired colliery brickworks in West Yorkshire, such as Ackton Hall,

Featherstone, from the NCB (Kitching 2016, 86-87). Above the brick panel, but below the level of the inset of the gable, the top of a blocked window with a stone lintel is visible [*3627*]; this window was previously noted on the internal elevation, and is at first floor level relative to the economiser house. To the east, an inserted first floor doorway, blocked with blockwork and again previously noted internally, once gave access to the interior first floor or upper part of the economiser house from the boiler house.

4.6 At the base of the brick panel, there was a plinth which projected 0.50m from the face of the panel above. It appeared to be built of the same brickwork and was also heavily sooted to the surface. A number of flues were associated with this plinth and the brick panel. Towards the west end of the plinth, a 0.50m wide flue with brick walls and a flat concrete roof emerged through it at a low level. At a higher level, at the west end of the brick panel, there was a second ruined flue, which curved around from the south-east to the west. Finally, below this, the fragmentary remains of a flue line on a more acute north-east/south-west angle were visible. There may have been the curved top of a brick flue above this, in line with an inserted opening in the west end of the boiler house's north gable [*3628*]. This opening had been rather crudely inserted through the wall, and the interior was heavily sooted. A slanting steel joist supported firebricks above, and then above this there was a heavily corroded metal joist with a pipe emerging over it, again supporting firebricks [*3629*] (see plate 51). The east jamb of the opening may have revealed two different skins of stonework to the north gable of the boiler house, although this was not certain [*3631*].

The Northern Engine House

4.7 During the same visit, the interior of the northern engine house was inspected, as far as was safely possible, following the demolition of the west wall and part of the roof structure. The removal of the internal staircase rising up the north wall demonstrated that internally, only the bottom 1.20m of the wall was built of stonework, above the wall was faced with brickwork [*3636, 3637*]. To the east wall, a faint large diameter circle may have been partly visible around the large blocked bearing box [*3638, 3639*] (see plate 52). Demolition of the west wall revealed that, at an upper level, it too was faced with brickwork internally like the north wall [*3641, 3642*]. One of the tie-beams of the northern engine house's roof trusses became more visible following partial removal of the roof, revealing the metal plate bolted to one face [*3640*] (see plate 53).

The Southern Engine House Engine Bed

4.8 The second watching brief visit, on the 14th January 2020, was undertaken to view the demolition of the engine bed in the southern engine house. As has already been noted, the partial demolition of the engine house, the presence of unsupported two storey walls and the heavy machinery necessary to break up the engine bed meant that the amount of new structural information revealed was limited [*4649, 4651, 4663*] (see plate 54).

4.9 When the engine bed was broken up, the large rectangular raised plinth at the north-east corner was revealed to have been built from large dressed stone blocks, which had later been covered in a cement render [*4659*]; it therefore presumably formed part of the original stone steam engine bed. To the west of this, much of the concrete surface was seen to be 0.15m thick or less, and to have been cast over rubble infill to larger recesses in the surface of the stone engine bed, although the latter could not be clearly viewed [*4660, 4661*]. The north [*4654, 4656*], east

[*4657, 4658*] and west [*4653*] interior walls of the south engine house were also re-photographed as the roof had been removed, although no new features other than those described above were revealed.

Other Buildings

4.10 Although not required as part of the WYAAS specification, a number of photographs were taken during the demolition of the c.1857 warehouse frontage (Unit G) [*3645-3648*] (see plates 55 and 56).

5 DISCUSSION AND CONCLUSIONS

5.1 It has been determined that the large weaving shed (Unit C), the warehouse/office range to the Ilkley Road frontage (Unit G) and the earliest of the associated ancillary buildings formed the first phase of development of this part of the Otley Mills complex, erected in c.1857 (see figure 5). The weaving shed, concealed behind the warehouse/office range (Unit G) fronting the Ilkley Road, was of a standard form, of plain appearance and formerly lit by a saw-tooth profiled north light roof. This shed housed power looms, and formed one of the earliest elements of Ackroyd, Duncan and Barraclough's moves to supplement the worsted spinning undertaken elsewhere at the complex since the early 19th century with worsted weaving. In doing so, they created an integrated mill. By the 1870s, integrated mills were the most common type in Yorkshire, and in the worsted branch integration depended on the addition of powered weaving and combing to earlier spinning mills (Giles & Goodall 1992, 98-99). Within the West Yorkshire textile industry as a whole during the late 19th century, there was a general diversification with parts of the traditional woollen-manufacturing zone moving into worsted production, particularly in the Huddersfield area (Giles & Goodall 1992, 4). In 1865, the company name of Otley Mills changed to 'Duncan, Barraclough & Company', and they specialised in the weaving of material known as 'Huddersfield fancy worsted cloth'. From 1888, the firm specialised in the manufacture of cloth for menswear.

5.2 The structural information recording during the project has enabled a more detailed sequence of development of the recorded buildings to be constructed than was previously possible. In summary, several different phases of development took place, the majority between c.1857 and 1916, although they still continued to be made after 1935. Although more detailed interpretation is made difficult because of subsequent alterations and rebuilding, the following scenarios may be suggested.

5.3 The earliest power source for the looms in the weaving shed was the southern engine house. This was attached to the outside south-west corner of the shed, and was rectangular in plan and two storeys in height. Internally, the engine would have been supported on a stone engine bed. There was an internal first or 'beam' floor along the west and south sides of the interior, and possibly also the east side; the part along the south side appears to have taken the form a walkway, which could be accessed from a doorway in the east wall, linking it to the warehouse/office range fronting Ilkley Road. The ground and first floor walls were plastered, with the first floor walls also being decorated with a painting scheme to resemble ashlar. Although few details of the stone engine bed could be recorded, the general arrangement of the southern engine house and the features exposed in the east wall would suggest that a vertical engine, rather than a beam engine, was present; the house is certainly not long enough for a normal size beam engine (Richard Lamb, *pers. comm.*). An attached corner position for the engine house (as at Otley) was deemed particularly suitable for vertical engines, as it allowed direct connection to the main transmission systems (Giles & Goodall 1992, 143). It is also possible that the earlier engine bed, seen to have been built from the large dressed stone blocks and suggested above to have been original, was actually a later structure with the original engine bed being lower, perhaps at the same level as the adjacent southern passage; this would have provided sufficient height for a vertical engine of simple design, possibly even with two cylinders in view of the width of the room (Richard Lamb, *pers. comm.*).

5.4 The main bearing box towards the north end of the east wall of the southern engine house would have transferred power into the weaving shed via a main drive shaft. This was probably driven by a wide flat belt from a pulley on the crankshaft, presumably opposite the flywheel, which may have been approximately 8½ feet (2.6m) in diameter (Richard Lamb, *pers. comm.*). In the south wall of the weaving shed, there is a deep ashlar course placed at approximately the same height as the bearing box, which bears scarring left by the removal of brackets or similar features. This ashlar course, and associated brackets, would have been used to secure the main drive shaft running along and parallel to the shed's south wall, which would then have transferred power through bevel wheels to countershafts or line shafts set at right-angles to the south wall and thence to the power looms; the original means of support for these counter or line shafts had been removed by the time of the EDAS survey. Another smaller bearing box at the south end of the southern engine house's east wall, matched with another in the west wall, as well as possibly another further to the north in the east wall, also allowed power to be transferred via east-west drive shafts into the ground floor of the adjacent warehouse/office structure (Unit G) to the east. It is not known whether there was originally a condenser under the engine house for maximum efficiency, or whether the engine simply exhausted to the atmosphere.

5.5 The original boiler house for the southern engine house must have stood to the west, between it and the chimney; this was the commonly adopted position, so that the engine house acted as a buffer between the boilers and the mill in the event of a fire or explosion (Giles & Goodall 1992, 147) (see figure 10A). The form of the chimney pedestal suggests that it was once free-standing, rather than being attached to the boiler house. Subsequent alterations (see below) appear to have removed much of the original boiler house structure, making interpretation difficult, although it is possible that some parts were preserved within the north gable of the recorded boiler house; this gable is of stone for full thickness, whereas parts of the west and south walls are faced with brick internally. The original boiler house may well have been of a single storey only, as this was a commonly adopted form, with water tanks over on a flat roof.

5.6 At a later date, and before 1891, the northern engine house was built onto the north end of the southern engine house, and possibly partly over the east wall of the earlier, lower, boiler house. The period 1860-1890 was one of transition in the field of steam power technology. Although the beam engine had been made reliable, it had virtually reached its full potential. Horizontal steam engines had been in use for many decades, with smaller versions sometimes used to assist beam engines where additional power was required. However, after 1860, the horizontal engine began to supplant the beam engine. The first recorded use of a horizontal engine in a Yorkshire textile mill dates from c.1864-65 at Whetley Mills in Manningham, but there were also early installations at Northowram and Skipton (for example) in 1870 (Giles & Goodall 1992, 135). At Otley, the length of the northern engine house might suggest that a tandem-compound style horizontal engine was installed (Giles & Goodall 1992, 141) - it is not known if it initially assisted the vertical engine in the southern engine house, or if it wholly replaced it as the power source; it is perhaps quite likely that the first engine was kept operating for a while until the second one was complete and ready to take over. There was no surviving evidence for any engine bed in the northern engine house, nor for any possible condenser beneath.

5.7 The large bearing box in the east wall of the northern engine house transferred power via an east-west drive shaft into the weaving shed to the east. It is interesting to note that this bearing box was at a lower level than the earlier one in

the southern engine house, so this would have necessitated a new drive arrangement to connect with the main drive shaft - evidence for this may have been visible as the recesses in the wall of the weaving shed to the south of the bearing box. There would also have been a large diameter flywheel concentric with the centre of the bearing box - the mark on the wall suggests it had a diameter of 17 feet (5.2m) (Richard Lamb, *pers. comm.*). The surviving ceiling in the northern engine house indicated that its interior, like that in the southern engine house, was once decorated to some degree; if the match boarding in the southern engine house was contemporary with the ceiling over the northern engine house, then it may suggest that the earlier engine was removed when the horizontal engine was installed. As well as providing light, the large north window would also have been used to bring components into the engine house.

5.8 After the north engine house had been built, but again before 1891, the original boiler house was enlarged, most probably by raising it in height and extending to the north; this may well have been the result of a larger engine requiring more steam, hence presumably longer boilers. Evidence for this extension may be provided by the two straight joints of the north wall of the southern engine house in the boiler house's east wall, and also the north-east corner not being tied into the west wall of the north engine house. If this was the case, then the suggestion made above that the north gable of the recorded structure might be a remnant of the original boiler house would be less likely. The non-sequential numbering of the roof trusses in the recorded structure may also indicate that they had been re-set at some point, or perhaps had been re-used from an earlier phase of the boiler house, although they may of course simply have been erected out of sequence to begin with. At a later date, after 1908 but before 1921, the boiler house was extended again, but to the south.

5.9 The boiler house most likely housed two parallel boilers, running north-south, possibly of the Cornish-type initially or more probably of the standard Lancashire type which had been invented in 1844; these typically measured 6-7 feet (1.8m-2.1m) in diameter and up to 30 feet (9.1m) long, and are likely to have been brought in via the southern frontage. In operation, these boilers would have been placed on substantial brick settings which channelled the hot flue gasses from the ends of the fire tubes under the centre of the boilers towards the firing end, then after dividing, back again at an upper level in order to extract as much heat as possible, before connecting to the chimney which provided the necessary draught (Richard Lamb, *pers. comm.*). Coal would have been brought into the firing place at the south end of the boiler house; it is possible that the recorded south gable was built after 1908, replacing some kind of earlier canopy or covered area.

5.10 The development of the economiser in the 1840s allowed savings to be made by utilising the exhaust gases from the boiler furnace to heat boiler feed water, thus reducing the energy required to produce steam. The economiser was essentially a tubular heat exchanger consisting of a series of vertical cast-iron pipes through which cold boiler feed water was pumped from bottom to top, with a mechanism for scraping soot off the surface of the pipes, with two soot chambers in the base, all neatly enclosed in a brick chamber through which the hot flue gasses passed on their way to the chimney (Richard Lamb, *pers. comm.*). The economiser house was therefore simply a shelter for this apparatus and so is usually of a simple form (Giles & Goodall 1992, 149-50) (see figure 10B).

5.11 It is not known whether the earlier boiler house was provided with an economiser house, and if so, where it might have been located. The large oval metal flue in the east side of the free-standing chimney base appears to be a relatively modern

insertion. However, if it has destroyed evidence for an earlier, direct connection to the boilers here, this might imply that initially there was no economiser house. Alternatively, it is also possible that that there was such a structure, aligned east-west and positioned to the east of the chimney base (Richard Lamb, *pers. comm.*). Either way, the recorded economiser seems to have been installed after the boiler house was extended, presumably for the larger boilers, with a new opening made in the north side of the chimney base plus appropriate connections (Richard Lamb, *pers. comm.*).

5.12 Map evidence shows that the economiser house apparently went through several subsequent modifications between 1891 and 1935, although the recorded structural evidence relates to two main phases. The earlier phase relates to the low angled arched opening fitted with the iron door, inserted into the east end of the boiler house's north gable; this opening must have emerged from the raised area of brick and stone at the north-east corner of the boiler house's interior. Exhaust gases from the boilers passed through this opening, through the economiser in the economiser house and then out through the latter's west end into a curving flue which entered the chimney via the inserted opening at the base of its north side. A similar arrangement is illustrated in a 1909 economiser (Giles & Goodall 1992, 152) (see figure 10B), and the fact that the opening in the chimney's north side is inserted must indicate that this earlier phase is still not the original arrangement. At a later date, the exhaust gases were directed through the inserted opening at the west end of the boiler house's north gable, and then apparently into the chimney along a similar route to the earlier phase. This would appear to effectively bypass the economiser house, unless it once related to the structure shown at the north-west corner here on maps in 1921 and 1935.

5.13 The concrete base cast over the earlier stone engine bed in the southern engine house, together with some of the other surviving fixtures and fittings recorded at the time of the EDAS survey, suggest that the horizontal steam engine in the northern engine house was eventually replaced by electrical power. In Yorkshire, the earliest known example of a mill powered by electricity is in 1907 at Becks Mill in Keighley, but by 1918 electricity was in common use. Where a mill owner decided to generate his own power, boilers, a steam turbine and an electric generator were required; the alternative to this was to purchase electricity supplies from a public company (Giles & Goodall 1992, 163-164). The horizontal steam engine was therefore removed from the northern engine house, and a first floor inserted. It is possible that boiler plant was retained for a while after the engine was removed, to provide steam for processing and/or hot water for heating, for example, but it too was also subsequently removed from the boiler house, and this was given over to other functions.

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1908 Ordnance Survey 25" to 1 mile map Yorkshire sheet 187/5 (revised 1906)

1921 Ordnance Survey 25" to 1 mile map Yorkshire sheet 187/5 (revised 1919)

1926 Aerial photograph of the Otley Worsted Mills, Otley, 1926 (Historic Environment Scotland EPW015692)

1935 Ordnance Survey 25" to 1 mile map Yorkshire sheet 187/5 (revised 1934)

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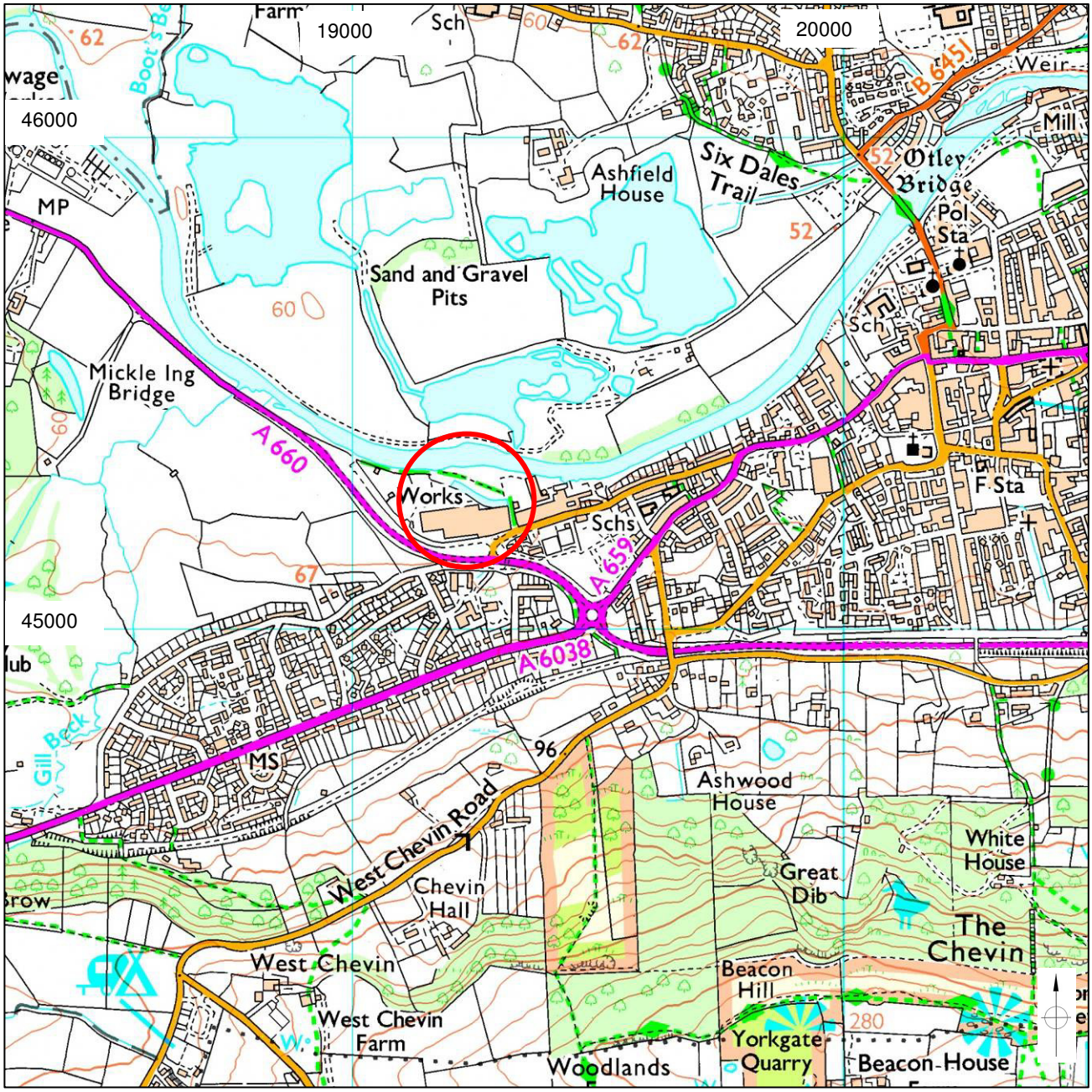
https://newwoodlesford.xyz - 'Woodlesford: The story of a station'

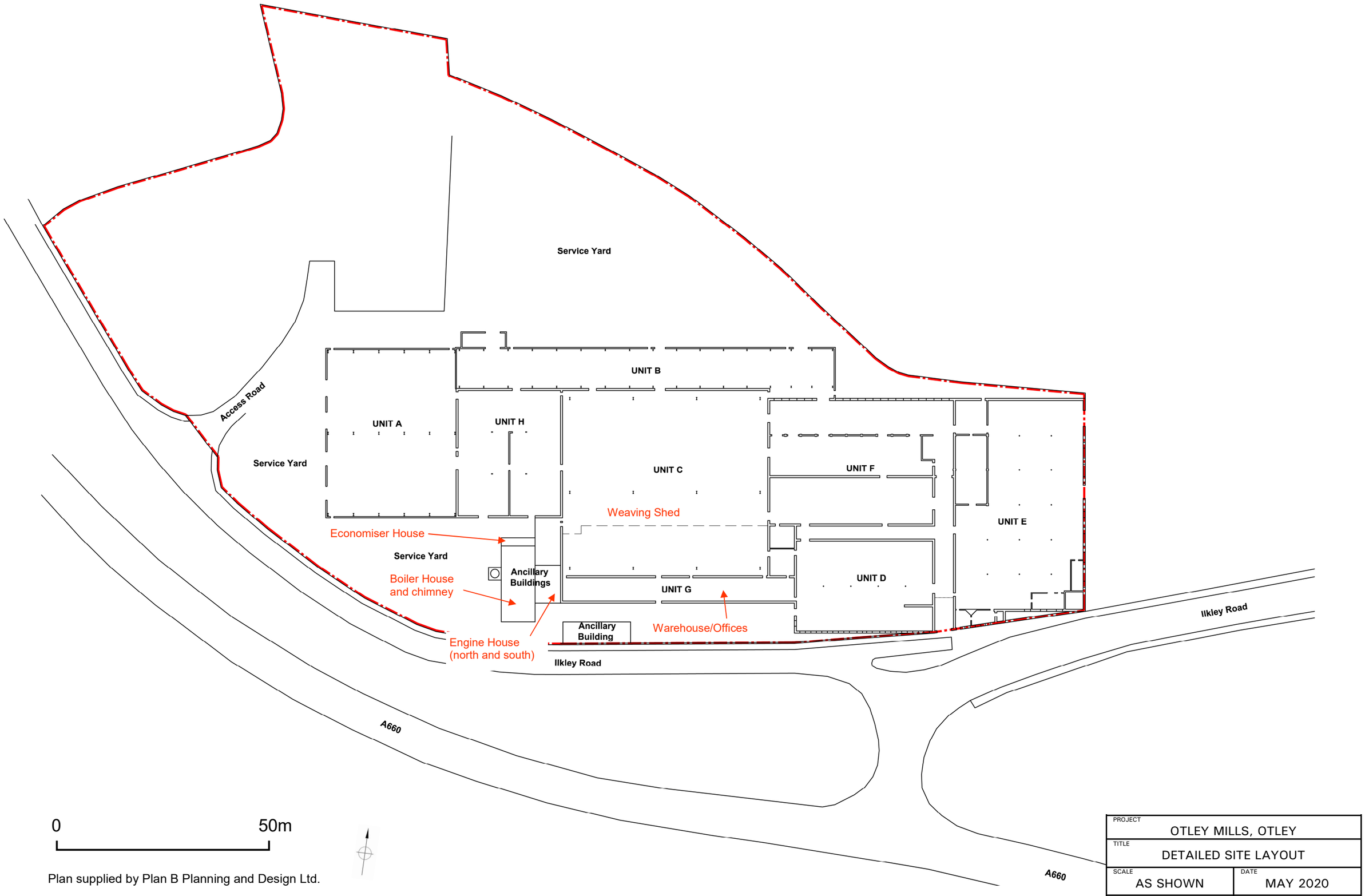
7 ACKNOWLEDGEMENTS

7.1 The archaeological structural watching brief at Otley Mills was commissioned and funded by Andrew Hillas Properties Ltd. EDAS would like to thank Andrew Hillas and Robert Beal of Plan B Planning & Design for their help and for facilitating site access.

7.2 The pre-intervention survey work was undertaken by Shaun Richardson and Richard Lamb, and Stephen Haigh took the photographs. The watching brief work was undertaken by Shaun Richardson. The documentary research was carried out by Shaun Richardson, who also produced a draft report and site archive. Technical comments of the suggested interpretation of the recording buildings were provided by Richard Lamb. The aerial photograph on figure 4A has been reproduced with permission from Historic Environment Scotland. The final report was produced by Ed Dennison, with whom the responsibility for any errors or inconsistencies remains.



PROJECT: OTLEY MILLS, OTLEY	
TITLE: GENERAL LOCATION	
SCALE: AS SHOWN	DATE: MAY 2020
EDAS	FIGURE: 1

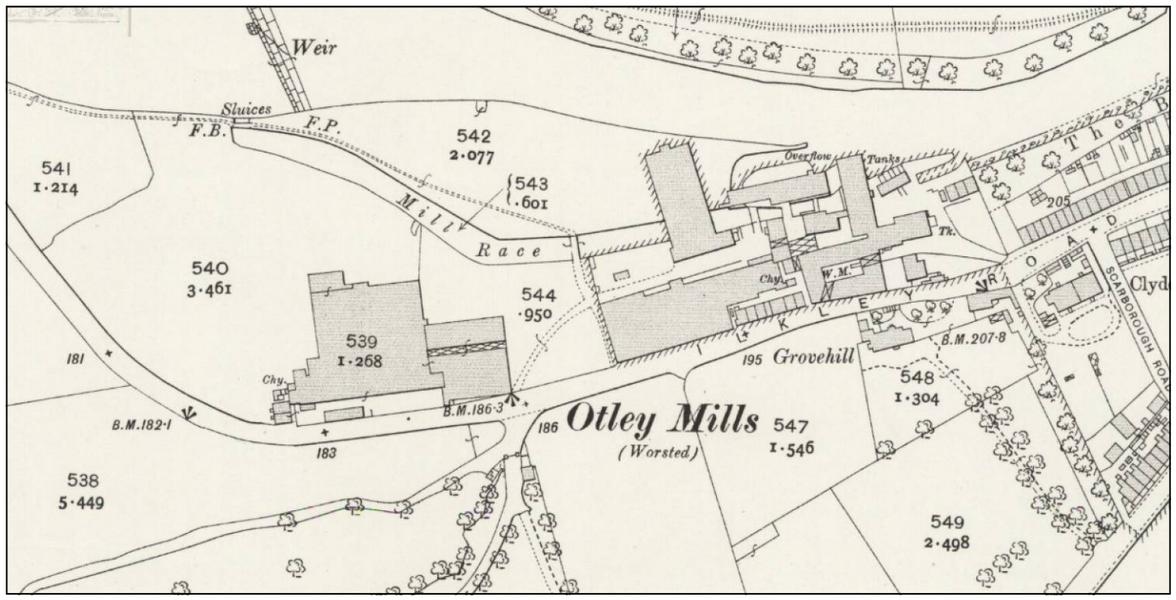


0 50m

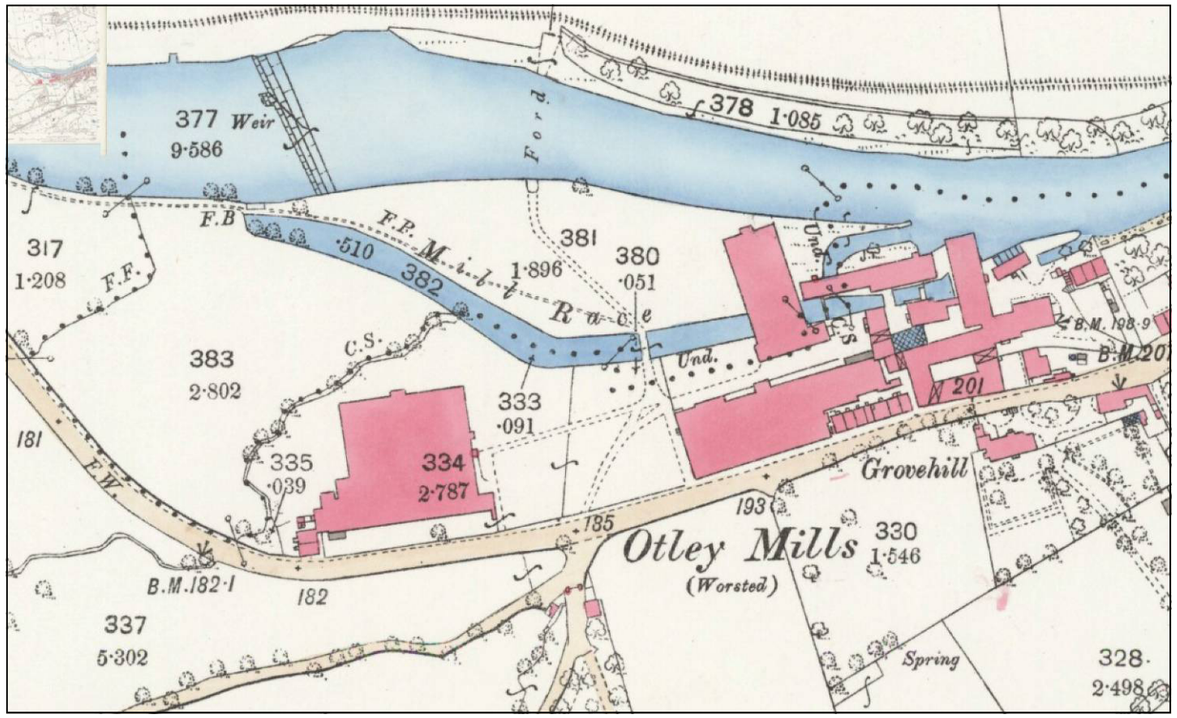
Plan supplied by Plan B Planning and Design Ltd.

PROJECT: OTLEY MILLS, OTLEY	
TITLE: DETAILED SITE LAYOUT	
SCALE: AS SHOWN	DATE: MAY 2020
EDAS	FIGURE: 2

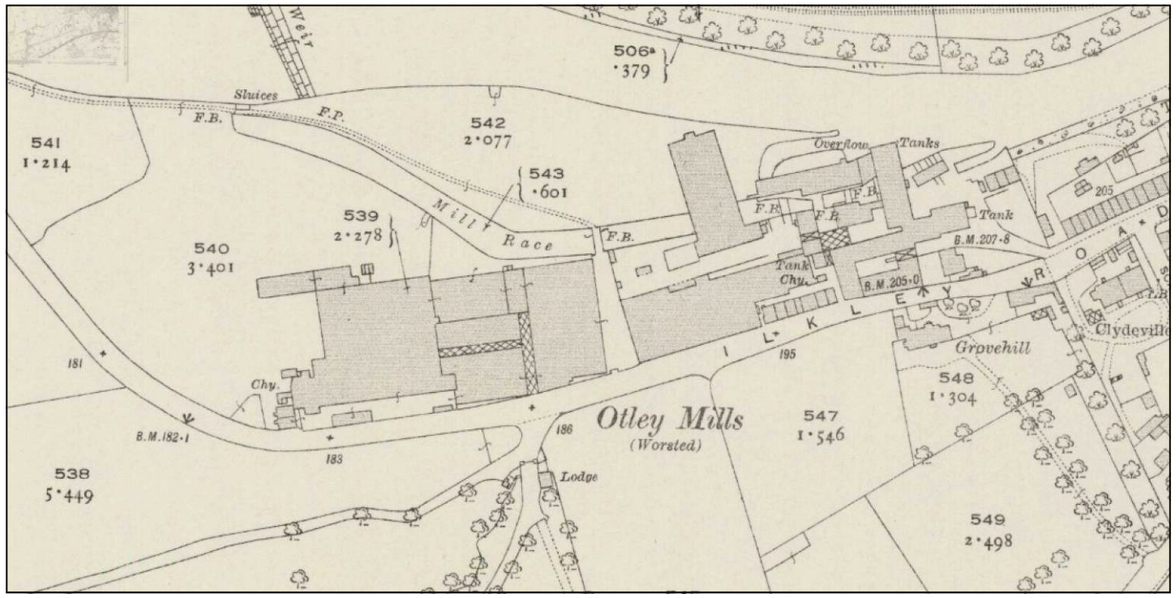
A) 1851 Ordnance Survey 6" to 1 mile map Yorkshire sheet 187 (surveyed 1847-48).



C) 1908 Ordnance Survey 25" to 1 mile map Yorkshire sheet 187/5 (revised 1906).

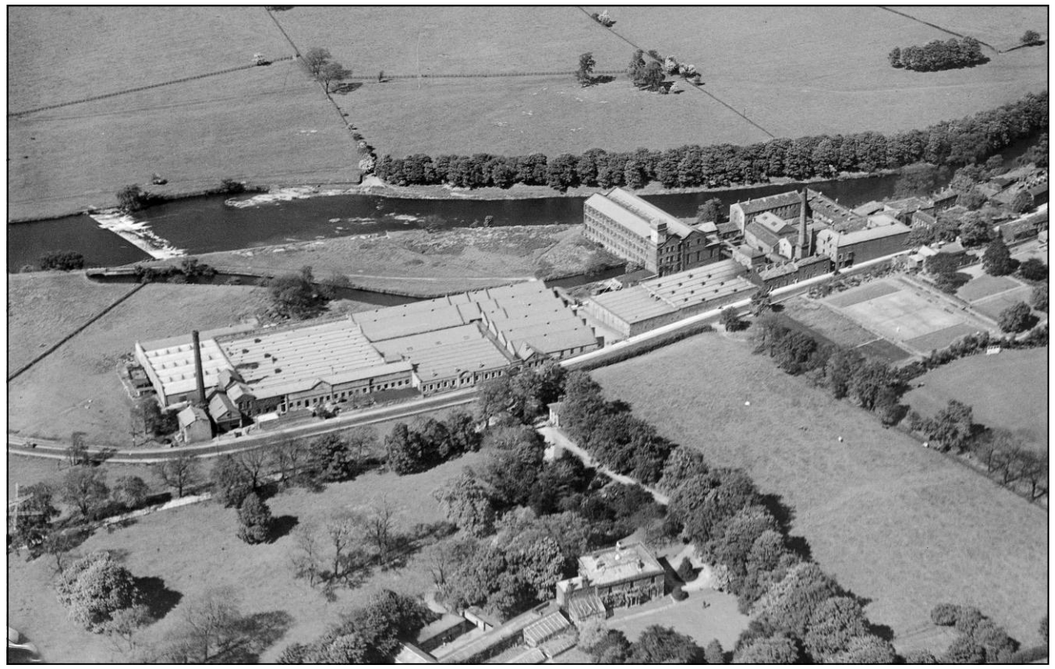


B) 1891 Ordnance Survey 25" to 1 mile map Yorkshire sheet 187/5 (surveyed 1889).

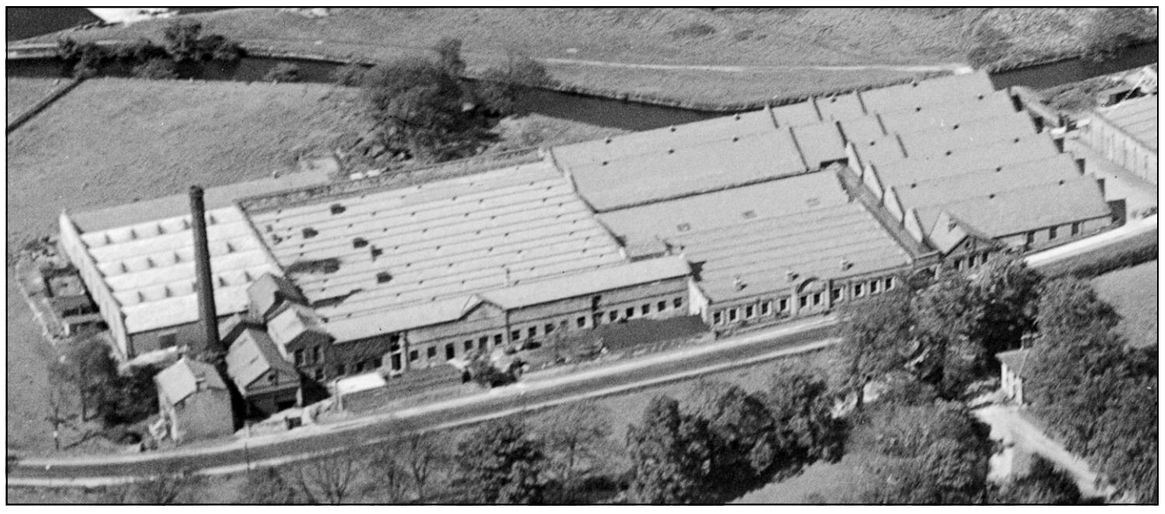


D) 1921 Ordnance Survey 25" to 1 mile map Yorkshire sheet 187/5 (revised 1919).

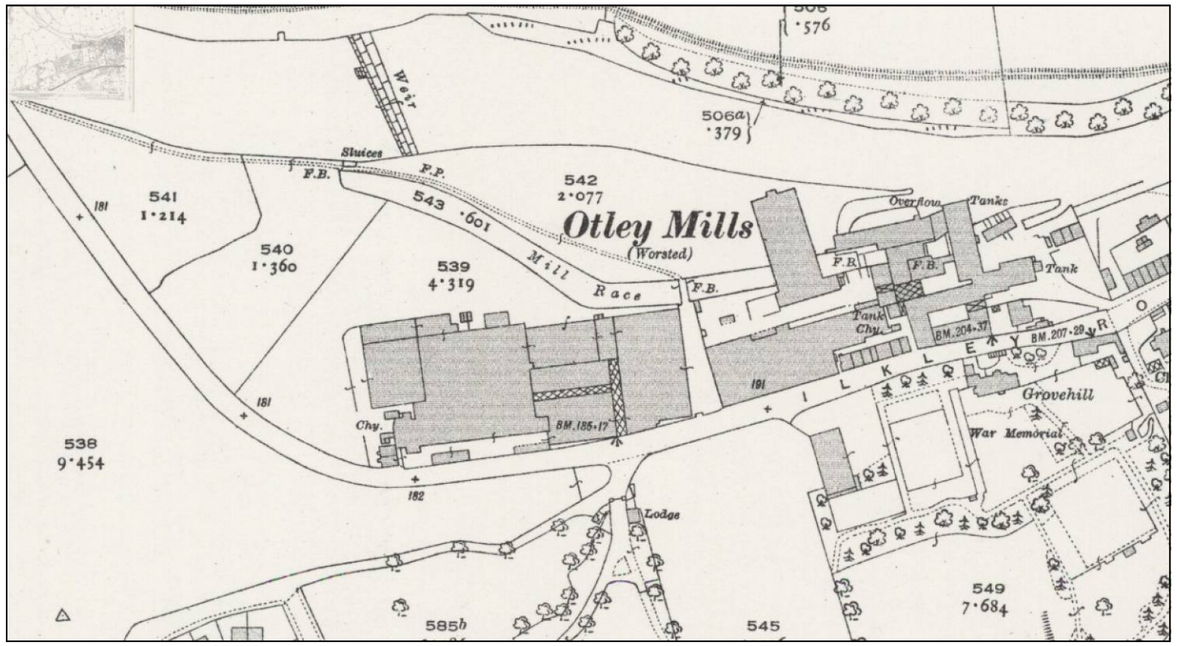
PROJECT: OTLEY MILLS, OTLEY	
TITLE: 1851-1921 ORDNANCE SURVEY MAPS	
SCALE: NTS	DATE: MAY 2020
EDAS	FIGURE: 3



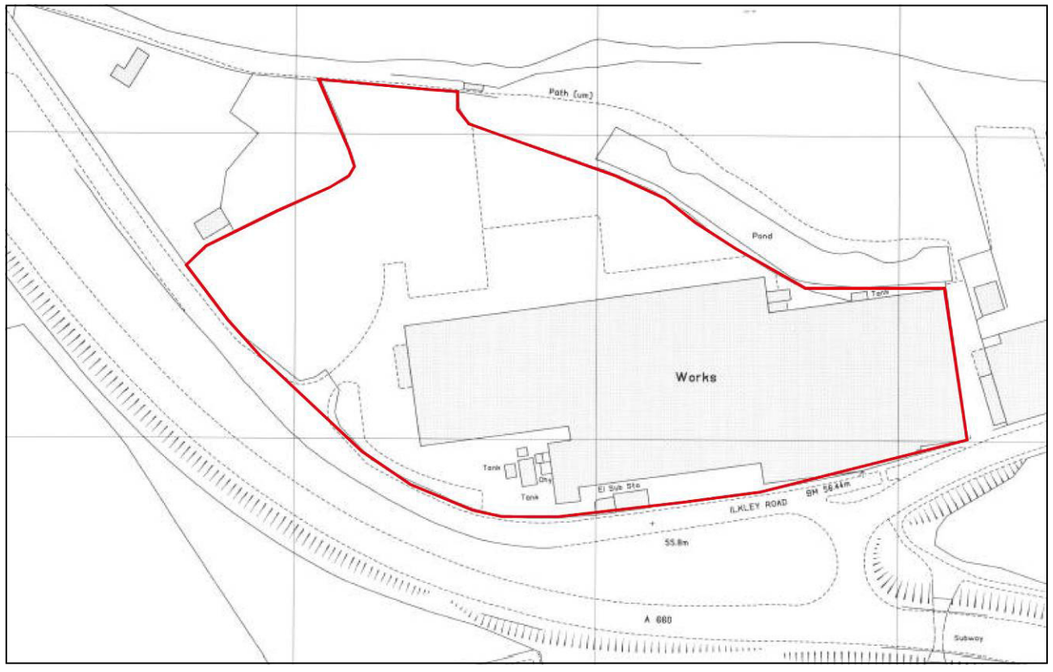
A) 1926 Aerial photograph of the Otley Worsted Mills, Otley, general view
(Source: Historic Environment Scotland, EPW015692 © Historic England).



A) 1926 Aerial photograph of the Otley Worsted Mills, Otley, detailed view
(Source: Historic Environment Scotland, EPW015692 © Historic England).

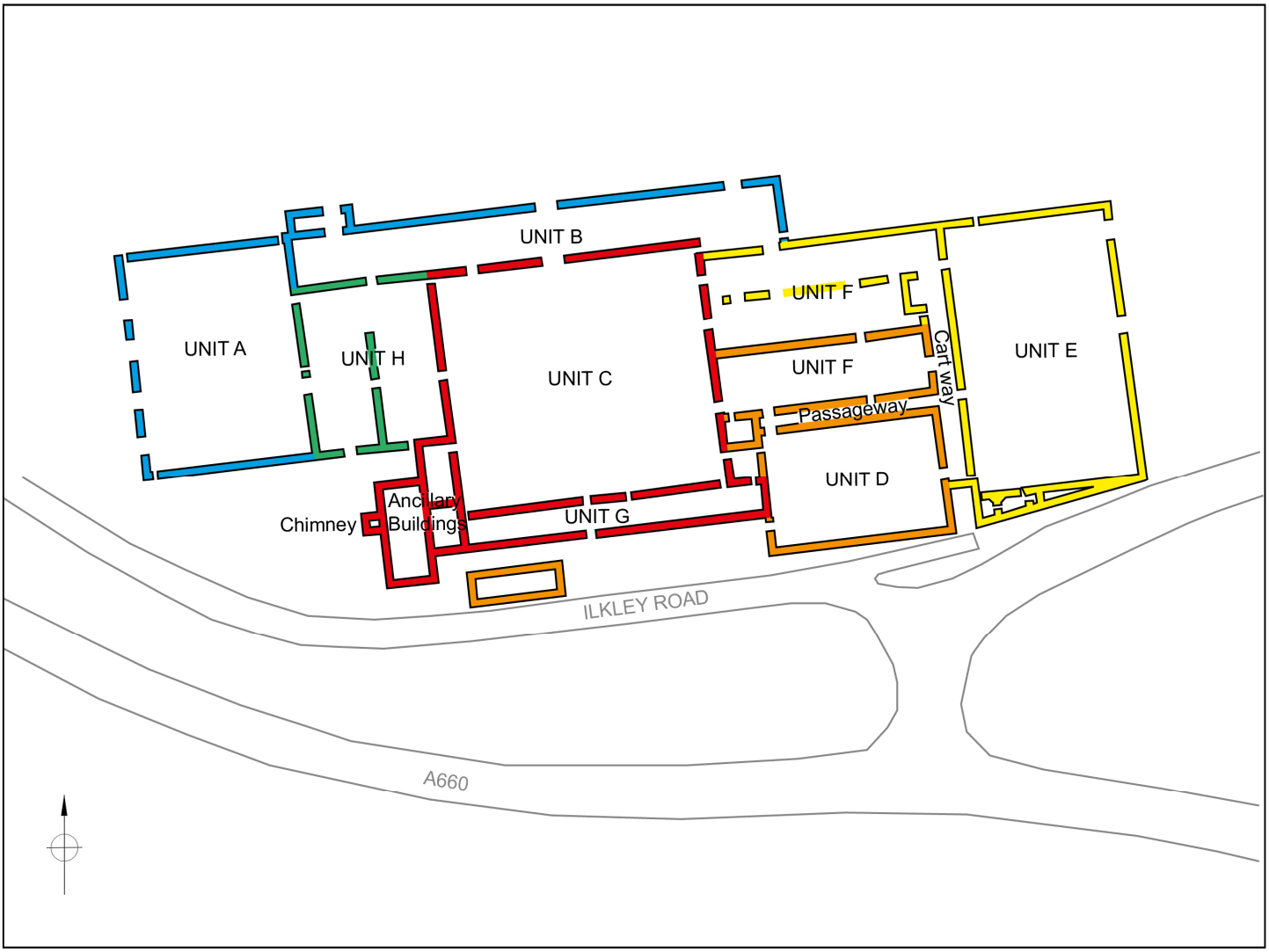


B) 1935 Ordnance Survey 25" to 1 mile map Yorkshire sheet 187/5 (revised 1934).



C) 1988 Ordnance Survey 25" to 1 mile map
(Source: Govier 2019, figure 11).

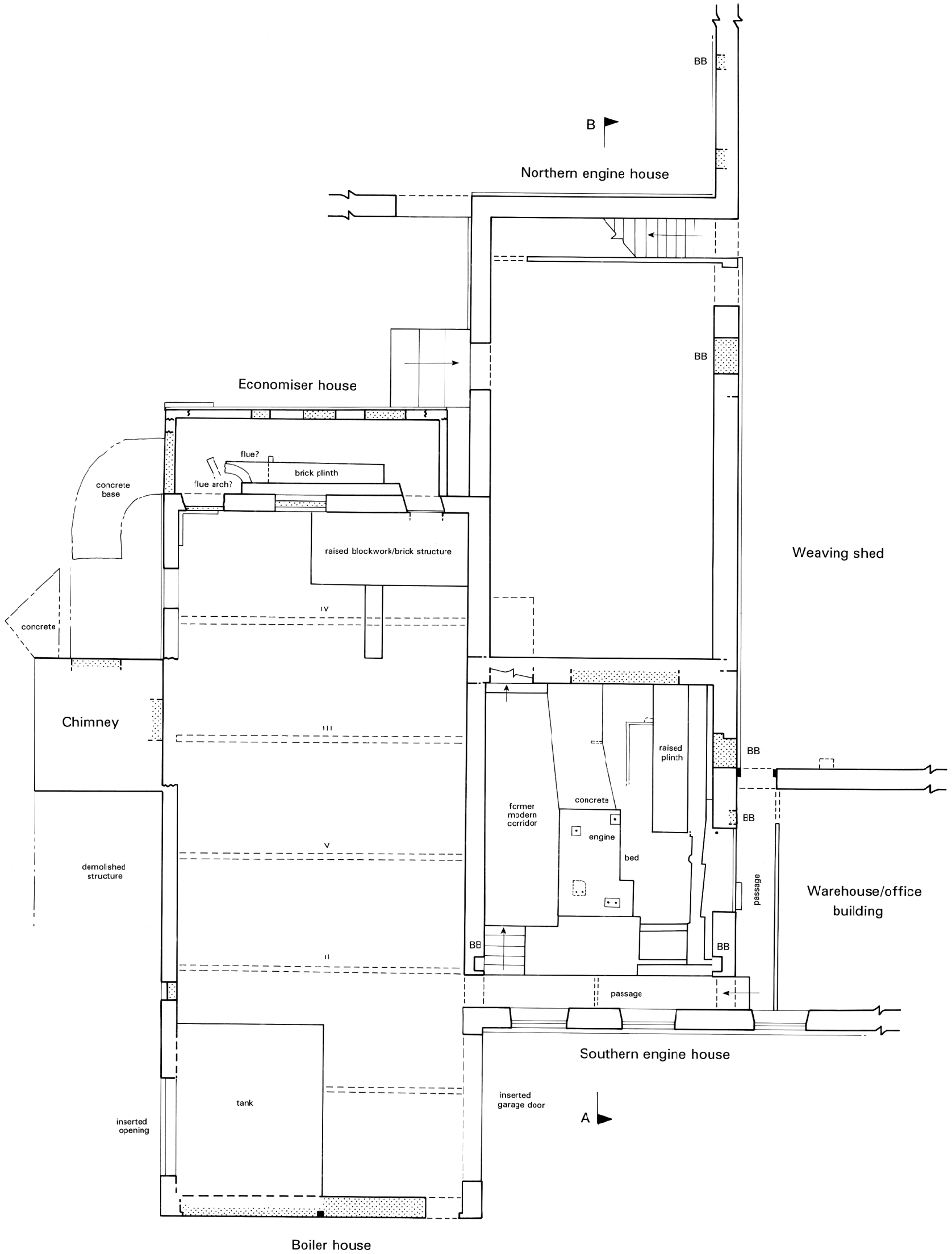
PROJECT	OTLEY MILLS, OTLEY
TITLE	1926 AND LATER INFORMATION
SCALE: NTS	DATE: MAY 2020
EDAS	FIGURE: 4



PHASE 1 - 1851 to 1891
PHASE 2 - 1892 to 1908
PHASE 3 - 1909 to 1921
PHASE 4 - 1922 to 1934
PHASE 5 - 1974 to 1988

Source: Govier 2019, figure 12.

PROJECT: OTLEY MILLS, OTLEY	
TITLE: PHASING OF COMPLEX	
SCALE: NTS	DATE: MAY 2020
EDAS	FIGURE: 5

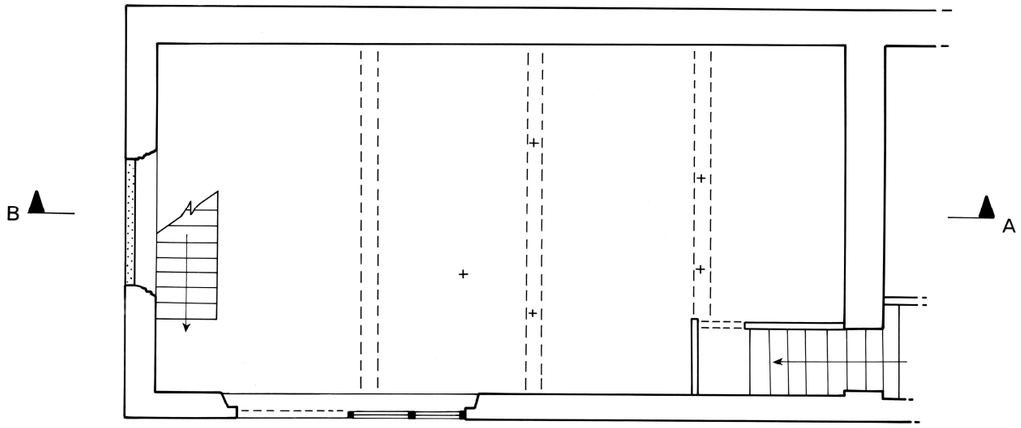


BB BEARING BOX

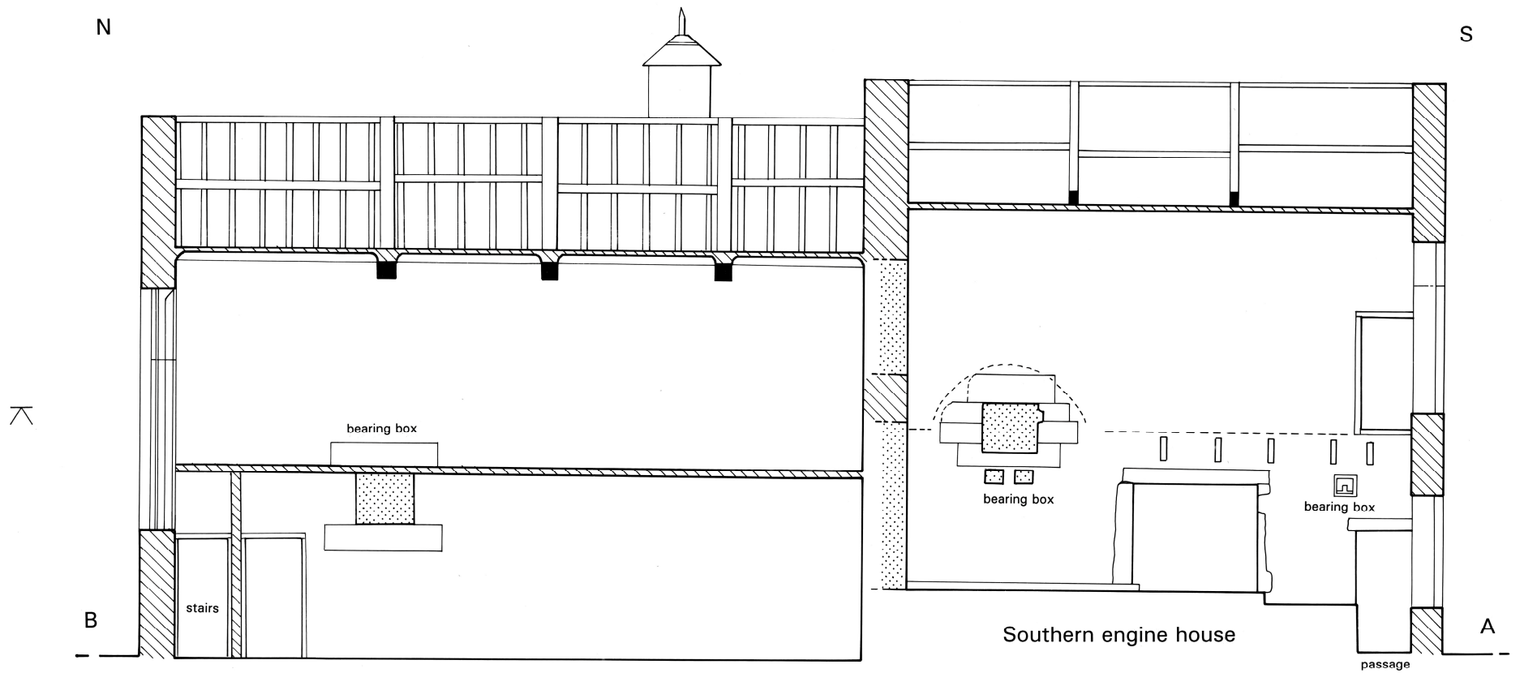
BLOCKING

0 10m

PROJECT: OTLEY MILLS, OTLEY	
TITLE: ANCILLARY BUILDINGS GROUND PLAN	
SCALE: AS SHOWN	DATE: MAY 2020
EDAS	FIGURE: 6



First floor plan of northern engine house



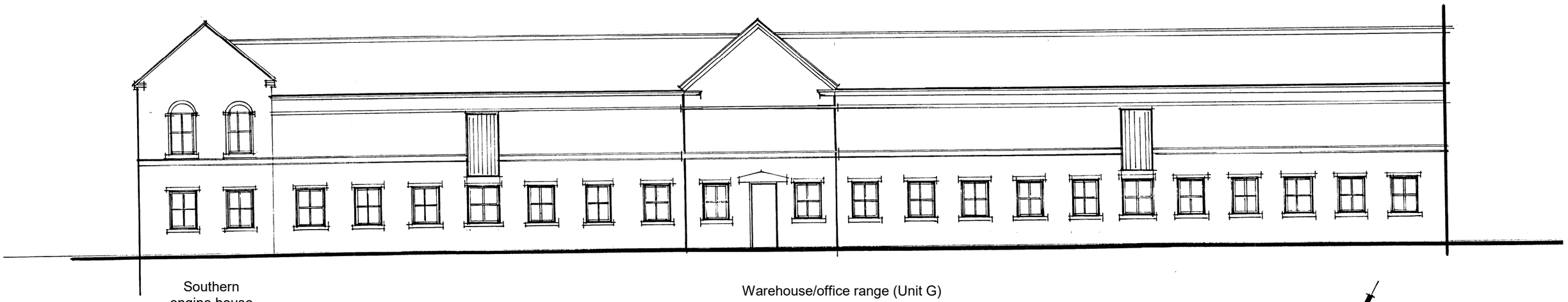
Section through engine house

BLOCKING

0 10m

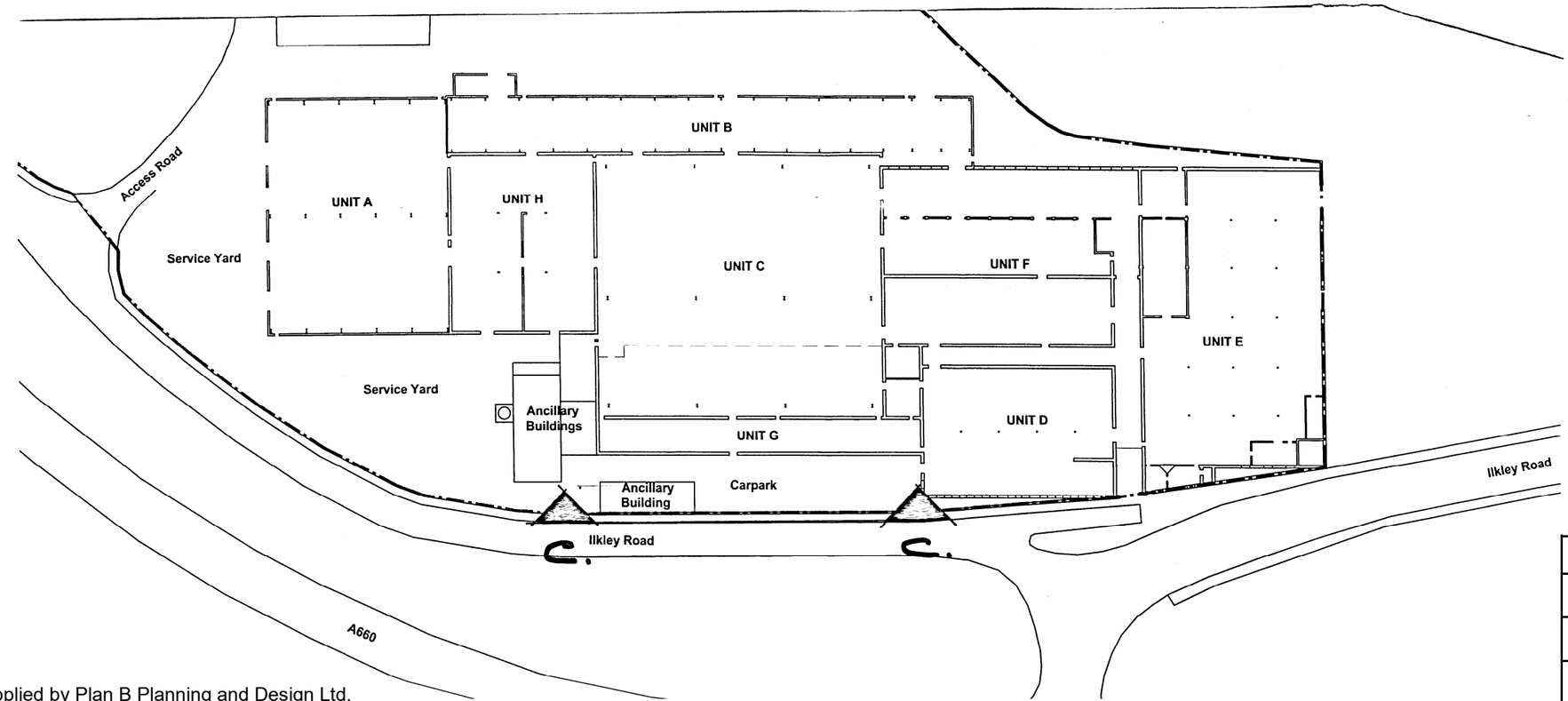
PROJECT: OTLEY MILLS, OTLEY	
TITLE: ENGINE HOUSE FIRST FLOOR PLAN AND SECTION	
SCALE: AS SHOWN	DATE: MAY 2020
EDAS	FIGURE: 7

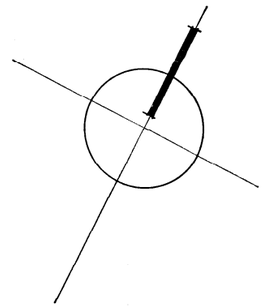
EXISTING ELEVATION. C:C.



Southern engine house

Warehouse/office range (Unit G)



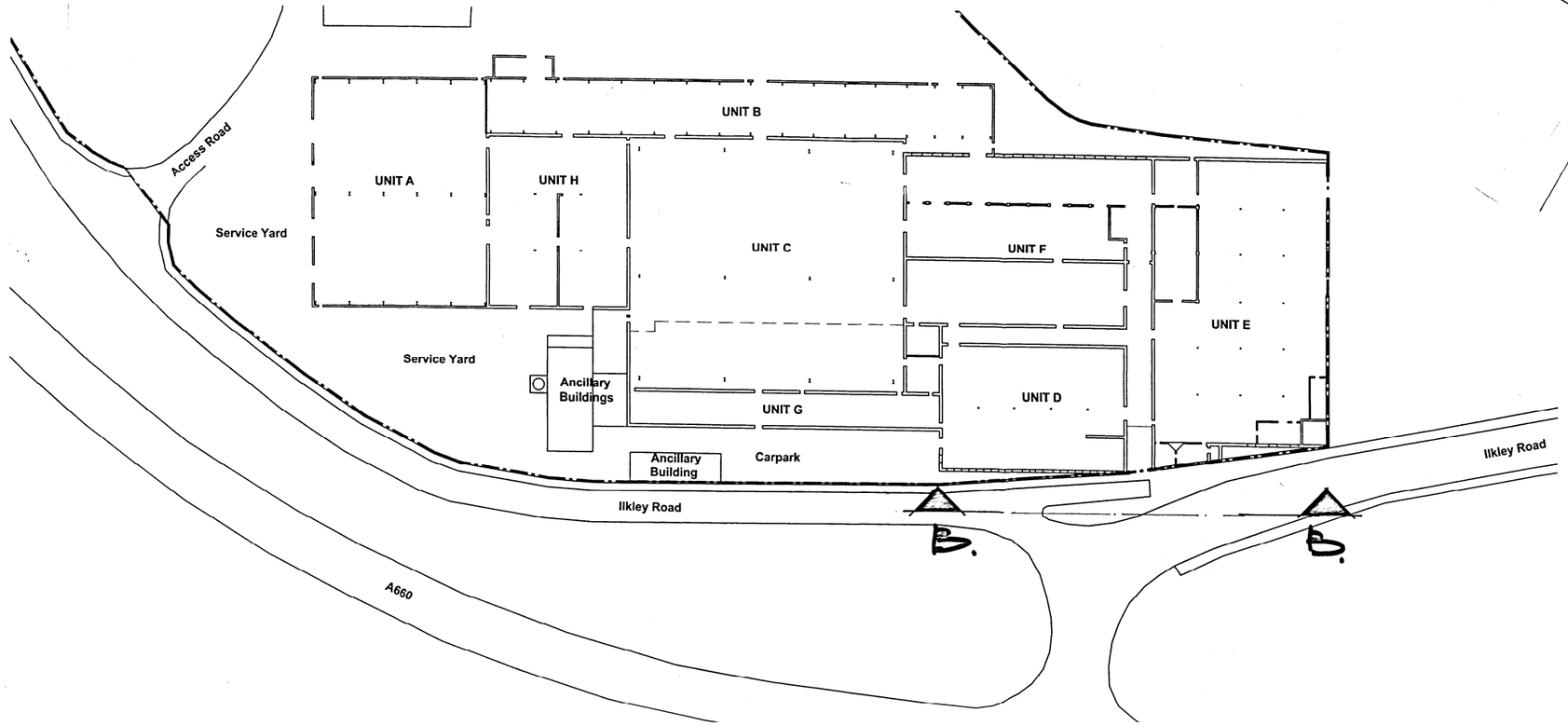


Drawing supplied by Plan B Planning and Design Ltd.

PROJECT: OTLEY MILLS, OTLEY	
TITLE: c.1857 FRONTAGE	
SCALE: NTS	DATE: MAY 2020
EDAS	FIGURE: 8

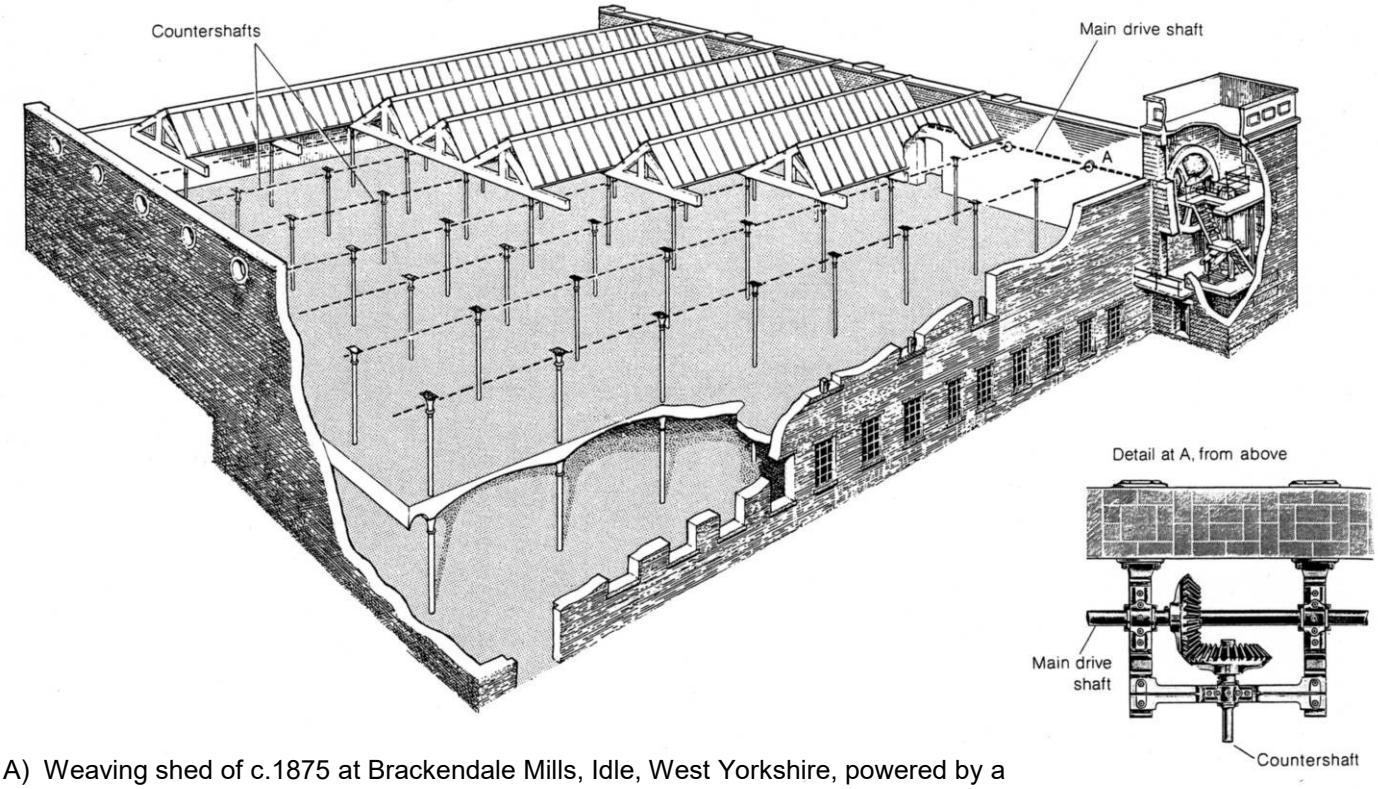
1891-1908 frontage (Unit D)

1908-1921 frontage (Unit E)

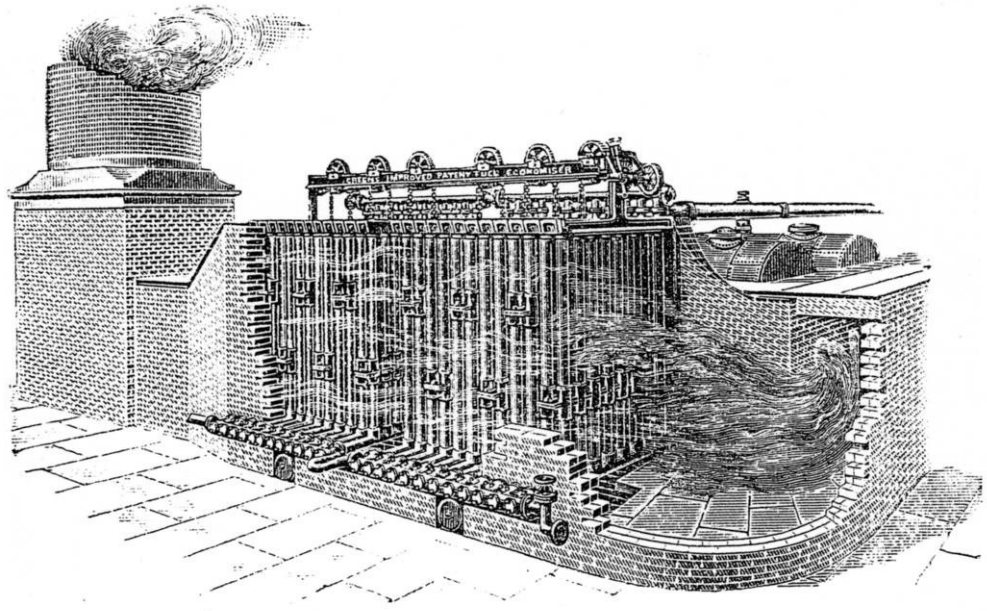


Drawing supplied by Plan B Planning and Design Ltd.

PROJECT: OTLEY MILLS, OTLEY	
TITLE: 1891-1921 FRONTAGE	
SCALE: NTS	DATE: MAY 2020
EDAS	FIGURE: 9



A) Weaving shed of c.1875 at Brackendale Mills, Idle, West Yorkshire, powered by a vertical engine in an engine house at the corner of the building. Inset shows the transfer of power by bevel wheels from the main shaft to the countershafts.



B) Green's c.1909 Economiser in operation.

Source: Giles, C & Goodall, I 1992 *West Yorkshire Textile Mills 1770-1930,* figures 228 and 274.

PROJECT: OTLEY MILLS, OTLEY	
TITLE: COMPARABLE STRUCTURES	
SCALE: NTS	DATE: MAY 2020
EDAS	FIGURE: 10

Plate 1: Boiler house, south gable and south end of west elevation, looking NE (photo 11765).

Plate 2: Boiler house, south gable, looking N (photo 11759).

Plate 3: Boiler house, west elevation and chimney, looking E (photo 11772).

Plate 4: Boiler house, west elevation and chimney, looking NE (photo 11775).

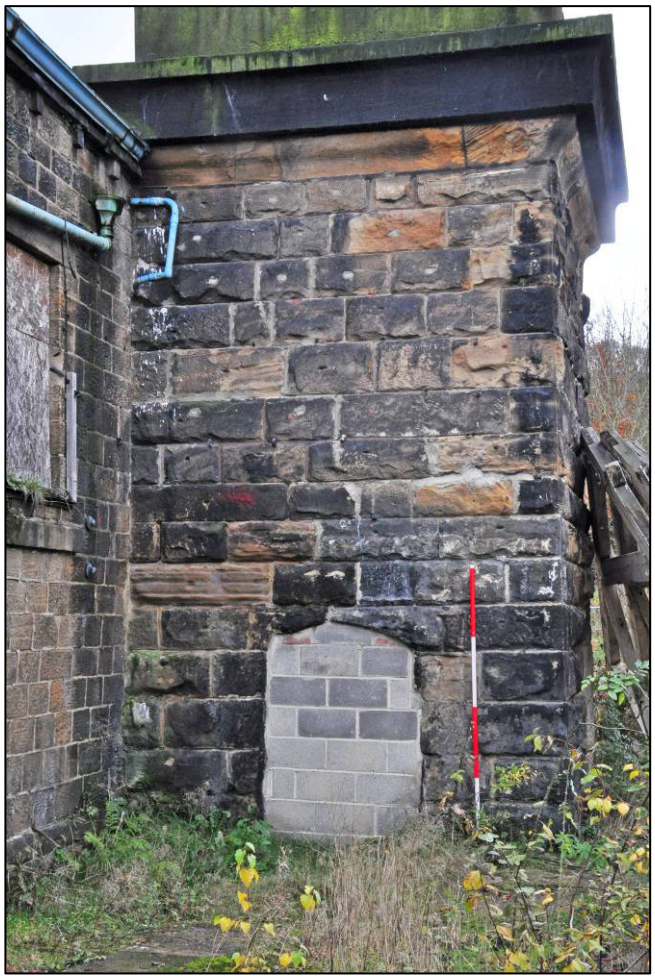


Plate 5: Chimney, north side of base, looking S (photo 11789).

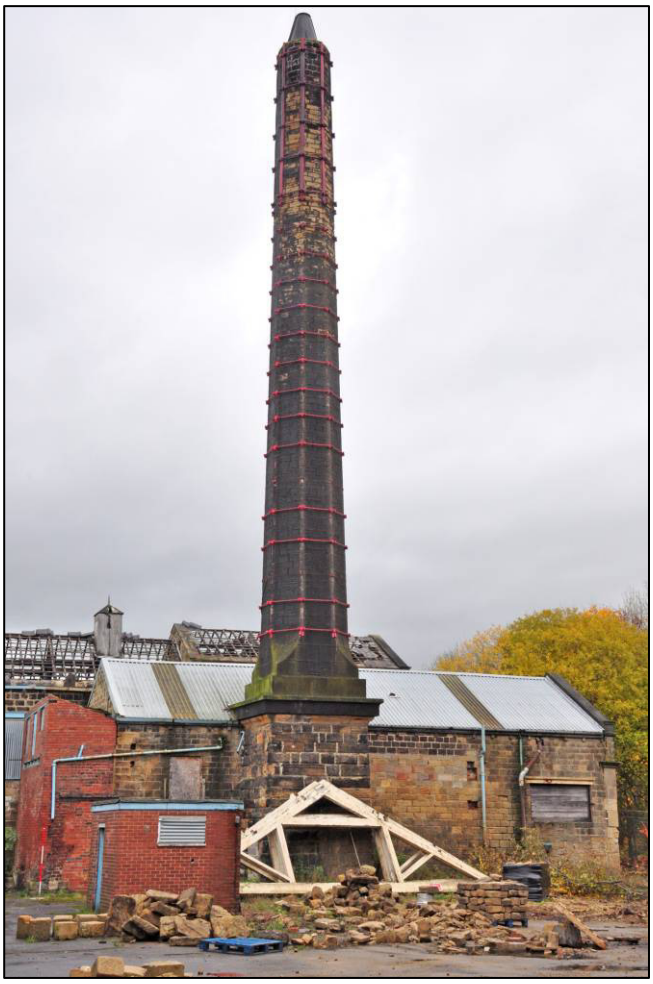


Plate 6: Boiler house and chimney, looking E (photo 11781).

Plate 7: Economiser house, west and north elevations, looking NE (photo 11787).

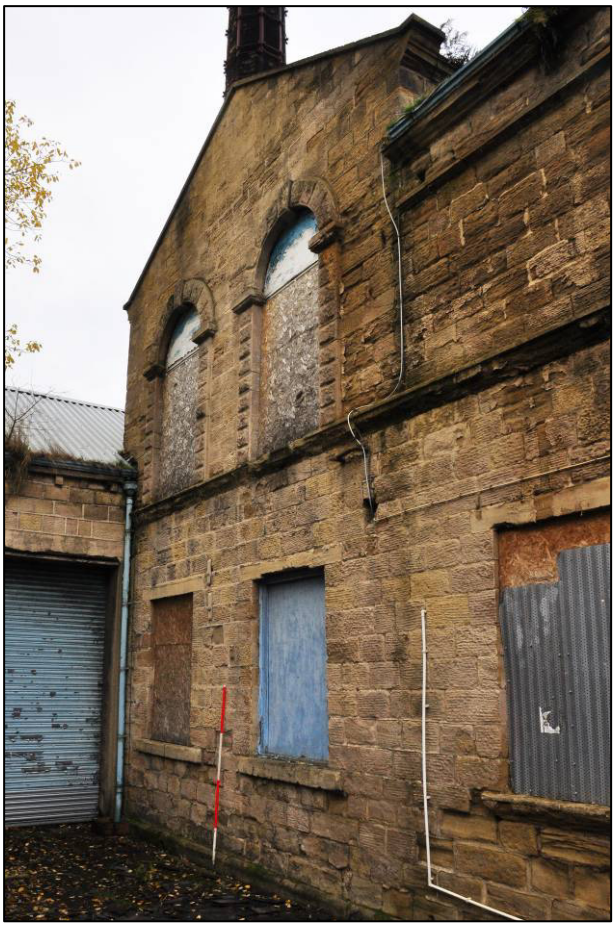


Plate 8: Southern engine house, south gable, looking NW (photo 11749).

Plate 9: Northern engine house, north end of west elevation, looking E (photo 11791).

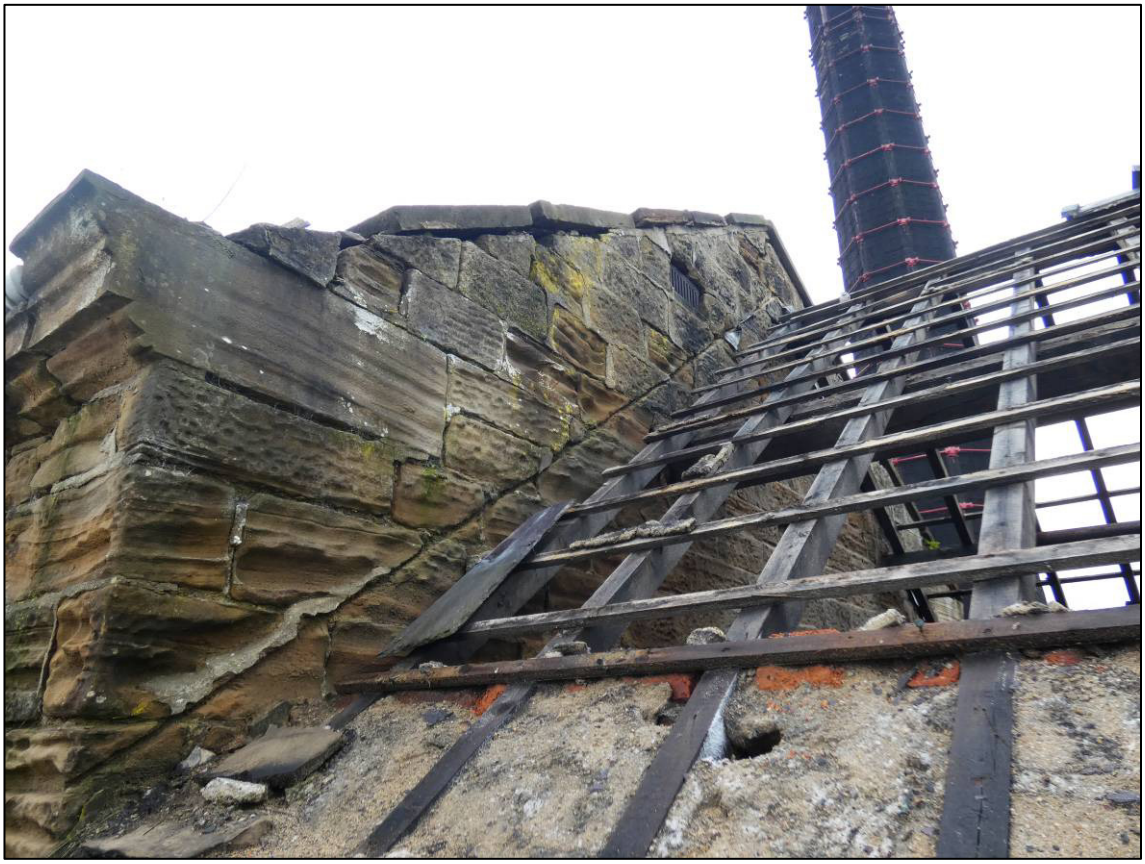


Plate 10: Southern engine house, north gable, looking SW (photo 2398).

Plate 11: Northern engine house, upper north gable, looking SW (photo 11805).

Plate 12: Northern engine house, north gable, from within Unit H, looking SE (photo 11697).

Plate 13: Northern engine house, roof with wooden vent, looking E (photo 11786).

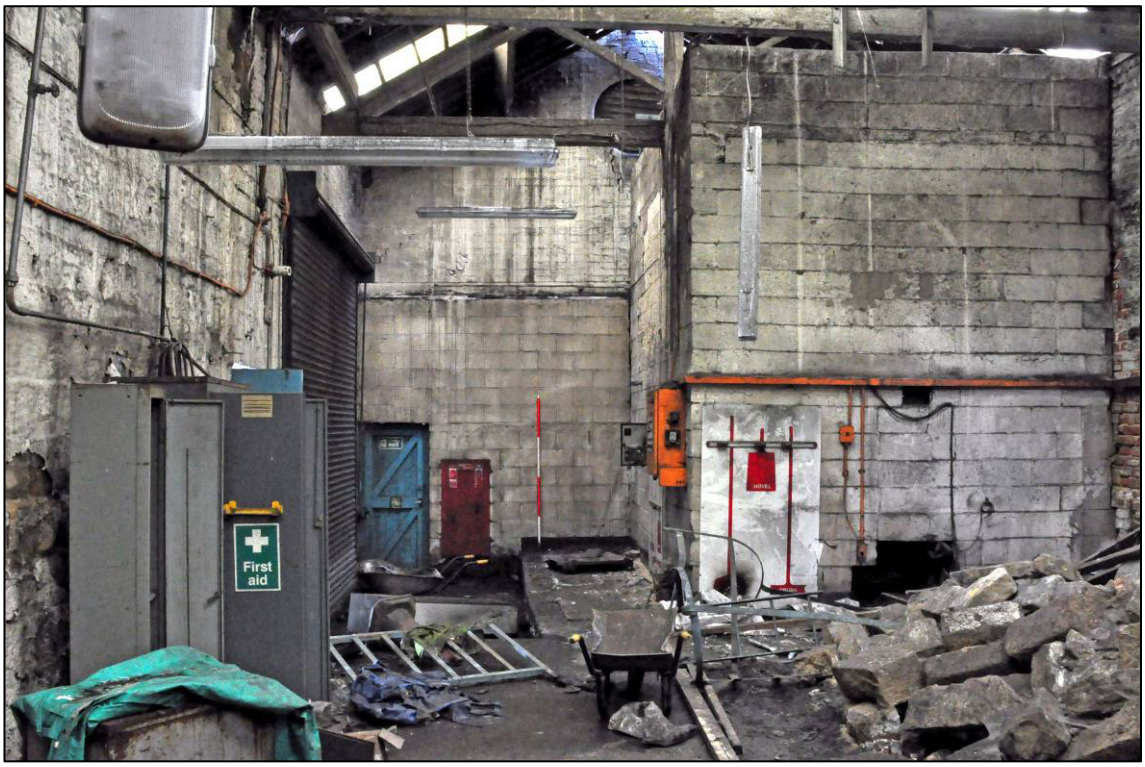


Plate 14: Boiler house, south wall, looking S (photo 11816).

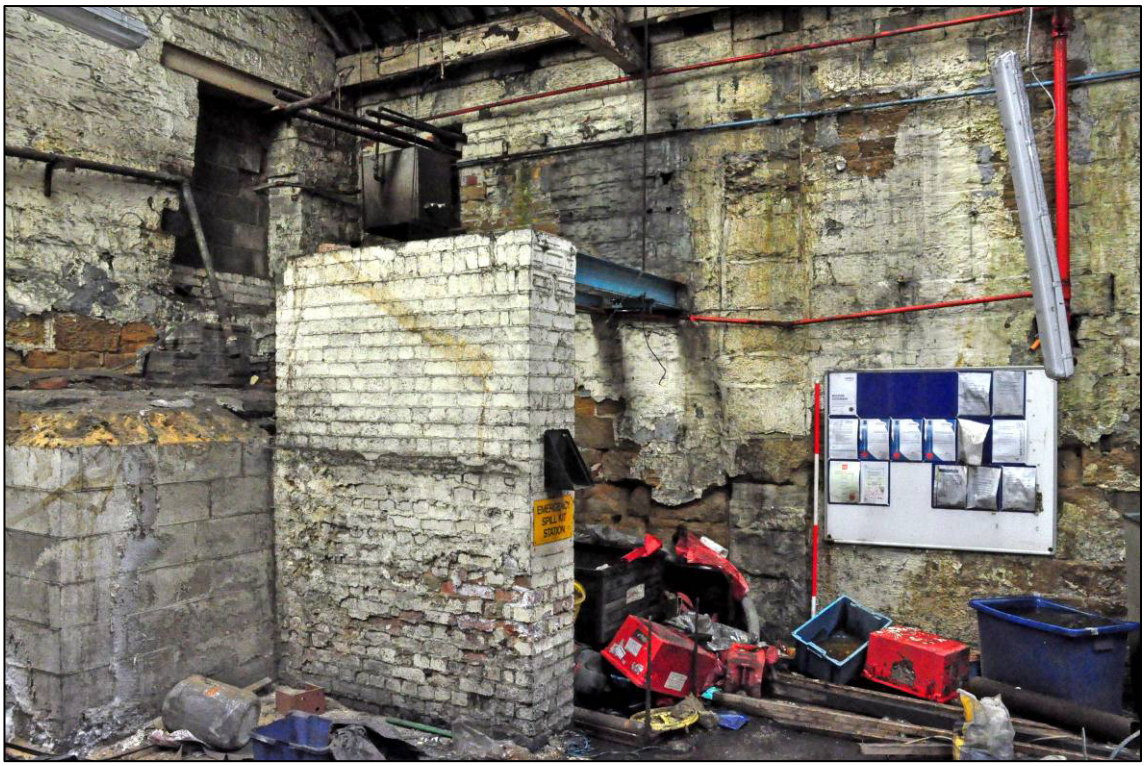


Plate 15: Boiler house, north end of east wall, looking E (photo 11825).

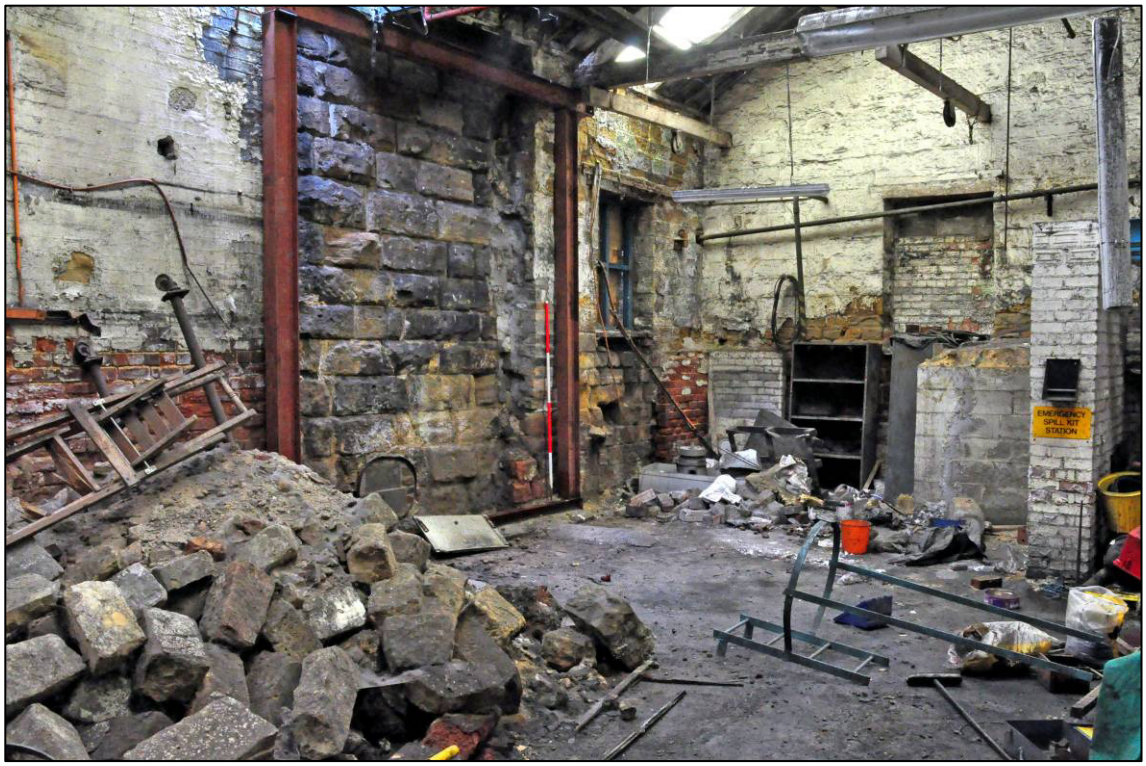


Plate 16: Boiler house, west and north walls, showing base of chimney, looking NW (photo 11828).

Plate 17: Boiler house, northernmost roof truss, looking N (photo 11831).

Plate 18: Southern engine house, lower east elevation revealed in north-south passage, looking S (photo 11808).

Plate 19: Southern engine house, ground floor east-west passage to south side, looking W (photo 11810).

Plate 20: Southern engine house, ground floor, modern north-south corridor, looking N (photo 11836).

Plate 21: Southern engine house, ground floor, south wall, looking S (photo 11838).

Plate 22: Southern engine house, ground floor, western window in south wall, looking S (photo 11840).

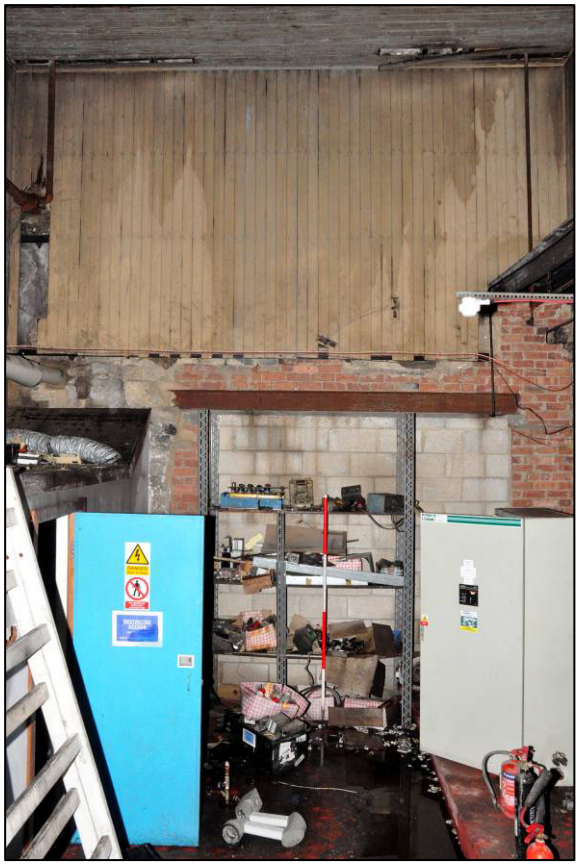


Plate 23: Southern engine house, ground floor, north wall, looking N (photo 11845).

Plate 24: Southern engine house, ground floor, match boarding to ceiling, looking S (photo 11849).

Plate 25: Southern engine house, ground floor after stripping out, original engine bed, looking E (photo 2387).

Plate 26: Southern engine house, ground floor after stripping out, secondary bed, looking NE (photo 2382).

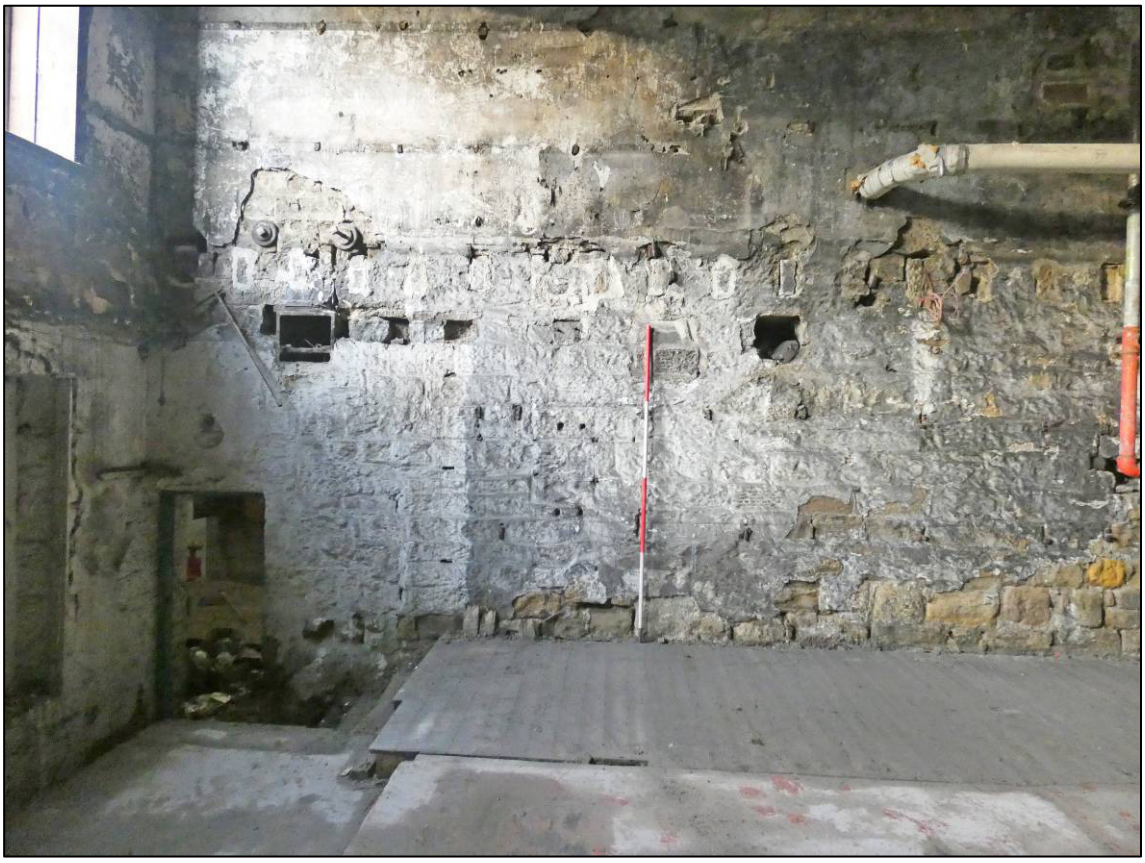


Plate 27: Southern engine house, ground floor after stripping out, west wall, looking W (photo 2335).

Plate 28: Southern engine house, ground floor after stripping out, bearing box at north end of east wall, looking E (photo 2378).

Plate 29: Southern engine house, ground floor after stripping out, south wall, looking S (photo 2369).

Plate 30: Southern engine house, ground floor after stripping out, blocked window in north wall, looking N (photo 2352).

Plate 31: Southern engine house, ground floor after stripping out, painted decoration at upper level of north wall, looking N (photo 2394).

Plate 32: Northern engine house, ground floor, looking N (photo 11801).

Plate 33: Northern engine house, ground floor, bearing box at north end of east wall, looking E (photo 11803).

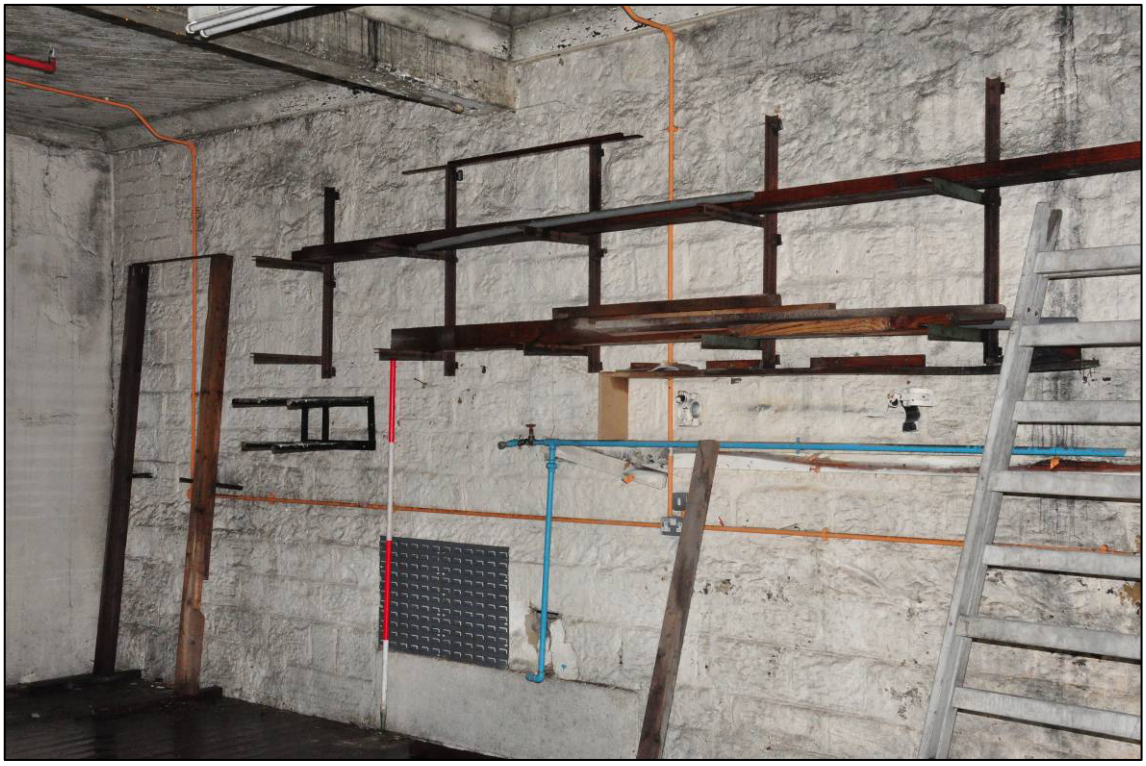


Plate 34: Northern engine house, first floor, east wall, looking NE (photo 11852).

Plate 35: Northern engine house, first floor, north wall, looking N (photo 11851).

Plate 36: Northern engine house, first floor, ceiling beams with lifting rings, looking NE (photo 11855).

Plate 37: Northern engine house, first floor, lifting rings, looking SW (photo 11858).

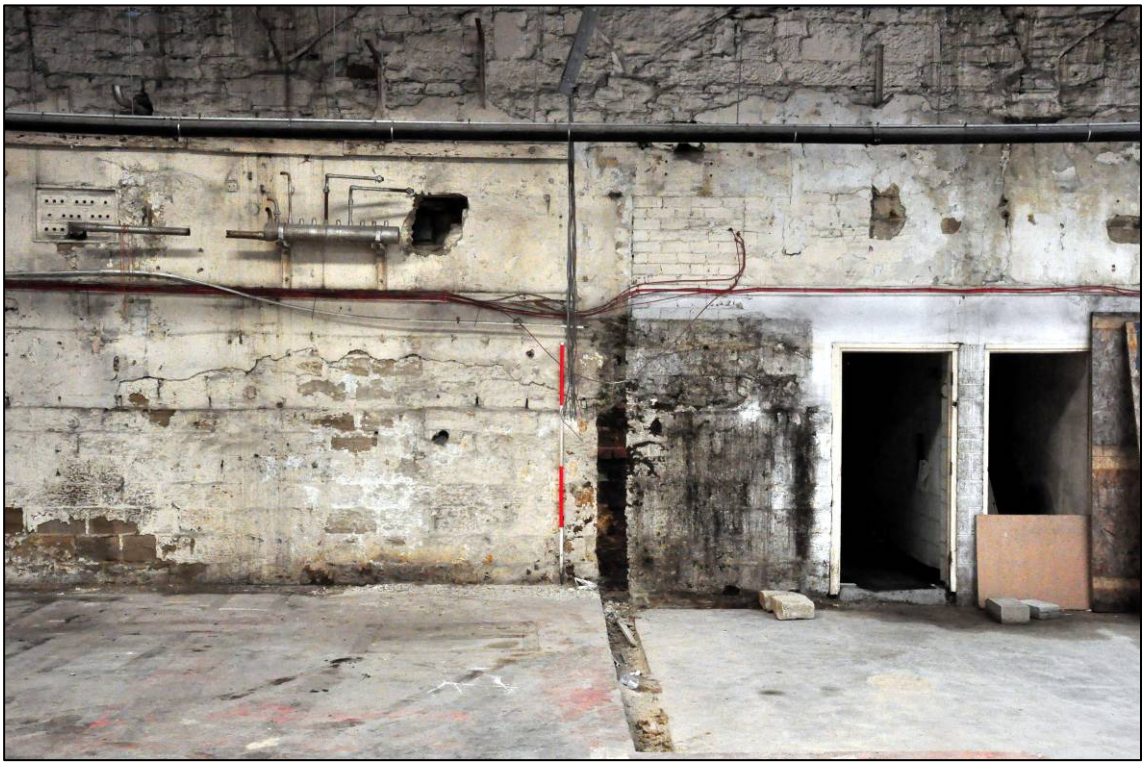


Plate 38: Weaving shed (Unit C), south end of west wall, showing bearing box from northern engine house, looking W (photo 11691).

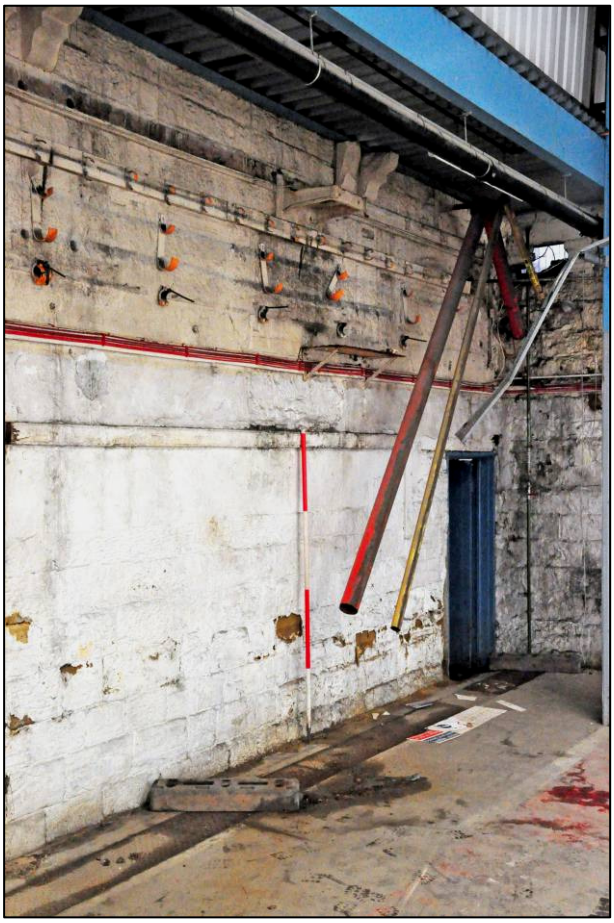


Plate 39: Weaving shed (Unit C), west end of south wall, showing ashlar course, looking SW (photo 11694).

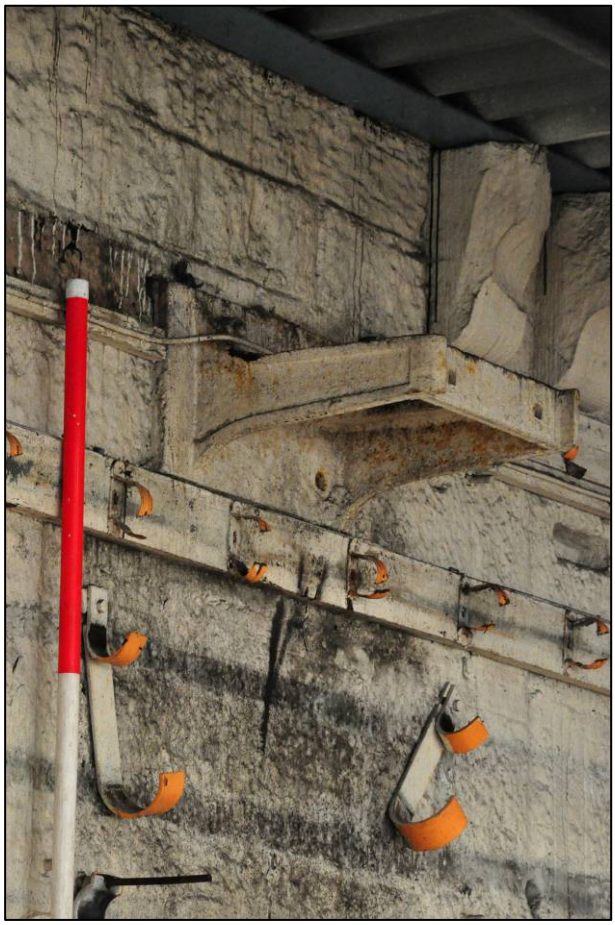


Plate 40: Weaving shed (Unit C), west end of south wall, showing transmission bracket, looking SW (photo 11695).

Plate 41: General view of Otley Mills, Ilkley Road frontage, looking NW (photo 11867).

Plate 42: Ilkley Road frontage, c.1857 original part (Unit G), looking NW (photo 11717).

Plate 43: Ilkley Road frontage, c.1857 original part (Unit G), central entrance and pediment, looking N (photo 11737).

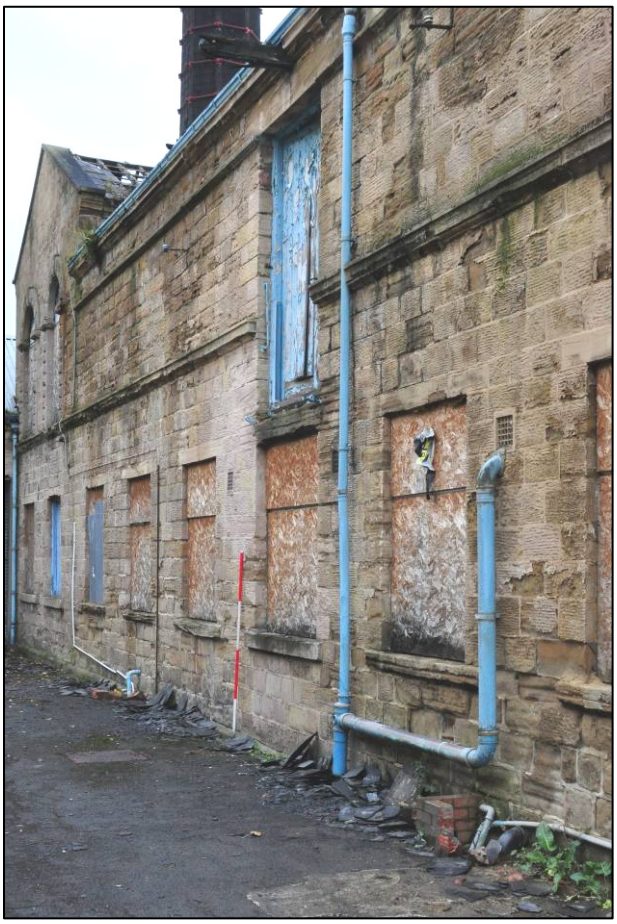


Plate 44: Ilkley Road frontage, c.1857 original part (Unit G), western loading door and windows, looking NW (photo 11744).

Plate 45: Ilkley Road frontage, 1891-1908 extension (Unit D), looking NW (photo 11716).

Plate 46: Ilkley Road frontage, 1891-1908 extension (Unit D), detail of central pediment, looking N (photo 11726).

Plate 47: Ilkley Road frontage, 1908-21 extension (Unit E), looking NE (photo 11705).

Plate 48: Ilkley Road frontage, 1908-21 extension (Unit E), cart entrance, looking N (photo 11713).

Plate 49: Economiser house after demolition, south wall, looking S (photo 3621).

Plate 50: Boiler house, ground floor opening at east end of north gable, revealed after demolition of economiser house, looking S (photo 3632).

Plate 51: Boiler house, ground floor opening at west end of north gable, revealed after demolition of economiser house, looking S (photo 3629).

Plate 52: Northern engine house during demolition, north end of east wall, looking E (photo 3638).

Plate 53: Northern engine house during demolition, southernmost roof truss with lifting rings, looking S (photo 3640).

Plate 54: Southern engine house engine bed during demolition, looking NW (photo 4663).

Plate 55: Ilkley Road frontage during demolition, c.1857 original part (Unit G), looking W (photo 3645).

Plate 56: Ilkley Road frontage during demolition, ashlar band from c.1857 original part (Unit G), looking NW (photo 3648).

APPENDIX 1
EDAS PHOTOGRAPHIC CATALOGUE

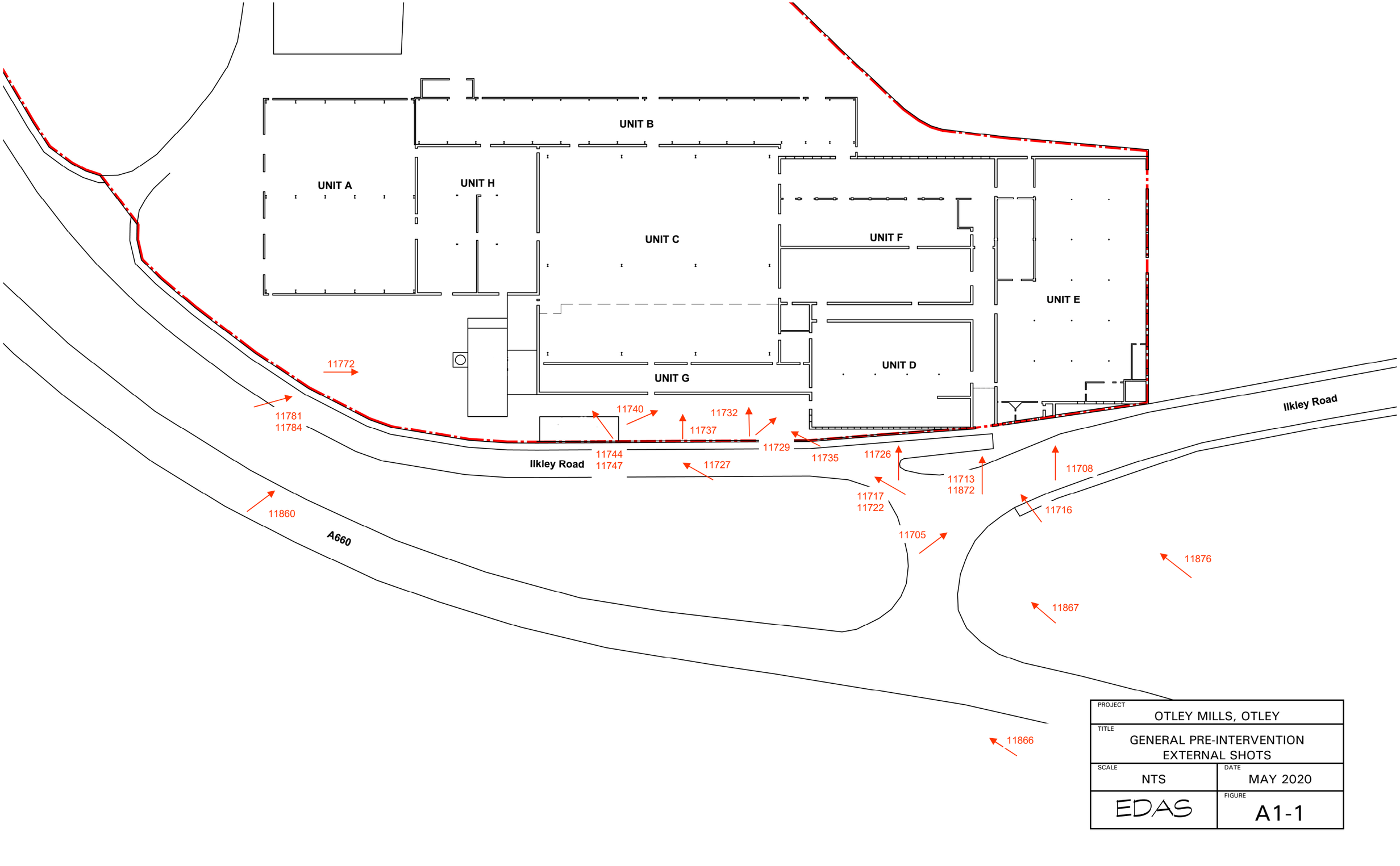
APPENDIX 1: OTLEY MILLS PHOTOGRAPHIC CATALOGUE

1 - Colour digital photographs taken November 8th 2019 (prior to stripping put)
2 - Colour digital photographs taken November 19th 2019
3 - Colour digital photographs taken December 20th 2019
4 - Colour digital photographs taken January 14th 2020

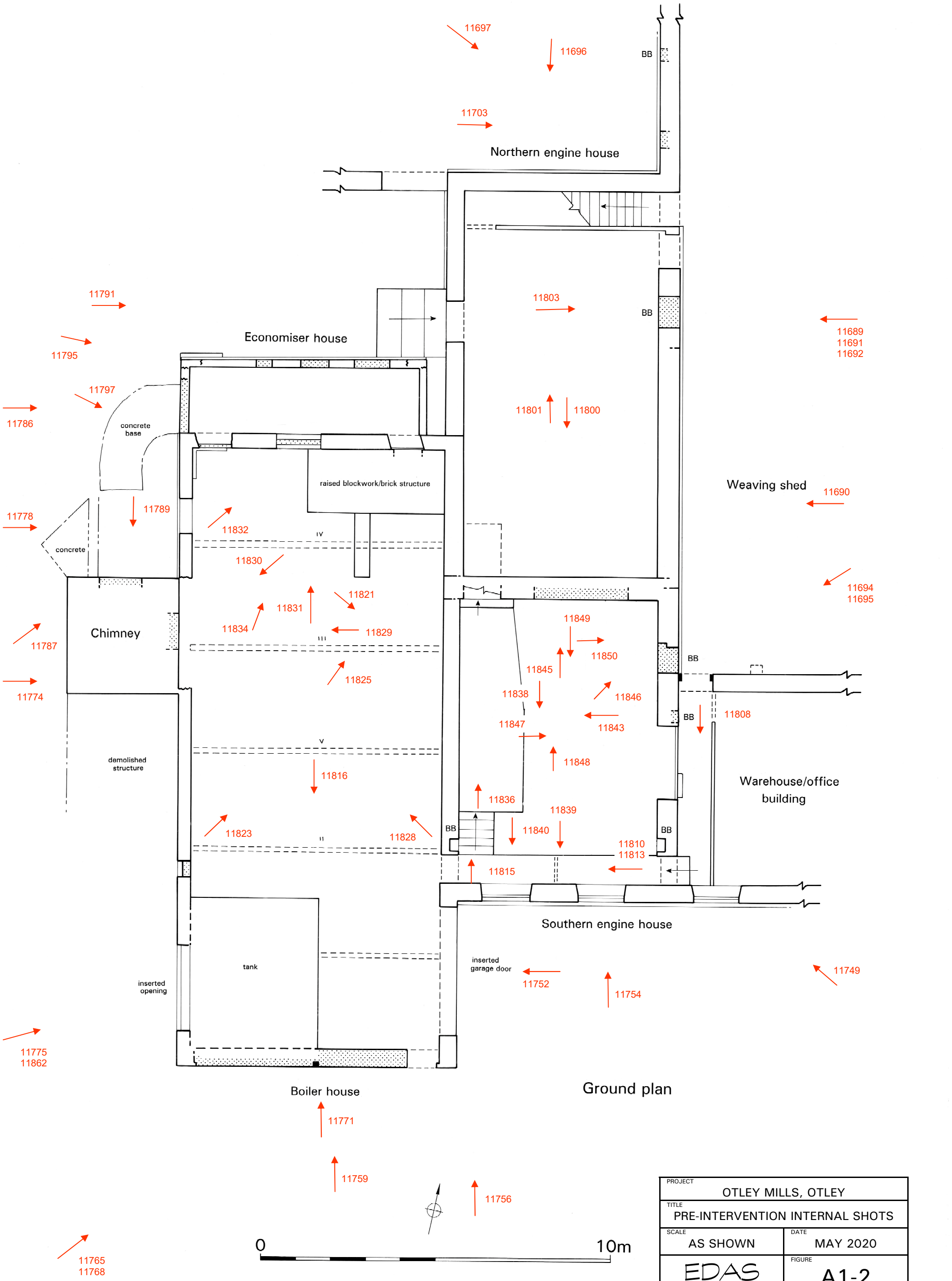
Date	*Image*	*Subject*	*Scale*
1	11689	Weaving shed (Unit C), south end of west wall, showing bearing box from northern engine house, looking W	1 x 2m
1	11690	Weaving shed (Unit C), south end of west wall, looking W	1 x 2m
1	11691	Weaving shed (Unit C), south end of west wall, showing bearing box from northern engine house, looking W	1 x 2m
1	11692	Weaving shed (Unit C), south end of west wall, bearing box from northern engine house, looking W	1 x 2m
1	11694	Weaving shed (Unit C), west end of south wall, showing ashlar course, looking SW	1 x 2m
1	11695	Weaving shed (Unit C), west end of south wall, showing transmission bracket, looking SW	1 x 2m
1	11696	Northern engine house, north gable, from within Unit H, looking S	1 x 2m
1	11697	Northern engine house, north gable, from within Unit H, looking SE	1 x 2m
1	11703	Weaving shed (Unit C), south end of west elevation, from within Unit H, looking E	1 x 2m
1	11705	Ilkley Road frontage, 1908-21 extension (Unit E), looking NE	1 x 2m
1	11708	Ilkley Road frontage, 1908-21 extension (Unit E), looking N	1 x 2m
1	11713	Ilkley Road frontage, 1908-21 extension (Unit E), cart entrance, looking N	1 x 2m
1	11716	Ilkley Road frontage, 1891-1908 extension (Unit D), looking NW	1 x 2m
1	11717	Ilkley Road frontage, c.1857 original part (Unit G), looking NW	-
1	11722	Ilkley Road frontage, c.1857 original part (Unit G), looking NW	-
1	11726	Ilkley Road frontage, 1891-1908 extension (Unit D), detail of central pediment, looking N	1 x 2m
1	11727	Ilkley Road frontage, detached structure, looking NW	1 x 2m
1	11729	Ilkley Road frontage, c.1857 original part (Unit G), east end and west elevation of 1891-1908 extension (Unit D), looking E	1 x 2m
1	11732	Ilkley Road frontage, c.1857 original part (Unit G), loading door towards east end, looking N	1 x 2m
1	11735	Ilkley Road frontage, c.1857 original part (Unit G), looking NW	1 x 2m
1	11737	Ilkley Road frontage, c.1857 original part (Unit G), central entrance and pediment, looking N	1 x 2m
1	11740	Ilkley Road frontage, c.1857 original part (Unit G), eastern part, looking NE	1 x 2m
1	11744	Ilkley Road frontage, c.1857 original part (Unit G), western loading door and windows, looking NW	1 x 2m
1	11747	Ilkley Road frontage, c.1857 original part (Unit G), western loading door, looking NW	-
1	11749	Ilkley Road frontage, southern engine house, south gable, looking NW	1 x 2m
1	11752	Boiler house, east elevation, looking W	1 x 2m
1	11754	Ilkley Road frontage, southern engine house, south gable, looking N	1 x 2m
1	11756	Boiler house and southern engine house, south gables, looking N	1 x 2m
1	11759	Boiler house, south gable, looking N	1 x 2m
1	11765	Boiler house, south gable and south end of west elevation, looking NE	1 x 2m
1	11768	Boiler house, south gable and south end of west elevation, looking NE	1 x 2m
1	11771	Boiler house, south gable, detail of woodwork, looking N	1 x 2m
1	11772	Boiler house, west elevation and chimney, looking E	1 x 2m
1	11774	Boiler house, west elevation and chimney, looking E	1 x 2m
1	11775	Boiler house, west elevation and chimney, looking NE	1 x 2m
1	11778	Boiler house, west elevation and chimney, looking E	1 x 2m
1	11781	Boiler house and chimney, looking E	1 x 2m
1	11784	Boiler house and chimney, looking E	1 x 2m
1	11786	Northern engine house, roof with wooden vent, looking E	-
1	11787	Economiser house, west and north elevations, looking NE	1 x 2m
1	11789	Chimney, north side of base, looking S	1 x 2m
1	11791	Northern engine house, north end of west elevation, looking E	1 x 2m
1	11795	Economiser house, west and north elevations, looking SE	1 x 2m
1	11797	Boiler house and economiser house, west elevations, looking SE	1 x 2m
1	11800	Northern engine house, ground floor, looking S	1 x 2m

1	11801	Northern engine house, ground floor, looking N	1 x 2m
1	11803	Northern engine house, ground floor, bearing box at north end of east wall, looking E	1 x 2m
1	11804	Northern engine house, upper north gable, looking SW	-
1	11805	Northern engine house, upper north gable, looking SW	-
1	11808	Southern engine house, lower east elevation revealed in north-south passage, looking S	1 x 2m
1	11810	Southern engine house, ground floor east-west passage to south side, looking W	1 x 2m
1	11813	Southern engine house, ground floor east-west passage to south side, bracket, looking W	-
1	11815	Southern engine house, ground floor, stone steps to west wall, looking N	0.50m
1	11816	Boiler house, south wall, looking S	1x 2m
1	11821	Boiler house, east wall, looking SE	1 x 2m
1	11823	Boiler house, north and east walls, looking NE	1 x 2m
1	11825	Boiler house, north end of east wall, looking E	1 x 2m
1	11828	Boiler house, west and north walls, showing base of chimney, looking NW	1 x 2m
1	11829	Boiler house, west wall, base of chimney, looking W	1 x 2m
1	11830	Boiler house, west wall, looking SW	1 x 2m
1	11831	Boiler house, northernmost roof truss, looking N	-
1	11832	Boiler house, timber with pulley to north of northernmost roof truss, looking NE	-
1	11834	Boiler house, structures adjacent to north wall, looking N	1 x 2m
1	11836	Southern engine house, ground floor, modern north-south corridor, looking N	1 x 2m
1	11838	Southern engine house, ground floor, south wall, looking S	1 x 2m
1	11839	Southern engine house, ground floor, detail of possible cable supports in south wall, looking S	-
1	11840	Southern engine house, ground floor, western window in south wall, looking S	-
1	11843	Southern engine house, ground floor, match boarding to west wall, looking W	1 x 2m
1	11845	Southern engine house, ground floor, north wall, looking N	1 x 2m
1	11846	Southern engine house, ground floor, bearing box in east wall, looking NE	1 x 2m
1	11847	Southern engine house, ground floor, match boarding to east wall, looking E	-
1	11848	Southern engine house, ground floor, match boarding to ceiling, looking N	-
1	11849	Southern engine house, ground floor, match boarding to ceiling, looking S	-
1	11850	Southern engine house, ground floor, bearing box in east wall, looking E	1 x 2m
1	11851	Northern engine house, first floor, north wall, looking N	1 x 2m
1	11852	Northern engine house, first floor, east wall, looking NE	1 x 2m
1	11853	Northern engine house, first floor, south wall, looking S	1 x 2m
1	11854	Northern engine house, first floor, west wall, looking SW	1 x 2m
1	11855	Northern engine house, first floor, ceiling beams with lifting rings, looking NE	-
1	11856	Northern engine house, first floor, lifting ring, looking N	-
1	11857	Northern engine house, first floor, lifting ring, looking NE	-
1	11858	Northern engine house, first floor, lifting rings, looking SW	-
1	11859	Northern engine house, first floor, ceiling panel, looking W	-
1	11860	Boiler house & chimney, looking NE	-
1	11862	Boiler house & chimney, looking NE	-
1	11866	General view of Otley Mills, looking NW	-
1	11867	General view of Otley Mills, Ilkley Road frontage, looking NW	-
1	11872	Ilkley Road frontage, 1908-21 extension (Unit E), cart entrance, looking N	-
1	11876	Ilkley Road frontage, 1908-21 extension (Unit E), looking NW	
2	2335	Southern engine house, ground floor after stripping out, west wall, looking W	1 x 2m
2	2337	Southern engine house, ground floor after stripping out, west wall, looking NW	1 x 2m
2	2342	Southern engine house, ground floor after stripping out, north end of west wall, looking W	1 x 2m
2	2343	Southern engine house, ground floor after stripping out, west wall, looking SW	1 x 2m
2	2352	Southern engine house, ground floor after stripping out, blocked window in north wall, looking N	-
2	2354	Southern engine house, ground floor after stripping out, north wall, looking N	1 x 2m
2	2357	Southern engine house, ground floor after stripping out, west wall, looking W	1 x 2m
2	2361	Southern engine house, ground floor after stripping out, west wall, looking W	1 x 2m
2	2362	Southern engine house, ground floor after stripping out, south end of west wall, looking W	1 x 2m
2	2364	Southern engine house, ground floor after stripping out, bearing box and wall ties at south end of west wall, looking W	1 x 2m
2	2369	Southern engine house, ground floor after stripping out, south wall, looking S	1 x 2m
2	2370	Southern engine house, ground floor after stripping out, east wall, looking E	1 x 2m

2	2373	Southern engine house, ground floor after stripping out, east wall, looking E	1 x 2m
2	2378	Southern engine house, ground floor after stripping out, bearing box at north end of east wall, looking E	1 x 2m
2	2379	Southern engine house, ground floor after stripping out, opening in east wall, looking E	1 x 2m
2	2381	Southern engine house, ground floor after stripping out, secondary bed, looking SE	1 x 2m
2	2382	Southern engine house, ground floor after stripping out, secondary bed, looking NE	1 x 2m
2	2385	Southern engine house, ground floor after stripping out, secondary bed, looking S	1 x 2m
2	2386	Southern engine house, ground floor after stripping out, secondary bed, looking E	1 x 2m
2	2387	Southern engine house, ground floor after stripping out, original engine bed, looking E	1 x 2m
2	2393	Southern engine house, ground floor after stripping out, painted decoration at upper level of north wall, looking N	-
2	2394	Southern engine house, ground floor after stripping out, painted decoration at upper level of north wall, looking N	-
2	2397	Southern engine house, north gable, moulding to eaves, looking SE	-
2	2398	Southern engine house, north gable, looking SW	-
3	3621	Economiser house after demolition, south wall, looking S	1m
3	3622	Economiser house after demolition, south wall, looking S	1m
3	3624	Economiser house after demolition, south wall, looking SE	1m
3	3625	Economiser house after demolition, south wall, looking SW	1m
3	3626	Economiser house after demolition, south wall, looking SW	1m
3	3627	Boiler house, window in upper north gable revealed after demolition of economiser house, looking S	-
3	3628	Boiler house, ground floor opening at west end of north gable, revealed after demolition of economiser house, looking SE	1m
3	3629	Boiler house, ground floor opening at west end of north gable, revealed after demolition of economiser house, looking S	1m
3	3631	Boiler house, ground floor opening at west end of north gable, revealed after demolition of economiser house, looking SE	-
3	3632	Boiler house, ground floor opening at east end of north gable, revealed after demolition of economiser house, looking S	1m
3	3633	Boiler house, ground floor opening at east end of north gable, revealed after demolition of economiser house, looking SW	1m
3	3634	Boiler house, ground floor opening at east end of north gable, revealed after demolition of economiser house, looking S	1m
3	3636	Northern engine house during demolition, north wall, looking N	1m
3	3637	Northern engine house during demolition, window in north wall, looking NE	1m
3	3638	Northern engine house during demolition, north end of east wall, looking E	1m
3	3639	Northern engine house during demolition, south end of east wall, looking SE	1m
3	3640	Northern engine house during demolition, southernmost roof truss with lifting rings, looking S	-
3	3641	Northern engine house during demolition, south end of west wall, looking SW	-
3	3642	Northern engine house during demolition, south end of west wall, looking SW	-
3	3643	Economiser house after demolition, typical stamped brick	0.3m
3	3644	Economiser house after demolition, typical stamped brick	0.3m
3	3645	Ilkley Road frontage during demolition, c.1857 original part (Unit G), looking W	-
3	3646	Ilkley Road frontage during demolition, c.1857 original part (Unit G), looking NW	-
3	3647	Ilkley Road frontage during demolition, c.1857 original part (Unit G), looking N	-
3	3648	Ilkley Road frontage during demolition, ashlar band from c.1857 original part (Unit G), looking NW	-
4	4649	Southern engine house engine bed during demolition, looking N	-
4	4651	Southern engine house engine bed during demolition, looking N	-
4	4653	Southern engine house during demolition, west wall, looking W	2 x 1m
4	4654	Southern engine house during demolition, north wall, looking N	1m
4	4656	Southern engine house during demolition, north wall, looking N	-
4	4657	Southern engine house during demolition, bearing block in east wall, looking E	-
4	4658	Southern engine house during demolition, bearing block in east wall, looking E	-
4	4659	Southern engine house engine bed during demolition, north-east part, looking E	-
4	4660	Southern engine house engine bed during demolition, south part, looking S	1m
4	4661	Southern engine house engine bed during demolition, north part, looking N	-
4	4663	Southern engine house engine bed during demolition, looking NW	-

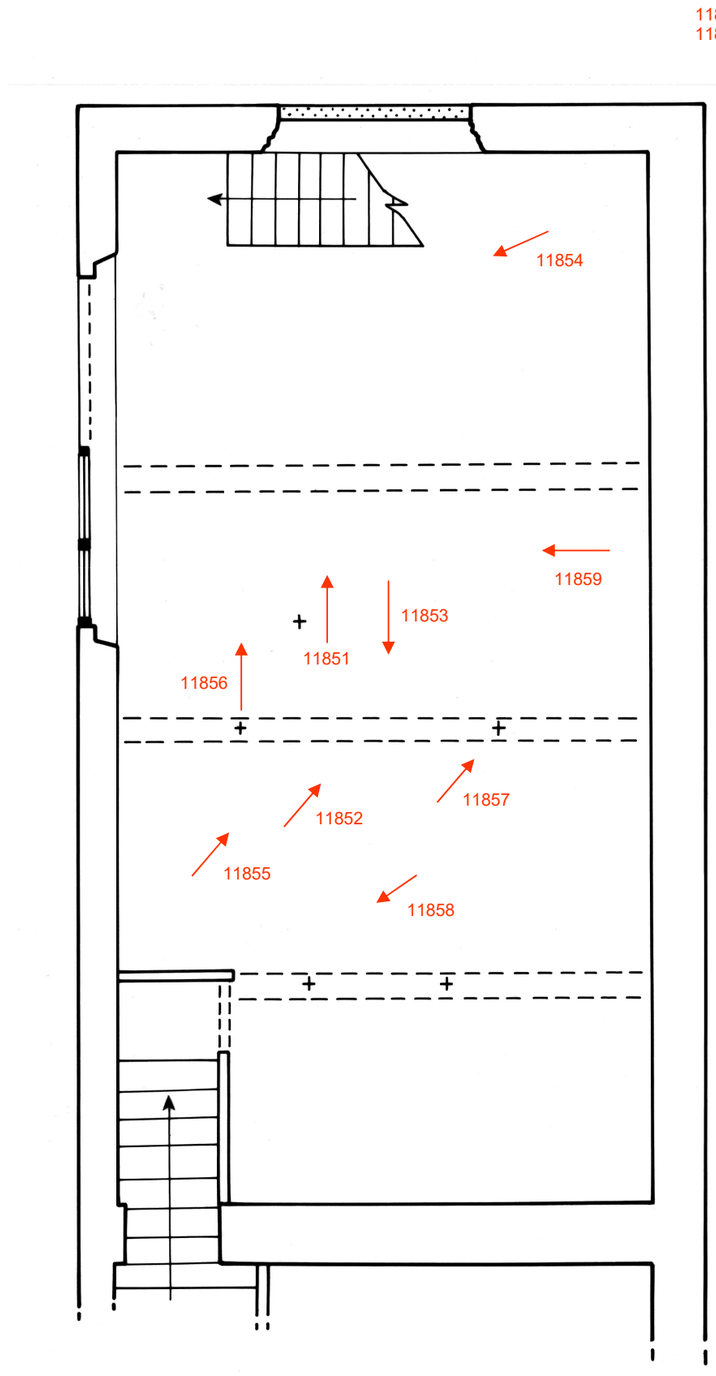


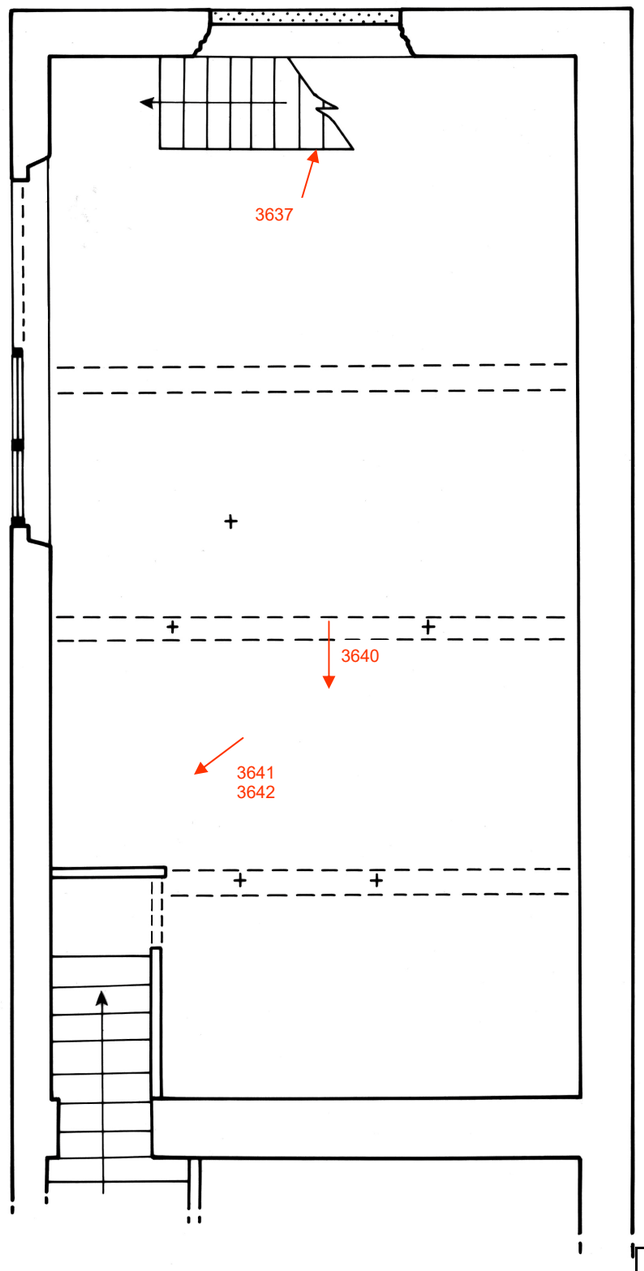
PROJECT	OTLEY MILLS, OTLEY
TITLE	GENERAL PRE-INTERVENTION EXTERNAL SHOTS
SCALE: NTS	DATE: MAY 2020
EDAS	FIGURE: A1-1



Ground plan

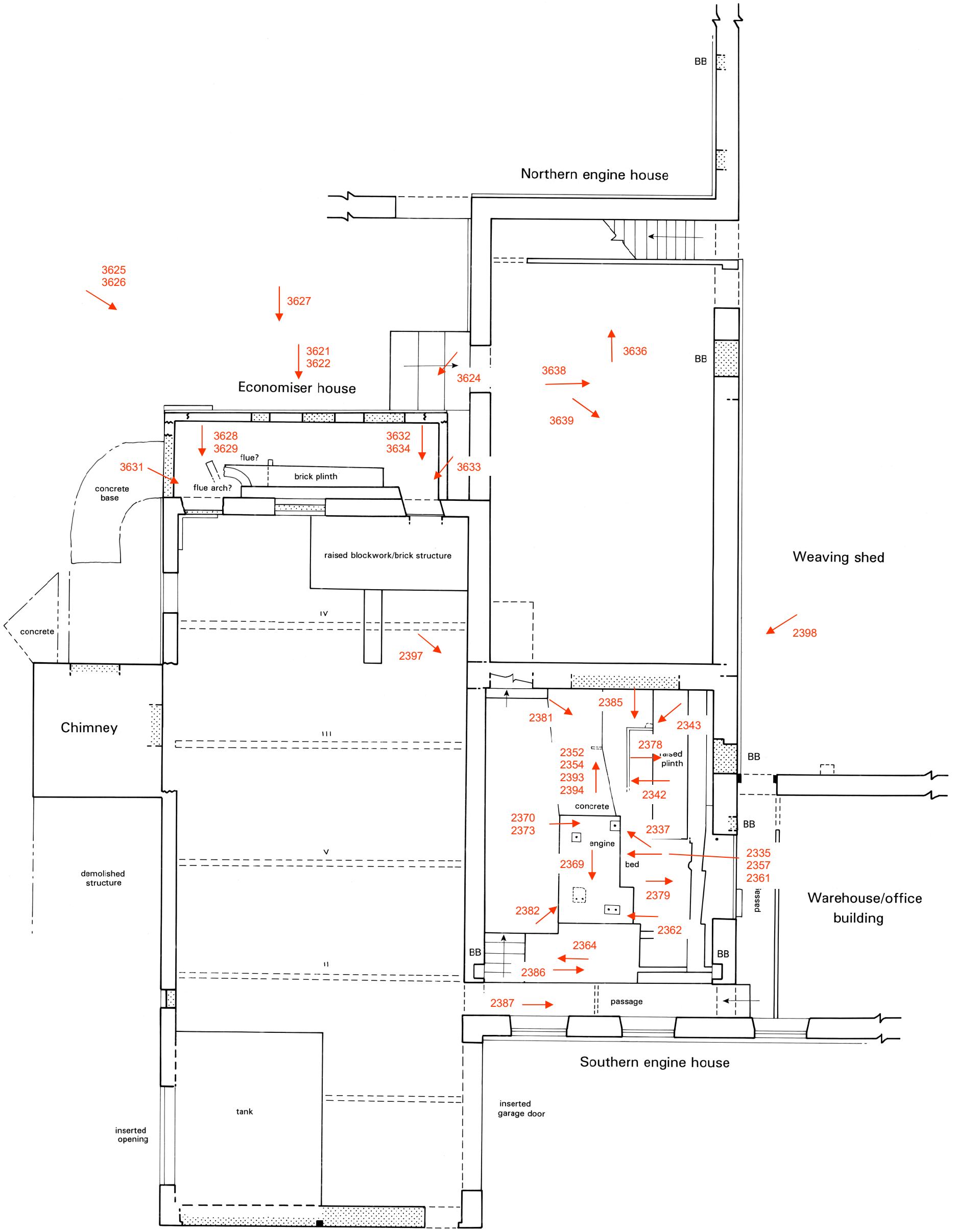
PROJECT	OTLEY MILLS, OTLEY
TITLE	PRE-INTERVENTION INTERNAL SHOTS
SCALE: AS SHOWN	DATE: MAY 2020
EDAS	FIGURE: A1-2





First floor plan of northern engine house

PROJECT	OTLEY MILLS, OTLEY
TITLE	PRE-INTERVENTION AND MONITORING INTERNAL SHOTS
SCALE: NTS	DATE: MAY 2020
EDAS	FIGURE: A1-3



PROJECT	OTLEY MILLS, OTLEY
TITLE	MONITORING SHOTS
SCALE: AS SHOWN	DATE: MAY 2020
EDAS	FIGURE: A1-4

APPENDIX 2
WYAAS SPECIFICATION

SPECIFICATION FOR AN ARCHAEOLOGICAL STRUCTURAL WATCHING BRIEF AT OTLEY MILLS, OTLEY, WEST YORKSHIRE

SE 19189 45190

This specification is prepared on behalf of Leeds City Council. It details the requirements for an archaeological structural watching brief (targeted archaeological and architectural photographic and drawn recording) prior to and during demolition at Otley Mills (planning consent 19/01633/FU).

1. Summary

1.1. This specification covers the requirements for targeted photographic building recording and a below-ground & structural watching brief (drawn and photographic record) at Otley Mills prior to partial demolition and redevelopment.

1.2. This specification has been prepared by the West Yorkshire Archaeology Advisory Service, the holders of the WY Historic Environment Record

1.3. Failure to fully comply with the terms of this specification will be treated as a breach of planning consent by WYAAS.

1.4. Please note that a hard copy of the final report must be submitted to the West Yorkshire Historic Environment Record to enable the results of fieldwork to be made publically accessible as required by the National Planning Policy Framework. The WYAAS will only recommend discharge of any archaeological planning condition once a report been received and found to be satisfactory..

NOTE: The requirements detailed in paragraphs 8.1, 8.2 and 8.3 are to be met by the archaeological contractor **prior** to the commencement of fieldwork by supplying confirmation details in writing to the WY Archaeology Advisory Service.

2. Background

2.1. In response to the proposed selective demolition of parts of this former mill the WYAAS recommended a heritage and fabric appraisal of the complex. This identified much alteration had taken place in the 20th century although the façade of the mill was relatively original in appearance. The planning permission grants permission to demolish and alter elements of the mill, including the main warehouse and engine house buildings but the mill chimney, boiler house and early 20th century façade, which lie in a conservation area, are to be retained.

2.2. This specification has been prepared by the WYAAS at the request of Mr Robert Beal of Plan B Planning and Design Ltd (12 Chestnut Drive, Holme on Spalding Moor, YO43 4HW) to detail what is required for and to allow an archaeological contractor to provide a quotation.

3. Archaeological / Architectural Interest

3.1. A programme of targeted archaeological building recording should be carried out in conjunction with the consented structural repair of this nationally important building. The results of this recording should be made publicly accessible.

3.2. It has not been possible to definitively date the construction of the original portion of Otley Mills. However, based on regional trends it is likely to date from the 1870s. This is based on its plan form and the provision of a large, by West Yorkshire standards, horizontal steam engine. This type of prime mover became increasingly common from the mid-1850s.The original mill building comprised a weaving shed with attendant offices and warehouse, steam engine to provide power, boiler house and chimney.

3.3. This standalone form of mill wove cloth to contract and illustrates the breakdown of sub-regional specialism in the textile industry. Otley Mills is identified as a worsted mill by the Ordnance Survey in the 1890s. Earlier in the century this type of cloth had been the specialist product of Bradford mills whilst manufacturers in the valleys to the north of Leeds had focused on woollen cloth.

3.4. The warehouse is unusual in that although clearly two storeys with a central pediment the upper floor has few openings save taking in-doors. The provision of an out of keeping Egyptian style stone surround to the central door is a further quirk of this elevation. Internal inspection revealed the warehouse to have windows in the southern side of the first floor. Internally the ground floor of the warehouse has been modernised whilst the first floor was open to the rafters and plain.

3.5. The weaving shed is now covered by a single span portal structure supporting a pitched roof. Evidence of the original multiple gable north light roof survives as corbels or modillions on the *inside* of the northern wall. During the WYAAS' site visit it was not possible to identify any evidence of how the shed was powered. However, the location of the engine house means power was delivered to the south-west corner of the mill and probably distributed from a main drive shaft running along the front of the northern wall.

3.6. The engine house is located at the western end of the mill complex at the south-western corner of the original weaving mill in line with front of the principal buildings. It is a stone-built two storey building with prominent triangular pediment. Two high-level round headed windows are provided in its southern façade and a single large round headed window was provided in the northern wall. To the rear there is a change in roof level suggesting a functional division existed within the building.

3.7. Internally the engine house retains some elements of its original fit out. It is divided into two parts forming space for modern electrical supply equipment in the southern part and modern office space with an inserted first floor in the northern portion. The division of the engine house and installation of electrical equipment appears to have happened early in the 20th century as the

subdivided space has been clad in match boarding. However, the change in roof line indicates the division pre-date this .Gaps in the match board wall covering reveal oil and grease stains which may indicate evidence of the original engine position and layout survives behind the wooden cladding.

3.8. The change in roof level noted above could not be observed internally but may reflect the present division. It is possible that major changes to the mills power plant took place during its early 20th century expansion. The structural watching brief should attempt to identify if this took place. Wellington Mill, Silsden, was re-fitted with a vertical type engine during the First World War whilst a move from mechanical to electrical power was encouraged in new build factories by government ministries during the war. The latter might be achieved by acquiring a steam turbine or adding a dynamo to an existing engine.

3.9. The two storey southern portion of the engine house preserves large ceiling beams with lifting eyes to allow for the moving and fitting of engine or other components during installation and maintenance. It is notable that the panels between the beams contain matchboard cladding set on a diagonal in contrast to the plain parallel planks in the ceiling of the northern room. Further evidence of the engine may be revealed during stripping out and demolition of this structure.

3.10. The boiler house is stone-built and has a pediment similar to the warehouse and engine house. A brick-built economiser house has been added to its southern end (Green's economisers were common from the 1850s so this is probably a replacement). This addition suggest an increase or change to the mills boiler provision, see 3.8 above). Internally some evidence of boiler house fittings survives.

3.11. The 1890s and early 20th century expansion of the mill to the west has undergone extensive re-ordering and re-roofing.

3.12. Based on the WYAAS' observations the following aspects of the mill complex should be subject to a programme of recording before and during demolition and development. These are:

- A Photographic record of the façade along Ilkley Road and the setting of the mill in the Wharfe valley.
- The engine house
- The boiler house, economiser and chimney, and
- Any evidence of power transmission from the engine house to the to the weaving mill
- Record the development of the engine house during strip out and demolition, potentially including below ground remains of the engine bed.

4. Aims

4.1. The aim of the proposed work is to identify and objectively record by means of photographs and selected drawings select significant archaeological and architectural features and evidence for the original and subsequent historical form and functions of Otley Mills, and to place this record in the public domain by depositing it with the West Yorkshire Historic Environment Record (West Yorkshire Archaeology Advisory Service , West Yorkshire Joint Service, Nepshaw Lane South, Morley, Leeds LS27 7JQ; email wyher@wyjs.org.uk).

5. Archaeological Below-Ground Watching Brief

5.1. An archaeologist should be present during the stripping out and demolition of the engine house to record evidence of the building's development, the engine and the transmission of power to the adjacent weaving mill. The aim of this element of the fieldwork is to identify and record the presence/absence, extent, condition, character and date (as far as circumstances permit) of any archaeological features (industrial or earlier) and deposits which are disturbed or exposed as a result of groundworks.

5.2. Fieldwork Methodology of the Below Ground Floor Watching Brief

5.2.1. The archaeologist should view the engine house as it is being demolished and record any evidence revealed when it is safe to do so. Where archaeology is judged to be present, the excavated area should be rapidly cleaned and the need for further work assessed. Where appropriate, any features and finds should then be quickly hand excavated, sampled if appropriate, and recorded.

5.2.2. Any features/deposits of archaeological interest should be accurately located on a site plan and recorded by photographs, scale drawings and written descriptions sufficient to permit the preparation of a report. Section drawings (at a minimum scale of 1:20) must include heights O.D. Plans (at a minimum scale of 1:50) must include O.D. spot heights for all principal strata and any features.

5.2.3. If no archaeological remains are present the actual areas of ground disturbance should be recorded on a suitable development plan and the stratigraphic sequence and the depth of the excavations briefly recorded.

5.2.4. The intention of the archaeological watching brief is not to unduly delay the work of other contractors on site, however, a degree of flexibility is also expected of the developer in order that the archaeologist can fulfil the terms of this specification. The archaeologist shall not excavate any area beyond those scheduled for destruction by the development.

5.2.5. If, in the professional judgement of the archaeologist on site, the watching brief reveals below-ground conditions which indicate that potentially archaeological levels are absent, the archaeologist should

contact WYAAS to discuss reducing or curtailing the requirements. The work may only be curtailed with the prior agreement of WYAAS and written confirmation will be provided by WYAAS.

6. Unexpectedly Significant or Complex Discoveries

6.1. Should there be, in the professional judgement of the archaeologist on site, unexpectedly significant or complex discoveries made that warrant more detailed recording than possible within the terms of this specification, then the archaeological contractor is to urgently contact WYAAS with the relevant information to enable the matter to be resolved with the developer.

7. The Structural Watching Brief

7.1. As safe opportunity and access allows, the archaeologist should examine any exposed elements of the building's structure to record means of construction, evidence of the building's development, the engine and the transmission of power to the adjacent weaving mill

8. General Instructions

8.1. Health and Safety

8.1.1. The building recorder on site will naturally operate with due regard for Health and Safety regulations. Prior to the commencement of any work on site the building recorder will need to carry out a Risk Assessment on the building / structure in accordance with the Health and Safety at Work Regulations. The building recorder should identify any hazards and contaminants which constitute potential Health and Safety risks and make arrangements with the owner / developer for decontamination/making safe as necessary and appropriate. The WY Archaeology Advisory Service and its officers cannot be held responsible for any accidents or injuries which may occur to outside contractors engaged to undertake this survey while attempting to conform to this specification.

8.2. Confirmation of Adherence to Specification

8.2.1. The contractor should confirm in writing to WYAAS in advance of commencement of work, their adherence to the issued specification. Unauthorised variations are made at the sole risk of the building recorder. Proposed modifications presented in the form of a re-written specification/project design will not be considered. For technical queries see para. 14.1.

8.3. Confirmation of Timetable and Contractors' Qualifications

8.3.1. Prior to the commencement of any work, the building recorder must provide the local planning authority and WYAAS in writing with:

- a projected timetable for the site work

- details of the staff structure and numbers
- names and *CVs* of key project members (the project manager, site supervisor, any proposed specialists, sub-contractors *etc.*)

8.3.2. All project staff provided by the building recorder must be suitably qualified and experienced for their roles. In particular, staff involved in building recording should have proven expertise in the recording and analysis of industrial buildings.

8.3.3. The timetable should be adequate to allow the work to be undertaken to the appropriate professional standard.

8.4. Notification and Monitoring

8.4.1. WYAAS should receive at least one week's notice in writing of the intention to start fieldwork.

9. Recording Methodology

9.1. Site preparation

9.1.1. Prior to the commencement of work on site the building recorder should identify all removable modern material which may significantly obscure areas requiring a photographic record, and should contact the developer in order to make arrangements for its removal. It is not the intention of this specification that large-scale removal of material of this type should take place with the building recorder's manpower or at that contractor's expense.

9.2. Documentary research

9.2.1. The existing heritage statement produced by Archaeological Services WYAS, which covers the history and development of Otley Mills in detail, should be used to inform the interpretation of any evidence revealed. A copy of this document is held by the WYHER (PRN 16475).

9.2.2. Prior to the commencement of fieldwork, the HER should be visited by either the project manager or the site supervisor, in order to gain an overview of the archaeological/historical background of the site and environs. Please note that the HER makes a charge for consultations of a commercial nature.

9.3. Site/building plans

9.3.1. Previous plans & elevations have been produced and should be used for any annotation relative to the photographic record (permission of the copyright holder must be sought).

10. Photographic Record

10.1. Detailed record shots should be made of all exterior elevations on to Ilkley Road and all features of archaeological and architectural interest

identified during the process of the structural watching brief. Typically, items of interest would include:

- All original structural elements, columns, roof structures / trusses and method of construction
- Use of materials, e.g. cast iron column or steel reinforcement
- Any inscriptions, dedications or date stones
- Any graffiti, tally marks, instructional signage
- Any original doors and window frames
- Evidence of original staircases, walkways and other access arrangements
- Evidence for the routing and generation of steam, mechanical and electrical power
- Evidence of the transmission of mechanical power to the weaving mill
- Evidence for the former location of engine and engine bases
- Evidence for heating and lighting arrangements, particularly any evidence of early use of electricity

But this list should not be treated as exhaustive. The building recorder on site should also identify and note:

- any significant changes in construction material – this is intended to include significant changes in stone/brick type and size
- any blocked, altered or introduced openings
- evidence for phasing, and for historical additions or alterations to the building.

10.2. Elements for which multiple examples exist (e.g. each type of roof truss, column or window frame) may be recorded by means of a single representative illustration. N.B. Detail photographs must be taken at medium-to-close range and be framed in such a way as to ensure that the element being photographed clearly constitutes the principal feature of the photograph.

10.3. <u>Equipment</u>

10.3.1. General photographs should be taken with a Large Format monorail camera (5” x 4” or 10” x 8”), or with a Medium Format camera that has perspective control, using a tripod. The contractor must have proven expertise in this type of work. Any detail photographs of structural elements should if possible be taken with a camera with perspective control. Other detail photographs may be taken with either a Medium

Format or a 35mm camera. All detail photographs must contain a graduated photographic scale of appropriate dimensions (measuring tapes and surveying staffs are not considered to be acceptable scales in this context). A 2-metre ranging-rod, discretely positioned, should be included in a selection of general shots, sufficient to independently establish the scale of all elements of the structure.

10.4. Digital photography

10.4.1. Digital photography: as an alternative for colour slide photography, good quality digital photography may be supplied, using cameras with a minimum resolution of 10 megapixels. Digital photography should follow the guidance given by Historic England in Digital Image Capture and File Storage: Guidelines for Best Practice, July 2015. Note that conventional black and white print photography is still required and constitutes the permanent record. Digital images will only be acceptable as an alternative to colour slide photography if each image is supplied as both a JPEG and a TIFF versions. The latter as an uncompressed 8-bits per channel TIFF version 6 file of not less than 25Mbs (See section 2.3 of the Historic England guidance). The contractor must include metadata embedded in the TIFF file. The metadata must include the following: the commonly used name for the site being photographed, the relevant centred OS grid coordinates for the site to at least six figures, the relevant township name (Otley), the date of photograph, the subject of the photograph, the direction of shot and the name of the organisation taking the photograph. Any digital images are to be supplied to WYAAS on gold "archive quality" CDs by the archaeological contractor accompanying the hard copy of the report.

10.5. Film stock

10.5.1. All record photographs to be black and white, using conventional (not chromogenic) silver-based film only, such as Illford FP4 or HP5, or Delta 400 Pro that is replacing HP5 in certain film sizes (such as 220). Dye-based films such as Ilford XP2 and Kodak T40CN are unacceptable due to poor archiving qualities.

10.6. Use of Digital Archiving in Place of Film

10.6.1. In response to the mounting costs and decreasing numbers of practitioners offering professional photographic building recording on large and medium format chemical film the WYAAS have investigated other means to secure the long term preservation of photographic images. The WYAAS are satisfied that it is now feasible to substitute digital photography for this aspect of building recording in some projects as an alternative to monochrome photography as specified above.

10.6.2. The long-term archiving and curation of image captured during building recording will be carried out by the Archaeology Data Service (ADS). The ADS charge for this service and it is the contractor's responsibility to pay for this long term curation. See:

10.6.3. An estimate of the cost of archiving digital images and reports using the ADS Easy service can be obtained from the ADS website:

http:/archaeologydataservice.ac.uk/easy/costing

10.6.4. Larger, long running projects may need bespoke costing from the ADS Collections Development Manager (collections@ADS.ac.uk).

10.6.5. The buildings archaeologist should follow the ADS' polices and requirements for metadata accompanying digital files. Comprehensive guidance can be found on the ADS website dealing with planning for the creation of a digital archive, collecting data, selection and discard policies, file structures, licencing and the transfer of material to the ADS.

10.7. Equipment

10.7.1. A digital SLR with a resolution of at least 10 megapixel should be employed. Cameras with an FX sensor, which is close to equivalency with 35mm film, are preferable to DX sensor equipped cameras. A variety of lenses should be used to best capture the subject and its setting

10.7.2. Care should be taken to ensure sharply focused well composed photographs are taken and when appropriate the camera should be set up and levelled on a tripod, e.g. when recording facades and larger interior spaces. The use of perspective shift lenses or pan and tilt adaptors may be necessary in some situations to achieve an acceptable image. Alternatively lens distortion may be removed post-capture by software but this must be recorded in the photographic catalogue and details of the software used given in the report. Original pre-correction images should be included in the site archive.

10.7.3. Photographs should be taken with a low ISO setting to reduce noise in the images captured and RAW format used before archiving in tiff format.

10.7.4. The camera should also be Exchange Image File (EXIF) compliant and accurate time, date and, where applicable, GPS information and other metadata set up prior to commencing recording work on site. Further requirements relating to metadata are described below.

10.8. Archiving Digital Photographs

10.8.1. Photographs and reports should be archived with using the ADS. Smaller projects (fewer than 300 files and of less than 10MB each) may be submitted online using the ADS-e Easy online service. (http://archaeologydataservice.ac.uk/easy/home). Larger project will require 'traditional' submission using either CD/DVD/USB device or a drop-off service. An estimate of the cost to archive digital images and reports using the ADS Easy service can be obtained from the ADS website:

http://archaeologydataservice.ac.uk/easy/costing

10.8.2. Grey Literature reports may be archived using the OASIS System free of charge, reports and oasis records can later be linked to an ADS-easy photography submission.

http://archaeologydataservice.ac.uk/easy/costing

10.8.3. The buildings archaeologist should follow the ADS' polices and requirements for metadata accompanying digital files. Comprehensive guidance can be found on the ADS website dealing with planning for the creation of a digital archive, collecting data, selection and discard policies, file structures and naming conventions, licencing and the transfer of material to the ADS

http://archaeologydataservice.ac.uk/advice/guidelinesForDepositors.xhtml

10.8.4. Meta data: The contractor should create Project-level meta data, this is used to populate the ADS systems (enables users to search for collections, and populates the ADS webpage for the project. The 'coverage@ field in this document or online submission should include the historic township, site name and grid reference of the site:

(http://archaeologydataservice.ac.uk/advice/DatasetlevelMetadata.xhtml#Collection-level Metadata Requirements).

10.8.5. A raster data meta data file, cataloguing the digital photographs, should also be prepared. A template for this spreadsheet is available to download from the ADS (a template & examples of the latter are available from the ADS at:

http://archaeologydataservice.ac.uk/advice/FilelevelMetadata.xhtml

10.8.6. The contractor is responsible for notifying WYAAS of the release of the collection on the ADS website. The forwarding of an email containing the collection Digital Object Identifier (DOI) to wyher@wyjs.org.uk will suffice.

10.8.7. The WYAAS will only recommend the discharge of planning conditions upon receipt of the digital object identifier (DOI) allocated by the ADS.

10.8.8. Please note the WYAAS still require hard copy of the report accompanied by laser prints (cross referenced plates) of the photographs on archivally stable paper and a facsimile copy of the report in PDF (ISO 1005-1 compliant (PDF/A) format and the images on a "gold" archive quality CD.

10.9. Rectified Digital Photography

10.9.1. As an adjunct to hand drawn elevations and plans the recording of significant and complex built structures, machine and engine bases,

stone and brick surfaces may be carried out using digital rectified photography to provide orthophotographic images at the scales given in section 5.2,2 above. Photographs must be taken at a resolution adequate to allow the creation of images at these scales. The collection and archiving of digital photographs used to create orthophotographs must follow and comply with Historic England's guidance contained in "Measured and Drawn: Techniques and practice for the metric survey of historic buildings (2nd edition)", English Heritage 2009" and Photogrammetric Applications for Cultural Heritage, Guidance for Good Practice, Historic England 2017.

10.9.2. In general photographs must be taken parallel or near parallel to the subject's main surface, sufficient photographs must be taken from additional viewpoints to capture any changes in level or concealed areas; photographs must have sufficient overlap (60%-80%) to ensure good interpolation by the software used; targets or scales must be used and the resulting image must be checked against the subject/archaeological features before their destruction. Ortho-photographs or copies should be annotated with relevant context numbers (and feature boundaries when not obvious) and be cross referenced in the descriptive and interpretive text in the site report.

10.10. Printing

10.10.1. Record photographs should be printed at a minimum of 5" x 7" .In addition a small selection of photographs (the best of the exterior setting shots and interior shots with important detail) should be printed at 10" x 8". Bracketed shots of identical viewpoints need not be reproduced, but all viewpoints must be represented within the report.

10.10.2. Prints may be executed digitally from scanned versions of the film negatives, and may be manipulated to improve print quality (but not in a manner which alters detail or perspective). All digital prints must be made on paper and with inks which are certified against fading or other deterioration for a period of 75 years or more when used in combination. If digital printing is employed, the contractor must supply details of the paper/inks used in writing to the local authority with supporting documentation indicating their archival stability/durability.

10.11. Documentation

10.11.1. A photographic register and photo location plan are required. The photographic register should (as a minimum) include location, direction and subject of shot must accompany the photographic record; a separate photographic register should be supplied for any colour slides and digital photographs. Position and direction of each photograph and slide should be noted on a scaled copy of the building plan (minimum acceptable scale 1:100), which should also be marked with a north pointer. Separate plans should be annotated for each floor of the building/ structure. (See also para. 5.3 above.).

10.12. Drawn Record

10.12.1. Drawings should be made at an appropriate scale (not smaller than 1:50 for plans; not smaller than 1:20 for sections).

10.13. Dimensional accuracy

10.13.1. Dimensional accuracy should accord with the normal requirements of the English Heritage Architecture and Survey Branch (at 1:20, measurements should be accurate to at least 10mm; at 1:50, to at least 20mm; at 1:100, to at least 50mm).

10.14. Drawing method

10.14.1. The survey may be executed either by hand or by means of reflectorless EDM as appropriate. In accordance with national guidelines[1], drawings executed on site should be made either on polyester-based film (minimum thickness 150 microns) with polymer-bonded leads of an appropriate thickness and density, or on acid-free or rag paper. If finished drawings are generated by means of CAD or a similar proven graphics package, recorders should ensure that the software employed is sufficiently advanced to provide different line-weight (point-size); this feature should then be used to articulate the depth of the drawings. CAD repeats or cloning of features should not be used. What is required as an end product of the survey is a well-modelled and clear drawing; ambiguous flat-line drawings should be avoided. Drawing conventions should conform to English Heritage guidelines as laid out in English Heritage 2006, Understanding Historic Buildings – a guide to good recording practice, and the WYAAS would recommend that the CAD layering protocol detailed in the same volume (8.3, Table 2) should be adhered to.

10.14.2. See 10.9 above for the possible use of rectified digital photography.

11. Post-Recording Work and Report Preparation

11.1. Report Preparation, Report format and content

A written report should be produced. This should include:

- an executive summary including dates of fieldwork, name of commissioning body, planning application reference and condition number and a brief summary of the results including details of any significant findings
- an introduction outlining the reasons for the structural watching brief
- a brief architectural description of the building presented in a logical manner, starting with setting, then progressing to the affected areas of the structure in sequence

[1] English Heritage 2006, *Understanding Historic Buildings – a guide to good recording practice*, 7.1.1ff

- a discussion placing the mill and engine house in its local and historical contexts.

Architectural and technical and analytical description and discussion should be fully cross-referenced to the photographic record, sufficient to illustrate the major features of the mill and the major points raised.

11.2. Report Illustrations

Illustrations should include:

- a location map at a scale sufficient to allow clear identification of the building(s)/structure in relation to other buildings in the immediate area
- A phase plan
- a complete set of site drawings at a legible scale, on which position and direction of each photograph has been noted
- a complete set of good-quality laser copies of selected photographs. All photographs should be accompanied by detailed captions clearly locating and identifying any pertinent features.
- Any drawings arising from the structural watching brief showing detail of the mill or engine house at the appropriate scales given above

The latter should be bound into the report, appropriately labelled (numbered, and captioned in full) and fully referenced within the report. When captioning, contractors should identify the individual photographs by means of a running sequence of numbers (e.g. Plate no. 1; Plate no. 2), and it is this numbering system which should be used in cross-referencing throughout the report and on the photographic plans. However, the relevant original film and frame number should be included in brackets at the end of each caption.

11.3. Report deposition

A hard copy of the full report (plus a digital copy on on "archive" quality gold disk in ISO 10005-1 compliant (PDF/A) format) will be submitted directly to the WY Archaeology Advisory Service within twelve weeks of completion of the fieldwork. The report will then assessed by WYAAS to establish whether or not it is suitable for accession into the WY Historic Environment Record. A copy of the final report (in .pdf format) shall also be supplied to Historic England's Science Advisor (Dr Andy Hammon (Andy.Hammon@HistoricEngland.org.uk). Any comments made by WYAAS in response to the submission of an unsatisfactory report will be taken into account and will result in the reissue of a suitably edited report to all parties, within a timescale which has been agreed with WYAAS. Completion of this project and a recommendation from WYAAS for the full discharge of the archaeological condition is dependent upon receipt by WYAAS of a satisfactory full report. The report will become publicly accessible once deposited with the West Yorkshire Historic Environment Record, unless confidentiality is explicitly requested, in which case it will become publicly accessible six months after deposit.

11.4. The West Yorkshire HER supports the Online Access to Index of Archaeological Investigations (OASIS) project. The overall aim of the OASIS project is to provide an online index to the mass of archaeological grey literature that has been produced as a result of the advent of large-scale developer funded fieldwork. The building recorder must therefore complete the online OASIS form at http://ads.ahds.ac.uk/project/oasis/. Contractors are advised to contact the West Yorkshire HER officer prior to completing the form. Once a report has become a public document by submission to or incorporation into the HER, the West Yorkshire HER may place the information on a web-site. Please ensure that you and your client agree to this procedure in writing as part of the process of submitting the report to the case officer at the West Yorkshire HER.

11.5. A note on the fieldwork should be prepared for inclusion in Post Medieval fieldwork in Britain, Ireland and the Channel Islands which is published annually in Post-Medieval Archaeology by the Society for Post-Medieval Archaeology. A similar note or longer article should also be supplied to the Council for British Archaeology's Yorkshire Forum publication (please contact the editor or CBA's website for more information forum-editor@cba-yorkshire.org.uk).

12. Deposition of Building Recording Archive with WYAAS (as holders of the West Yorkshire Historic Environment Record)

12.1. The report copy supplied to the WY Archaeology Advisory Service (see address at the base of this document) should also be accompanied by both the photographic negatives and a complete set of labelled photographic prints (mounted in KENRO display pockets or similar, and arranged in such a way that labelling is readily visible) bound in a form which will fit readily into a standard filing cabinet suspension file (not using hard-backed ring-binders). Labelling should be on the back of the print in pencil giving film and frame number only (taking care not to damage the print) and on applied printed labels stuck on the front of the relevant photographic sleeve and which should include:

- film and frame number
- date recorded and photographer's name
- name and address of building
- national grid reference
- specific subject of photograph.

12.2. Negatives should be supplied in archivally stable mounts (KENRO display pockets or similar), and each page of negatives should be clearly labelled with the following:

- national grid reference
- Site name and address
- Date of photographs (month/year)

- Name of archaeological contractor
- Film number

12.3. Colour slides should be mounted, and the mounts suitably marked with the 'site name' at the top of the slide; grid reference at the bottom; date of photograph at the right hand side of the mount; subject of photograph at the left hand side of the mount. Subject labelling may take the form of a numbered reference to the relevant photographic register. The slides should be supplied to the WY Archaeology Advisory Service in an appropriate, archivally stable slide hanger (for storage in a filing cabinet). In all other respects, standards for archive compilation and transfer should conform to those outlined in Archaeological Archives – a guide to best practice in creation, compilation, transfer and curation (Archaeological Archives Forum, 2011).

13. Copyright

13.1. Please note that by depositing this report, the contractor gives permission for the material presented within the document to be used by the WYAAS, in perpetuity, although The Contractor retains the right to be identified as the author of all project documentation and reports as specified in the Copyright, Designs and Patents Act 1988 (chapter IV, section 79). The permission will allow the WYAAS to reproduce material, including for commercial use by third parties, with the copyright owner suitably acknowledged.

14. Technical Queries

14.1. Any technical queries arising from the specification detailed above, should be addressed to WYAAS without delay.

15. Valid Period of Specification

15.1. This specification is valid for a period of one year and may need to be reviewed to comply with current best practice, knowledge and changes in techniques.

West Yorkshire Archaeology Advisory Service **October 2019**
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15.2.