Programme of archaeological work at Sheffield Lock, Burghfield, Kennet and Avon Canal, West Berkshire

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Introduction

A programme of archaeological work was carried out at Sheffield Lock, Burghfield, Kennet and Avon Canal, West Berkshire (SU 648 706; Figs 1.1 and 1.2) at the request of David Viner of the Canal & River Trust. This work was undertaken in response to conditions received from Eliza Alqassar BA MA MCIfA, Assistant Inspector of Ancient Monuments, as a result of an application for scheduled monument consent (ref SMC S00122528), applied for by the Canal & River Trust on 26th October 2015. It was also undertaken in compliance with a written scheme of investigation provided by Martin Cook BA MCIfA. The written scheme of investigation was approved by Eliza Alqassar, BA MA MCIfA, Assistant Inspector of Ancient Monuments. Condition (b) stated:

No ground works shall take place until the applicant has confirmed in writing the commissioning of a programme of archaeological work during the development in accordance with a written scheme of investigation which has been submitted to and approved by the Secretary of State advised by Historic England.

The programme of archaeological work was to comprise documentary research, a watching brief, subsequent analysis and a report.

Summary

A programme of archaeological work was carried out at Sheffield Lock, Burghfield, Kennet and Avon Canal, West Berkshire. Relict features protruding from the invert of the lock and presumably relating to the former turf lock were identified. These included the use of early pattern railway line which probably dates from the ownership of the canal by the Great Western Railway in 1852. The nature of the joint between the king posts and the transverse beams was determined. The character of the scalloped brickwork was recorded,leading to the conclusion that, while some of it was probably original, the greater part was reconstruction or repair. Similarly, the extent of modern repairs was also identified.

The documentary material

Historic mapping

The Ordnance Survey mapping of 1899, 1912 and 1936 was obtained (Figs 2.1 and 2.2). These maps show Sheffield Lock in its current position and configuration but are at too small a scale for useful analysis.

The Kennet Navigation and the Kennet and Avon Canal

The Kennet Navigation as a feat of engineering has been described as the out-standing early 18th century navigation (Skempton 1984). Of the original twenty turf-side Kennet Navigation locks constructed by John Hore between 1715 and 1724 (Clew 1973) nothing is likely now to survive. Sometime in the later 18th century, possibly in 1767 (Clew 1973, Chrystall 1976) the locks of the Kennet Navigation were enlarged to 122ft x 19ft allowing access for the 109ft x 17ft 'West Country' or 'Newbury' barges (Clew 1968).

At the end of the 18th century the Kennet Navigation was incorporated into the Kennet and Avon canal system, this being completed in 1810 (Clew 1973) although the navigation was not legally incorporated by Act of Parliament until 1813.

By the 1820s the wide locks of the Kennet and Avon canal, apart from being extremely wasteful of water, were unnecessary for the narrowboats and shorter barges which by then were operating along most of the system. In a letter to a Taunton solicitor in 1830 it was stated that most of the barges passing through the wide locks were of 60 tons burthen and that only a few of the 120 ton barges

used them. Those that did were only transporting timber from Reading to Aldermaston.

The main factor behind the desired reduction, however, appears to have been the needs of the mill owners; smaller locks were seen as:

beneficial to the millers on the river in saving water.

In 1831 an Act of Parliament was passed which granted the Kennet and Avon Canal Company the power to reduce the size of the locks on the River Kennet. Work was carried out on the Kennet's locks throughout the 1830s. It is believed that the massive timbers protruding from the invert of the lock (Phase 2 of the recording project) relates to this time.

In 1852 the canal was bought by the Great Western Railway Company (Hadfield 1969). It is believed that the use of Barlow rail (Phase 2 of the recording project) relates to this time. By the mid 1870s the railway company was engaging in only minimal maintenance as they were content to allow the waterway system to decline (Clew 1973).

In June 1950 the Docks and Inland Waterways Executive finally declared a stoppage on navigation through the Kennet and Avon system (Liddiard 1976).

Other documentary material

Excavations and surveys of similar locks

The excavations at Monkey Marsh Lock (Harding and Newman 1990)

General

An extensive excavation of Monkey Marsh Lock was undertaken by Wessex Archaeology in advance of reconstruction of the lock. Only those aspects of the excavations that seemed to throw light upon the current project are described below. For example, no conclusive evidence for the chamber revetments at Sheffield Lock was found. Consequently, the extensive corresponding data from Monkey Marsh Lock has not been reproduced. An exception was made for the tie beams, comparable examples of which were located during the restoration of the Chesterfield Canal. (Coxah and Gardner 2003). It was felt that this might further the determination of contemporary, general engineering principles for the construction of retaining structures.

During the excavation, no remains of the original lock were observed. This would have been built during the initial construction of the Kennet Navigation. It has been suggested that the locks on the Navigation were totally rebuilt and enlarged about 1767 with chambers 122 feet (37m) in length and 19 feet (5.8m) in width. It is likely that these larger locks would have removed much if not all of the evidence for their smaller predecessors. Very few artefacts were recovered during the excavation and what there were came from the turf bank.

Phase 1

The lock had timber entrance aprons [within the chamber] at its head and tail (fig 3). These comprised two transverse timbers, extending beyond each edge of the chamber, which were morticed into two longitudinal timbers, one on each side of the chamber. Within the basal structure thus formed were located five transverse timbers, half-lapped into the longitudinal timbers. This structure supported joists and planking across the floor of the entrance. Vertical timbers tenoned into the longitudinal basal timbers supported the sides of the entrance and the gates. Timber piles had been driven below the canal bed and secured to the western transverse timber with nails.

The tie beams

There were eighteen tie beams on the south bank and seventeen on the north, associated with the phase 1 lock. The tie beams were formed from large timbers, which were anchored into the bank at their outer end by cross braces restrained by vertical posts. Their inner ends were presumably attached to the revetment's whaling but no direct relationship survived. Their purpose was to prevent the forward movement of the upper part of the revetment. The tie beams were made from trunks or boughs which had been trimmed or halved. The thick proximal ends were usually squared to shape and the distal ends were slotted to receive the cross braces.

Phase 2
The principle feature of this phase was the reduction in width of the lock chamber by 0.45m.

Phase 3
This phase was characterised by further narrowing of the lock chamber by 0.35m and its rebuilding using softwoods and re-used railway materials.

In phase 3, piles were formed of re-used wide gauge rails and spaced approximately 1.8m apart. These rails would also have acted as training piles preventing barges colliding with the wooden sides [or drifting beyond the limits of the central channel].

Recent repairs
The sides of the entrances were formed of concrete faced with horizontal railway sleepers. It was not possible to date the introduction of concrete to the site.

The turfed banks
The turfed banks were constructed of a series of tips, filling and built over a cutting and revetted by the timber lock frontages. The cutting was dug for the phase 1 lock, the timber revetments being put in place and then the bank material tipped behind it. A turf line representing the original (pre 1720s) ground surface was noted. This did not survive close to the lock chamber as it had been cut away by the construction of the phase 1 lock.

With one exception, the finds were of a probable mid-19th century date.

Discussion
Turf sided locks were retained at Aldermaston and Sheffield where the brickwork was restricted to a low, scalloped wall constructed to a level just above the low water mark. The purchase of the Kennet and Avon Canal by the Great Western Railway in 1852 introduced railway components to the construction of the timber-revetted locks. At Garston, Heales,Sheffield, Towney and Widmead iron rails were used to support the chamber sides and as training piles.

Survey and watching brief at Garston Lock (Trust for Wessex Archaeology 1994)
General
A survey and watching brief was undertaken on Garston Lock, the only unrestored turf-sided lock on the Kennet and Avon Canal. Two significant phases were identified but neither could be related to the lock on this site which formed part of the original Kennet Navigation of 1713.

Phase 1
The remains of a wooden mitre cill and apron were recorded. These comprised two longitudinal timbers laid on the natural gravel supporting a number of transverse timbers. The floor of the apron consisted of sawn elm boards, laid parallel to the longitudinal timbers.

Wooden tie beams which protruded from the canal bank were not excavated but corresponded with those excavated at Monkey Marsh Lock (Harding and Newman 1990, above).

Phase 2
In phase 2 the head, tail and their aprons were of brick construction. The bulk of the lock chamber invert appears to have been left as natural gravel.

Turf-sided locks in general
A turf-sided lock is an early form of canal lock design that uses earth banks to form the lock chamber, subsequently attracting grasses and other vegetation, instead of the now more familiar and widespread brick, stone, or concrete lock wall constructions. This early lock design was most often used on river navigations in the early 18th century before the advent of canals in Britain. The sides of the turf-lock are sloping so, when full, the lock is quite wide. Consequently, this type of lock needs more water to operate than vertical-sided brick- or stone-walled locks. On British canals and

waterways most turf-sided locks have been subsequently rebuilt in brick or stone, and so only a few good examples survive, such as at Garston Lock, and Monkey Marsh Lock on the Kennet and Avon Canal.

Most of the locks on the Wey Navigation were originally turf-sided. The chamber was excavated to ensure that it was wide enough to accommodate a barge, which was considerably wider than the narrowboats that are now commonly seen along the waterway today. At either end of the chamber substantial walls of timber were built in order to support the massive and heavy lock gates, which had to be strong enough to bear considerable water pressure. The rest of the lock sides between the gates and these retaining walls did not have to be particularly robust and were left as sloping bare earth over which turf was allowed to grow. Provided they didn't leak water these earth banks worked perfectly well, although on the Wey half-height timber walls were built from end to end in order to keep the heavy barges in line with the gates.

The use of railway line in lock construction
The style of railway line used on the Kennet and Avon locks (and elsewhere) is known as 'Barlow Rail'. Barlow rail was a rolled rail section used on early railways. It has wide flaring feet and was designed to be laid direct on the ballast, without requiring sleepers. It was widely adopted on lightly trafficked railways, but was ultimately unsuccessful because of maintenance difficulties.

The rail profile was invented in 1849 by W.H.Barlow, engineer of the Midland Railway. The design was patented. On 14 May 1850, he presented a paper to the Institute of Civil Engineers in London detailing his ideas and stating that a test section of 125 lb/yd rail on the Midland Junction Railway had proven satisfactory. He admitted that there had been difficulty in rolling the section but this had been overcome by the manufacturers at Middlesbrough.

Barlow rail was widely withdrawn from primary service as rails and so large quantities of it were available cheaply. The South Wales Railway offered 400 tons of it for sale in 1857, with free delivery to anywhere along their line. The wide distribution of Barlow rail laid on the routes influenced by Brunel has left a legacy of fence posts, and in some cases bridge decks.

Timber tie-beams on the Chesterfield Canal
It was noted that timber tie-beams were employed at both Monkey Marsh Lock and at Garston Lock (Harding and Newman 1990 and Trust for Wessex Archaeology 1994). Although it was not possible to identify similar tie-beams at Sheffield Lock, due to the construction work not extending sufficiently far or deeply into the surrounding area, it was thought worthwhile to briefly refer to similar tie-beams that were recorded on the Chesterfield Canal at Stone Lock (Coxah and Gardner 2003; Figs 71.1 and 71.2) for more general comparative purposes. Two such tie-beams were found. These, like those at Monkey Marsh Lock were made from trunks or boughs, neither of which were particularly straight, which had been roughly trimmed and pegged to receive the cross braces or anchors. Unlike the Kennet and Avon examples, the Chesterfield tie-beams supported a stone chamber wall and, as with the Kennet and Avon examples, no evidence survived regarding their connection with the chamber wall.

The fieldwork

General
Fieldwork took place on the 25th and 26th January, 1st, 2nd, 3rd, 10th, 11th and 15th February and the 2nd, 4th and 22nd March. It comprised recording of features exposed on the lock floor, outline recording of the lock walls and recording of sections on the lock top with records (drawing, written description and photographs) made as appropriate. A full description of the contexts is given in Appendix 1. Contexts are described in summary form below.

Description and commentary
Phase 1: pre-canal deposits
The only deposit that could be dated to the pre-canal era was the natural subsoil (contexts 082 and 083) This comprised small rounded flint gravel and presumably relates to the historic bed of the

River Kennet.

Phase 2: the turf-sided lock
Remains that could be ascribed to the former turf-sided lock were mostly positive, relict features which protruded from the floor of the existing lock. These comprised:

- early pattern railway line known variously as Barlow Rail or Baulk Road (see above, **The use of railway line in lock construction**; (contexts 012, 015, 017, 018, 020, 022, 023, 025, 026, 029, 030, 031, 032, 033, 034, 035, 036 and 037; Figs 3.1, 5, 8, 9, 10, 11, 13, 15, 16, 18, 19, 22, 23, 24, 25, 26, 27, 28, 29, and 30).

These occurred at consistent intervals (approximately 3m centres), adjacent to most but not all of the transverse beams. It is believed that these are the remains, sawn off near the invert of the lock, of training piles associated with the turf lock. Comparative information regarding training piles is scarce. A visit was paid to Garston Lock, which has been substantially rebuilt in the style of a turf-sided lock. Training piles (referred to in the report as 'king posts') at this lock are spaced at variable intervals between 1.1m to 1.3m centres with one interval at 1.4m.

Historic photographs of locks provide limited information. Two photographs of the Lea and Stort navigation (Figs 70.1 and 70.2) show what would now be called 'king posts', clearly serving the additional function of 'training piles'. The photographs are oblique and there is little to provide a scale of distance but it might reasonably be assumed that they lie at around 3m centres. On the Wey Navigation at Paper Court Lock (Fig 70.3) something more akin to a training 'fence' appears to have been provided but this might relate more to the anticipated size of craft at the time.

- timbers of various dimensions also protruded from the lock invert; (contexts 014, 019, 024, 027 and 028; Figs 7, 12, 17, 20 and 21).

These relict timbers tended to occur at the eastern end of the lock. There are too few of them to make any pattern analysis feasible but it is practically certain that they relate to an earlier configuration of the lock and it is felt likely that they are the remains of the turf-sided lock. The lock at Garston was shortened by abandoning part of the upstream structure. It is possible that the distribution of surviving timbers within the chamber at Sheffield Lock relates to a similar circumstance.

Phase 3: the scalloped brickwork lock
This is the existing Sheffield Lock structure and records of this phase relate to the sequence and process of its construction.

The lock comprises a supporting timber framework that is largely invisible when the lock is in use. It consists of:

- transverse beams (contexts 072, 086, 087, 088, 089, 090, 091, 092, 093, 094 and 098; Fig 3.1) laid at approximately 3m intervals on the natural gravel of the lock floor (contexts 082 and 083).

- trapezoid section king posts (contexts 039, 040, 041, 042, 043, 044, 045, 046, 047, 048, 049, 050, 051, 052, 053, 054, 055, 056, 057, 058, 059 and 060; Figs 3.1, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52 and 53).

These were tenoned into the ends of the transverse beams (context 055; Fig 61) at a slightly oblique angle enabling the king posts to be erected to a batter (context 050; Fig 3.4). The top of each king post was secured with a ground anchor consisting of a metal bar (contexts 005, 010, 065, 071 and 075; Figs 3.2 and 3.3).

- cill beams between each pair of king posts. These could be examined at two points only: at the base of context 055 (context 061; Figs 3.1 and 60) and between contexts 040 and 041 (context 080; Figs 3.1 and 57).

It was not possible to be certain but it appeared that the cill beams were halved into the transverse beams and the king post, whose tenon was offset (Fig 61), clamped the ends of the cill beams in place. A schematic, exploded drawing (Fig 3.6) demonstrates this.

- timber piling secured with hand-made nails to a transverse beam (contexts 072 and 081; Figs 3.1 and 58).

This piling was presumably intended to protect and retain the natural gravel (contexts 082 and 083) at the western (upper) end of the lock against scour produced when the paddles at this end of the lock were raised.

The remaining components of the scalloped lock are executed in brickwork. These comprise:

- a brick invert at the western end of the lock (contexts 077, 078 and 079; Figs 3.1, 54, 55 and 56).

- the scalloped walls which give the lock its special character (contexts 099, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121 and 122; Fig 3.1).

The brick invert at the western end of the lock was clearly intended to offer further protection against the effects of scour produced when the paddles at the upper end of the lock were opened. The need for this is demonstrated by the significant scour hole that was found upon draining of the lock, exposing the natural gravel (context 082; Figs 3.1 and 59) and severely eroding the transverse beam that passed through this position (context 087; Fig 3.1). It was not possible, at the time of the recording project, to directly observe the rush of water into the lock upon opening of the upper paddles. However, observation of a similar scalloped lock at Aldermaston showed that there was considerable turbulence, particularly in the vicinity of the first and second bays from the upper gates (Fig 71.3). At Sheffield Lock this is where the greatest erosion of the lock invert was located.

The scalloped walls themselves are an interesting engineering feature that, because of their configuration, must have required considerable effort and resources to construct. They are segmental in plan, abutting a king post at each of their ends. They rest upon timber cill beams at the level of the lock's invert. They are battered to the same angle as the king posts and appear to be a single brick thick for most of their depth. The complete replacement of a king post (context 057) enabled a partial inspection of the rear of the scalloped wall at this position. It was apparent that the scallop wall thickened below a point approximately 1.15m above the level of the invert. A postulated transverse profile of the scallop wall has been suggested on Section 6 (Fig 3.4). The height of this thickening above the invert of the lock is approximately coincident with the profile of the turf-sided lock, projected from a cut (context 125) identified in Section 6 and this may be significant.

The scallop walls are, in fact, horizontal arches and it must be presumed that they were intended to resist a horizontal force. In this context it is notable that the king posts are trapezoidal and may be considered to be equivalent to key stones. The side of the lock is a retaining wall. A useful over-simplification for calculating the effective position of thrust of the retained material against a retaining wall is that this position occurs at approximately ⅔ of the depth of the retained material. It is also notable that it is at such a depth that the scalloped wall thickens (Fig 3.4).

Horizontal arches or curved retaining walls are common throughout the canal system. Traditional canal bridge spandrel walls are curved in both the horizontal and vertical planes, presumably to better resist the forces applied to them. No doubt it would have been simpler and cheaper to construct them 'on the square' but this economy was ignored more often than not.

The character of the scalloped wall brickwork
The construction of the scalloped walls varied depending upon their location in the lock. During the course of this project the only taking down and rebuilding of the scalloped walls took place at the level of the highest few courses, limiting the possible extent of investigation. Therefore the recording and analysis below depended upon the surface appearance of the brickwork. With this *caveat* the following account is offered:

- header bond brickwork extending from invert of lock to between 0.6m and 1m above the level of the invert on the southern side of the lock, headers *c* 105mm wide x 65mm deep (contexts 110, 111, 112, 113, 114, 115, 116 and 121; Fig 3.1).

- header bond brickwork extending from invert of lock to about 2m above the level of the invert on the northern side of the lock, headers *c* 105mm wide x 65mm deep (contexts 106, 107, 108 and 109; Fig 3.1).

It is believed that this brickwork could be surviving remnants of the original scalloped wall construction. On the southern side of the lock the level at which this style of brickwork terminates is approximately coincident with the level at which the thickening of the scalloped walls occurs. This may be significant.

Phase 4: historic repairs to phase 3
Three different types of historic repair or improvement appear to have been carried out. These are:

- reinforcement of the joint between the king posts and the transverse beams (contexts 016, 021 and 038; Figs 3.1, 9, 14 and 31).

- reinforcement of the base of a scallop wall (context 011; Figs 3.1 and 4).

In three locations it is clear that the mortice and tenon joint between the king posts and the transverse beams must have failed. The foot of the king posts (contexts 053, 056 and 058; Fig 3.1) were retained using the same early pattern railway line that had formerly been used for training piles (contexts 016, 021 and 038; Figs 3.1, 9, 14 and 31).

In one location it seems likely that the cill beam supporting the scallop wall had failed. The base of the scallop wall was reinforced using timber piles (context 011; Fig 4).

Phase 5: modern repairs and the sections
Quite extensive repairs were carried out from the late 1970s onwards. These are referred to in a project brief prepared by British Waterways (now the Canal & River Trust; Anon, undated) probably prepared *c* 2000. These repairs seem to have comprised the following:

- replacement of the lock fore bays with concrete.

Both lock fore bays were replaced with mass concrete supported with steel sheet piling (contexts 096 and 097; Fig 3.1).

- reinforcement of the joint between the king posts and the transverse beams

It was apparent that the mortice and tenon joints between the king posts and the transverse beams must have failed, or were believed to have failed, generally, around the lock. A number of metal brackets had been inserted to support this joint. These were not recorded specifically by this project but they may be seen in a number of the photographic figures (eg Figs 5, 11, 14, 15, 18, 32.2 and 33.2).

- rebuilding of substantial areas of the scallop walls

Around the lock the same brick size employed in what is presumed to be the original scallop wall construction was re-used in stretcher bond and a modern brick size was also employed in stretcher bond. This style of brickwork probably represents rebuilding and repair.

- reinforcement of the base of a scallop wall.

As had previously occurred (Phase 4) it seems likely that a cill beam supporting a scallop wall had failed. The base of the scallop wall was reinforced with brickwork (context 013; Fig 6).

- resealing of the joints between the king posts and the scallop walls.

It was noted in the project brief that the joints between the king posts and the scallop walls had opened up, resulting in loss of the fine components of the fill behind the lock walls and the saturation of the fill. The method of repair was to auger holes behind the king posts and introduce grout under pressure. A British Waterways engineer, at the time, had expressed concern in a memo that this procedure was ineffective. That he was right to be concerned is demonstrated by the sections that were recorded during the excavations for replacement of the tie rods (Figs 3.1, 3.2 and 3.3, sections 1, 2, 4 and 5). These clearly show that the grout, where present, is situated between 0.3 to 0.5m behind the king posts and is discontinuous.

The finds

There were no significant finds from the excavations.

Significance

Sheffield Lock is a scheduled ancient monument and is therefore of national significance. The work undertaken as a requirement of scheduled monument consent has thrown further light on the construction and repair of turf-sided locks whose systematic investigation was begun at Monkey Marsh Lock and Garston Lock (Harding and Newman 1990 and Trust for Wessex Archaeology 1994).

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Archive

The physical archive consists of:

125	Context sheets
4	Drawings
1	Hard copy of the report
1	Hard copy of the WSI

It will be deposited at a suitable museum upon approval of the report.

The digital archive consists of:

1	Digital copy of the report (.doc format)
59	Illustrations (.bmp format)

It will be deposited with the Archaeology Data Service upon approval of the report.

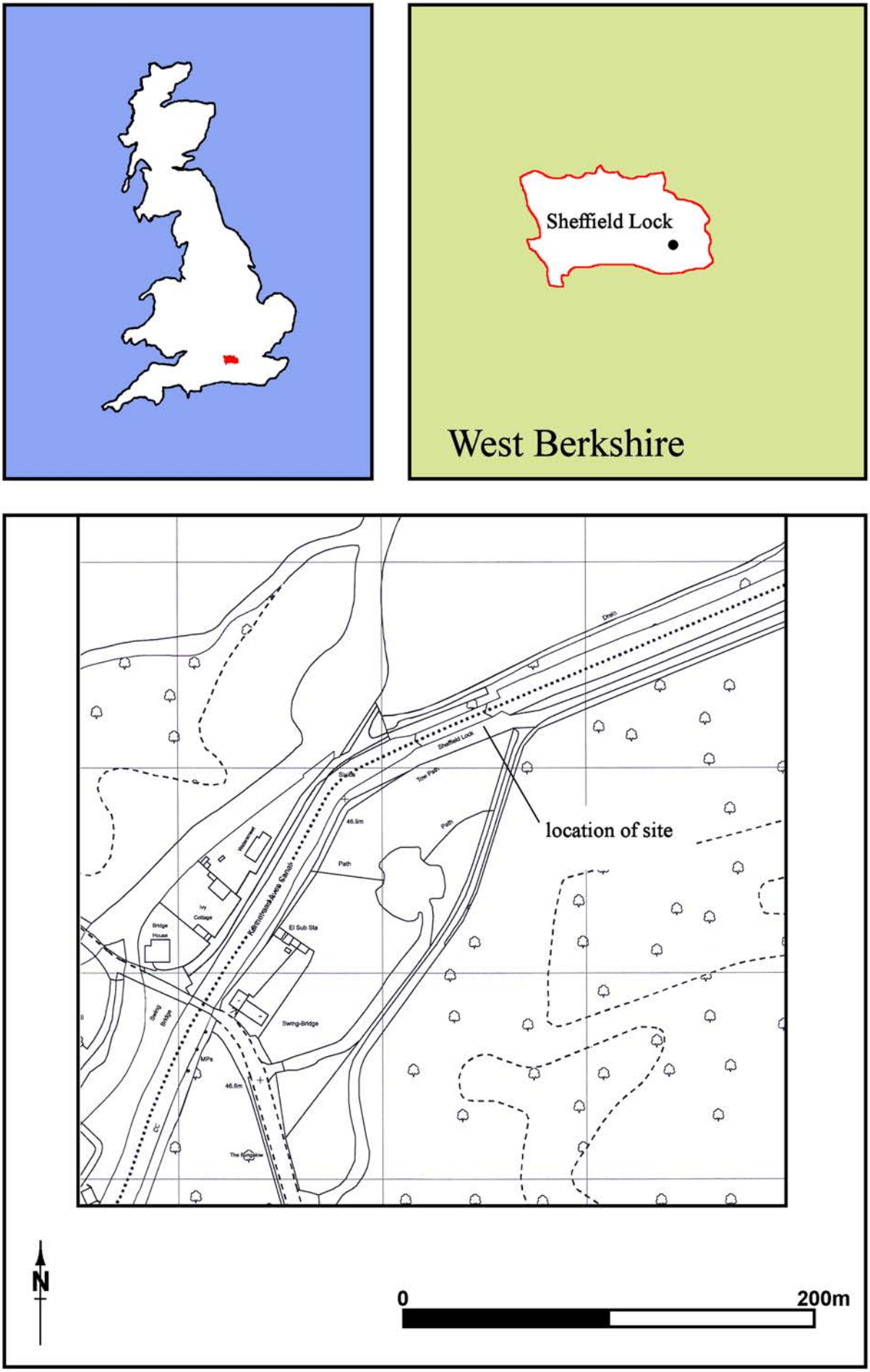


Fig 1.1: Location of site

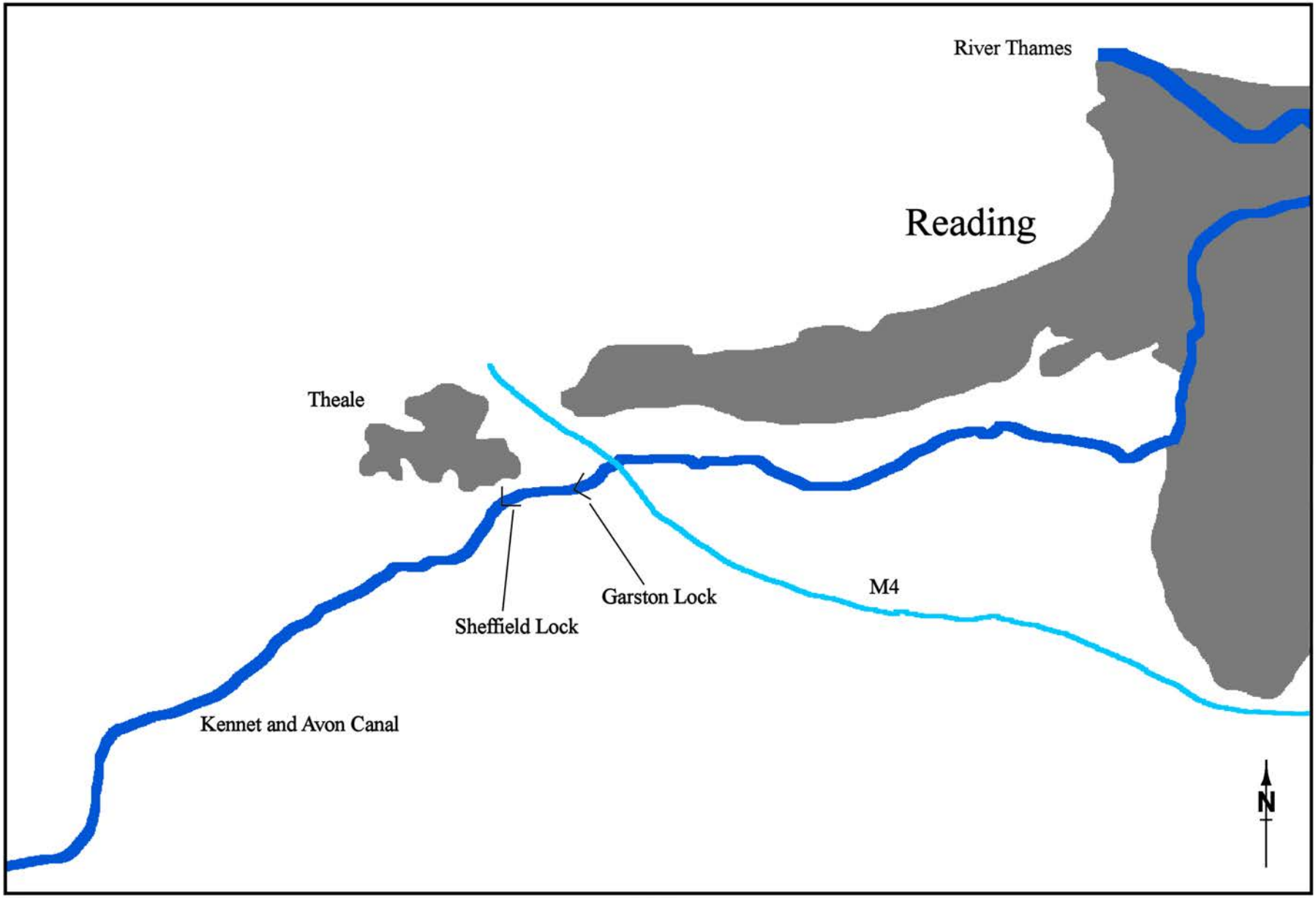
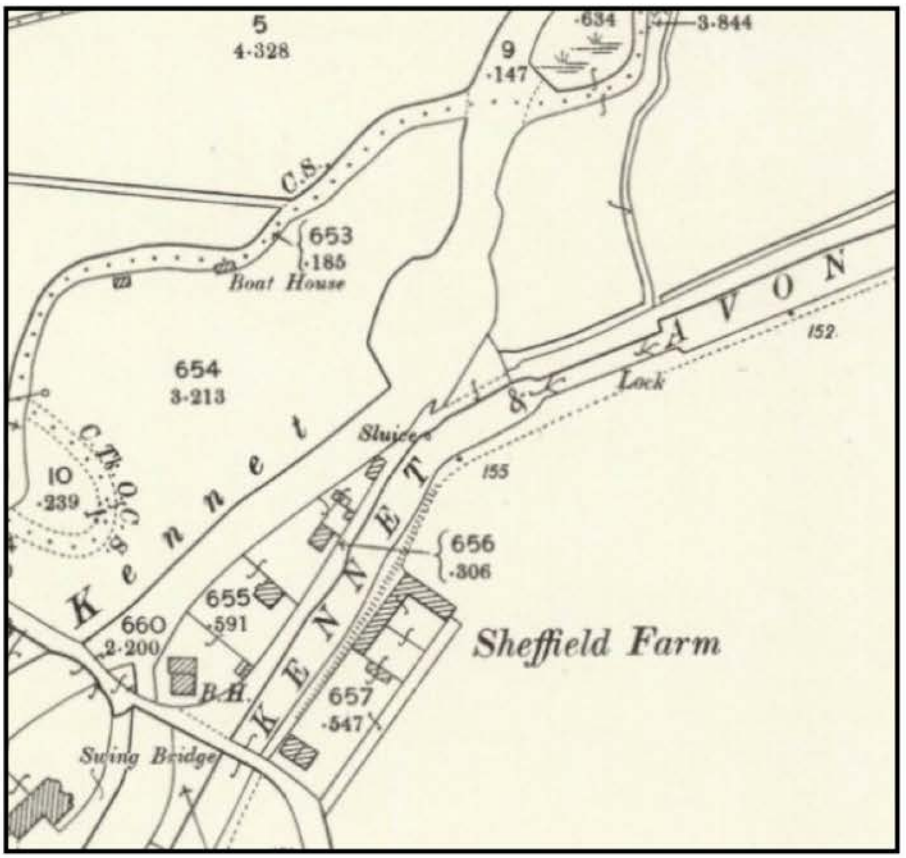
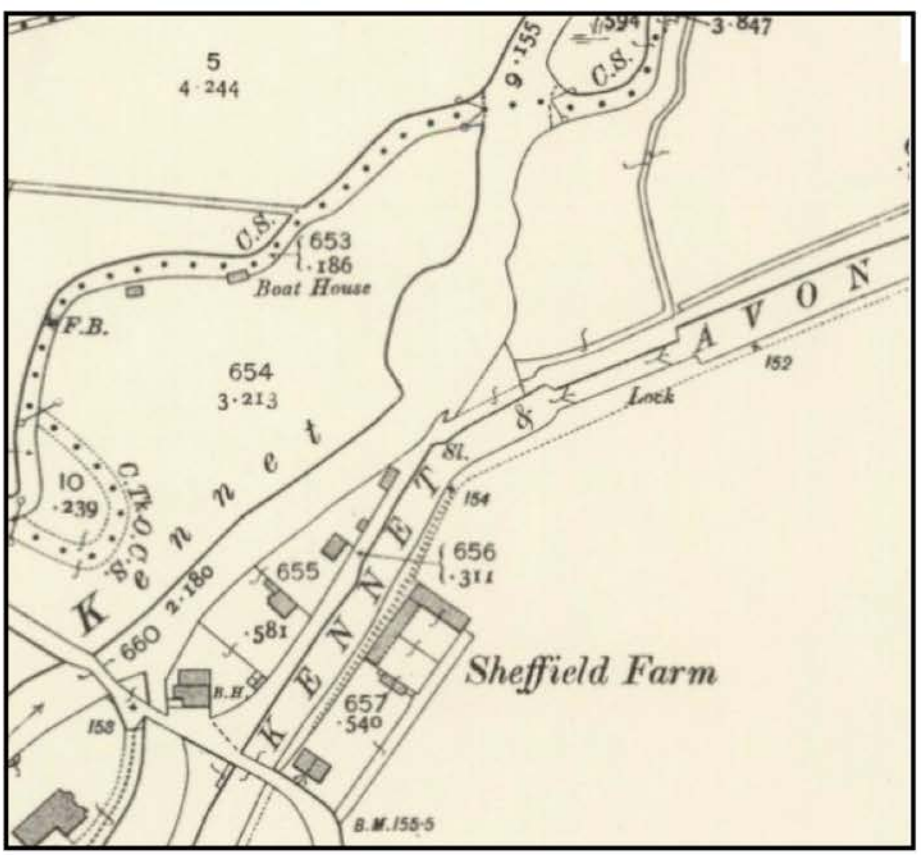


Fig 1.2: Location of site with respect to major landscape features

1899



1912



0 200m

Fig 2.1: Historic mapping

1936

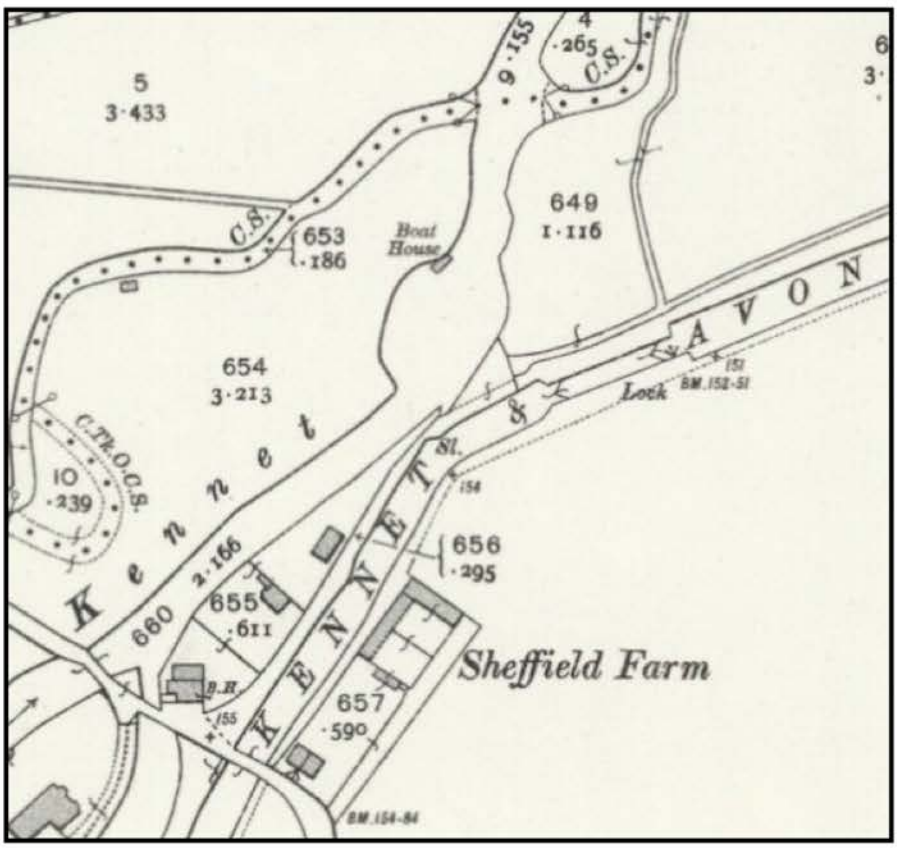


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Fig 2.2: Historic mapping

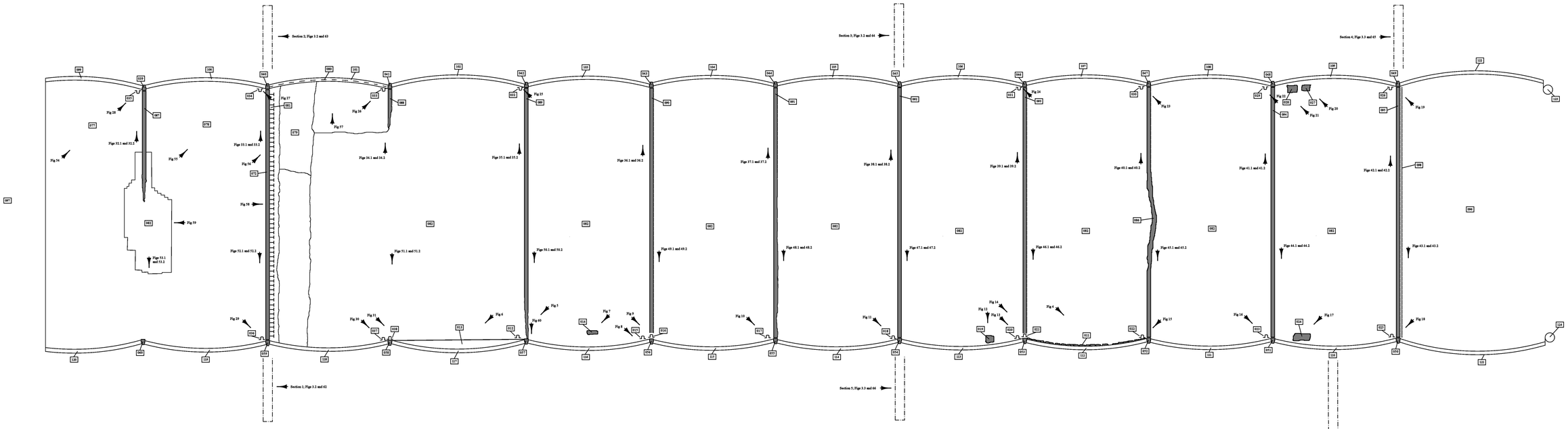
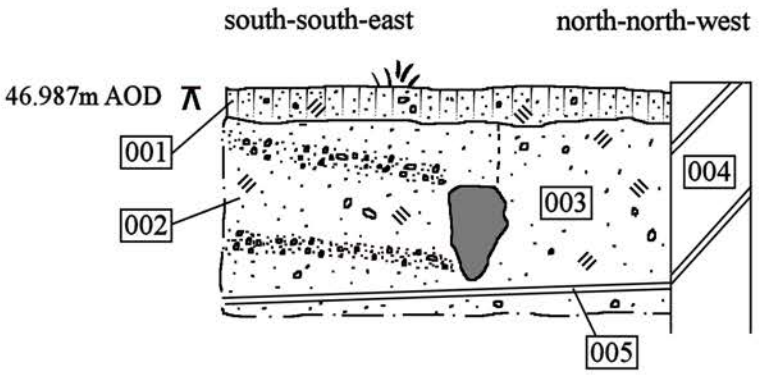


Fig 3.1 Plan of recorded features

Section 1



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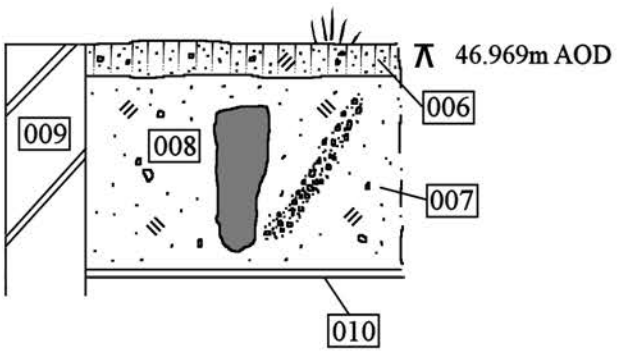
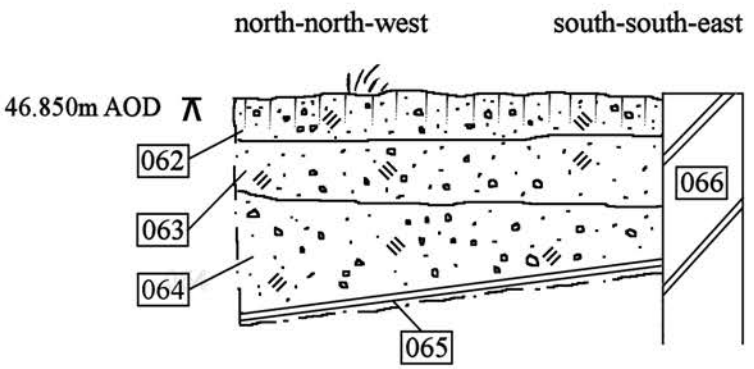


Section 3



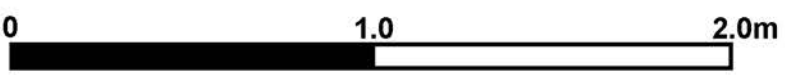
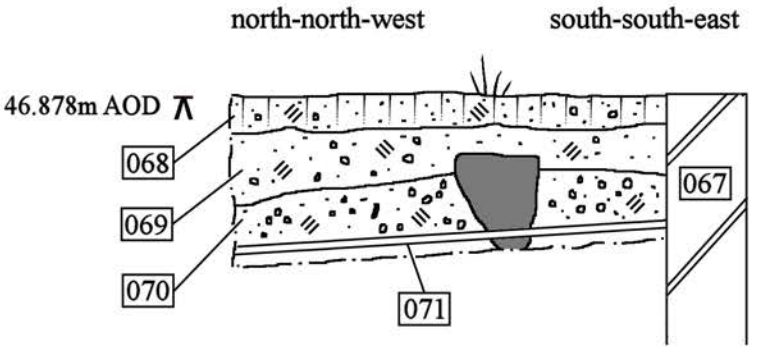
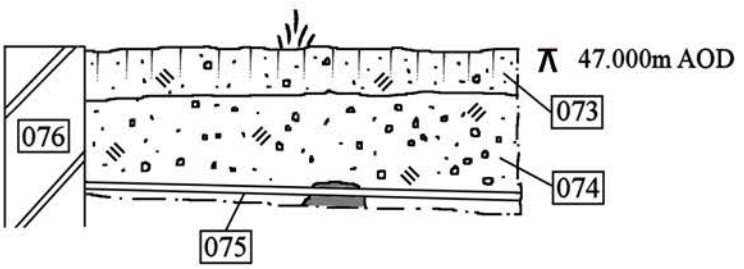


Fig 3.2: Sections

Section 4



Section 5



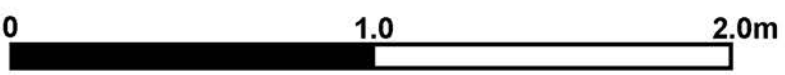
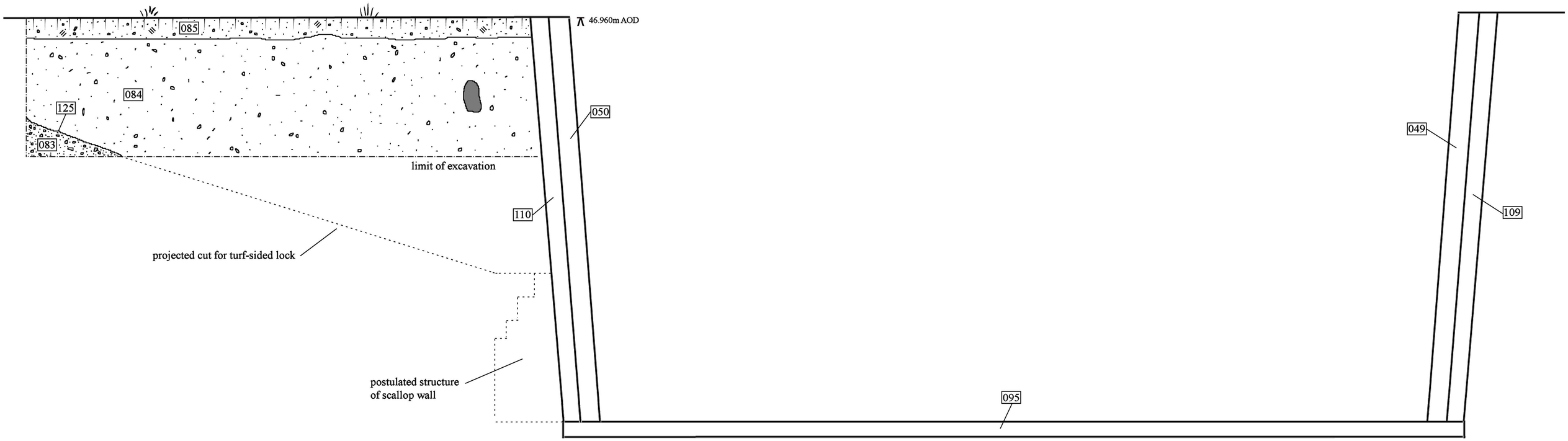


Fig 3.3: Sections

Section 6

south-south-east

north-north-west



0 1.0 2.0m

Fig 5.4: Composite section of lock

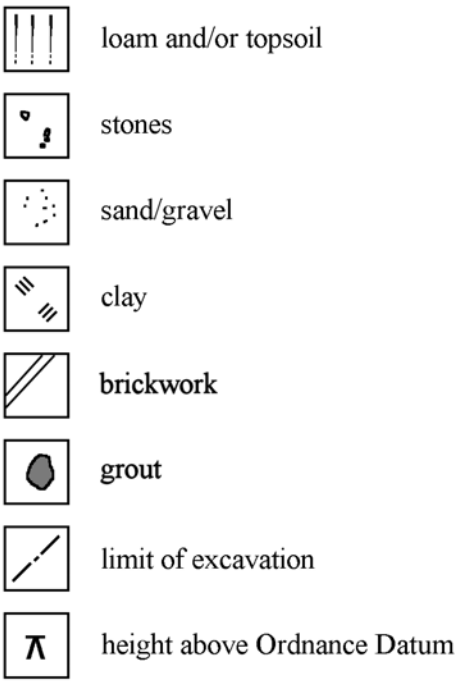


Fig 3.5: Key to sections

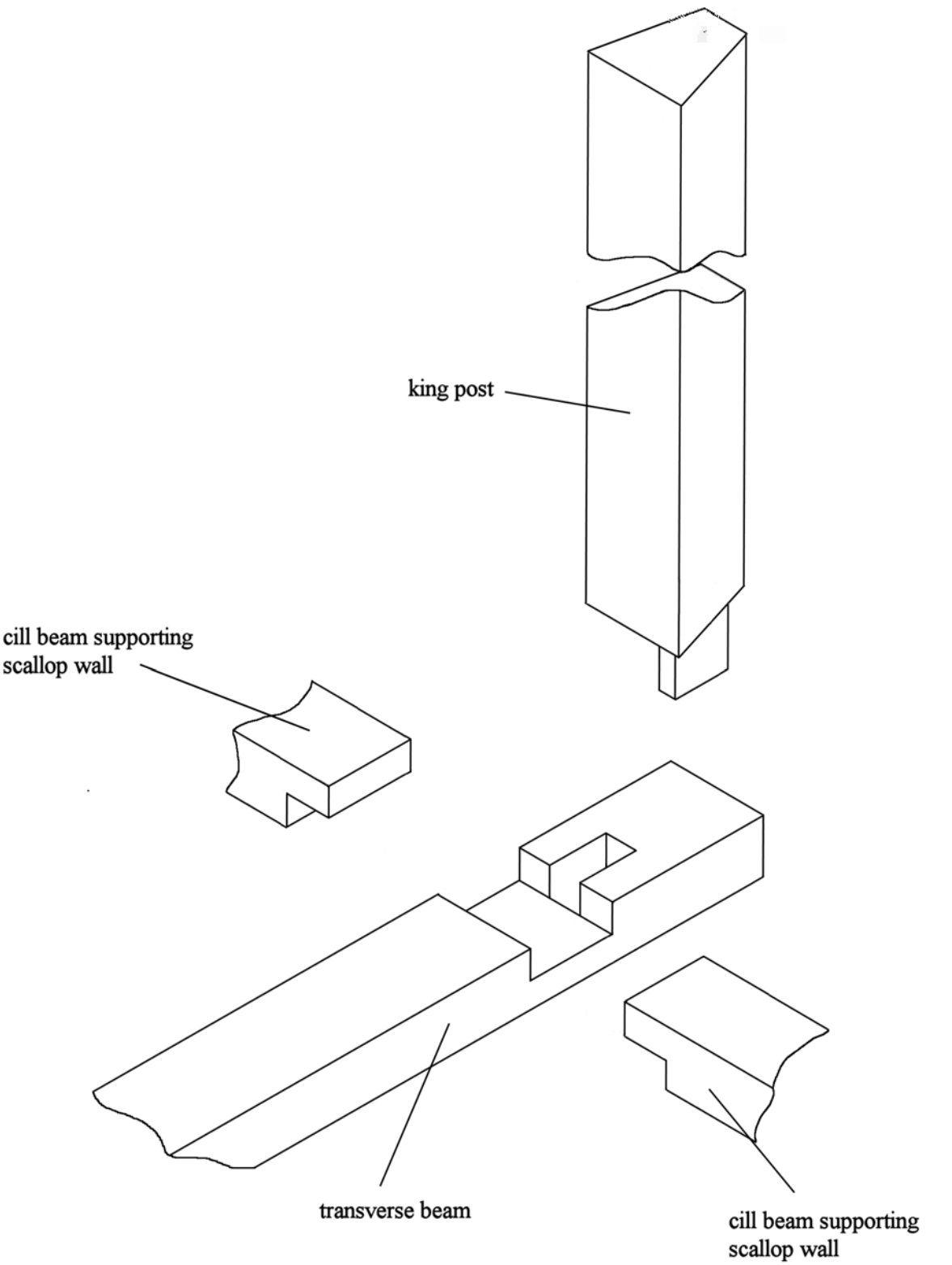


Fig 3.6: Schemattic showing arrangement of joint at base of kingpost and transverse beam

Fig 4: Context 011; timber piles following profile of scalloped brickwork

Fig 5: Context 012; early pattern rail, possibly part of turf lock

Fig 6: Context 013; 'chord' of brickwork across scalloped brickwork

Fig 7: Context 014; vertical timber forward of scallop wall, possible remains of turf lock

Fig 8: Context 015; early pattern rail, possible part of turf lock

Fig 9: Context 016; early pattern rail, repair to king post/transverse beam

Fig 10: Context 017; early pattern rail, possible part of turf lock

Fig 11: Context 018; early pattern rail' possible part of turf lock

Fig 12: Context 019; vertical timber forward of scallop wall, possible remains of turf lock

Fig 13: Context 020; early pattern rail, possible remains of turf lock

Fig 14: Context 021; early pattern rail, repair to king post/transverse beam

Fig 15: Context 022; early pattern rail, possible part of turf lock

Fig 16: Context 023; early pattern rail, possible part of turf lock

Fig 17: Context 024; vertical timber forward of scallop wall, possible remains of turf lock

Fig 18: Context 025; early pattern rail, possible part of turf lock

Fig 19: Context 026; early pattern rail, possible part of turf lock

Fig 20: Context 027; vertical timber forward of scallop wall, possible part of turf lock

Fig 21: Context 028; vertical timber forward of scallop wall, possible part of turf lock

Fig 22: Context 029; early pattern rail, possible part of turf lock

Fig 23: Context 030; early pattern rail, possible part of turf lock

Fig 24: Context 031; early pattern rail, possible part of turf lock

Fig 25: Context 032; early pattern rail, possible part of turf lock

Fig 26: Context 033; early pattern rail, possible part of turf lock

Fig 27: Context 034; early pattern rail, possible part of turf lock

Fig 28: Context 035; early pattern rail, posible part of turf lock

Fig 29: Context 036; early pattern rail, possible part of turf lock

Fig 30: Context 037; early pattern rail, possible part of turf lock

Fig 31: Context 038: early pattern rail, repair to king post/transverse beam

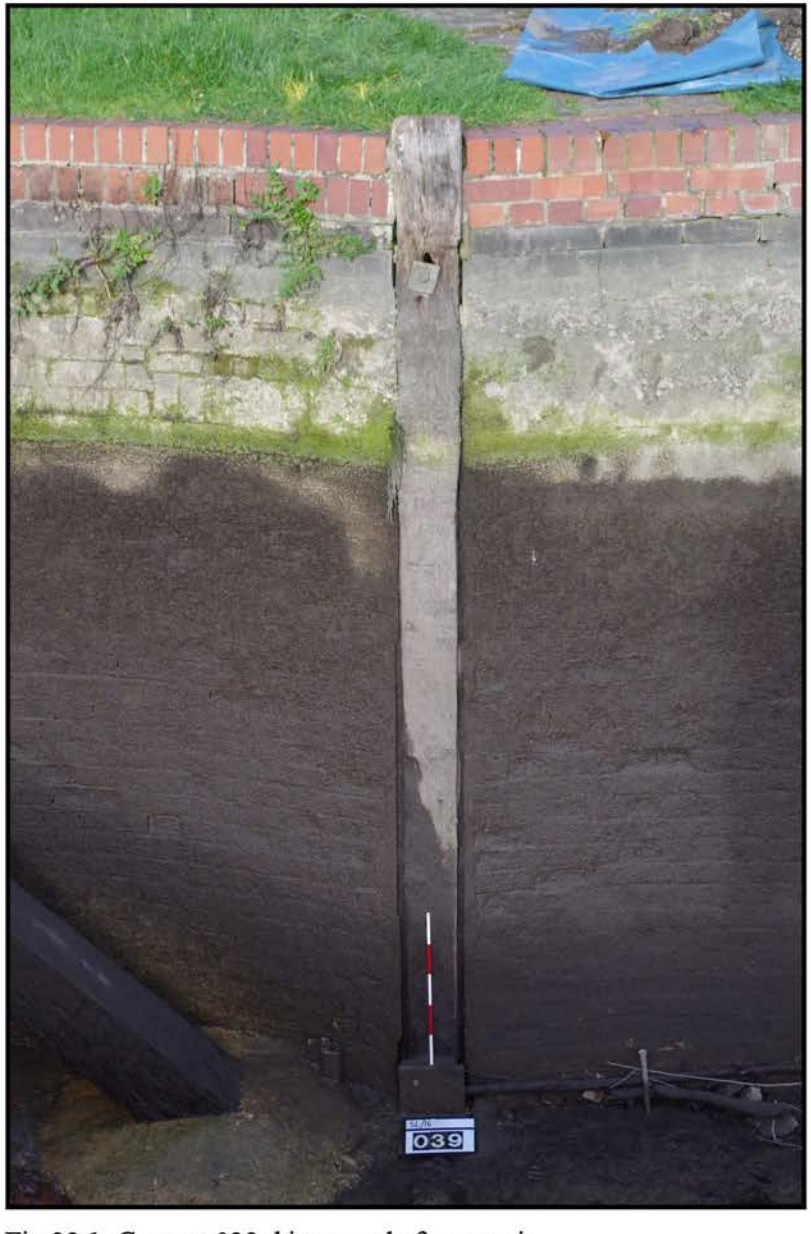


Fig 32.1: Context 039; king post before repair

Fig 32.2: Context 039; king post after repair

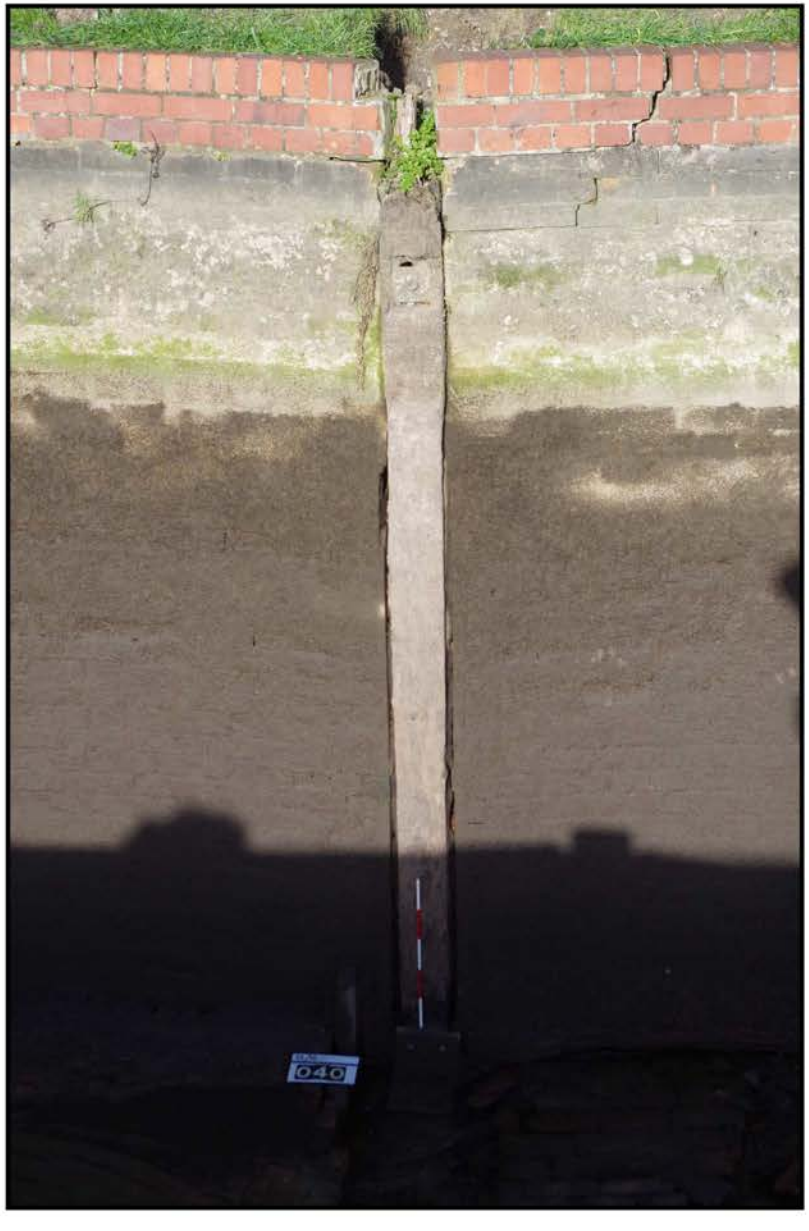


Fig 33.1: Context 040; king post before repair

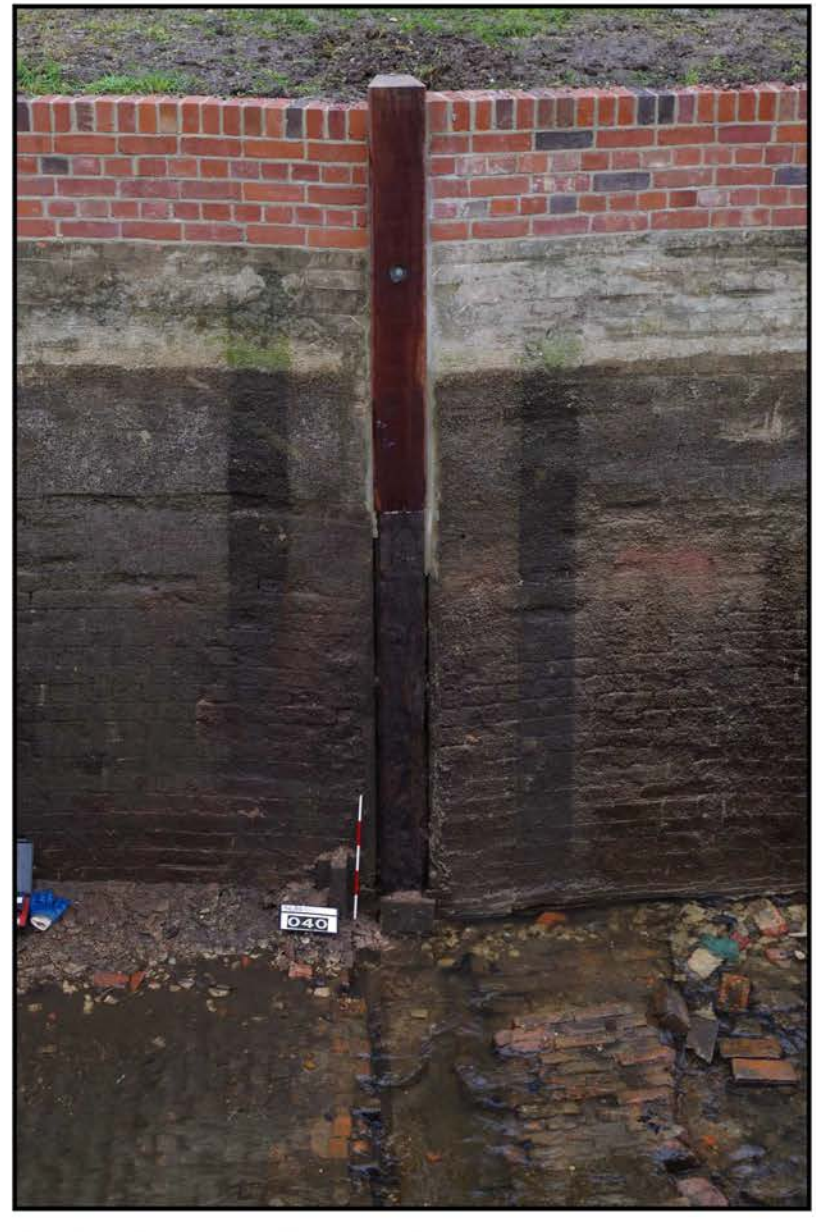


Fig 33.2: Context 040; king post after repair

Fig 34.1: Context 041; king post before repair

Fig 34.2: Context 041; king post after repair

Fig 35.1: Context 042; king post before repair

Fig 35.2: Context 042; king post after repair

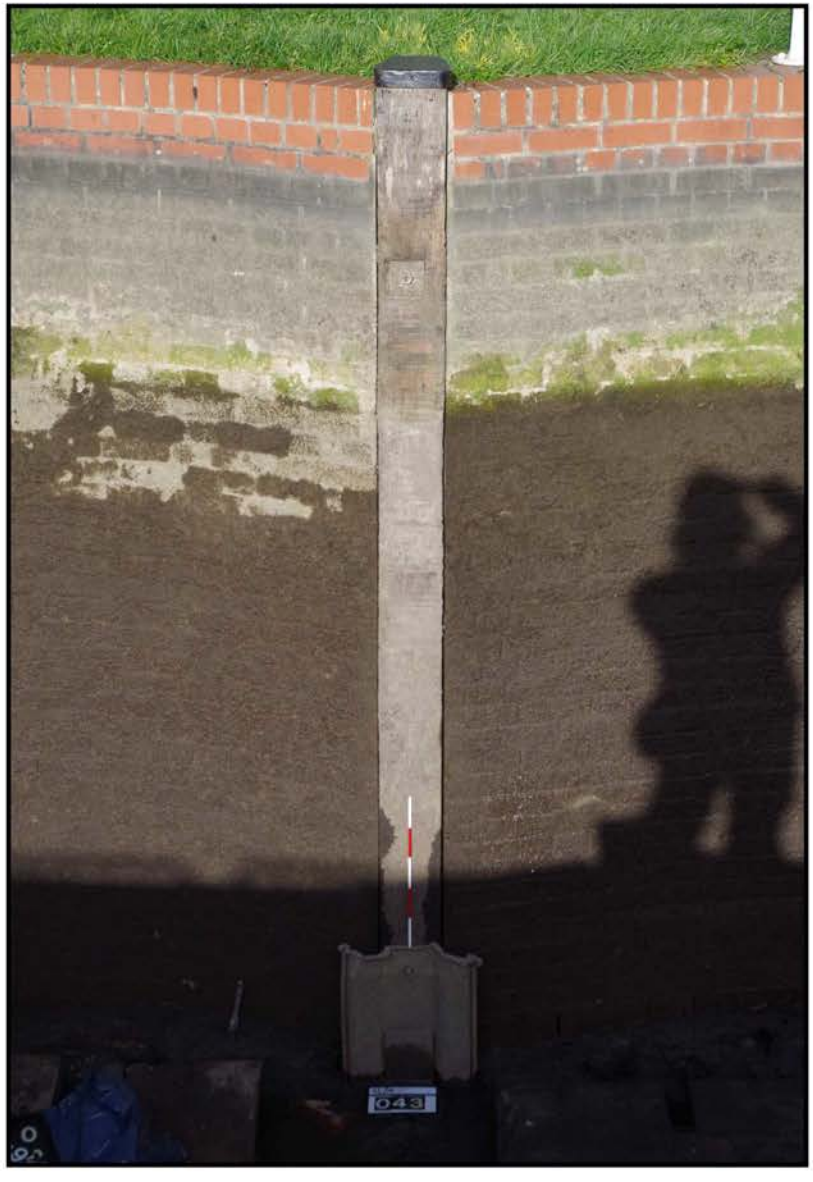


Fig 36.1: Context 043; king post before repair

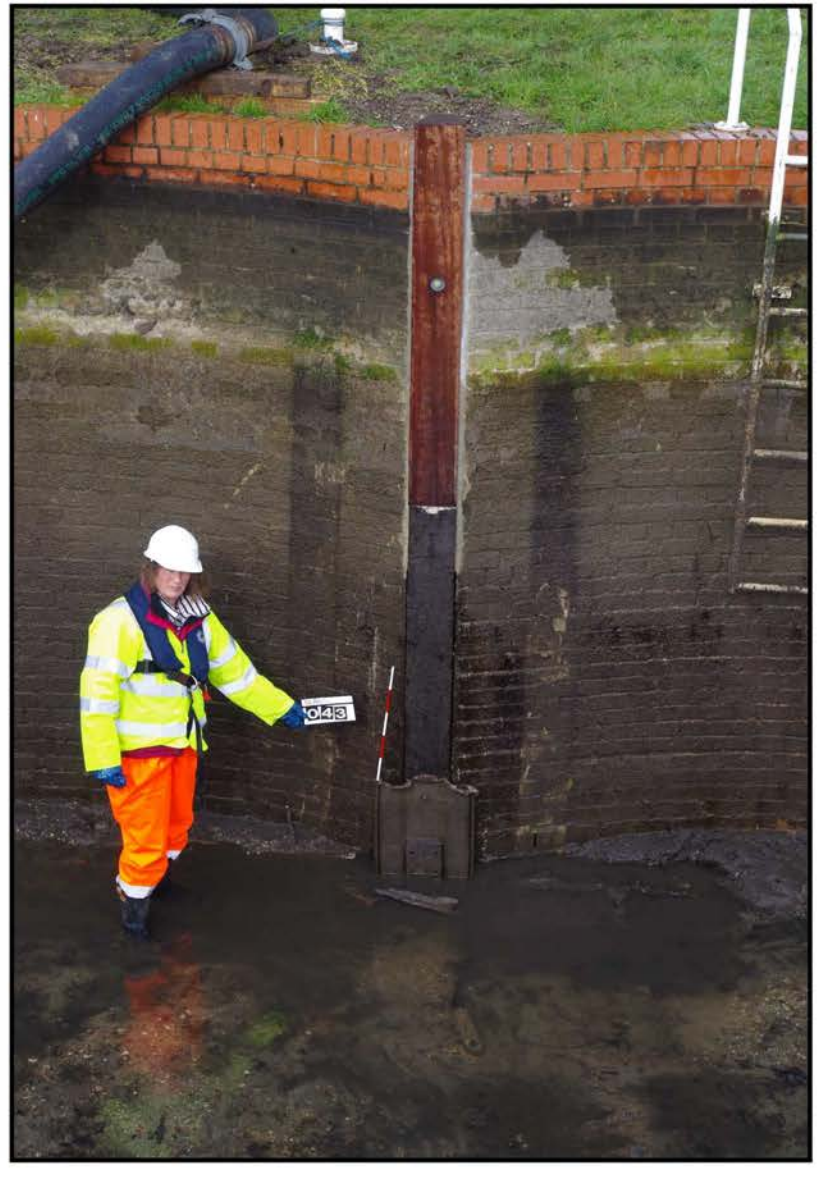


Fig 36.2: Context 043; king post after repair

Fig 37.1: Context 044; king post before repair

Fig 37.2: Context 044; king post after repair

Fig 38.1: Context 045; king post before repair

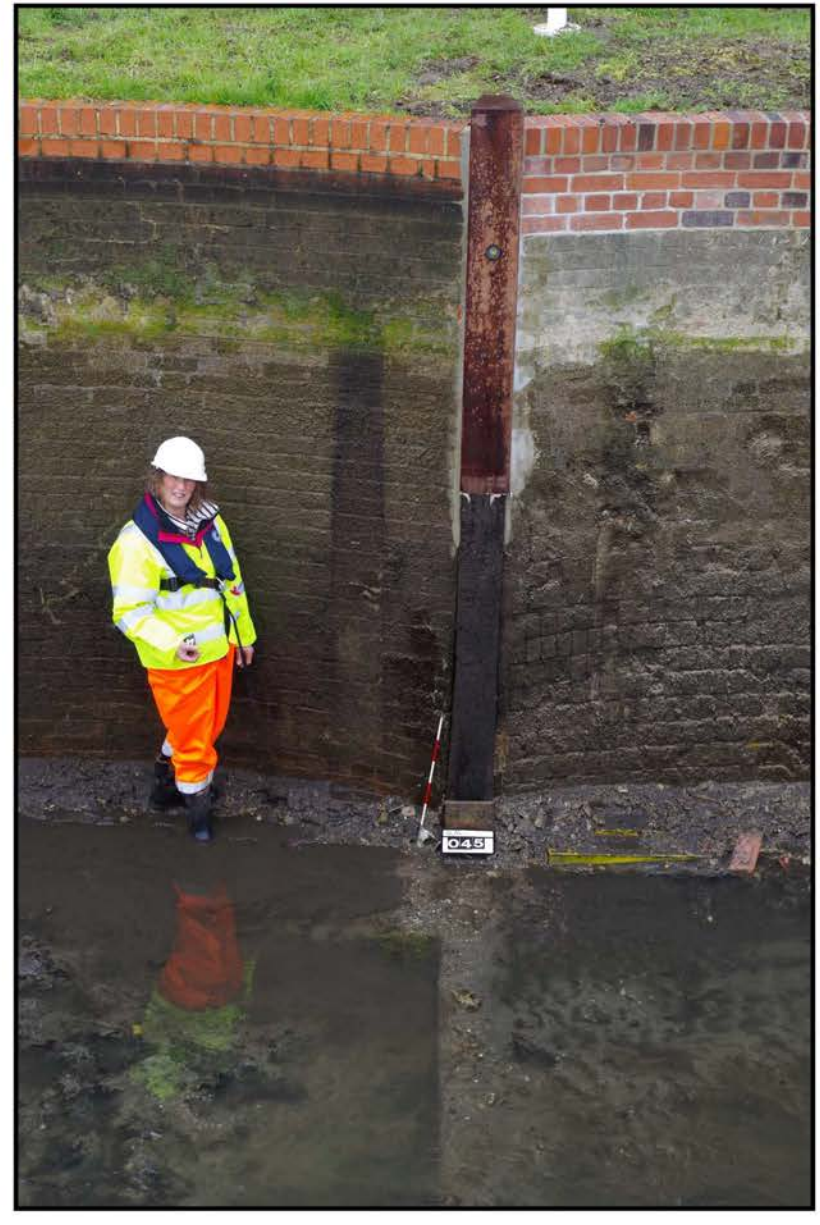


Fig 38.2: Context 045; king post after repair

Fig 39.1: Context 046; king post before repair

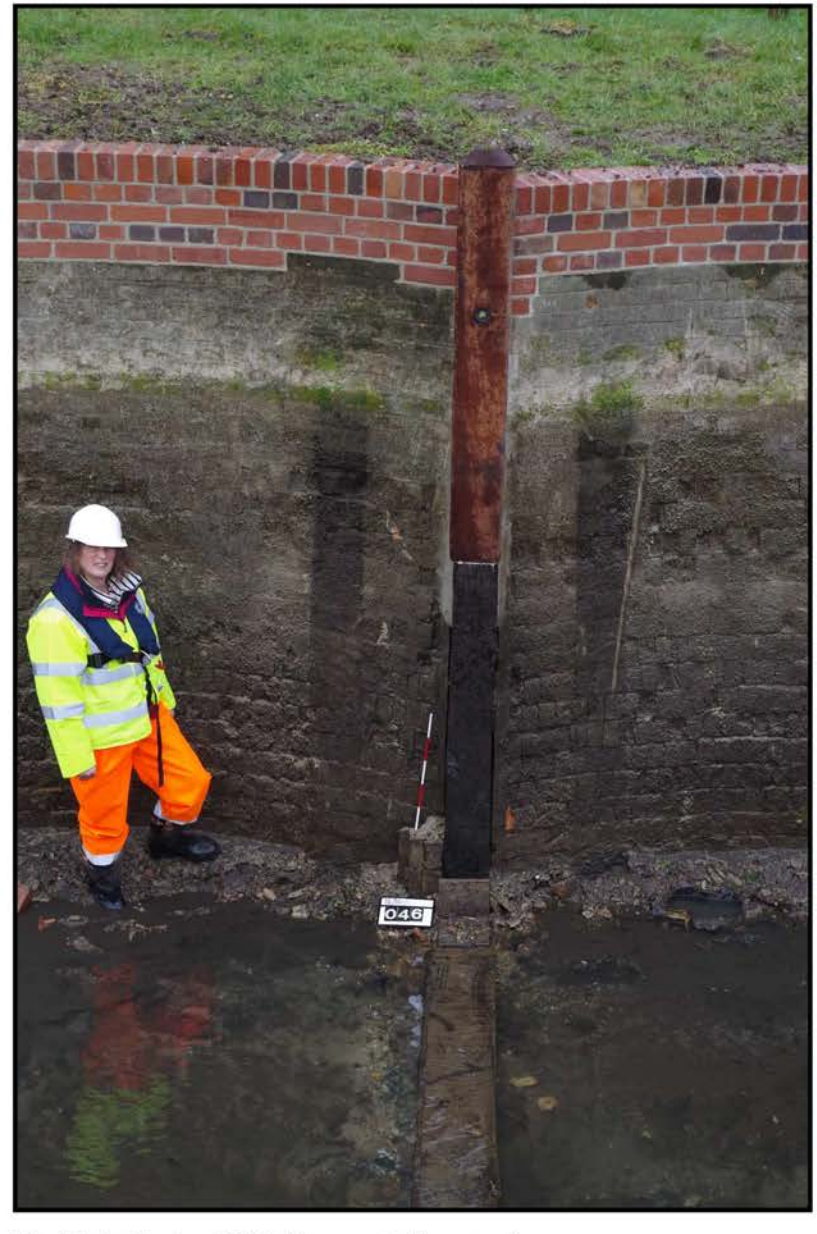


Fig 39.2: Context 046; king post after repair

Fig 40.1: Context 047; king post before repair

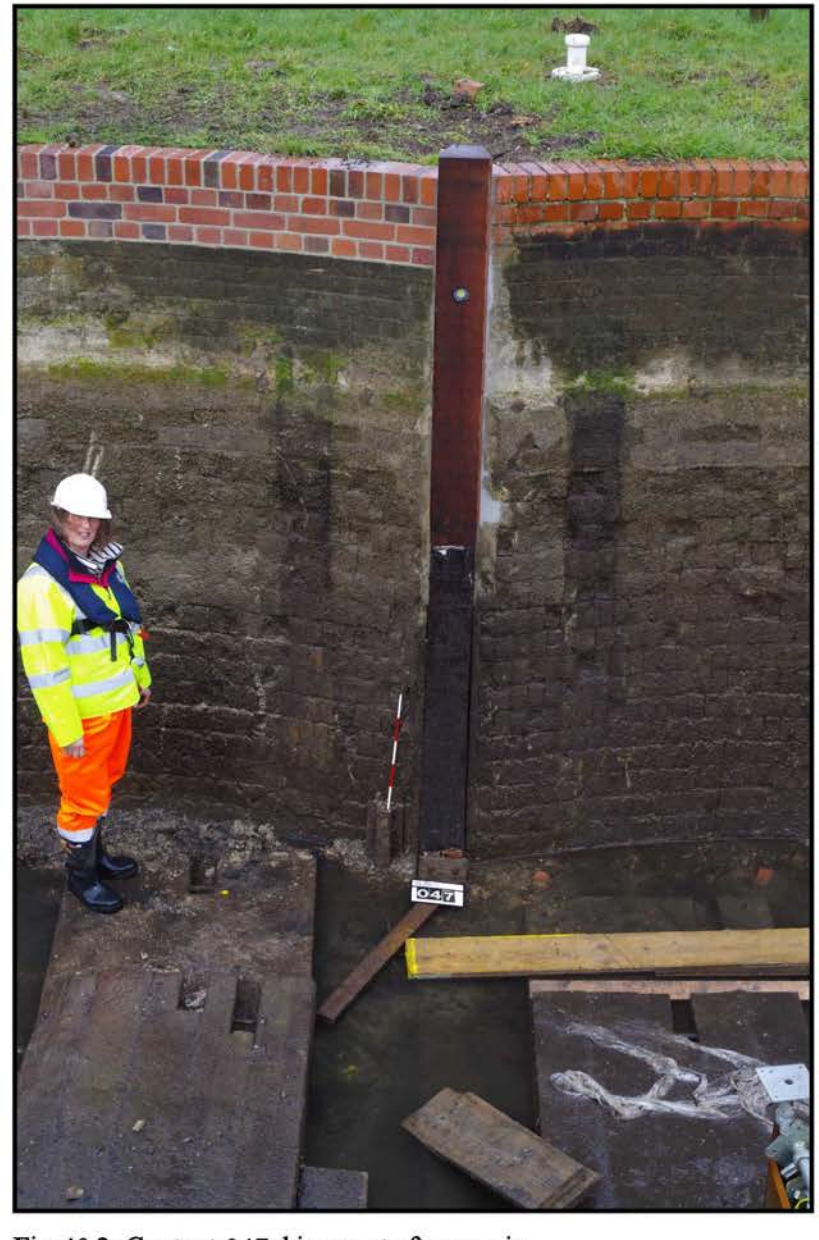


Fig 40.2: Context 047; king post after repair

Fig 41.1: Context 048; king post before repair

Fig 41.2: Context 048; king post after repair

Fig 42.1: Context 049; king post before repair

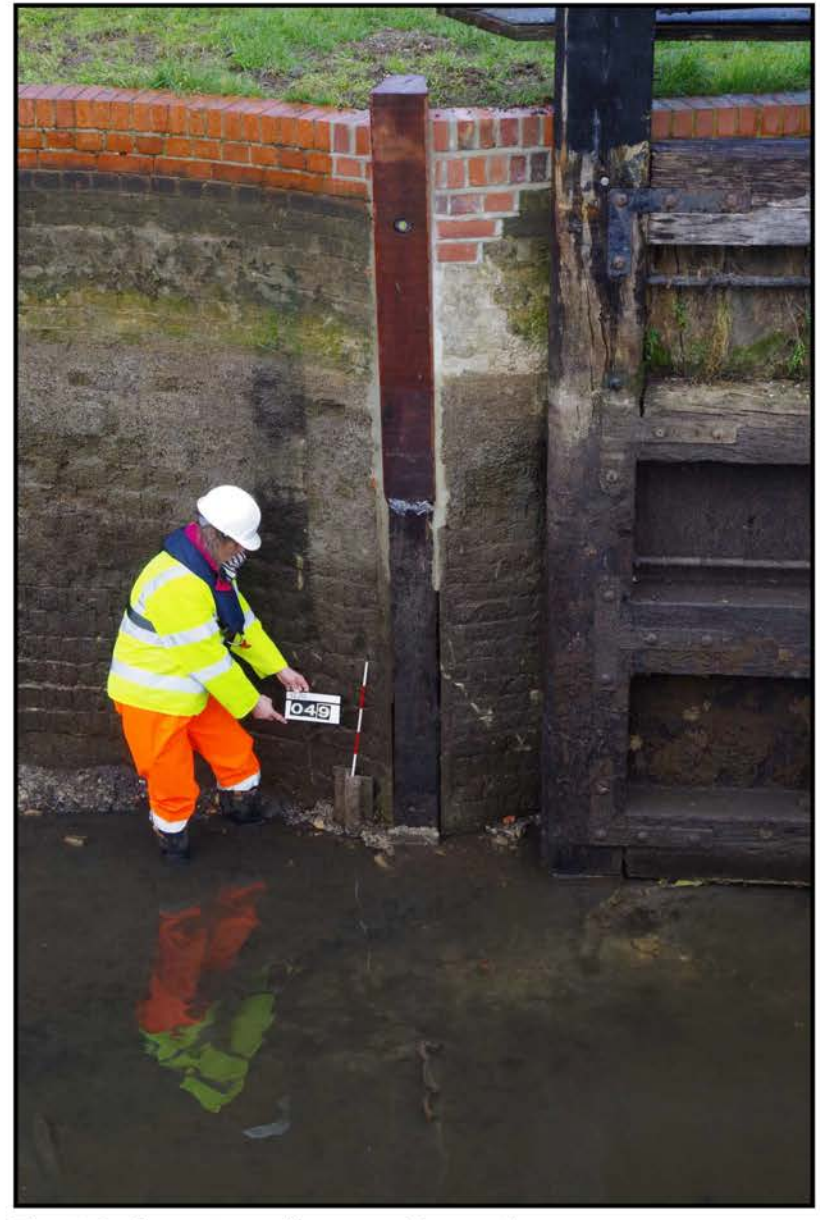


Fig 42.2: Context 049; king post after repair

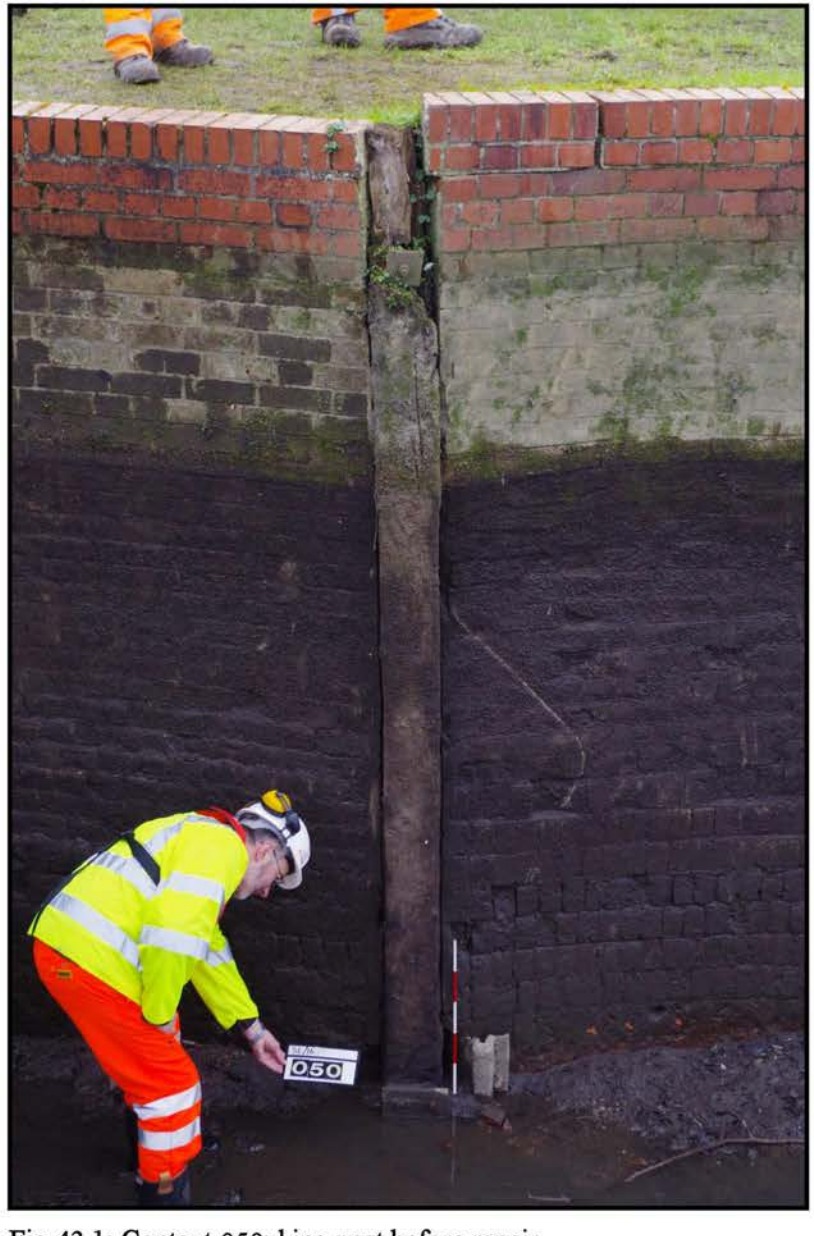


Fig 43.1: Context 050; king post before repair

Fig 43.2: Context 050; king post after repair

Fig 44.1: Context 051; king post before repair

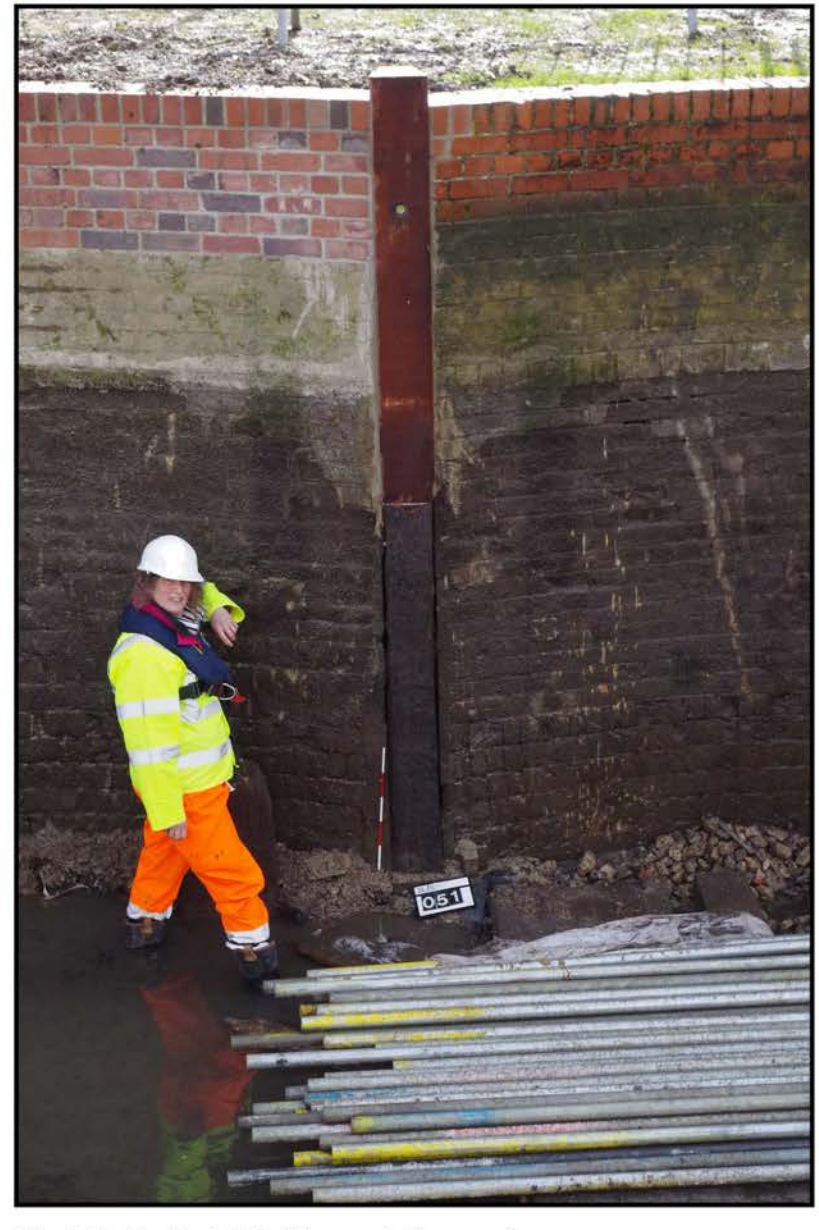


Fig 44.2: Context 051; king post after repair

Fig 45.1: Context 052; king post before repair

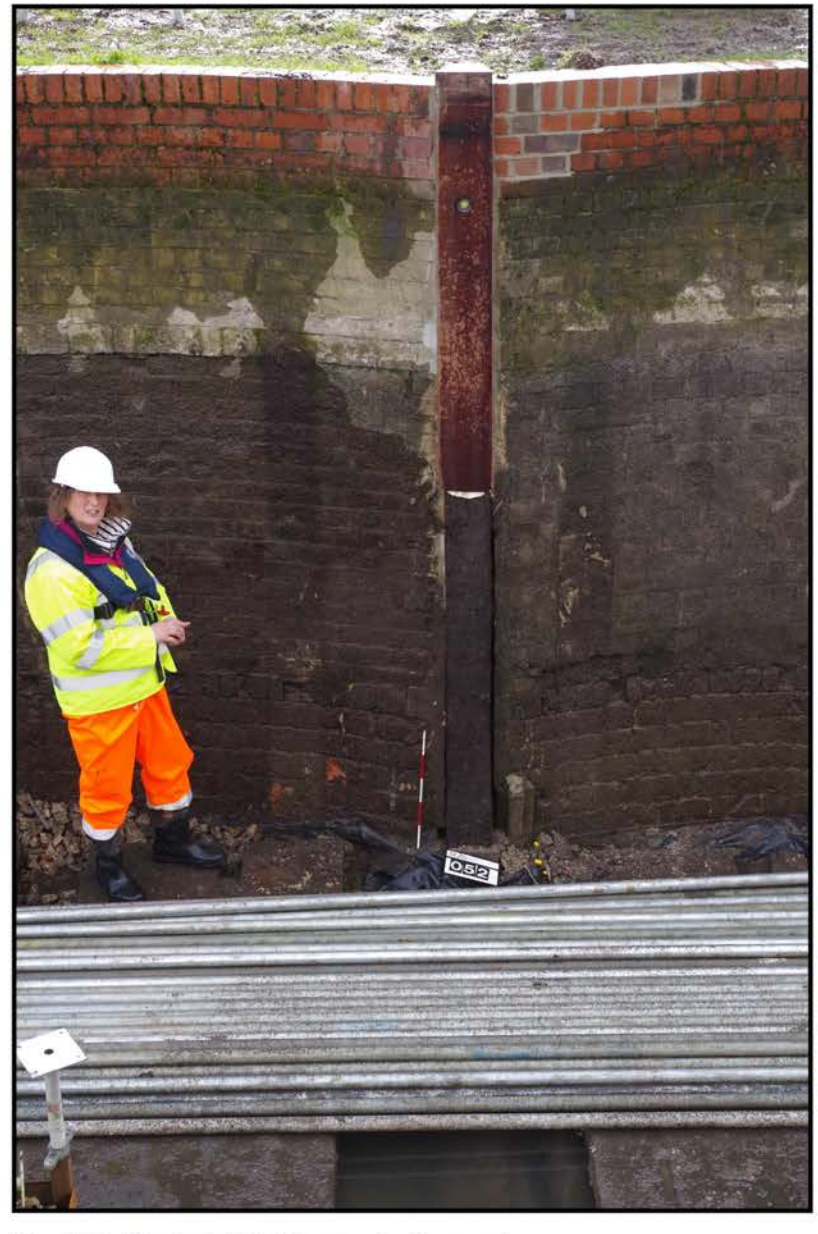


Fig 45.2: Context 052; king post after repair

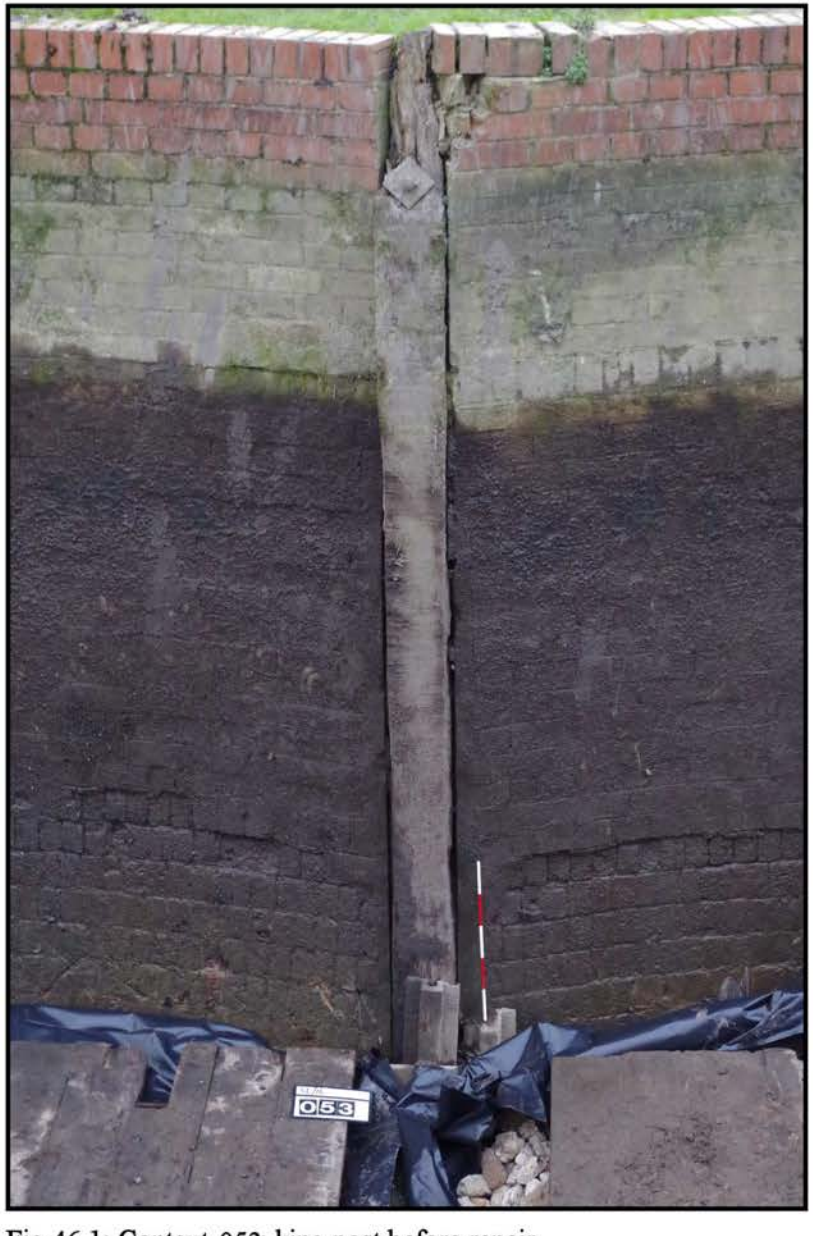


Fig 46.1: Context 053; king post before repair

Fig 46.2: Context 053; king post after repair

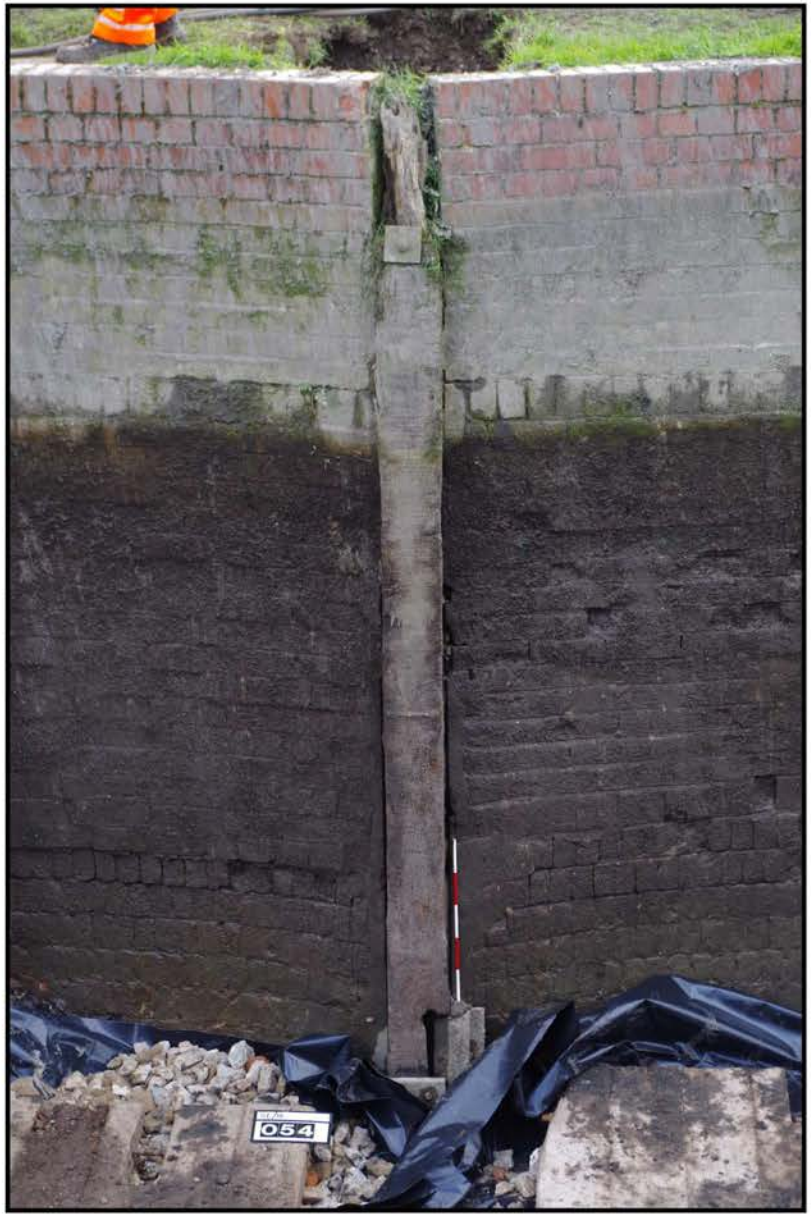


Fig 47.1: Context 054; king post before repair

Fig 47.2: Context 054; king post after repair

Fig 48.1: Context 055; king post before repair

Fig 48.2: Context 055; king post after repair

Fig 49.1: Context 056; king post before repair

Fig 49.2: Context 056; king post after repair

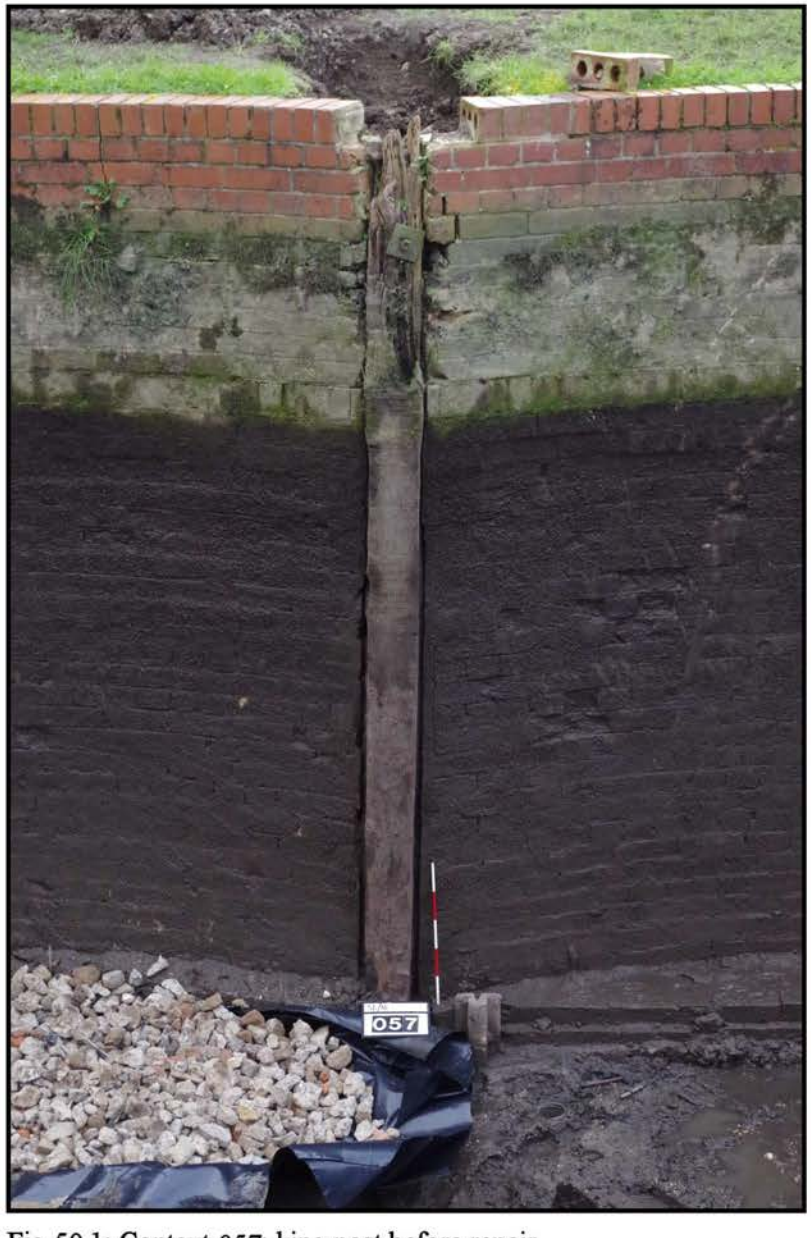


Fig 50.1: Context 057; king post before repair

Fig 50.2: Context 057; king post after repair

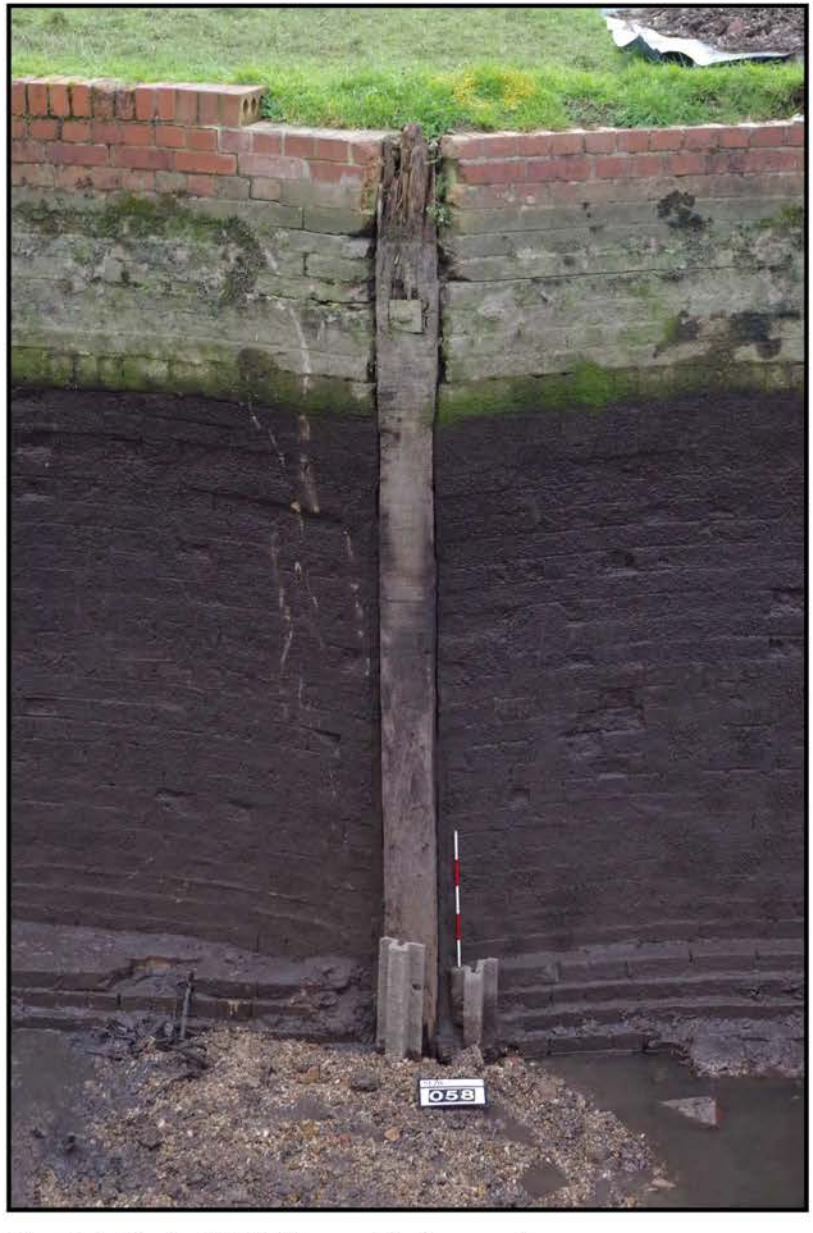


Fig 51.1: Context 058; king post before repair

Fig 51.2: Context 058; king post after repair

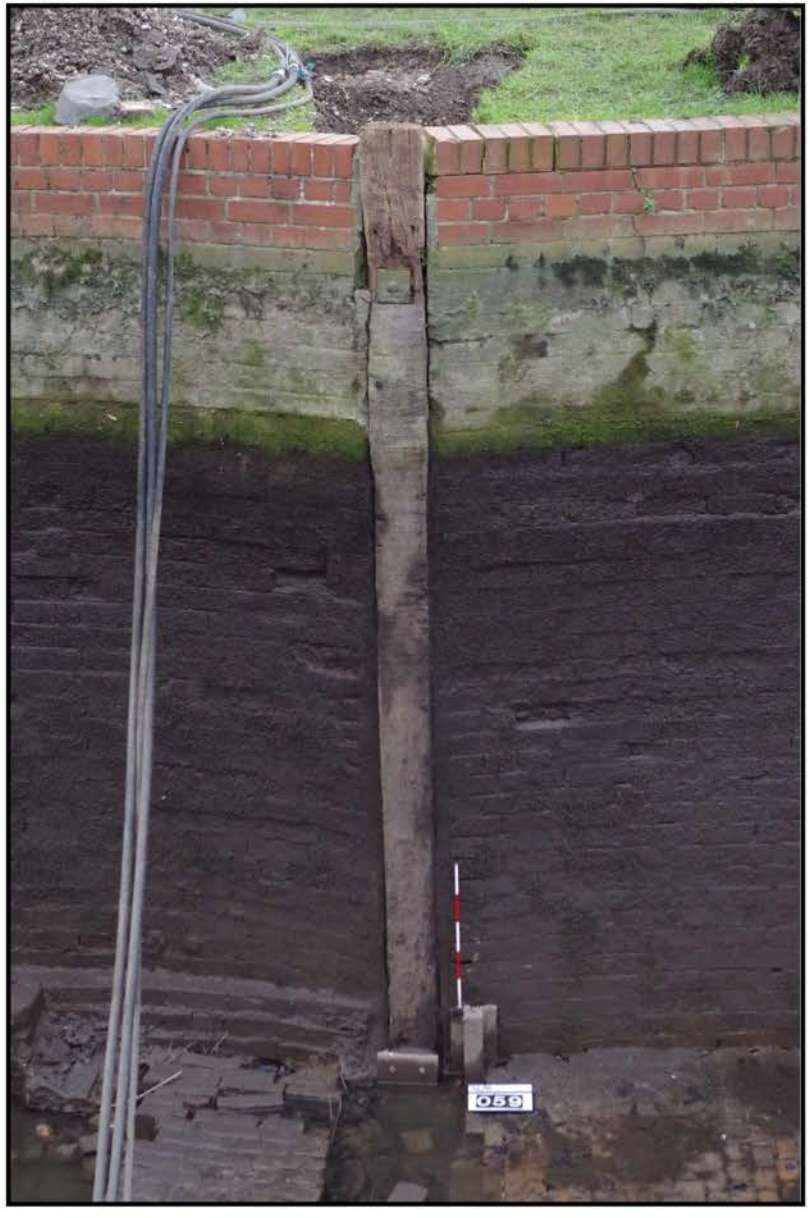


Fig 52.1: Context 059; king post before repair

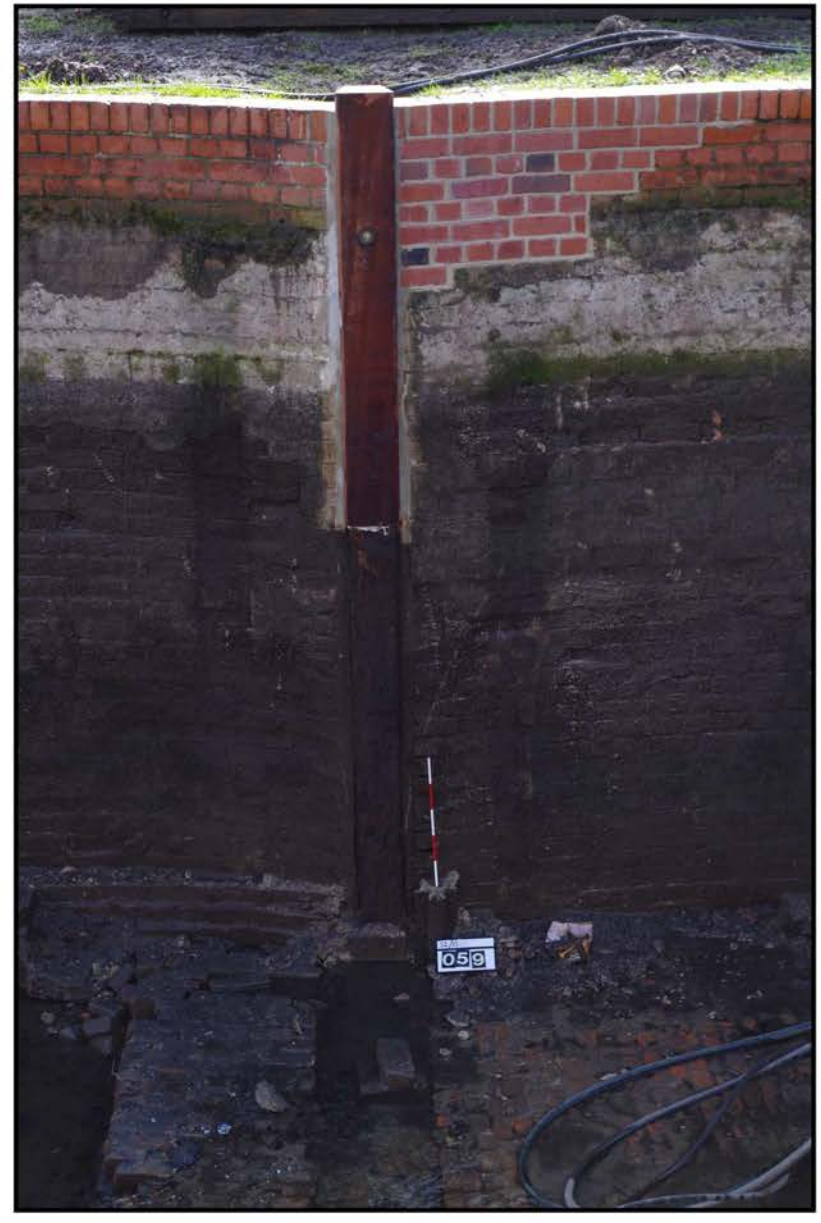


Fig 52.2: Context 059; king post after repair

Fig 53.1: Context 060; king post before repair

Fig 53.2: Context 060; king post after repair

Fig 54: Context 077; header bond brickwork in invert

Fig 55: Context 078; header bond brickwork in invert

Fig 56: Context 079; header bond brickwork in invert

Fig 57: Context 080; cill beam supporting scalloped brickwork

Fig 58: Context 081; heads of timber piling

Fig 59: Context 082; rounded flint gravel (natural subsoil) underlying brick invert

Fig 60: Context 061; cill beams supporting scalloped brickwork either side of transverse beam (context 089)

Fig 61: Context 055; king post, detail of tenon

Fig 62: Section 1

Fig 63: Section 2

Fig 64: Section 3

Fig 65: Section 4

Fig 66: Section 5

Fig 67: Section 6

Fig 68: General view of lock from west

Fig 69: Recording invert of lock

Fig 70.1: Lea and Stort Navigation, Sawbridgeworth Lock

Fig 70.2: Lea and Stort Navigation, South Roydon Old Lock

Fig 70.3: Wey Navigation, Paper Court Lock

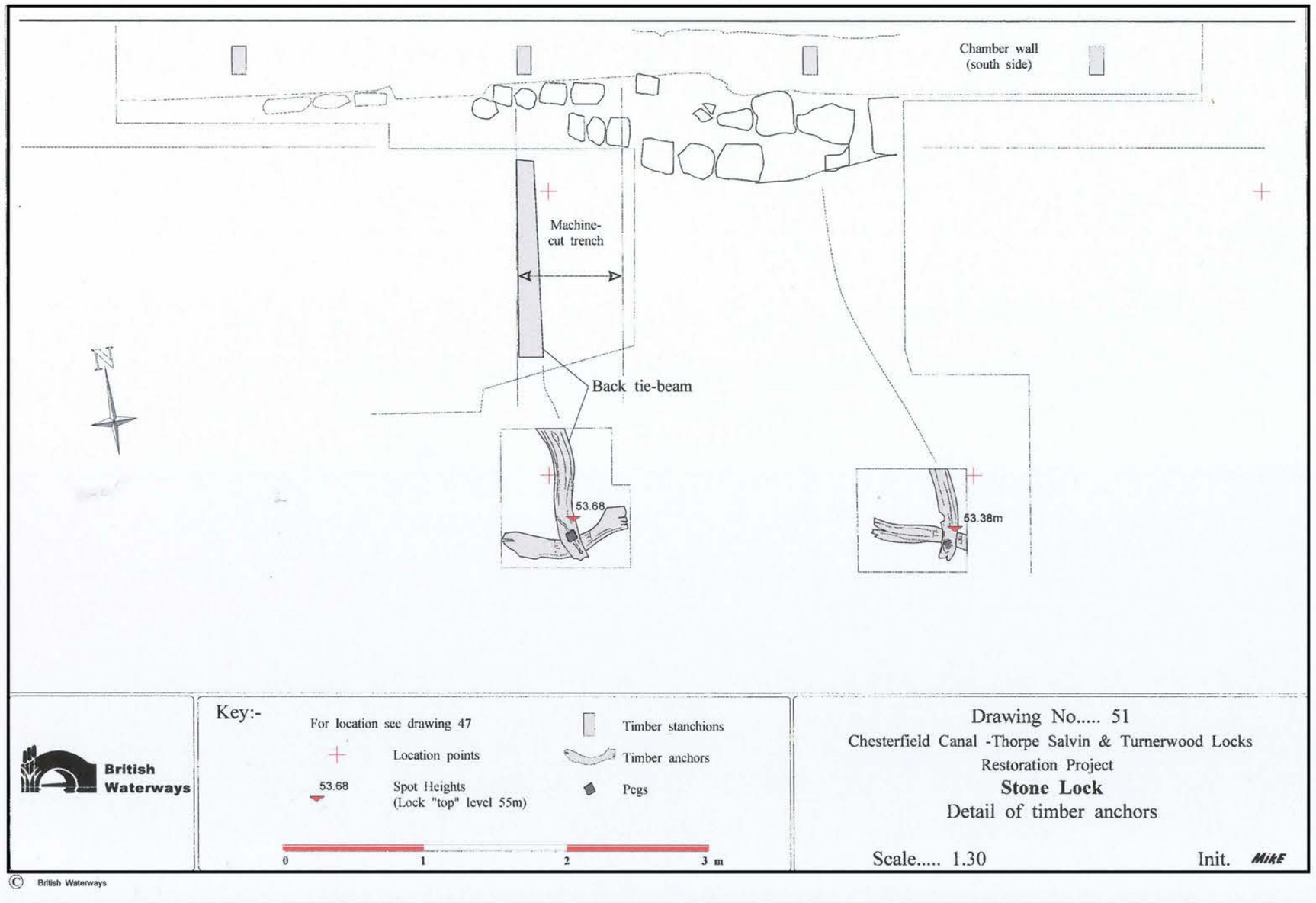


Fig 71.1: Timber tie-backs on the Chesterfield Canal, Stone Lock

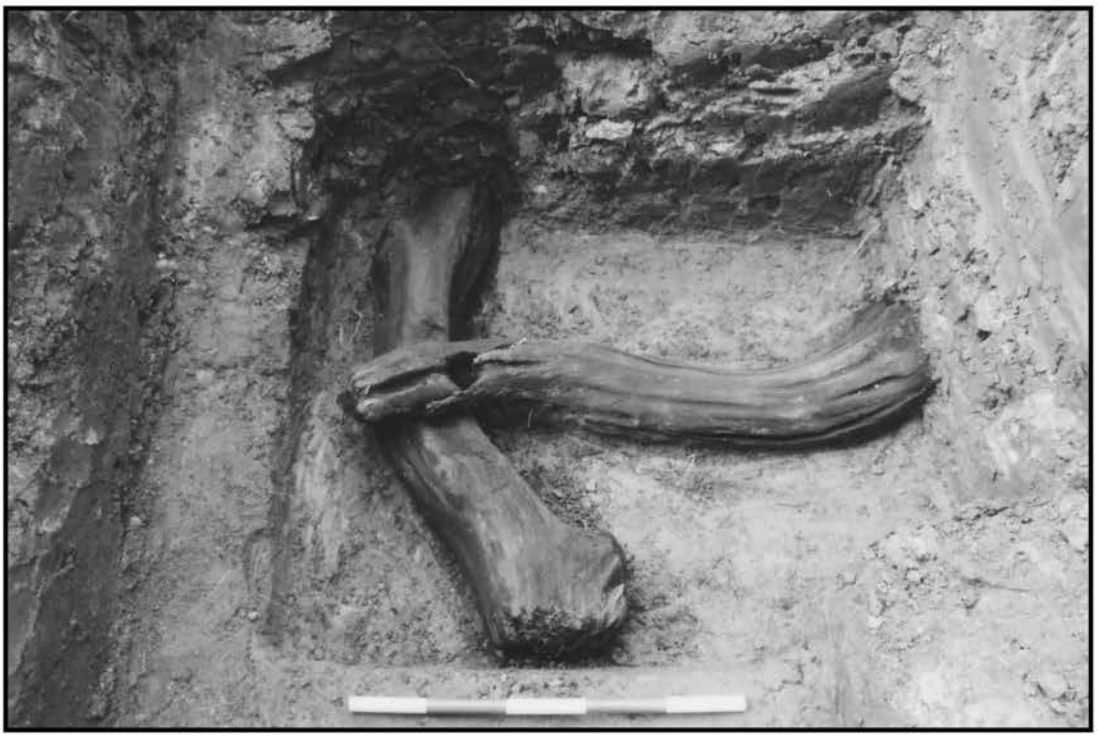


Fig 71.2: Timber tie-back on the Chesterfield Canal, Stone Lock

Fig 71.3: Aldermaston Lock showing turbulence caused by opening of gate paddles

Index

Appendix 1: List of the contexts

Context number	Description	Interpretation
001	Dark reddy brown sandy loam	Topsoil
002	Dark reddy brown sandy clay with lenses of very small rounded stones	Backfill of turf-sided lock with tip lines
003	Dark reddy brown sandy clay	Backfill of turf-sided lock against scalloped lock wall
004	English bond brickwork in scalloped configuration, slightly battered from bottom to top with wooden posts at intervals	Replacement construction for turf-sided lock – batter and scallops intended to resist overturning effect of loose material behind wall
005	Iron bar	Tie-back for king posts
006	Dark reddy brown sandy loam	Topsoil
007	Dark reddy brown sandy clay with a lens of very small rounded stones	Backfill of turf-sided lock with a tip line
008	Dark reddy brown sandy clay	Backfill of turf-sided lock against scalloped lock wall
009	English bond brickwork in scalloped configuration, slightly battered from bottom to top with wooden posts at intervals	Replacement construction for turf-sided lock – batter and scallops intended to resist overturning effect of loose material behind wall
010	Iron bar	Tie-back for king posts
011	Timber piles in bay 9 (from west), nearside, following profile of scalloped brickwork	Possible repair/reinforcement of scallop wall
012	Early pattern rail	Possible part of turf lock – guide rail. Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway
013	'Chord' of brickwork across scallop, bay 4 (from west), nearside	Possible repair/reinforcement of scallop wall
014	Vertical timber froward of scallop wall, bay 5 (from west), nearside	Possible remains of turf lock lower structure
015	Early pattern rail	Possible part of turf lock – guide rail. Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway
016	Early pattern rail	Reinforcement/repair to king post/transverse beam – mortice and tenon joint must have failed for rail to have been inserted
017	Early pattern rail	Possible part of turf lock – guide rail.

Context number	Description	Interpretation
		Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway
018	Early pattern rail	Possible part of turf lock – guide rail. Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway
019	Vertical timber froward of scallop wall, bay 8 (from west), nearside	Possible remains of turf lock lower structure
020	Early pattern rail	Possible part of turf lock – guide rail. Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway
021	Early pattern rail	Reinforcement/repair to king post/transverse beam – mortice and tenon joint must have failed for rail to have been inserted
022	Early pattern rail	Possible part of turf lock – guide rail. Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway
023	Early pattern rail	Possible part of turf lock – guide rail. Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway
024	Vertical timber froward of scallop wall, bay 11 (from west), nearside	Possible remains of turf lock lower structure
025	Early pattern rail	Possible part of turf lock – guide rail. Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway
026	Early pattern rail	Possible part of turf lock – guide rail. Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway
027	Vertical timber froward of scallop wall, bay 11 (from west), offside	Possible remains of turf lock lower structure
028	Vertical timber froward of scallop wall, bay 11 (from west), offside	Possible remains of turf lock lower structure
029	Early pattern rail	Possible part of turf lock – guide rail.

Context number	Description	Interpretation
030	Early pattern rail	Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway Possible part of turf lock – guide rail.
031	Early pattern rail	Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway Possible part of turf lock – guide rail.
032	Early pattern rail	Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway Possible part of turf lock – guide rail.
033	Early pattern rail	Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway Possible part of turf lock – guide rail.
034	Early pattern rail	Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway Possible part of turf lock – guide rail.
035	Early pattern rail	Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway Possible part of turf lock – guide rail.
036	Early pattern rail	Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway Possible part of turf lock – guide rail.
037	Early pattern rail	Probably rail known as 'baulk road', used by Brunel for his 7 foot gauge railway Possible part of turf lock – guide rail.
038	Early pattern rail	Reinforcement/repair to king post/transverse beam – mortice and tenon joint must have failed for rail to have been inserted
039	King post	Post battered from bottom to top,

Context number	Description	Interpretation
040	King post	trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
041	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
042	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
043	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
044	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
045	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
046	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
047	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
048	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
049	King post	Post battered from bottom to top,

Context number	Description	Interpretation
050	King post	trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
051	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
052	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
053	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
054	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
055	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
056	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
057	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
058	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
059	King post	Post battered from bottom to top,

Context number	Description	Interpretation
		trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
060	King post	Post battered from bottom to top, trapezoidal section, tenoned into transverse beam, probably provides springing for scalloped brickwork
061	Cill beams supporting scalloped brickwork, bays 6 and 7 (from west), nearside	Seen after removal of king post, 055; joint with transverse beam uncertain, may be halving joint, slight evidence that transverse bean extends beyond mortice with king post. Also, scalloped brickwork increases in depth at about 1.15m above top of transverse beam. Above that is rounded gravel fill. See also 080
062	Dark reddy brown sandy loam	Topsoil
063	Mid brown very slightly sandy clay with frequent small angular stones	Layer
064	Dark reddy brown very slightly sandy clay with very frequent small angular stones	Layer
065	Iron bar	Tie-back for king posts
066	English bond brickwork in scalloped configuration, slightly battered from bottom to top with wooden posts at intervals	Replacement construction for turf-sided lock – batter and scallops intended to resist overturning effect of loose material behind wall
067	English bond brickwork in scalloped configuration, slightly battered from bottom to top with wooden posts at intervals	Replacement construction for turf-sided lock – batter and scallops intended to resist overturning effect of loose material behind wall
068	Dark reddy brown sandy loam	Topsoil
069	Mid brown very slightly sandy clay with frequent small angular stones	Layer
070	Dark reddy brown very slightly sandy clay with very frequent small angular stones	Layer
071	Iron bar	Tie-back for king posts
072	Transverse beam, between bays 2 and 3	Principal function to maintain spacial relationship between the king posts which are tenoned into it. This transverse beam has a further function: nailed into its eastern face are the heads of vertical planks – see 081 - which have been driven into the natural gravel of the invert, 082

Context number	Description	Interpretation
073	Dark reddy brown sandy loam	Topsoil
074	Mid brown very slightly sandy clay with frequent small angular stones	Layer
075	Iron bar	Tie-back for king posts
076	English bond brickwork in scalloped configuration, slightly battered from bottom to top with wooden posts at intervals	Replacement construction for turf-sided lock – batter and scallops intended to resist overturning effect of loose material behind wall
077	Header bond brickwork, bay 1 (from west), brick size 215mm long, 105mm wide, 46mm deep	Brick reinforcement to invert below sheet pile weir. Presumably to prevent natural gravel invert being depleted by scour when paddles opened. Uncertain if this is an original part of the re-casting of the lock or whether it is a subsequent modification. Slight indication of the latter provided by 081. See also 078 and 079
078	Header bond brickwork, bay 2 (from west), brick size 215mm long, 105mm wide, 46mm deep	Brick reinforcement to invert below sheet pile weir. Presumably to prevent natural gravel invert being depleted by scour when paddles opened. Uncertain if this is an original part of the re-casting of the lock or whether it is a subsequent modification. Slight indication of the latter provided by 081. See also 077 and 079
079	Header bond brickwork, bay 3 (from west), brick size 215mm long, 105mm wide, 46mm deep	Brick reinforcement to invert below sheet pile weir. Presumably to prevent natural gravel invert being depleted by scour when paddles opened. This is clearly butted up against 081 and must be later. See also 077 and 078
080	Cill beam supporting scalloped brickwork, bay 3 (from west), offside	Seen after lowering of water level at this end of chamber. See also 061; sits below 101
081	Heads of timber piling (planks) driven into natural gravel of lock invert, 082, and secured to 072 with hand-made nails	Presumably intended to retain natural gravel at this end of chamber, against scour when paddles at west end opened
082	Rounded flint gravel	Natural gravel, presumably former river bed. See also 083

Context number	Description	Interpretation
083	Rounded flint gravel	Natural gravel, presumably former river bed. Shows sloping upper surface indicating former profile of turf lock. See also 082
084	Small angular gravel, heavily compacted	Backfill of turf lock
085	Dark reddy brown sandy loam	Topsoil
086	Transverse beam, between bays 9 and 10	Principal function to maintain spacial relationship between the king posts which are tenoned into it. This transverse beam is clearly a roughly squared tree, having a distinct curve in its middle section. It may be a surviving original structural element (all the other transverse beams appear to be sawn)
087	Remains of transverse beam, between bays 1 and 2	Principal function to maintain spacial relationship between the king posts which are tenoned into it. This transverse beam has been seriously eroded, presumably by scour, which has also damages part of the surrounding brick invert 077 and 078
088	Remains of transverse beam, between bays 3 and 4	Principal function to maintain spacial relationship between the king posts which are tenoned into it. This transverse beam has been very seriously eroded
089	Transverse beam, between bays 4 and 5	Principal function to maintain spacial relationship between the king posts which are tenoned into it.
090	Transverse beam, between bays 5 and 6	Principal function to maintain spacial relationship between the king posts which are tenoned into it.
091	Transverse beam, between bays 6 and 7	Principal function to maintain spacial relationship between the king posts which are tenoned into it.
092	Transverse beam, between bays 7 and 8	Principal function to maintain spacial relationship between the king posts which are tenoned into it.
093	Transverse beam, between bays 8 and 9	Principal function to maintain spacial relationship between the king posts

Context number	Description	Interpretation
		which are tenoned into it.
094	Transverse beam, between bays 10 and 11	Principal function to maintain spacial relationship between the king posts which are tenoned into it.
095	Transverse beam, between bays 11 and 12	Principal function to maintain spacial relationship between the king posts which are tenoned into it.
096	Concrete	Construction of bay 12 and eastern forebay
097	Concrete	Construction of part of bay 1 and western forebay
098	Steel sheet piles	Forms western limit of 096
099	Stretcher bond brickwork, bay 1, off side	Reconstructed scallop brickwork
100	Stretcher bond brickwork, bay 2, off side	Reconstructed scallop brickwork
101	Stretcher bond brickwork, bay 3 off side	Reconstructed scallop brickwork, sits on top of 080
102	Stretcher bond brickwork, bay 4 off side	Reconstructed scallop brickwork
103	Stretcher bond brickwork, bay 5 off side	Reconstructed scallop brickwork
104	Stretcher bond brickwork, bay 6 off side	Reconstructed scallop brickwork
105	Stretcher bond brickwork, bay 7 off side	Reconstructed scallop brickwork
106	Header bond brickwork, bay 8 off side, extending from invert of lock to about 2m high, headers *c* 105mm wide x 65mm deep	Possible original scalloped brickwork
107	Header bond brickwork, bay 9 off side, extending from invert of lock to about 2m high, headers *c* 105mm wide x 65mm deep	Possible original scalloped brickwork
108	Header bond brickwork, bay 10 off side, extending from invert of lock to about 2m high, headers *c* 105mm wide x 65mm deep	Possible original scalloped brickwork
109	Header bond brickwork, bay 11 off side, extending from invert of lock to about 2m high, headers *c* 105mm wide x 65mm deep	Possible original scalloped brickwork
110	Header bond brickwork, bay 11 near side, extending from invert of lock to about 0.7m high, headers *c* 105mm wide x 65mm deep	Possible original scalloped brickwork
111	Header bond brickwork, bay 10 near side, extending from invert of lock to about 0.7m high, headers *c* 105mm wide x 65mm deep	Possible original scalloped brickwork
112	Header bond brickwork, bay 9 near side, extending from invert of lock to about 0.7m high, headers *c* 105mm wide x 65mm deep	Possible original scalloped brickwork
113	Header bond brickwork, bay 8 near side, extending from invert of lock to about 0.6m high, headers *c* 105mm wide x 65mm deep	Possible original scalloped brickwork
114	Header bond brickwork, bay 7 near side, extending from invert of lock to about 1.0m high, headers *c* 105mm wide x 65mm deep	Possible original scalloped brickwork
115	Header bond brickwork, bay 6 near side, extending from invert of lock to about 0.7m high, headers	Possible original scalloped brickwork

Context number	Description	Interpretation
	c 105mm wide x 65mm deep	
116	Header bond brickwork, bay 5 near side, extending from invert of lock to about 0.6m high, headers *c* 105mm wide x 65mm deep	Possible original scalloped brickwork
117	Stretcher bond brickwork, bay 4 near side	Reconstructed scallop brickwork
118	Stretcher bond brickwork, bay 3 near side	Reconstructed scallop brickwork
119	Stretcher bond brickwork, bay 2 near side	Reconstructed scallop brickwork
120	Stretcher bond brickwork, bay 1 near side	Reconstructed scallop brickwork
121	Header bond brickwork, bay 12 near side, extending from invert of lock to about 0.7m high, headers *c* 105mm wide x 65mm deep	Possible original scalloped brickwork
122	Brickwork, bay 12 off side, otherwise unrecorded	Unknown
123	Timber on which off side, eastern gate hinges	Heel post
124	Timber on which near side, eastern gate hinges	Heel post
125	Cut	Cut of turf-sided lock