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**RECENT INVESTIGATION
AND CONSERVATION OF
SOME HISTORIC STRUCTURES AT
MOOR POND WOOD, PAPPLEWICK,
NOTTINGHAMSHIRE**



The University of
Nottingham

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*by
Richard Sheppard*

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Trent & Peak Archaeology
University Park
Nottingham
NG7 2RD

Tel: 0115 951 4823

Fax: 0115 951 4824

E-mail: TPA@nottingham.ac.uk

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A. INTRODUCTION

The following is part of an article published in the Transactions of the Thoroton Society for 2005 entitled '*The Moor Pond woods Project, Papplewick: A Progress Report*' (Volume 109; pages 93-98). Being a comprehensive summary of archaeological and conservation work carried out at Moor Pond Wood up until 2005 it is repeated here as an introductory section, with those aspects of the project which are dealt with in the report highlighted in bold script. The report looks at four aspects of the project (here called Sites A-D), with additional information from work carried between 2005-07.

Background to the project

The Moor Pond Woods Project is a Local Heritage Initiative (LHI) grant-aided scheme, set up as a millennium project by Papplewick Parish Council in 1999. Its aim has been to enhance the largely wooded area between the west side of the village and the River Leen for local recreational use, for nature conservation and as an educational resource because it contains relict features dating from the Industrial Revolution that include earthworks of leats, silted-up former millponds and sluices, parts of a complex water management system designed to power a series of cotton mills built by George Robinson alongside the Leen (Fig 1). Although detailed articles about Robinson's enterprise had previously been published (Greatrex 1986, 1987) a brief for further research was prepared with County Archaeologist Mike Bishop. Trent & Peak Archaeological Unit (TPAU) was commissioned to produce a desk-based report, followed by field survey and assistance in organizing local volunteers (Friends of Moor Pond Woods) to carry out investigative excavations. Since then the Friends have carried out further fieldwork under their own auspices. Clearance work has also been carried out by Leen Valley Conservation Volunteers and stone-work has been restored by Phil Turton Building and Consulting Services Ltd.

Desk-based study

The Stage 1 desk-based study (Sheppard 2001) was submitted to the Project's Steering Group in 2001. It collated documentary references, maps and previous written reports about the study site and suggested where further research was desirable. The report set out to build upon Greatrex's work by concentrating more on the water supply system rather than the mills, as previously. Robinson was first attracted to the area by the Leen's soft pure water being especially suitable for bleaching, initially for linen. He went on to build six cotton mills between 1778-94, four being of an industrial scale equal to Arkwright's, and on new rural sites; they were systematically demolished in the mid 19th century. A sophisticated water supply system had to ensure sufficient power could be derived from a modest river, whilst contending with variations in rainfall and geology, and the activities of the 5th Lord Byron, living upstream at Newstead Abbey, who provoked Robinson into a long drawn-out Court case over ensuring water rights. The system of millponds and leats may have developed in stages as more mills were built and as concerns over water supply escalated. Eventually, in response to the uncertainty, steam engines were installed in two of the mills as ancillary power sources. Robinson also built workers' tenement rows and estate buildings, some of which survive to this day.

The project area covers the site of three of Robinson's mills. Papplewick is recorded as having two water mills and a mill dam in 1540 (Walker 1970, 231) and a good case can be made for the latter having been above Wark Mill, part of which still remains today to the north of Papplewick Lane (SK 547 505). The area of the former Walk Mill Pond still shows in the fields to the north. In 1778 a new lease allowed Robinson 'to make a Cut or Canal from the said Dam or River Leen to and for the use of a large building then erecting ... intended to be used or employed as a Mill for spinning of Cotton, Silk, Flax or Wool. The mill was described in local newspapers as being 100 feet long, 30 feet wide and 5 storeys high. Situated close to present-day Grange Farm, it was later referred to as Old Mill, after another mill (New Mill), was built alongside several years later. Later collectively known as Grange Mill, the site is now grassland and gardens. Whilst Old Mill could be powered through a connection to an existing mill pond, Robinson's second mill, Top Mill, was built, along with new ponds (Top Upper Dam and Upper Dam), close to the

border with Linby (SK 545 510). This building was Robinson's smallest mill and its roadside elevation was embellished with Gothic detailing and castellated, thus its other name Castle Mill. Once derelict and threatened with demolition, its eventual renovation in 1962 received a Civic Trust Award. It remains the only intact survivor.

The current project has concentrated on investigating the water supply system and gaining understanding about how it operated. In brief, the north part of the system (the area covered by the project) includes the following components. From Top Upper Dam (SK 545 513) a leat ran southwards alongside Upper Dam and then parallel to the river to a triangular-shaped holding pond (SK 547 508). From here sluices (**Sluice 1** and Sluice 2) allowed water to be funnelled into Moor Pond (SK 548 507), the largest embanked reservoir of the entire system, or into (and perhaps from) a smaller irregular-shaped pond to the east (SK 548 508). **An outlet (in the centre of a length of support walling)** at the south-west corner of Moor Pond fed water into the canal mentioned above and perhaps back to the river when its volume was low. In addition, another leat skirted the western side of Moor Pond, terminating near a curious **egg-shaped brick-lined shaft** of unknown function (SK 548 504). Water was somehow transferred across Papplewick Lane to another wide leat or linear reservoir. From here water descended about 2m to enter a straight channel running behind Grange Cottages (SK 549 503) towards Grange Mill, and onwards as a tailrace to the next mill in sequence. Natural run-off and spring water may also have fed into the system from the east, where **an inlet** has been found.

Field survey

The Stage 2 field survey by TPAU (Sheppard 2003) included the detailed mapping of those parts of the system not already covered and the taking of levels at selected points. Along a distance of 1.2km, from Upper Dam in the north to near Grange Farm to the south, the River Leen today has a fall of about 8m, utilized along the way at Top Mill and Walk Mill. In contrast, the level of the leats to the east is fairly consistent for most of this distance, averaging a height of 72.5m, but dropping 1m into the leat / reservoir south of Papplewick Lane and another 3m between there and Grange Farm. The latter would have provided a powerful flow towards the large mill. With the exception of this southernmost leat, most of the system was designed for both conduit and for containment, as allowance appears to have been made for overflow, perhaps at times of heavy rainfall, into lower ditches and into subsidiary ponds. The four largest mills were all situated south of Moor Pond and other ponds created close to the river below Grange Farm.

Since 2002 fieldwork has been carried out around Moor Pond by volunteers from the Friends of Moor Pond Woods, Scouts, Air Cadets and the Leen Valley Conservation Group. The sluice at the south end of the triangular holding pond (**Sluice 1 – Site A below**) has been uncovered and since restored as a feature with a planned explanatory information board on a nearby bridge. Two phases of stonework were revealed here, the second, a rougher drystone walling, was in part aligned on a former timber-lined trough that had transferred water from a possible overflow pond, across the sluice to the leat that followed the west side of Moor Pond; this suggests that this particular leat was a later addition. Remaining iron fixtures showed that the trough had been 2ft wide, 4ft high and 36ft long (0.6 x 1.2m x 11m). Another sluice in the east side of the holding pond was later uncovered and recorded by project volunteers working with the Sherwood Archaeology Team (Sluice 2).

Other wall restoration has taken place at the south-west corner of Moor Pond (**Site C below**). A brick-arched drain situated in the middle of a 15m long curving stone wall had let water feed away towards the former canal mentioned above (now a long linear depression defined by field boundaries), or to the river beyond. The drain is also aligned on a brick-lined shaft of unknown purpose (**Site D below**) showing above Papplewick Lane, whose further investigation now requires safety measures (Plate 2). According to anecdotal sources, a number of drains have been exposed under the Lane in the past and this area, between Moor Pond, Walk Mill and the river, requires further investigation to find out where the Pond's water went to.

Additional work

Other work at Papplewick has included two sessions of resistivity survey carried out in the area of Grange Farm, the site of Old Mill and New Mill, together with some trial excavations. On the east side of Moor Pond another length of walling has been found and investigated (*Site B below*). This is believed to be an inlet point with evidence for a wooden trough, where water entered from a spring or unknown water source to the east of the reservoir.

B. DESCRIPTION

This section describes the results of investigative work and subsequent conservation carried out at four of the sites mentioned above, here referred to as Sites A to D.

Site A: Sluice 1 (Figs 1-4)

The existence of the sluice at the north-west corner of Moor Pond (Figs 1, 2) has been known for some time. Since 2002 it has been exposed, investigated and now fully consolidated by professional masons, with the stone slabs at the position of the gate re-erected into position. Plates 1-3a show these stages. A nearby footbridge provides a good viewing position and one for an explanatory board. The following description was written as background information for the latter, with some parts added since:

The stonework leading up to the sluice-gate would have stood at least 2 metres high, and was battered (angled backwards), well mortared and regularly coursed. It was built to funnel water towards a sluice-gateway that consisted of large ashlar blocks, four set on top of each other on either side of the narrow slipway, with a thick timber gate. Each block was slightly shorter than the one below. Central recesses are about 12 inches (300mm) across and deep enough to have held a thick timber gate between jambs; this could have been raised by a rack and pinion device. From here water was allowed into Moor Pond. This is the original Phase I structure of the feature.

At a later stage (Phase II) some top stonework on either side of the sluice was cut away to allow for a timber trough or launder to cross the sluice at an acute angle. This trough was built of wood, with horizontal planking at the sides, at least two inches (50mm) thick. How thick the timber base was is unclear, as is whether the top of the trough was enclosed or open. It was more likely boarded on all four sides. Upright metal rods occur on either side of where the trough passed through the banks behind the stone walling, and these show that the trough was about 2ft (0.6m) wide and 4 feet (1.2m) high. The rods were arranged at 3 feet (0.9m) intervals and had small iron plates at their base which acted as brackets to help hold the horizontal timbers and maintain the vertical sides. Although most of the rods had been subsequently cut and bent over near their tops, one was found with a similar plate found at the top end; this suggests the full enclosure of the trough. Large nails and bolts have also been found along the line of the trough, and the six basic types of ironwork recovered are shown in Fig. 3. Figure 4 is a reconstruction of how the trough may have appeared.

At either end of the trough, which was about 36 feet (11m) long, drystone walling was added in Phase II at the flanks of embanked earth to help funnel water towards and away from the trough. This stonework was not mortared and was of rougher construction than the original mortared walling. Similar drystone walling was added to the east side of the main sluice walling, and

perhaps on the west side, but this area is now still hidden beneath banking that supports a large tree and its roots. Drystone walling has also been partly exposed at the west end of the trough. The line of the trough has been partly excavated and is now made visible to the public by the inclusion of gravel (contained within timber lining) within the excavated east section and on the top of the unexcavated west part.

Water for the original sluice came from an embanked holding area north of the sluice (roughly triangular in shape) which held water that came via a leat from a reservoir further to the north (Top Upper Dam). Water for the trough came from a more naturally shaped open area of water to the east of this holding area, which is still partly under water today and may derive water from springs. The trough took water over to the north end of another leat and from here water flowed towards Papplewick Lane and eventually provided a head for a water-wheel at the mill close to Grange Farm.

Site B: possible inlet (Figs 1, 5).

In 2005 some intact stonework was noticed under the undergrowth on the east slope of Moor Pond. It appeared to be of a roughly similar nature to stonework already seen at Sluice 1. The following year the undergrowth was removed by members of Friends of Moor Pond Woods and the extent of the structure cleaned and recorded. The stages are shown in Plates 4-6.

The stonework was found to be similar to the Phase II walling at Sluice 1. It was built in a curve of about 4.2m in length, battered back and without mortar (but with some tile uses as infill). At least 13 courses were found intact and the wall had probably been built much higher. In the centre there was a gap of c.0.8m. This was found to contain fragments of wood and ironwork indicating another trough similar to that at Sluice 1. Fragments of wood survived at the base, together with pieces to the sides that indicated a width of 2 feet (0.6m) for the feature. One long rod was found, 30 inches (0.76m) long. The base timberwork indicated that the feature was sloping down and that the trough was delivering water towards the reservoir rather than draining it away.

Site C, pond walling (Figs 1, 6)

A length of well-built stone walling was fully revealed at the south-west corner of Moor Pond in 2003. This extended in an irregular curve for about 15m, although the full extent of its north end is not known. At the south-east end the wall was found to be 3 feet (0.9m) thick and towards its centre it was 4 feet (1.2m) thick. The stonework survived to a height of at least 1.4m, was gently battered and well mortared. The stages in its uncovering and consolidation are shown in Plates 7-9.

Towards the centre of the walling a brick-lined arched drain had carried water away to the south-west, in the direction of a brick-lined shaft (Site D), a distance of 15-20m away on the bank above the reservoir. The upper part of the brickwork arch was two-brick thick and strongly held together by mortar; it remains uncertain if it was fully or semi-circular in shape. Its diameter was 2 feet (0.6m).

The brick arch and stone walling around it had been cut through to insert interlocking sections of ceramic pipe 10 inches (0.25m) across. The ground had been cut into for some distance behind the wall as a line of disturbance and the dipping of its infill could be seen extending back from the wall, in the direction of the shaft. Whilst the 2½ inch (63mm) thick brick used in the arch indicated a date in the late 18th century, the ceramic pipe was of probable 20th century date.

The walling was later consolidated and the damaged stonework around the drain replaced. Problems with vandalism has meant that whilst the main walling has been consolidated with the use of lime mortar, the top courses have to be held together more strongly by modern cement mortar.

Site D, brick-lined shaft (Fig. 7)

Immediately to the south-west of the pond walling the drain led to a brick-lined open shaft that was first looked at in 2002 when some of the surviving upper brickwork was exposed. It has since been emptied of infill to its base and the top brickwork repaired and heightened to allow for a platform and a protective grill. Stages in its investigation are shown in Plates 10-13.

The shaft is built in an irregular egg-shape with, towards its base an inlet on the north-east side and an outlet directly opposite. It is 4.5m deep from the platform level erected around its upper perimeter. The structure is built of late 18th century 2½ inch (63mm) thick brick, laid with the header ends facing inwards. On the south-west side the walling is regular and mainly built from stone, with a lintel over the rectangular-shaped outlet (20 inches or c.0.5m across and high). The inlet opposite is within the brickwork, with an arched top of smaller dimension to the outlet (water in the base of the shaft interfered with its precise measurement. Part way up the south side there is a circular overflow drain, 20 inches (0.5m) across, tightly blocked up with infill material to prevent water loss.

How this feature (first referred to as the *plug-hole*) worked is unclear. Water flowed into it from the drain by the pond, itself estimated to have been about 1.5m above the level of the shaft inlet. Water was then either allowed to continue on through the outlet, or was forced upwards to go through the so-called overflow opening (Plate 13). Some form of shuttering or gate was used along the straight face above the outlet to control the water. No evidence for this survived although part of the upper stonework face was curved backwards to a depth of about 10cm for some associated reason - this shows in the lower part of Plate 12.

Water evidently either passed downhill towards the River Leen and a possible lower leat, or was forced upwards to flow into another watercourse that possibly ran directly across the line of Papplewick Lane to another feature on the opposite side of the road. Here, water may have risen by gravity to a higher level leat in a similar structure. Although no sign of this other parallel feature is currently known its former existence can be safely assumed if such a system was intended. Further investigation of this would be worthwhile.

D. Conclusion

Although the understanding of how exactly the water-control system is still in its early stages, some of the recent fieldwork around Moor Pond has proved extremely informative and led to

the provision of new features in the landscape for public enjoyment. The work has shown just how sophisticated the water control system was and perhaps how unique it may have been. Further work is clearly desirable. This should perhaps concentrate on checking and adding to surveyed levels and in finding out through boreholes the capacity of the reservoirs. This should help in the estimating of water pressures that the system was able to produce to power the large mills below Moor Pond.

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ILLUSTRATIONS

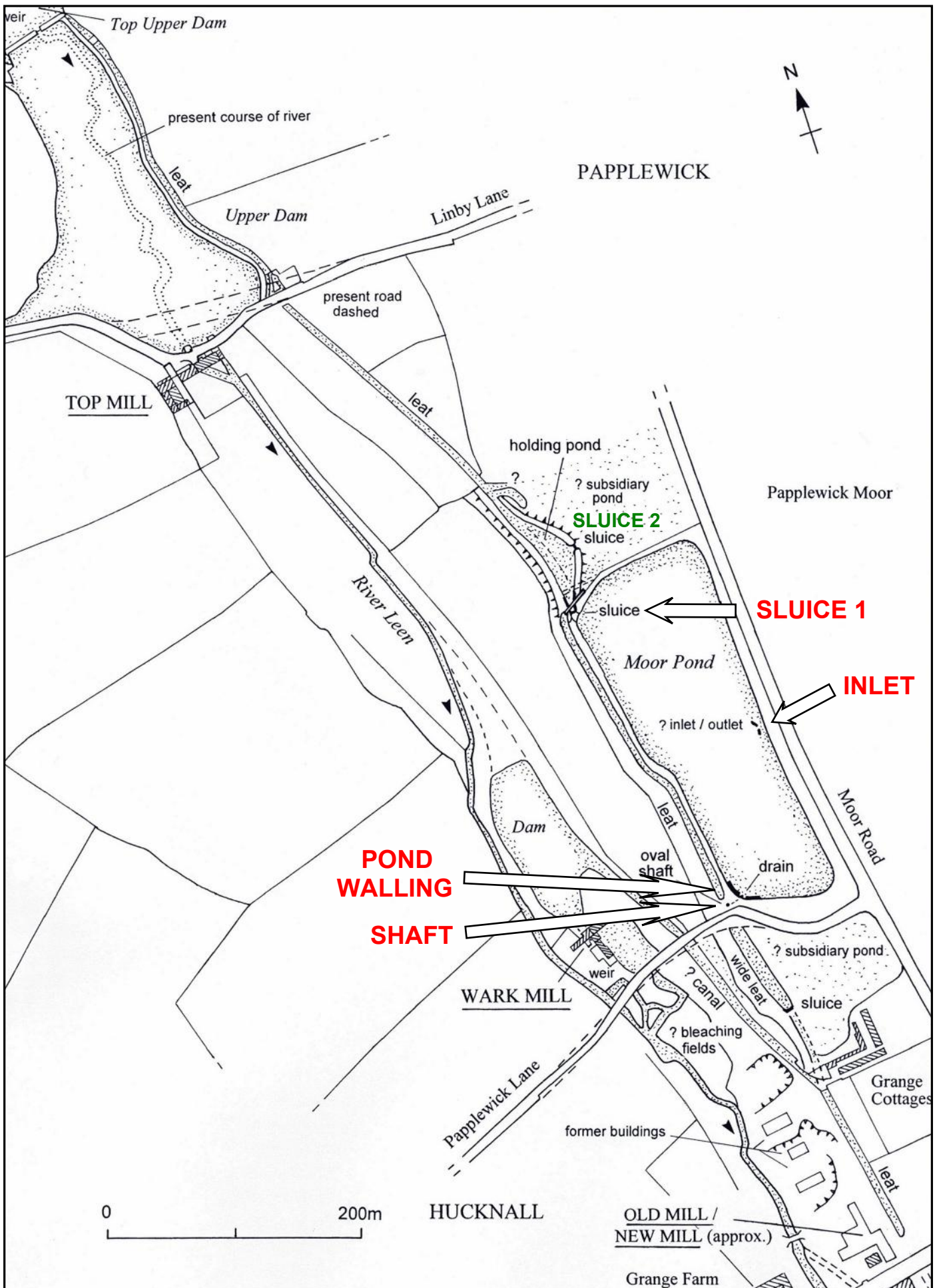


Fig. 1 Location of features referred to in the text, on the edge of or close to Moor Pond at Papplewick, Nottinghamshire. Scale 1:4000.

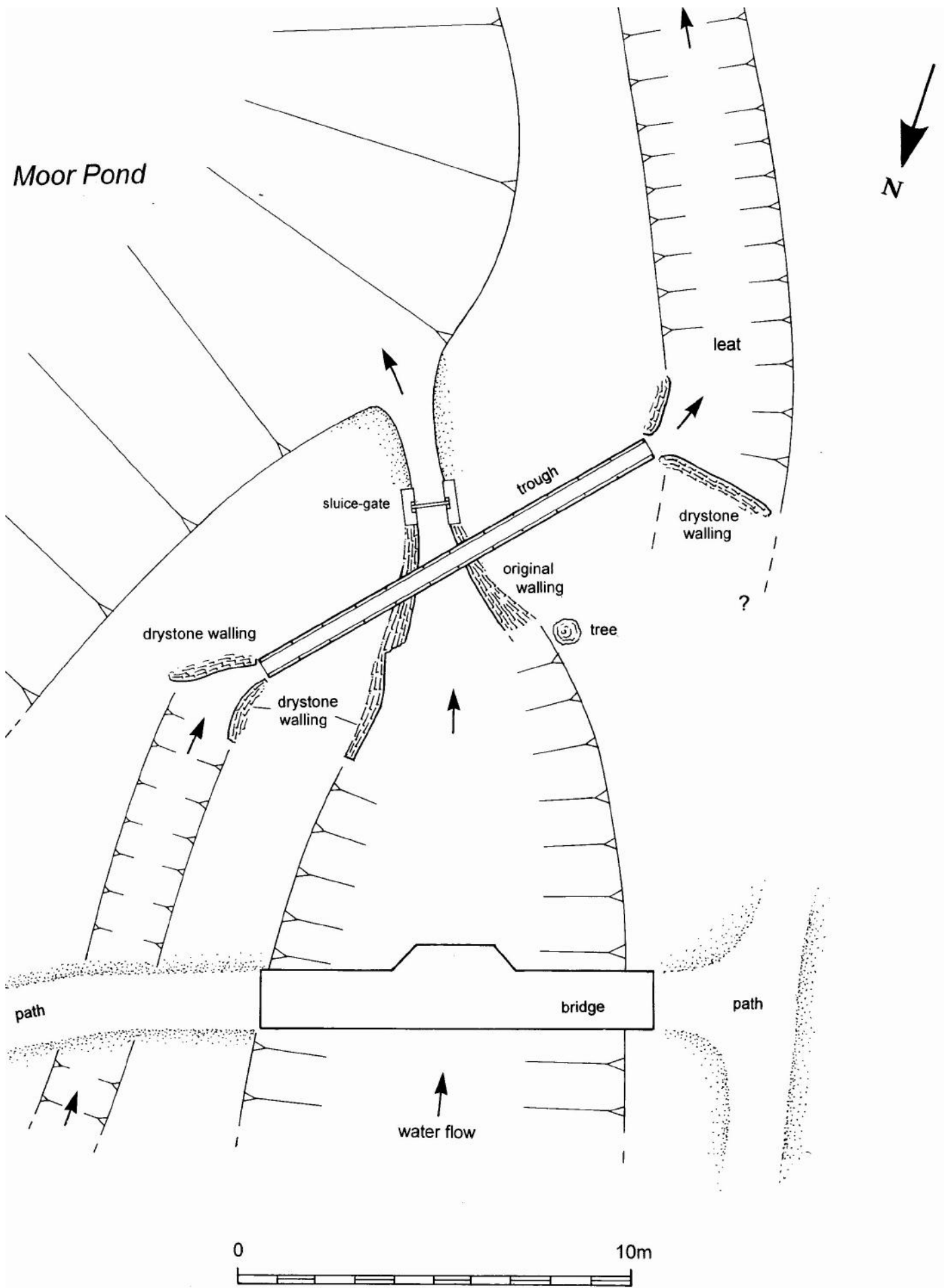


Fig. 2 Plan of Sluice 1 at the north-west corner of Moor Pond, Papplewick, showing original Phase I walling and later Phase II drystone walling and the line of the associated trough or launder that crossed over the approach to the sluice-gate. Scale 1:125.

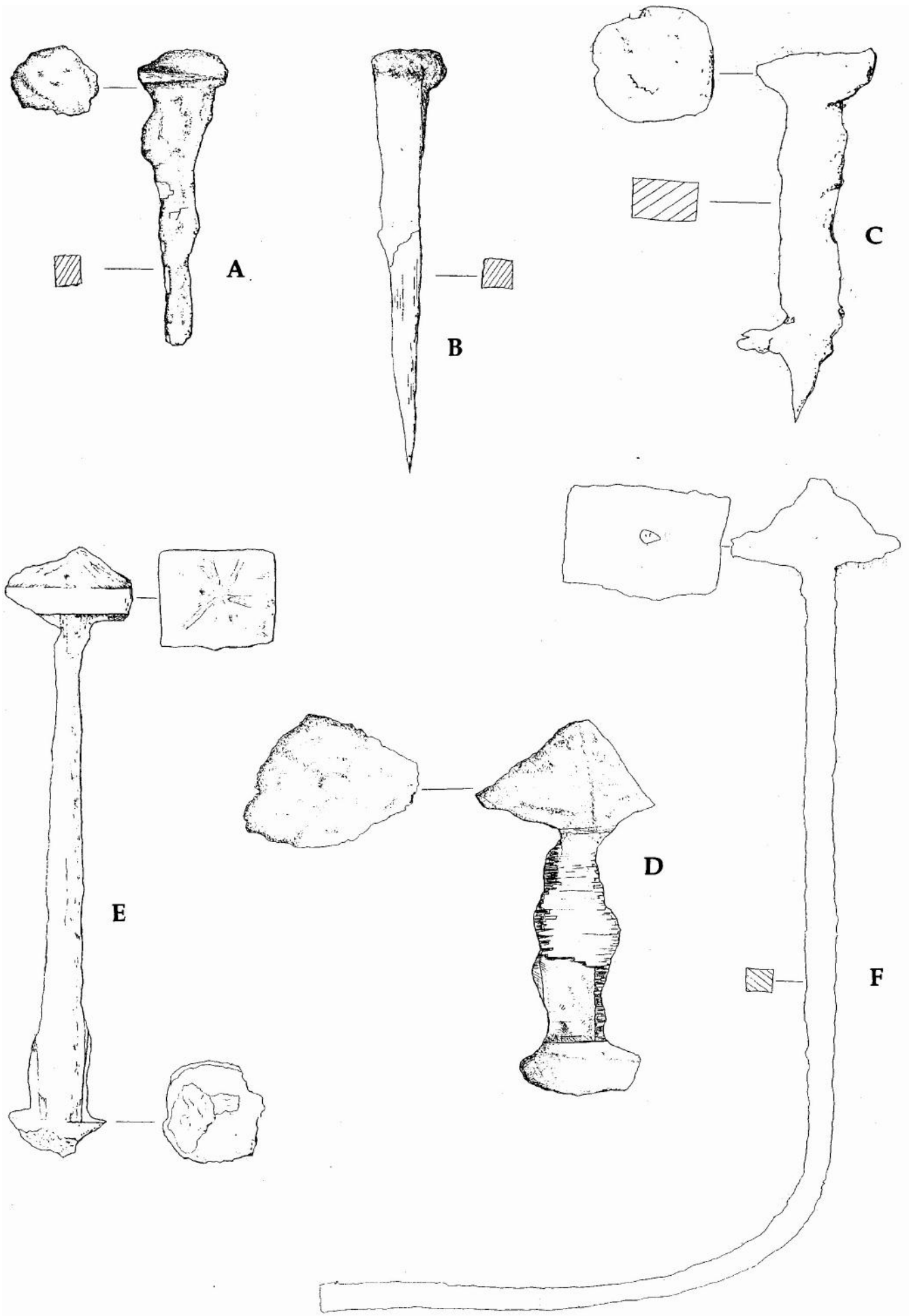


Fig. 3 Examples of the different types and sizes (A-F) of large nails, bolts and rods used in the structure of the wooden trough or launder associated with the Phase II walling at Sluice 1, Moor Pond, Papplewick. Scales A-E 1:2; F 1:4.

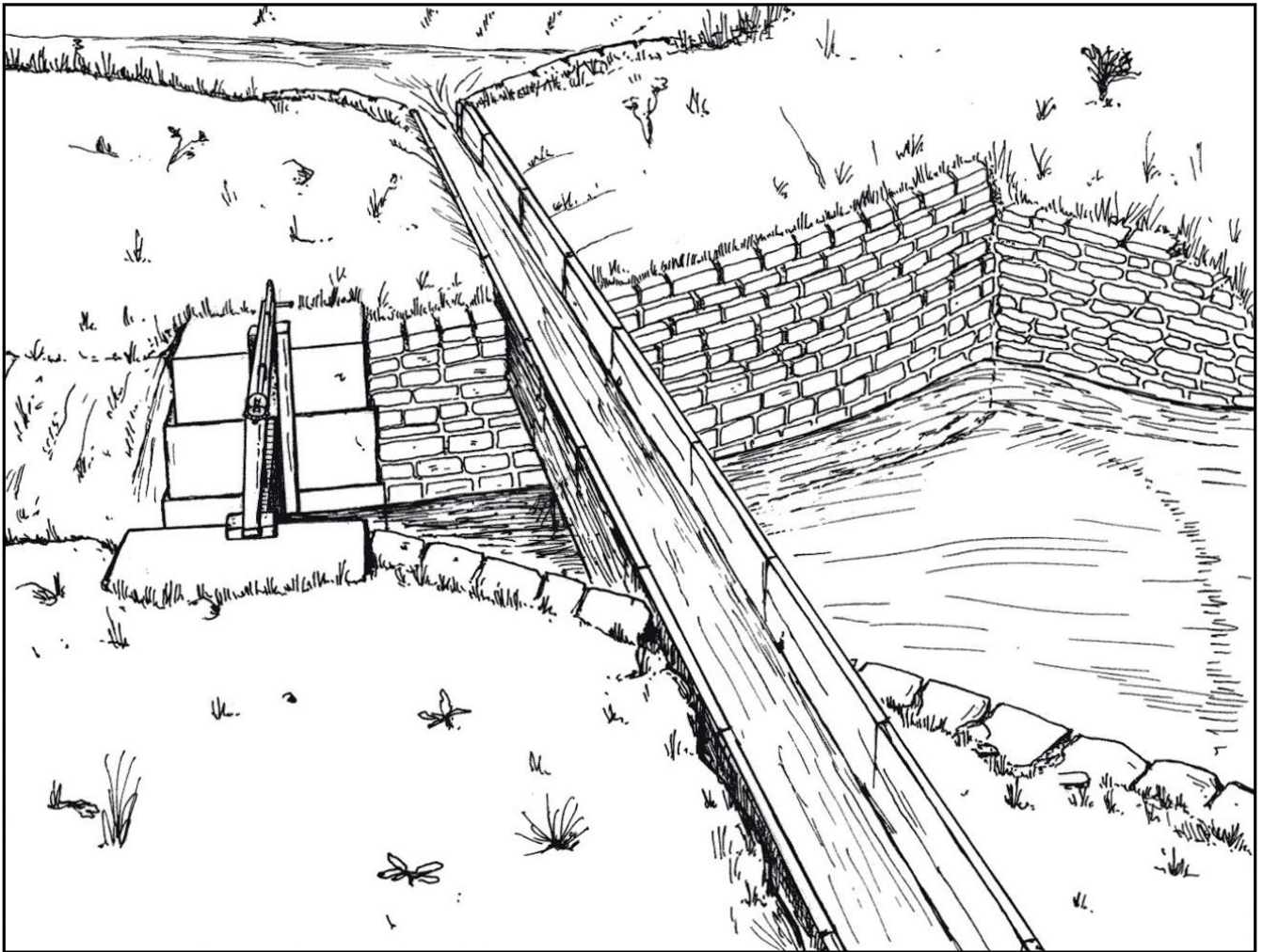


Fig. 4 Reconstruction of how the trough or launder that crossed Sluice 1 at Moor Pond, Papplewick may have appeared (looking south-west).

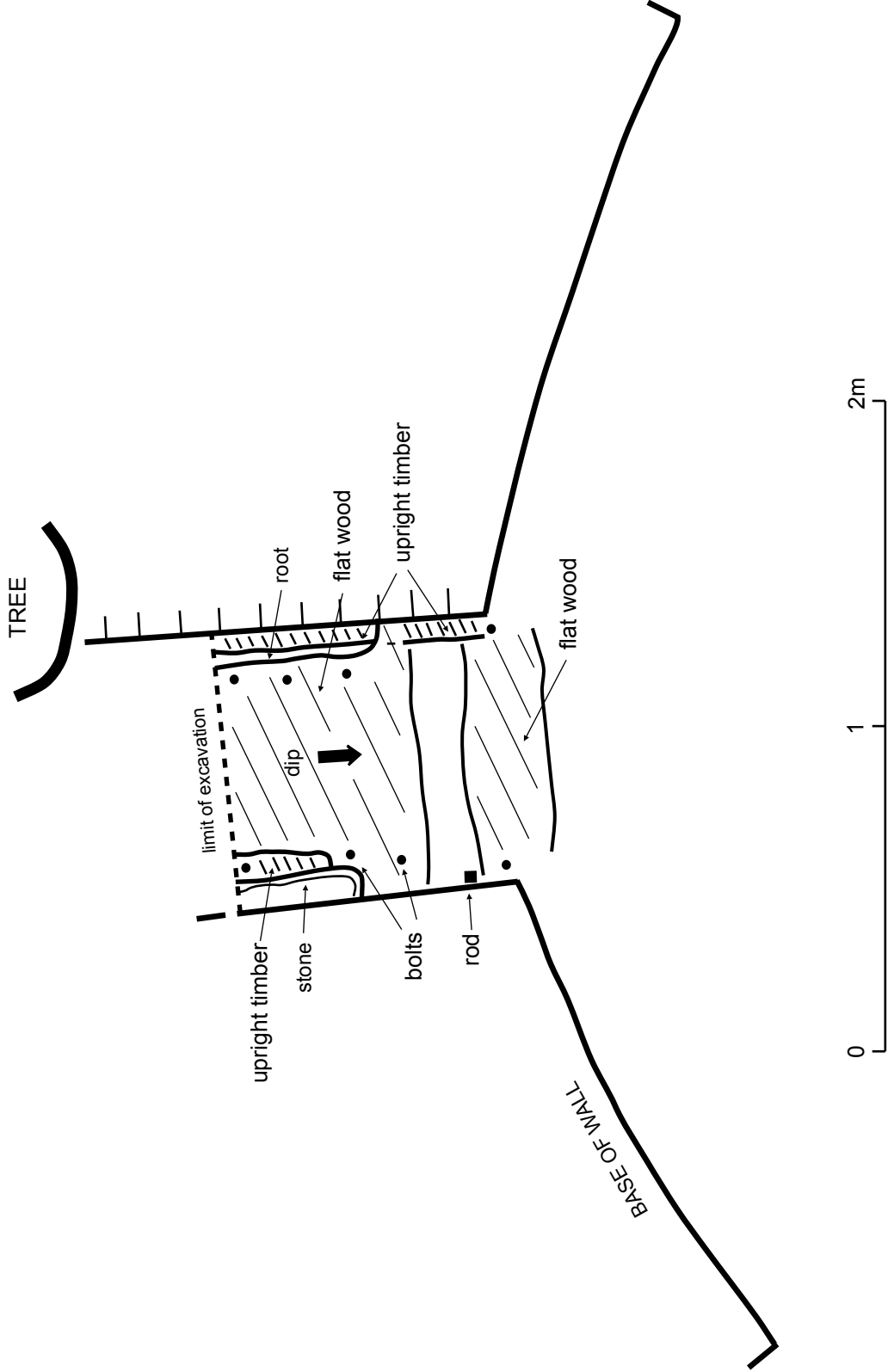


Fig. 5 Plan of the base of the probable inlet on the east side of Moor Pond, Papplewick. Scale 1:20.

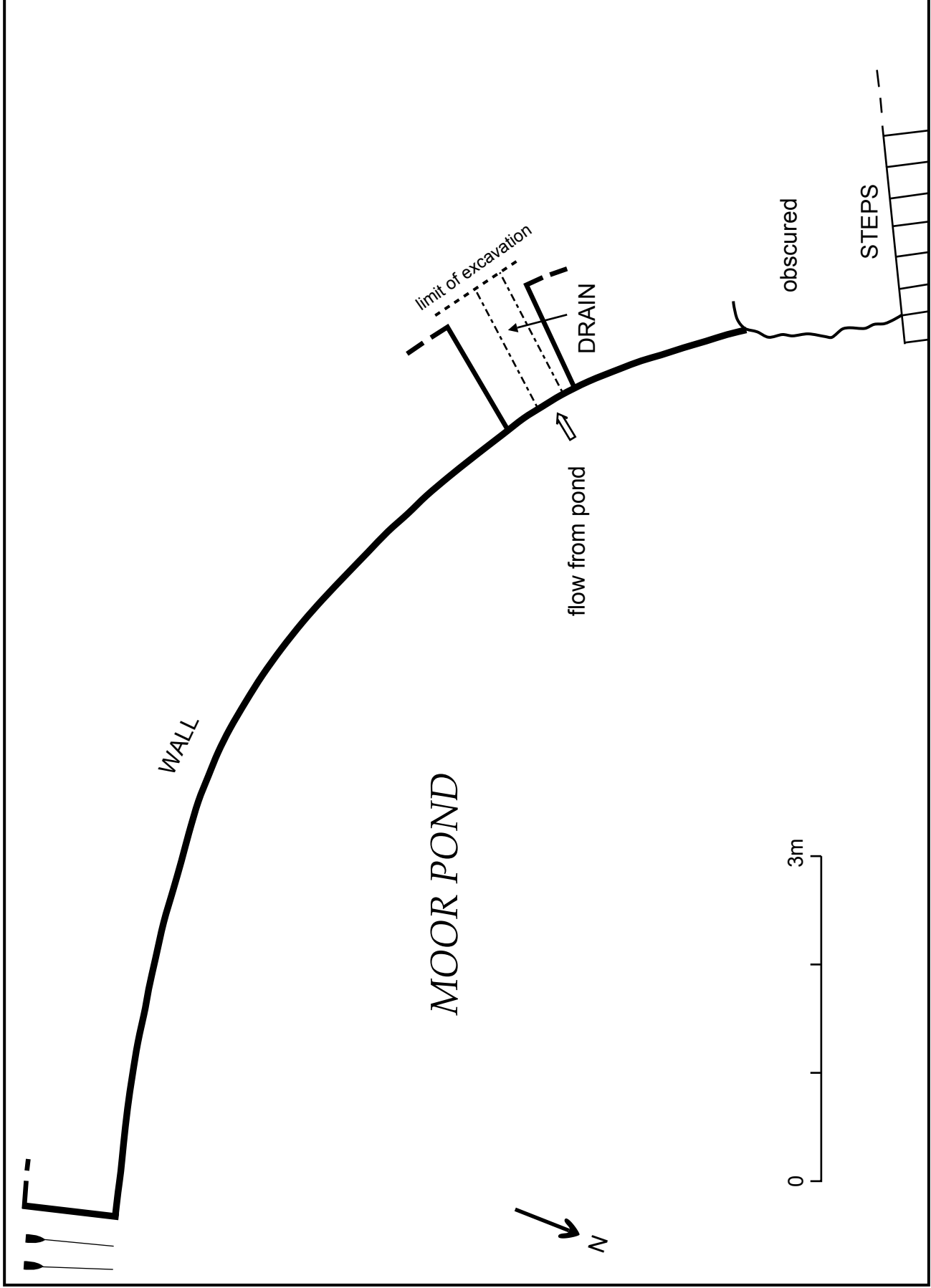


Fig. 6 Plan of the walling and drain at the south-west corner of Moor Pond, Papplewick. Scale 1:50

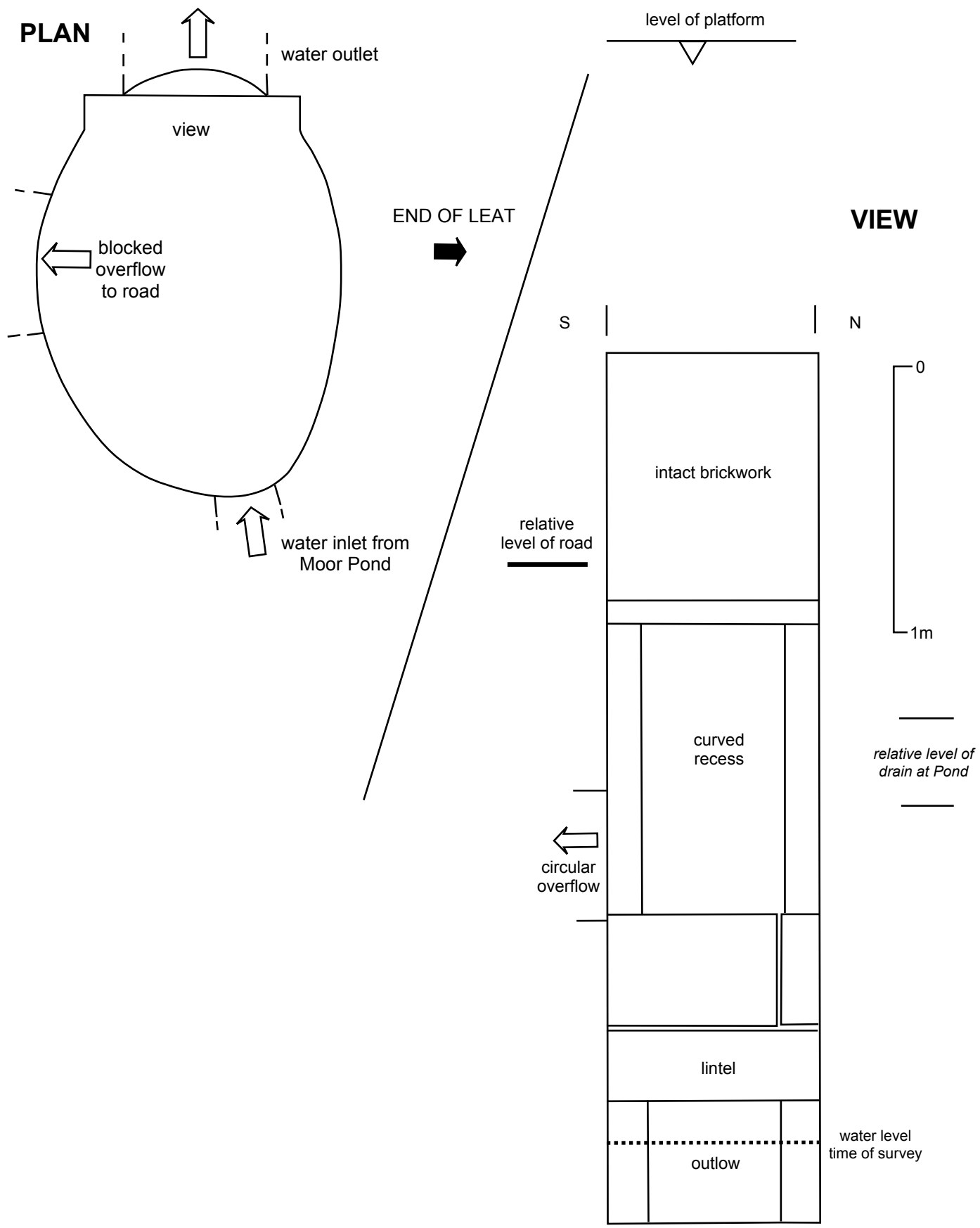


Fig. 7 Stylistic plan and west end view of the egg-shaped shaft to the south-west of Moor Pond, Papplewick (close to Papplewick Lane). Scale 1:20.



Plate 1
(AP 01)



Plate 2
(AP 29)



Plate 3a
(AP 97)



Plate 3
(AP 83)

Plates 1-3a: Stages in the uncovering, investigation and reinstatement of the stonework around Sluice 1, at the north-west corner of Moor Pond, Papplewick. Photos by author.
AP: Archive Photo number



Plate 4
(AP 99)



Plate 5
(AP 114)



Plate 6
(AP 115)

Plates 4-6: Stages in the revealing and investigation of the stonework around the probable inlet point on the east side of Moor Pond, Papplewick. Photos by author.
AP: Archive photo number

Plate 7
(AP 123)



Plate 8
(AP 141)

Plate 9
(AP 155)



Plates 7-9: Stages in the uncovering, investigation and reinstatement of the stonework at the south-west corner of Moor Pond, Papplewick. Photos by author.

AP: Archive photo number



Plate 10
(AP 159)



Plate 11
(AP 162)



Plate 12
(AP 168)



Plate 13
(AP 169)

Plates 10-13: Stages in the uncovering and investigation of the egg-shaped water control feature, situated north of Papplewick Lane, Papplewick. Photos by author.
AP: Archive photo number