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THE MILL ON THE LEYBOURNE STREAM AND ITS WATER MANAGEMENT IN THE EIGHTEENTH AND NINETEENTH CENTURIES

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In 2004 the Canterbury Archaeological Trust undertook a desk-based assessment of the environs of the former watermill (TQ 68715 58485) at Leybourne (**Fig. 1**), along with the recording of a surviving wall of the mill and a contour survey of an area to its south and west. The same area was sampled by evaluation trenching the following year (**Fig. 2**). These investigations into the mill's water-management system formed part of a much broader project, commissioned and coordinated by Kent County Council, to deal with the archaeological impact of the realignment of the A228 to bypass Leybourne and West Malling. The greater part of that project is reported upon elsewhere¹ whilst much of the later history of the mill has been covered in an unpublished study,² which its author generously made available.

Though some of the various phases of undated, low-level water channels identified on the valley floor (Tr.11, 18, ?19, 24 and 24A) may have fed early mills mentioned in documentary sources, there was no clear evidence that they were so associated, nor that they had been artificially diverted from their natural course. Other than these channels, only two main phases of water-management system could be identified during fieldwork and it is upon them, and contemporary documentary evidence, that this article will concentrate. The first such phase (**Fig. 3**) included three or four leats or ditches (A-D), most probably feeding a small mill pond. The subsequent phase (**Fig. 4**) incorporated at least two leats (E-F), an enlarged pond and, most significantly, a raised aqueduct which added the power of a second stream to that previously employed. The mill itself was probably rebuilt to a different pattern as part of the same reorganization, tentatively dated to 1800.

Historical Background

The geology of the area consists of Greensand Beds, often covered by

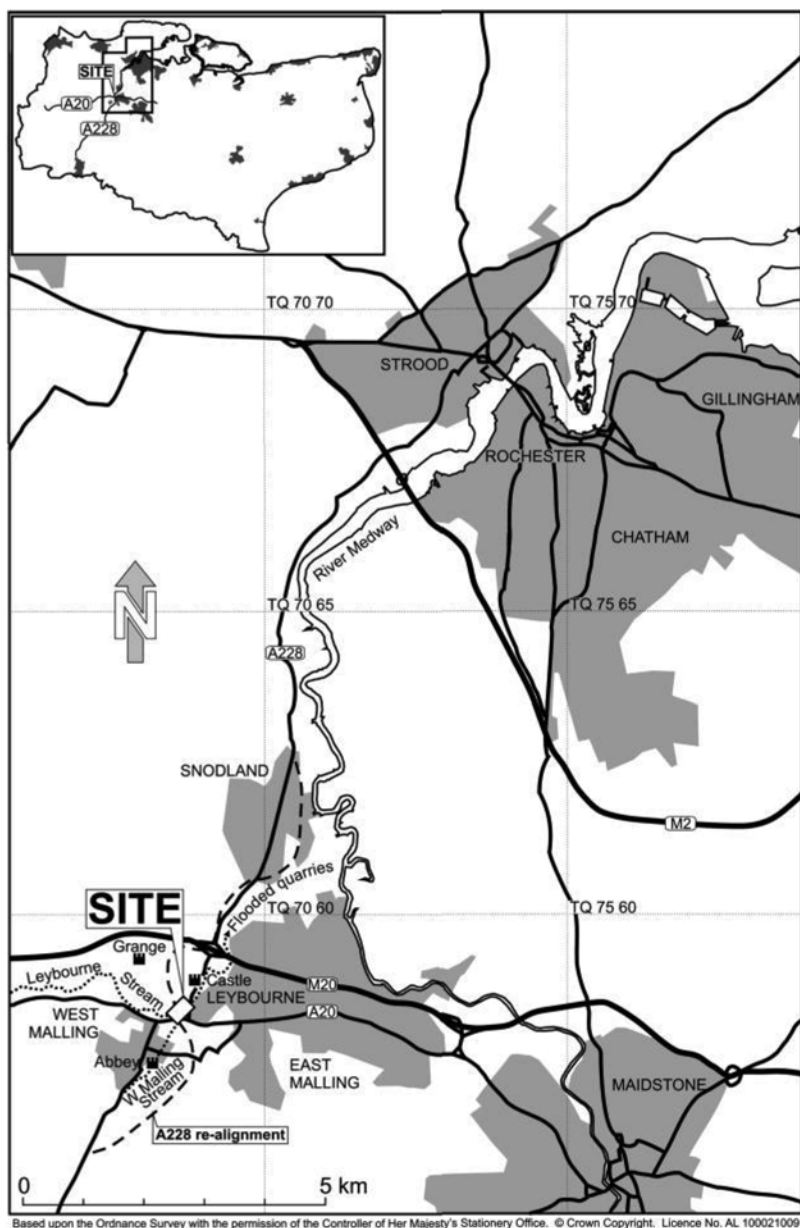


Fig. 1 Leybourne Mill: site location.

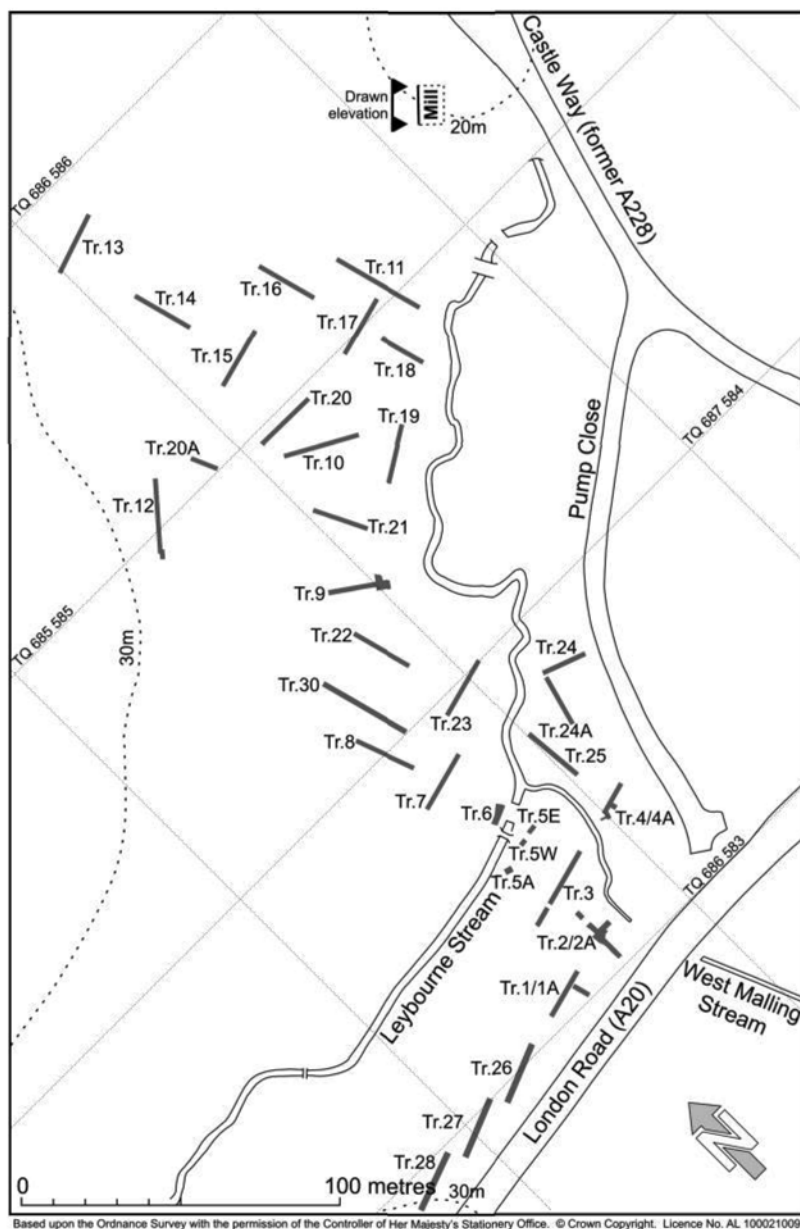


Fig. 2 Leybourne Mill: trench plan in relation to the road system before bypass construction.

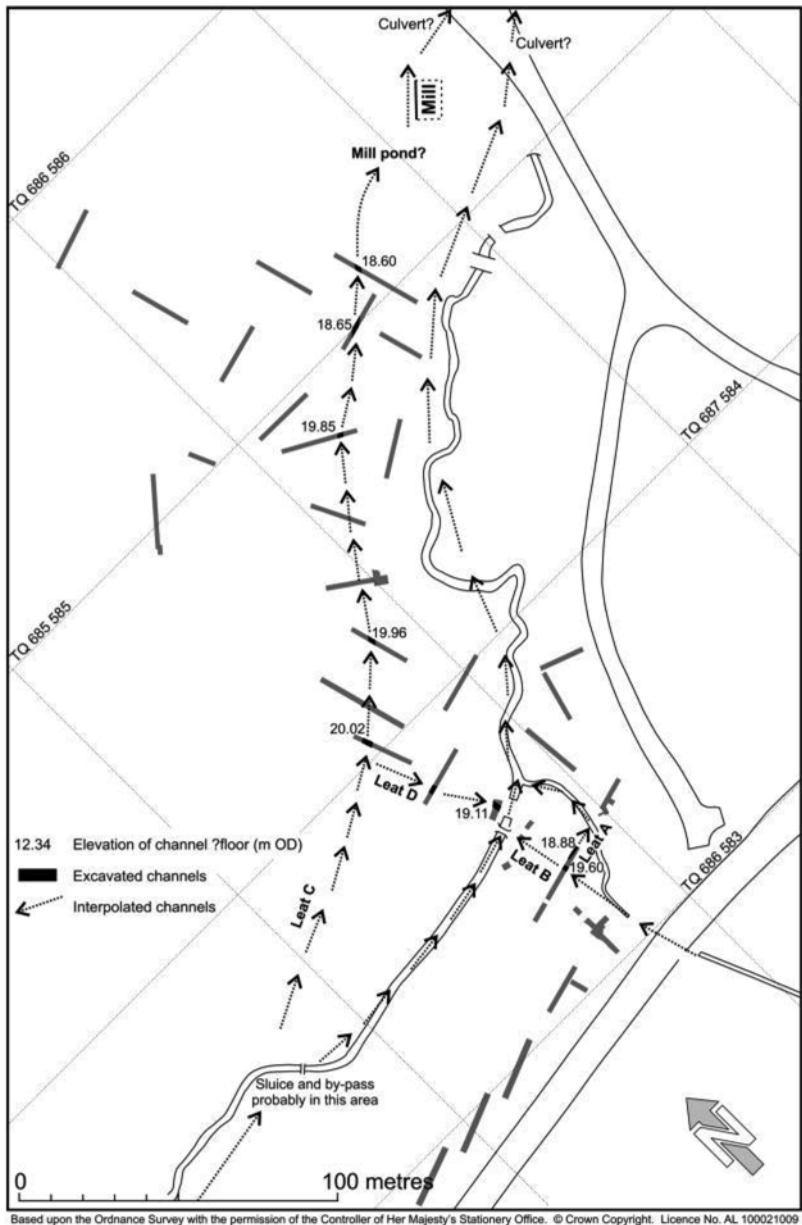


Fig. 3 Leybourne Mill: pre-aqueduct phase.

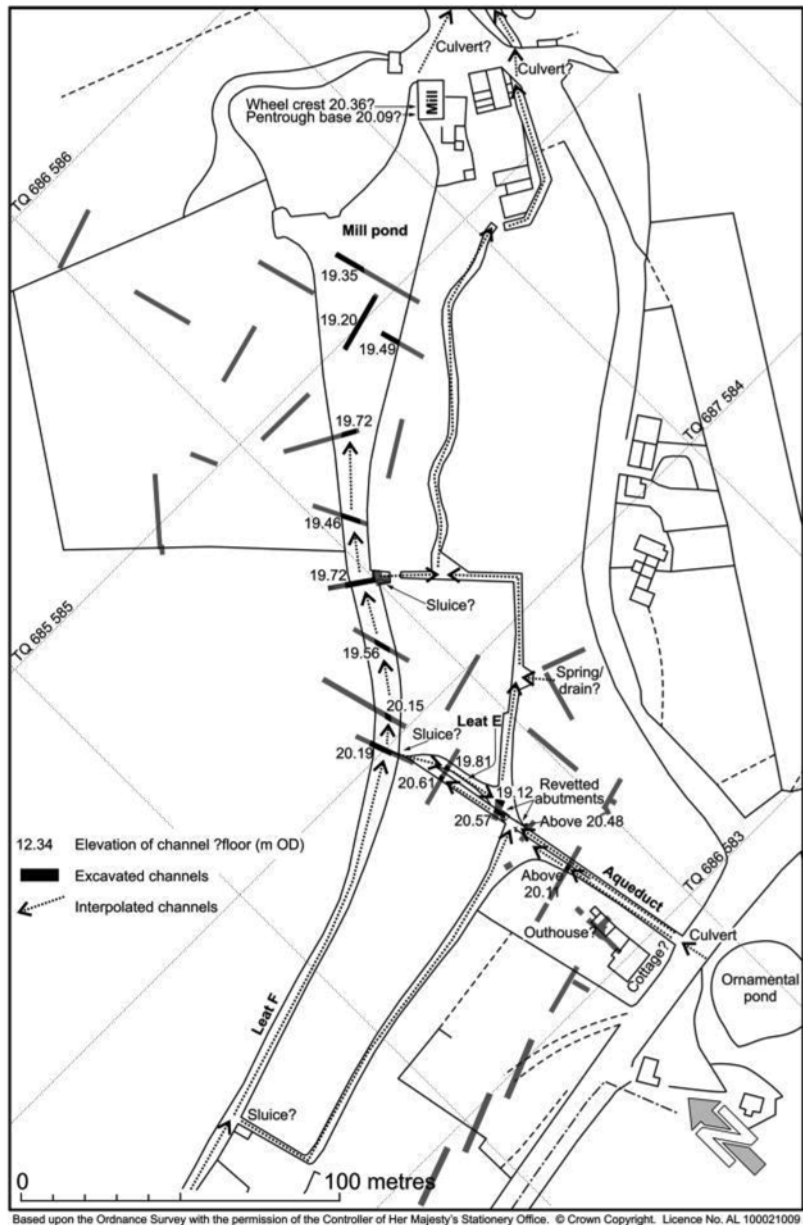


Fig. 4 Leybourne Mill: aqueduct-fed phase in relation to the 1842 tithe apportionment map.

colluvium, with various alluvia in the stream-cut valleys. The location of the early mill is unknown but, by the mid eighteenth century, it lay a little downstream of the confluence of the Leybourne (also known as Addington) and West Malling streams. Both are small and fairly fast-flowing, attributes which are, on the whole, better exploited by pond-fed overshot mills than by undershot or horizontal wheels. Though Leybourne (*lylle burnan*) and Malling (*Mealingas*) appear as early as 942-946³ and Leybourne had a mill by the time of Domesday,⁴ relatively few medieval documentary references survive.⁵ Leybourne Manor was granted to the Abbey of St Mary Graces, London, in 1375-6.⁶ Following the Dissolution, it was held briefly by Cranmer and then by a succession of families who sublet individual parcels.⁷

A sale document of 1659 mentions 'Smytherne mills (two water mills) and an adjacent house and lands, totalling five acres, in the parishes of Ryarsh and Leybourne',⁸ whilst a deed of 1686 refers to eleven acres belonging to Leybourne mill.⁹ The latter acreage appears fairly consistently (occasionally plus or minus an acre) in eighteenth- and nineteenth-century documents, suggesting that the mill stood on or near its current site throughout the period. In support of this, in 1968 and 2004, numerous blocks of ragstone ashlar were seen in the garden behind the mill house.¹⁰ These included examples with a neat, 50mm thick, horizontal band of punched decoration half way up the face, a distinctive feature which can also be seen in the 1638 rebuilding of Wye Bridge, and (perhaps re-used) in undated cutwaters at Barton Mill, Canterbury.¹¹

An inventory of Thomas Alchin, miller at Leybourne at his death in 1702, states that his house was two storeys high, having chambers over the hall.¹² In addition, there were a backhouse (which may have served as a kitchen), oast house, barn and the mill building, which accommodated, *inter alia*, 'three mills' (i.e., three pairs of mill stones). A brew house and milk house may also have been separate buildings and the miller had use of a hop ground.

In 1709 the mill was described as comprising 'all that messuage with barn, stable, outhouses, yard, backside, and garden, and all that watermill with the mill house, mill pond, mill dams and all manner of gear, tackle and mill stones to the mill belonging'.¹³ This appears to be the earliest reference to the pond. The property also included several pieces of land: arable, meadow, pasture and hop ground, and 'certain ways, passages, waters, watercourses and hedges' to a rental of £20 per annum. A lease of 1711 includes mention of a mill house, barn and stables as well as an adjacent garden, orchard, arable, meadow, pasture and hop ground.¹⁴

By 1724, the estate had been purchased by Francis Whitworth, whose tenants included the Alchins though it is not clear whether they still worked the mill.¹⁵ Whitworth resided at Leybourne Grange (about 1 km north-west of the mill), which he rebuilt. He also improved the grounds

around the house, turning some of the land between it and Leybourne Castle (0.4km north-east of the mill) into parkland.¹⁶ He died in 1742 and the estate passed to his son, Charles. Although there is nothing in the documentary sources to indicate whether they were involved in altering the watercourses on their estate, this did occur at the neighbouring estate at West Malling. Following an agreement between Fraser Honywood and Francis Brooke in 1760, the latter received permission to lay a water pipe between two ponds in the grounds of the former convent at *Douces Manor*, in the valley of the West Malling Stream.¹⁷ West Malling mill house seems to have been demolished about the same time because Brooke also received half the building material in his agreement with Honywood. In 1776 Charles Whitworth's son, another Charles, sold the Leybourne estate to James Hawley. The mill was not mentioned in the particulars of sale, but it may have been included within the general description of 'waters, watercourses and fishings'.¹⁸

Leybourne Mill was indicated in approximately the same location as the surviving mill house on Andrews, Dury and Herbert's 1769 map of Kent (Fig. 5), on Hasted's 1798 map and, less clearly, on Mudge's 1801 map. The 1769 map shows the former convent ('The Abbey') as occupied by 'S^r Jⁿ Honywood'. It also depicts two roughly rectangular features, presumably those connected by the 1760 water pipe, in the gardens of 'Fra^s Brooks Esq^r', along the line of the West Malling Stream. The same features appear in the 1798 map and clearly relate to the comment that 'in the meadows above the gardens, are large square excavations still visible, where the fish ponds of the nunnery formerly were'.¹⁹ The ponds do not appear on the 1801 map, having been replaced by a long, straight, narrow linear feature, clearly the canalised stream, terminating a little to the south of what appears to have been a new, circular pond just south of the London Road (now the A20): given the dates these alterations were, presumably, Hawley's work.

On 26 August 1788 a fire insurance policy was taken out, for £150, with the *Royal Exchange* (Policy no. 107961) by Thomas Stirrup, of West Malling, gentleman, the miller at this time being Thomas Lavender. It covered 'a house and water corn millhouse adjoining including the running tackle and machines therein, brick and stone built and tiled, situate in Layborn'. Given the nature of the document, and the flammability of flour, it is highly improbable that it would have omitted to mention that any significant part of the mill was weather-boarded: it may safely be assumed that, at this time, it was not. The mill was mentioned in the tithe apportionment award of 1842;²⁰ and shown on the tithe apportionment map of the same year (Fig. 4).²¹ The latter is the earliest map to show the mill pond and shows a more complex arrangement of watercourses, and in greater detail, than do any Ordnance Survey maps of the area.

An undated photograph shows the ground floor in brick but the three



Fig. 5 Leybourne Mill: enlarged extract from Andrews, Dury and Herbert, 1769, map of Kent.

above it, and the round-windowed gable end, all weather-boarded.²² Similar arrangements were recorded in two oil paintings. The mill seems not to have had a lucam to house an external hoist, although it may have had an arrangement to run a hoist out of an upper window.

The same photograph also shows the mill house, immediately east of the mill, as being two-storeyed and probably of late eighteenth- or early to mid nineteenth-century date. To its east were three, perhaps older, lapboard and tile buildings, that on the street frontage standing on squared rubble or ashlar foundations. An access lane running between this building and the mill house ramped steeply up before (to judge by the top of a fence beyond the rise) dropping steeply back down. The rise appears too high to be over

a culvert taking the outflow: it might have been a relic of an earlier water-management system or a precautionary measure to prevent any overflow from the pond from reaching the public road.

It has been suggested that the mill closed in the 1930s but this may have occurred as early as 1915.²³ By 1939 the property, known as the 'Old Mill', had been deemed unsafe and was partially demolished, the ground floor being retained to serve as a barn.²⁴ Its pond had been shown virtually unchanged from the 1842 representation in the first to fourth edition 1:25000 Ordnance Surveys but had disappeared by 1947, when the RAF took aerial photographs of the area. It was probably drained to increase arable acreage and perhaps, depending upon the date, to remove a reflective landmark for enemy night-bombers.

When C.P. Davies visited the site in 1958 he was told that all the milling gear had gone.²⁵ As well as evidence relating to the wheel, Fuller noted that, on his visit in 1968, there survived 'only the ground floor, and half of the first floor', both of brickwork (though the latter was probably a later alteration).²⁶ In 2004, only the north-western wall of the ground floor was seen (Fig. 6), with no sign of an upper storey. The wall had, however, been raised in yellow, twentieth-century brick when it was incorporated into a garage.

The wheel

The former wheel pit lay beside the surviving north-west wall of the mill and the well-preserved revetment walls of the headrace are to be found at its south-western end (Fig. 6). The brick floor of the headrace has been seen during gardening (Graham Woolton, pers. comm.). An iron pentrough would have carried the flow out over the waterwheel. Most of the physical evidence for the trough was removed when the mill wall's upper part was rebuilt in the twentieth century, though the end of its socket can still be seen in the brickwork. The projecting revetment, of English bonded red brick, carrying the headrace was about 3.1m wide. This, and the early photograph, suggest the wheel to have been about 2.0-2.5m wide and of a single bay.

The wheel had deeply grooved the brickwork of the mill's north-western wall, permitting a reasonable estimate of its centre as lying at about 17.55m OD (0.75m below current ground level), a third of the way along the wall. Within a circle of about 3.35m radius (12ft) from this centre, the wall was constructed in English bond, the remainder in Flemish, but the two elements are clearly of a single phase. The costlier English bond was doubtless intended to provide additional strength, having a greater ratio of headers to stretchers. The ascending phase, in the south-western part of the elevation, is worn smooth, the wear being deepest at the circumference, marked approximately by a groove some 2.80m from the centre. The

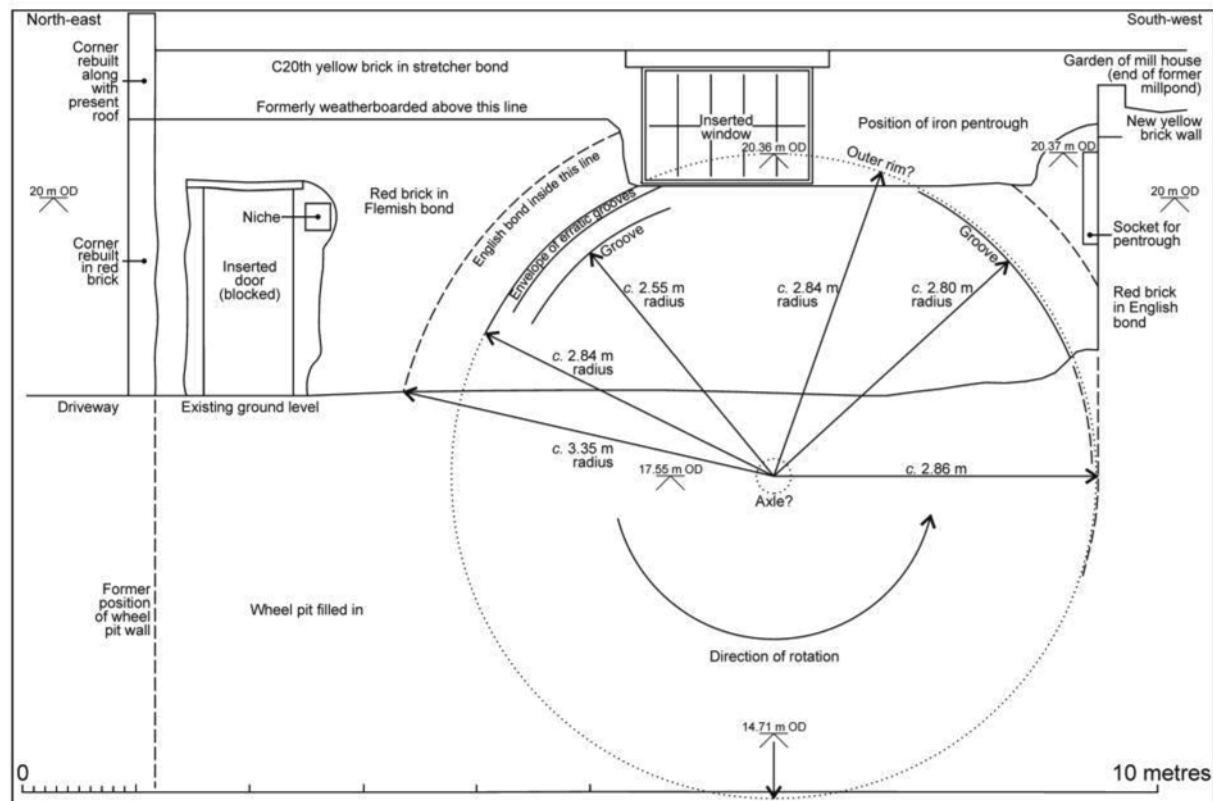


Fig. 6 Leybourne Mill: exterior elevation of north-west wall of mill, showing evidence for the size and location of the wheel.

descending phase, by contrast, is marked by an envelope of erratic, cross-cutting grooves, up to 2.84m from the centre (a little less higher up). This is consistent with a loose minor component irregularly dropping forwards during descent. Also on the downstream side is a shallower but more regular groove about 2.55m from the centre. The hard local water has left a pronounced build-up of scale within the area encompassed by the various grooves. The radius of the wheel's outer rim cannot well have been less than that of the ascending groove (2.80m OD), nor greater than the distance to the headrace wall (2.86m), suggesting a measurement of perhaps 2.84m (9ft 3in., matching the outermost descending groove) and thus a diameter of 5.68m (18ft 6in.), with its crest at 20.36m OD. This agrees very well with the top of the pentrough socket, at 20.37m OD. The wheel was clearly an overshot example, common in the area. Its level is also typical and is consistent with the millstones being accommodated on the first floor.

Pre-aqueduct water-supply

In Tr.3 (**Fig. 7**), the uppermost fills of the western terminus of Leat A (a simple ditch) appeared to be cut by the base of the eastern embankment of the more elaborate Leat B but, given the shallow angle between the former's edge and the trench section, it is possible that this represented undercutting or subsidence and that the two were contemporary. In this case, Leat A probably served as a bypass channel when B required cleaning or repair. A partially robbed drystone(?) wall revetted the western face of B's embankment and was paralleled by a better preserved clay-bonded stone wall 1.7 m to its west: it is likely that the latter also revetted an embankment. Between the two walls, a crushed stone and clay deposit represented the base of Leat B.

Although Leat B presumably carried the West Malling Stream, it may have served only for flood prevention or land drainage as it lay too low to flow into the contour-following Leat C (Tr.10, 11, 17, 22 and 30). The latter carried the Leybourne Stream north-east, towards what is now the garden of 15 Pump Close, probably the site of an earlier pond (perhaps that mentioned in the 1709 document). Leat C typically survived as a flat- or slightly concave-bottomed cut with sloping sides, over 5m wide and 0.5m deep, filled mostly by clayey silts with the occasional lens of sand or gravel. In Tr.11 (**Fig. 8**), it may have had a slight embankment on its downhill side and was broadly contemporary with a ploughsoil or colluvium which sealed the second of three phases of valley floor streams. A possible down-slope embankment was also seen in Tr.21 and a re-cut in Tr.17 (**Fig. 9**). In the latter, subsequent clayey silts were capped by a lens of sand at around 18.85m OD. This higher energy event may mark the final emptying of the leat prior to the extension of the putative early pond into that shown on the map of 1842.

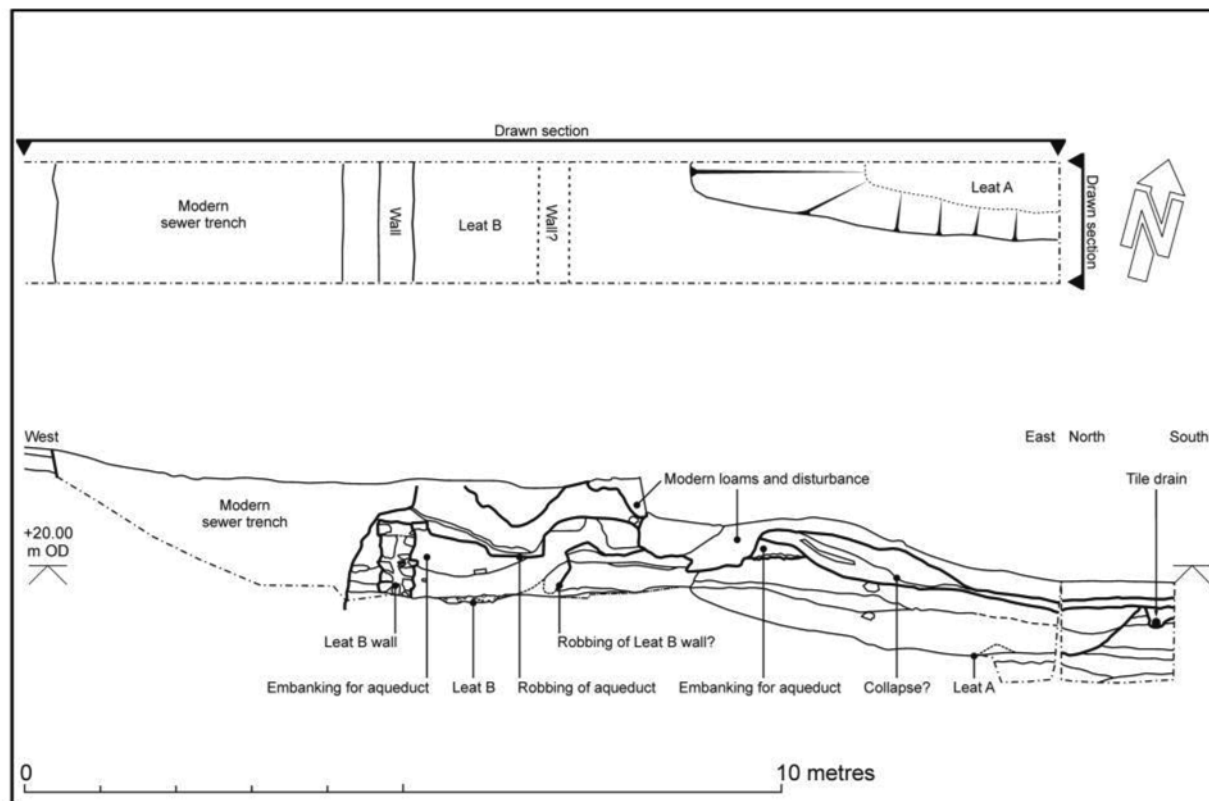


Fig. 7 Leybourne Mill: Tr.3, eastern half, plan and section, showing relationships between Leats A-B and the aqueduct.

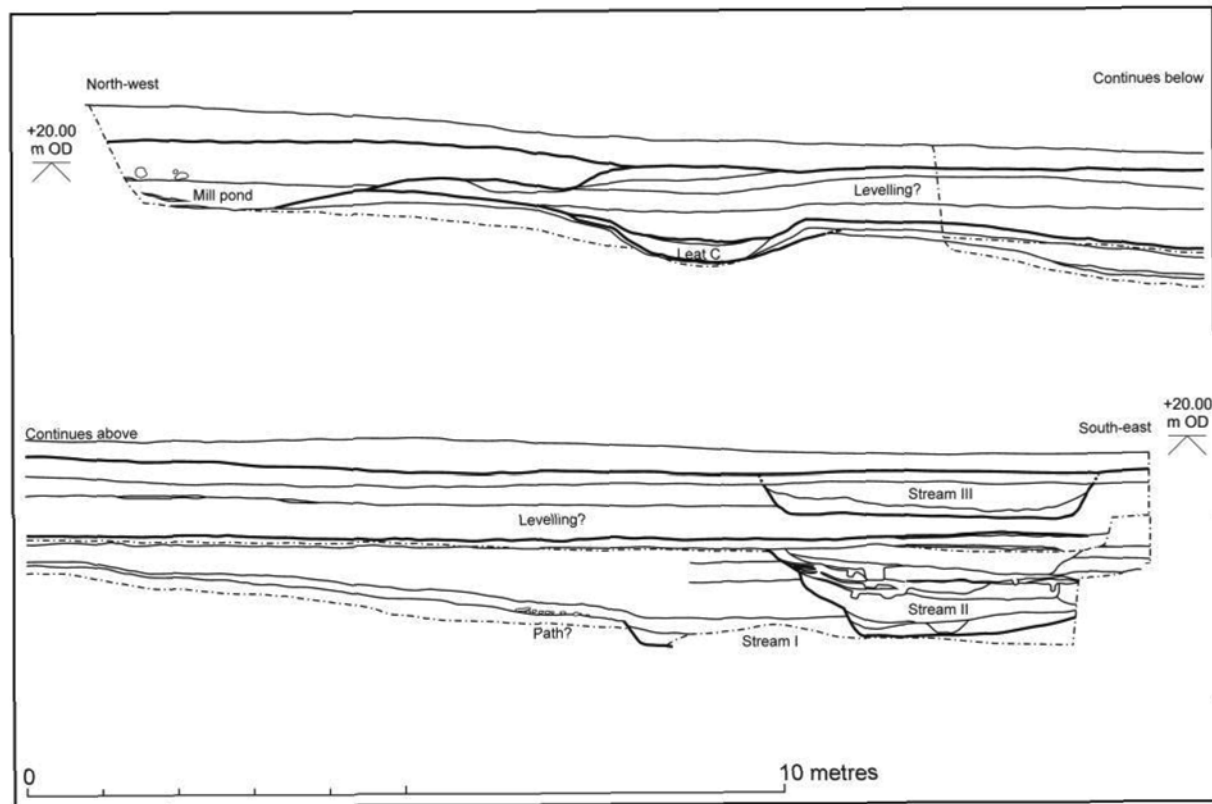


Fig. 8 Leybourne Mill: Tr.11, section, showing relationships between valley floor streams, Leat C, later pond and intermediate levelling(?) deposits.

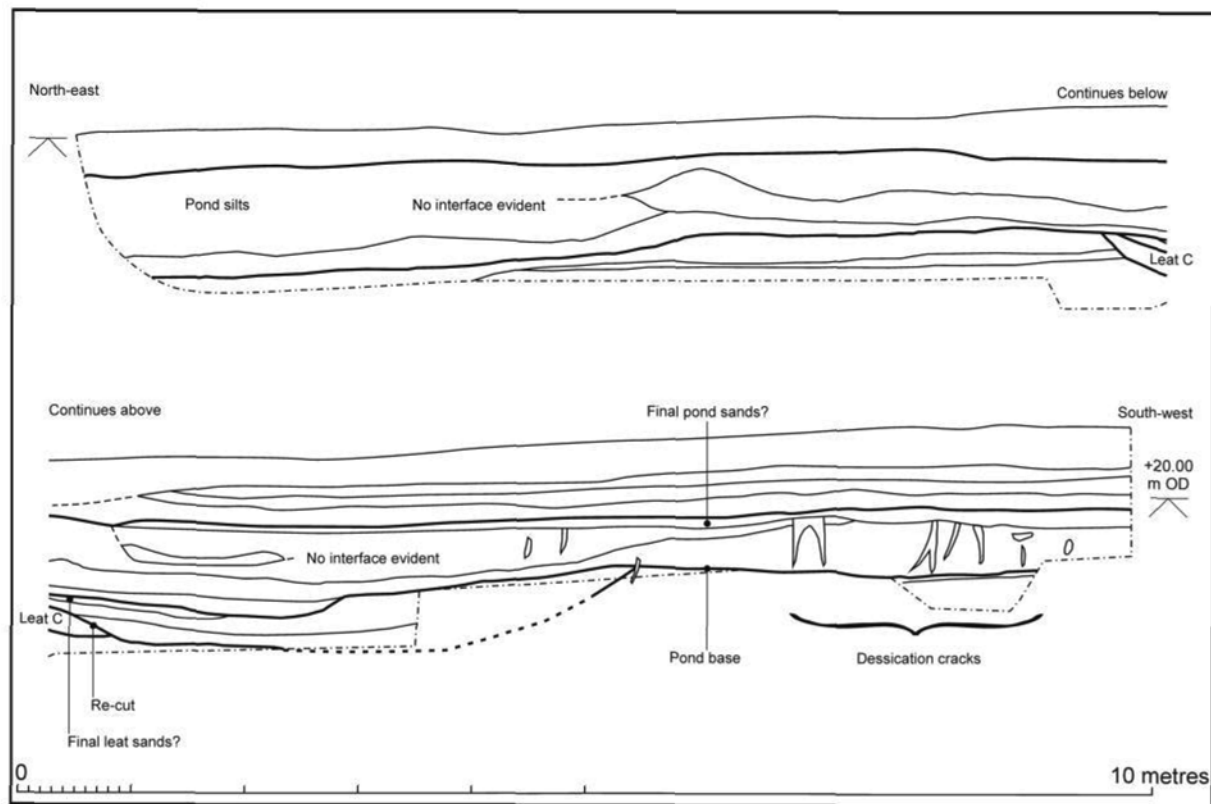


Fig. 9 Leybourne Mill: Tr.17, section, showing silt and sand sequences in Leat C and later mill pond.

The base of the pentrough for the wheel served by Leat C would probably have been set at around 19.2-19.3m OD, some 0.8-0.9m below that whose scar survives on the mill wall. While it is possible that the earlier mill was backshot and the later overshot, it is far more likely that both were overshot but the later wheel was of greater diameter, which would require heightening the headrace delivery level as well as lowering the base of the tailrace and/or raising the axle.

What may have been a bypass (Leat D), for Leat C was also identified in Tr.6 and, perhaps, Tr.7, running down to the current course of the Leybourne Stream a little downstream of the extrapolated outflow of Leat B. In this period the former channel upstream of here may also have served as a bypass for C, in which case a sluice and connecting leat probably lay to the west of the area investigated (as suggested by a dogleg shown on the 1842 map). The combined outflows of this channel and of Leats A, B and D presumably ran along the valley bottom in a stream chronologically intermediate between the second and third streams seen in Tr.11, though to their east and bypassing the mill.

Aqueduct-fed system

The second main phase of water-management (Fig. 4) included the replacement of Leat B with a raised, embanked aqueduct, perhaps incorporating a lower side channel running along its western side (Fig. 7). The aqueduct probably re-used stones robbed from the wall revetting the eastern bank of B but may have re-utilised that on the western side as part of its own structure. The aqueduct crossed the current line of the Leybourne Stream and partially overlay the infilled Leat D (Figs 10-12).

The internal structure of the aqueduct was best seen in Tr.6, which merits a more detailed description than other trenches. Here, the earliest (clayey) fills (316-317) of D included two rim fragments of a large unglazed vessel or pipe, probably of eighteenth- or nineteenth-century date. Though it is possible that they were contemporary with the use of D, they are more likely to be associated with the main fills of rammed chalk (318) under compact loamy clay (319), which consolidated the ground in preparation for the construction of the aqueduct. After an irregular base of silty clay (323) and puddled clay (324) was laid down, the lower courses of the eastern (and, presumably, of the western) revetting wall were built, slightly battered and temporarily supported by puddled clay (326). Loamy clay (327), including a large fragment of a late eighteenth- or nineteenth-century brick, was then laid between the walls and capped, to the east by a lens of crushed ragstone (328) and, to the west, by a taller base of ragstone blocks surmounted by crushed ragstone in puddled clay (329). Immediately west of 329 were set the mortared flint and crushed ragstone footings (330) of the channel's western wall, whilst puddled

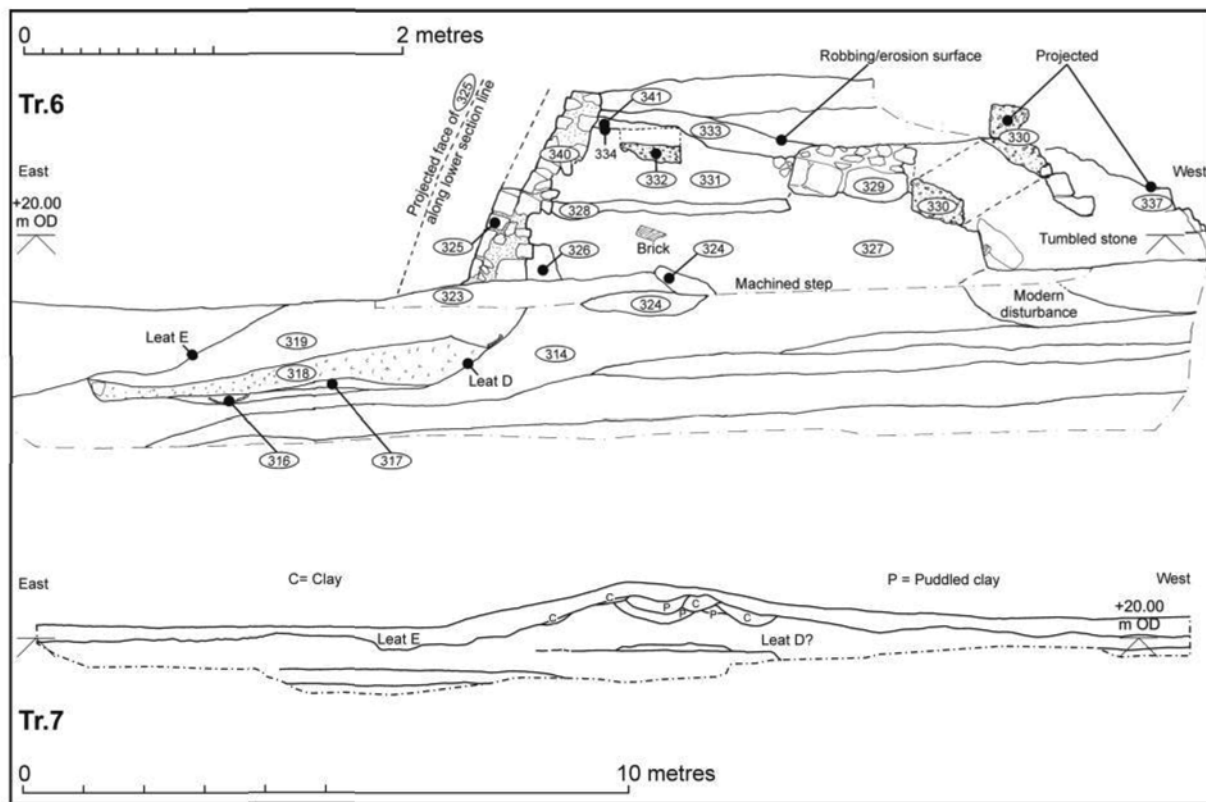


Fig. 10 Leybourne Mill: Tr.6 and 7, sections, showing construction details of the raised aqueduct.

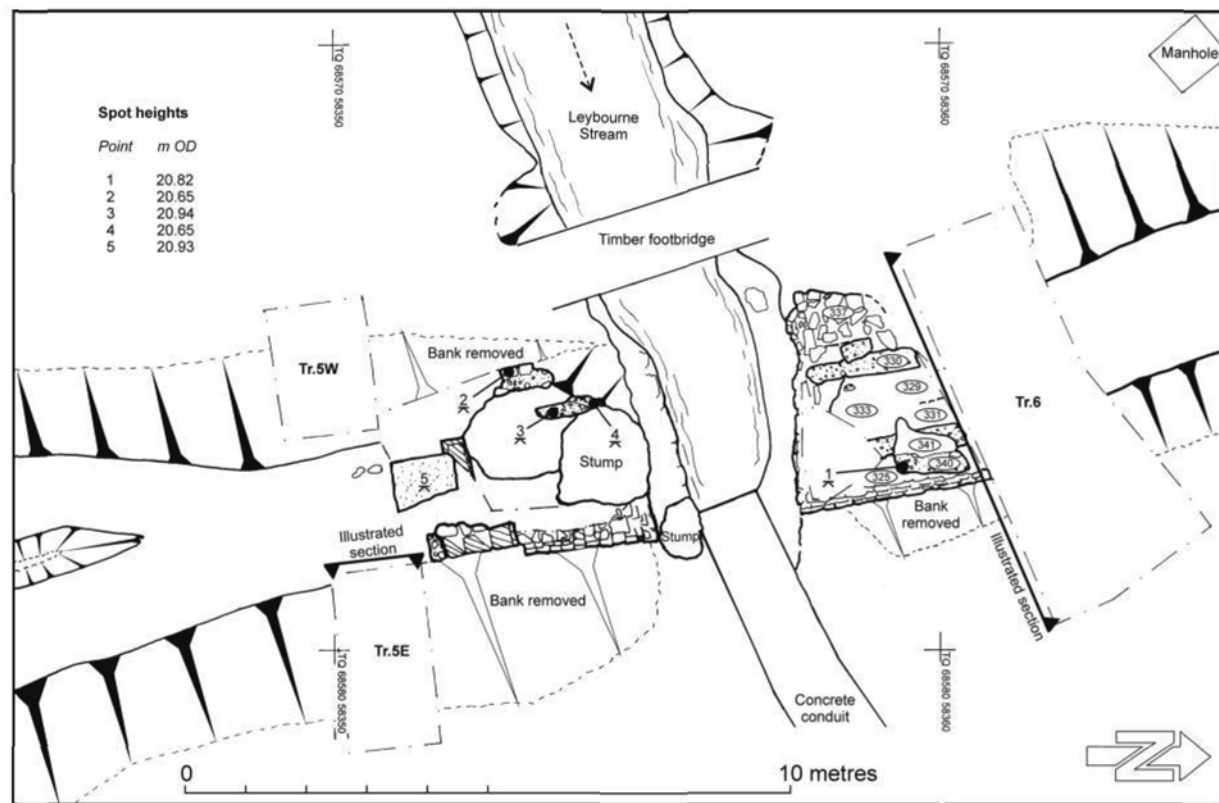


Fig. 11 Leybourne Mill: Tr.5E, 5W and 6, plan of raised aqueduct crossing the Leybourne Stream.

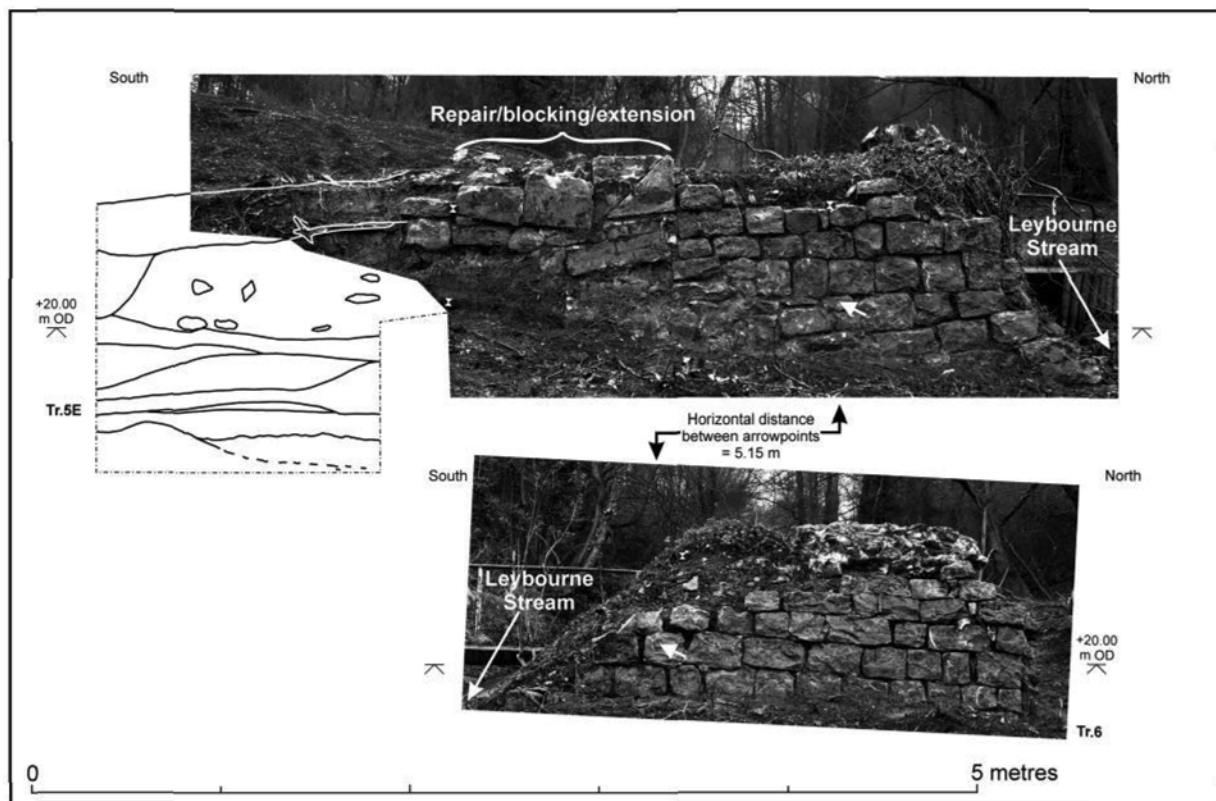


Fig. 12 Leybourne Mill: Tr.5E and 6, section and elevations of raised aqueduct crossing the Leybourne Stream.

clay (331 and 333), laid over 328, supported both the eastern channel wall and the upper part of the embankment's outer revetting wall. Though 329 may have supported a walkway, neither this nor a connection with the representation of double channels on the 1842 map, which probably mark lower by-passes, seem likely.

Farther uphill, in Tr.7, the aqueduct seems to have been unrevetted, the embankment probably being formed by scraping together sandy clay soils from either side, reinforced with clays and puddled clays (Fig. 10). A slight ditch formed or cut in the ground surface at the eastern foot of the embankment was probably one of the bypasses shown on the 1842 map (Leat E), which was also identified in Tr.7.

Tr.8 was cut at the intersection of the extrapolated line of the aqueduct base and Leat C. The latter had probably been re-cut (Leat F) and the end of the clay and puddled clay base of the aqueduct appeared to have been eroded away. Upstream from here, the embanked profile of F was recorded at various points along the northern slope of the valley of the Leybourne Stream and was also identified at several points downstream (Tr.9, 10, 21, 22 and 30). It was generally narrower and somewhat deeper than the earlier leat. It was also more often found to have been embanked on its downhill side, which would have helped raise the final water delivery level. In Tr.9, its embankment had a mortared ragstone internal facing along part of its length, probably to lodge a sluice controlling flow into a side channel shown on the 1842 and later maps. In Tr.21, what may have been a down-slope embankment for Leat C was partially razed and a new one built in very compact clay, capped by ragstone fragments and externally revetted with clay-bonded ragstone walling.

Downstream, Leat F gradually widened into a pond (Tr.11, 17 and 18), presumably that shown on the 1842 map. In Tr.17 the pond silts directly overlay silts and sands in Leat C (Fig. 9). In Tr.11, however, they were separated by a considerable build-up of what were probably levelling deposits (perhaps also sealing the second valley floor stream), laid to ensure that the floor of the expanded pond should not be too low in relation to the pentrough (Fig. 8).

In Tr.22 and Tr.30 a field drain, consisting of inverted U-shaped tiles over narrow rectangular tiles, ran alongside or just beneath the downhill foot of Leat F's embankment and appeared to be contemporary with it. A similar drain, also attributed to this phase, was found in Tr.3, running parallel to and only a little south of the infilled(?) Leat A.

Later work

Minor alterations and repairs were probably made occasionally into the twentieth century. In Tr.5, a repair to the western aqueduct revetment was made with blocks of re-used late eighteenth- to mid nineteenth-century

brickwork, including one or two fragments from a gable end. A concrete slab here was probably a contemporary repair to the base of the channel. In Tr.6 the western revetting wall seems to have begun to collapse outwards and was supported by an irregular drystone buttress. The side channel presumed to have been associated with the ragstone walling in Tr.9 was replaced by one with frogged brickwork walls and a concrete floor. Into an old ground surface sealing the latest stream in Tr.11 was set a small, shallow base of mortared, unfrogged brickwork, on the site of a tank marked on the first and second edition Ordnance Surveys. In Tr.30, the embankment and bed of Leat F showed signs of repair or reinforcement whilst a patchy lens of sand overlying the embankment's outer flank may have resulted from a breach.

Discussion

As noted above, the mill probably occupied more or less the same site from at least 1686 and several re-used blocks can be paralleled with a structure of 1638. Assuming the mill of the pre-aqueduct phase to have been overshot, the pond mentioned in 1709 and the earliest phase of Leat C were probably contemporary with its construction though other pre-aqueduct features need not be. Eighteenth-century maps show insufficient detail (generally, for example, omitting ponds) to establish whether they pre- or post-date this phase, for which there is no other direct dating evidence. Though the mill at West Malling may have been demolished around 1760 (along with the mill house) it probably lay too far upstream for this to affect the overall supply to Leybourne (though it may have held water back in dry periods) and there seems no reason to propose that particular date for Leat B. On balance the pre-aqueduct system described seems likely to have its origins in the seventeenth century though it may have been significantly altered, or added to, in the eighteenth.

The aqueduct-fed phase field drains identified in Tr.3, 22 and 30, presumably laid to intercept leakages, were of a type in use by the early nineteenth century but typically replaced by cylindrical tubes around the middle of the same century. In Tr.3, one of the aqueduct's embankment deposits included a brick of late(?) eighteenth- or early nineteenth-century type. The use of puddled clay in an aqueduct clearly echoes its use in canal-building. The technique was introduced to Britain by James Brindley (who began his career apprenticed to a millwright) during the construction of the Bridgewater Canal in 1759-61, which may be taken as a *terminus post quem*. A secure *terminus ante quem* is provided by the 1842 map which, as well as the pond, shows the West Malling Stream being carried, presumably by the aqueduct, straight across the Leybourne Stream to meet Leat F. It is reasonably certain, therefore, that the aqueduct and associated leats and pond date to the later eighteenth

or early to mid nineteenth century. The replacement of a small mill of, perhaps, two or three storeys, with a five-storey, weather-boarded mill to accommodate complicated, newly developed, hopper-fed systems, is a typical development for the early nineteenth century in Kent. The absence of a lucam is consistent with this.

There is tenuous evidence to support a much closer dating. The embankments and the relative levels of the bases of Leat C and the pond suggest that the wheel served by the later system may have been set somewhat higher, or was powered by a greater head of water, than previously (or much less probably, was converted from backshot to overshot). Furthermore, it now took the combined flow of two streams rather than one. Any of these factors may have required the wheel to be replaced. The increased flow may also lie behind the creation or, more probably, extension, of the pond to increase storage capacity and/or to raise the head of water. On 28 November 1800 the *Kentish Gazette* reported '[on] Saturday last as some workmen were repairing a mill, at Leybourne, a large piece of timber fell, upon a young man named Wood, of Maidstone, and killed him instantaneously'. These 'repairs' may actually represent a complete rebuilding of the mill (and mill house?) taking advantage of new milling technology and associated with the comprehensive reorganization of its water-management system, itself taking advantage of Brindley's innovation. If so, Hawley's alterations upstream of the London Road, from the arrangement shown in 1798 to that on the 1801 map, may have formed part of the same campaign of work.

ACKNOWLEDGEMENTS

Ms Wendy Rogers and Dr Robert Spain kindly read drafts of the current article and suggested several improvements.

ENDNOTES

¹ A. Thorne and S. Worrell, 2005, 'An Archaeological Evaluation along A228 Leybourne to West Malling Bypass', unpubl. Archaeology South-East client report; C. Ellis, forthcoming, 'Archaeology of the West Malling and Leybourne Bypass, West Malling, Kent', Wessex Archaeology.

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⁶ PRO, Public Record Office documents; PRO SC 6/898/27, SC 8/20/989, E 42/303, E 328/343; Hasted 1798, 501; D. Robinson (ed.), 1998, *The Cistercian Abbeys of Britain*, London, 136.

⁷ E. Hasted, 1798, *The History and Topographical Survey of the County of Kent IV*, Canterbury, 502-505; Fuller 1991, 222-223.

⁸ Lincolnshire Archives documents, LA2 Hawley 1/B/7.

⁹ CKS U269/T58; Fuller 1991, 222-223.

¹⁰ Fuller 1991, 232.

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¹² CKS Drb/Pi16/1.

¹³ CKS U36/T781.

¹⁴ CKS U269/T58; Fuller 1991, 223.

¹⁵ CKS U269/E323/3.

¹⁶ Hasted 1798, 505.

¹⁷ CKS U838/T241/3.

¹⁸ CKS U850/T1/1-2.

¹⁹ Hasted 1798, 519.

²⁰ CKS CTR/226A.

²¹ CCAL DCb/T/O/A/B/25; Fuller 1991, fig. 62.

²² Fuller 1991, 230-231; www.millarchive.com, item 23561, accessed 20/11/2008.

²³ Fuller 1991, 227.

²⁴ CPD F123182/2. C.P. Davies, 'Notes on Leybourne Mill in the Wind and Watermills Collection', Templeman Library, University of Kent.

²⁵ CPD F123182/8.

²⁶ Fuller 1991.