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Editors
David A Barrowclough
Mary Chester-Kadwell

Associate Editor (Archaeology) Professor Stephen Upex

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Upware and Bottisham sluices

K S G Hinde

Dredging of the River Cam at Upware in September 1989 unearthed a quantity of stakes and planks. This study seeks to explain their significance in the context of structures erected in the early nineteenth century to control the flow of water in the river below Clayhithe. No published information about these has been traced, save for partially misleading indications on some maps of the period.

Introduction

Chisholm (2005) explains the multiplicity of terms used to describe structures erected in watercourses for the purposes of control of water and navigation. For the purposes of this work, it is necessary to understand that an 'overfall' means a fixed dam allowing water to overflow only when it reaches a certain level and is in effect a weir. A 'staunch', also called a 'stank', means a form of dam adjustable to control the flow or head of water either by removable boards or a guillotine. When used for navigation, these were called 'flash locks', being opened when the head of water had built up sufficiently to allow a boat to pass through. Except for the flash lock on Bottisham Lode, the locks on the River Cam were all 'pound locks'. These consisted of gates enclosing each end of a chamber or pound. A boat enters the chamber and the water in it is then lowered or heightened so that it can move into the different level above or below the lock. A 'sluice' is the term used herein to describe a combination of all three; whilst a 'weir' is generally applied to what was probably a combination of overfall and staunch. A 'cradge bank' is a small bank to contain minor floods within a small area of washland and built nearer the river than the main flood bank.

The excavated remains

The *Ely Standard* of 21st September 1989 carried a report on the discovery which merits full repetition:

> 'Work dredging the River Cam at Upware turned up a major surprise on Thursday—a lock or staunch which had lain hidden for nearly 200 years. Dozens of massive stakes and planks came floating to the surface as workmen scraped away at the bottom of the nine-foot deep stretch of river. Some of the unbroken stakes were over 12 feet (3.6m) long, as thick as tree trunks, and still had sharp points, while among the planks were a few over six metres long.
>
> The dredging was being carried out by Waterbeach firm Taylors. Workman Paul Hodson said it was the largest and most unexpected find the firm had ever made. Archaeologists and local historians called to the site believe the wood was part of an early lock or staunch, built when the course of the river was diverted in the early nineteenth century.
>
> The structure would originally have stretched right across the river. A number of the poles had huge iron nails still embedded in them while one had roman numerals scratched into it. However, Alison Taylor, of the Cambridge archaeological unit said the discovery definitely did not date back beyond 200 years. A great deal of work was carried out on the river at Upware around 1820 when its course was straightened. Logic suggests that any man-made structure would date from then.
>
> Old drainage records would almost certainly refer to it, but Alison Taylor said her unit had neither the time nor the resources to go through them. As for the discovery's future, difficulties in preserving wood, coupled with the cost and impracticality of putting it back together means that it could end up as very historic firewood.'

The writer inspected the remains on 24 September 1989, and noted that they had been deposited on the washland just south of the junction of the outfall of Reach Lode and the Cam. He found the stakes to be rough tree branches, about 9 to 12in (23–30cm) thick, and some tapered to a centre point. The boards varied in width up to 18in (45cm). This wood was removed shortly afterwards. The only other remaining evidence of these is a series of photographs taken by Michael Petty, deposited in the Cambridgeshire Collection, Cambridge Central Library. Fig. 1 is one of these, and clearly shows the remains excavated, with

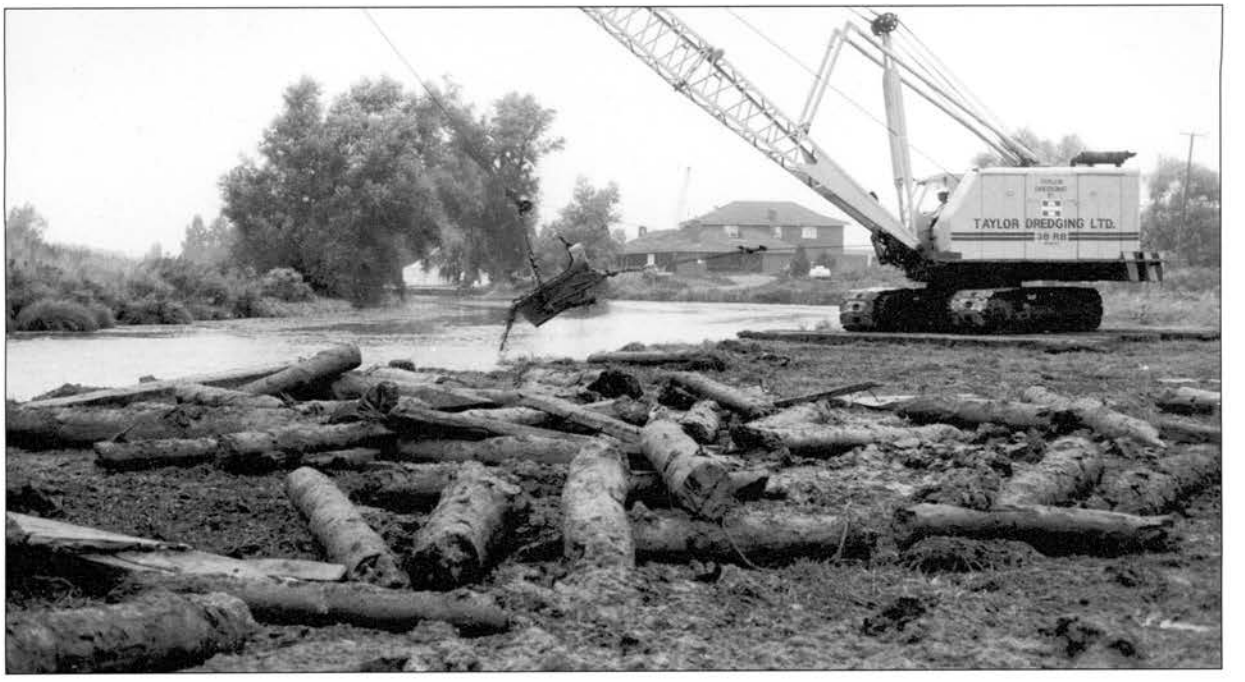

Figure 1. *Remains excavated in 1989 with the River Cam on the left and the 'Five Miles' public house in the background.*

the River Cam on the left, and the 'Five Miles' public house in the background.

The River Cam before 1820

The reconstruction of Denver sluice in 1748–50 would have caused problems in controlling water levels above Denver. Until 1820, there were no sluices on the River Cam and Ouse between Clayhithe and Ely except for the three installed in the mid-seventeenth century to regulate the flow of water into the Cam from the three lodes, Bottisham, Swaffham and Reach (Fig. 2). Although it was proposed to construct a sluice near Ely, this was never erected (Chisholm 2007) and there were also none on the Ouse from Ely to Denver Sluice. The actual levels of water maintained in the stretch from Clayhithe to Ely are open to conjecture. Elstobb (1778, 4 & 12) painted a dire picture of its condition, but probably for partisan reasons since he was wholly opposed to the retention of Denver sluice. He did recommend that a stank (*i.e.* staunch) be made across the Cam about a mile and a half 'below Upware, to raise a head of 2 or 3 ft. of water'. Later, in 1792, Mylne recommended the construction of one or two locks downstream from Clayhithe to create a greater depth of water. This implies continuing problems in maintaining the water level for navigation, but it was almost thirty years before these recommendations were implemented.

Statutory Authorities

To understand this account, it is necessary to appreciate the confusion of responsibilities placed upon the various bodies referred to below. W H Wheeler, as cited by Darby (1983 172–3), noted in 1882 that the number of Acts of Parliament concerned inter alia with the Ouse was 'extraordinary' and that the number of jurisdictions that controlled a river and its banks had so accumulated that it was almost impossible to define their powers and rights. In addition to those primarily cited below, the Cam Conservancy was responsible for the Cam between Cambridge and Clayhithe (see Chisholm 2003) and the Swaffham and Bottisham Drainage Commission was, after much dispute, obliged to accept maintenance of the three Lodes and their locks.

The Eau Brink Commission

Responsibility for maintenance of the rivers throughout the Bedford Level was originally vested in the Bedford Level Corporation by Act of Parliament of 1663, with power to tax the relevant land to meet the cost. Frequent floods throughout the eighteenth and early nineteenth centuries deprived many landowners of the means to pay these taxes and in consequence severely limited the capacity of the Corporation to fulfill its functions. Despite proposals in 1860 for its abolition, the Corporation survived in increasing impotence until 1920 (Summers 1976, 218). Navigation was particularly impeded by the wide bend in the River Ouse between Wiggenhall St. Mary and King's Lynn. In 1795 an Act (with eight supplementary Acts up to 1831) constituted the Eau Brink Commission to construct a new channel to bypass this bend. It was not in fact completed until 1821 (Darby 1983, 154). Because it was expected that this would reduce the average level of water immediately below Denver Sluice and thus up the Ouse and Cam, this Commission was also required to im-

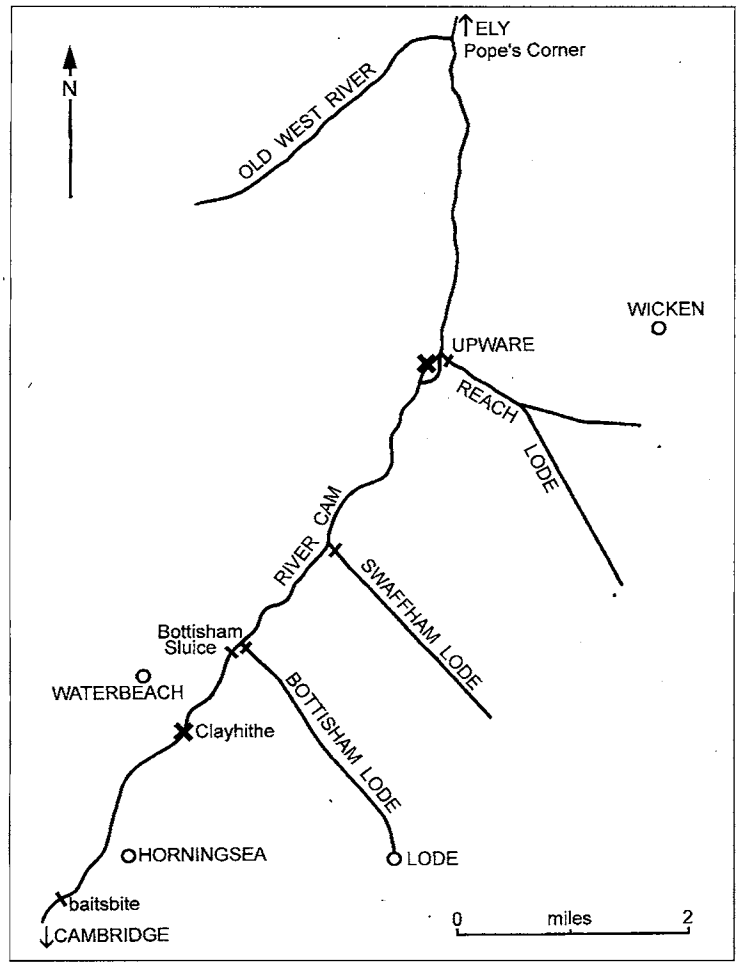

Figure 2. Upware 1820–1862.

prove the navigation and erect staunches or sluices on the River Cam up to Clayhithe Sluice. The latter had been erected by the Conservators of the River Cam (Chishom 2003). The extent of the works envisaged is evidenced by the estimate dated 1819 of probable expense remaining to be expended under the Eau Brink Acts (Wells 1830, 1, 765) including 'works upon the Cam for the protection of the navigation – £6543'. The Eau Brink Minutes of 22 May 1820 record the receipt of a tender for a lock, staunch and side cut near Reach Lode, *i.e.* at Upware, in the sum of £1290, and the same near Bottisham Lode for £1017.

Bottisham Sluice

The latter was to be erected at Waterbeach, below Clayhithe and was later known as Bottisham River Sluice to distinguish it from the single gate lock at the nearby point of discharge of Bottisham Lode into the Cam. The two tenders for Bottisham and Upware received in 1820 clearly demonstrate that the two sluices were to be erected at the same time. The existence of Bottisham sluice is confirmed by a reference to it in the Minutes of the Swaffham and Bottisham Drainage Commisson of 21 April 1821. It is also marked on Baker's Map of 1821 as a sluice, and on the Eau Brink Map as an overfall. Humphrey, 11, writing in 1829, identifies the inter-relation between the two sluices in controlling the flow of water: 'if the overfall or waste at Bottisham Sluice be dropt 2 ft. (60cm) the floor of the present sluice at Clayhithe will be laid nearly or quite dry'. This envisages a lowering of the water level above Bottisham. He continues: 'Diagram 3 shows what would be the state of the river if Baitsbite Sluice only were removed and the water between Clayhithe and Bottisham reduced 2 ft. (60cm), which is all it can be reduced without lowering the overfall at Upware—even if Bottisham Sluice were entirely taken away'. Previously, the Report of Thomas Telford and John Rennie dated 9 October 1823 (Eau Brink Records) had observed that the overfall at Upware was too high and could be reduced 10ins (c. 25cm) without injury to navigation.

Upware Sluice

At Upware there was a wide horseshoe-shaped bend in the river from Crooktree Farm in the south to the outfall of Reach Lode in the north (Fig. 3), based on the Wicken Enclosure map of 1840). This is still partially identifiable from the line of the present eastern flood bank. Baker's map of 1821 (compiled 1817–1820) shows that a new cut had been constructed by then to bypass this bend. In January 1822 the Eau Brink Minutes record receipt of a tender from Mrs Rayner 'for the land requisite for the New Cut making upon

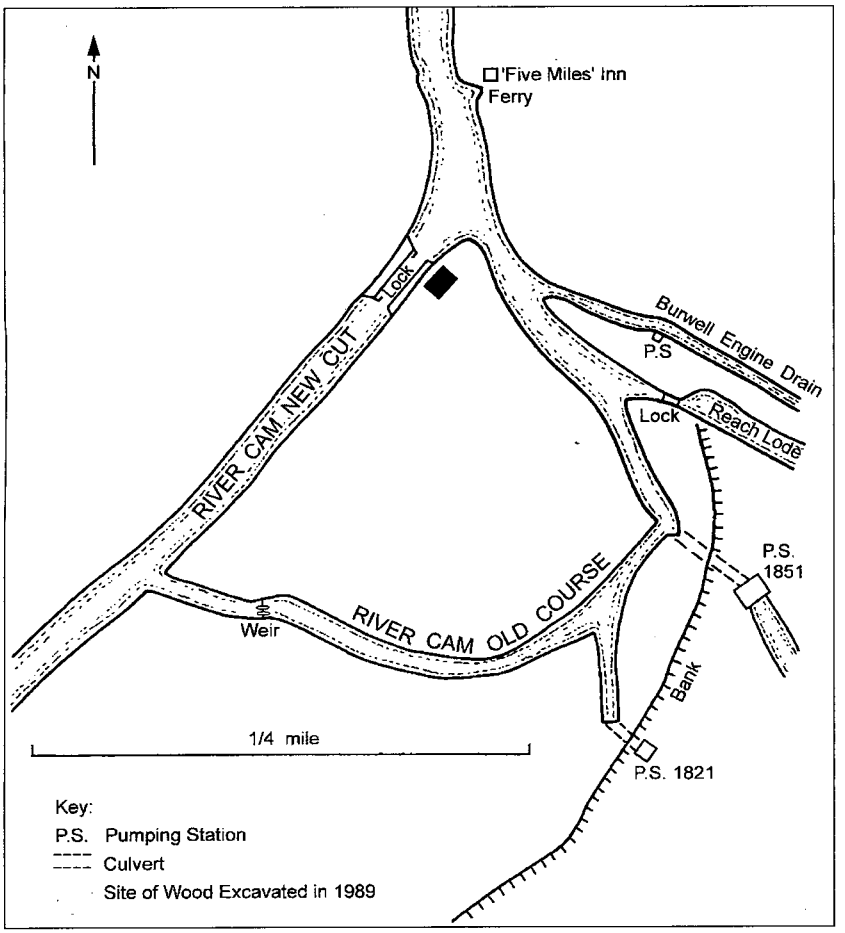

Figure 3. The River Cam from Cambridge to Ely.

the River Cam'. This may have been an offer to purchase. Certainly she owned this land by 1834 as is recorded in Lenny's Particulars (Lots 102 and 103 Wicken) as well as much other land in the parish (Knowles 1902, 38–9). Baker also marks a sluice, but without identifying its exact position. All subsequent maps mark the new cut, but are confusing in identifying the structures actually erected. Wells' map of 1829 marks a lock on the new cut but no structure on the old course. Lenny's map of 1833 marks an overfall on the southern section of the old course, as does the OS first edition of 1836 (calling it a staunch) but neither indicate a lock on the new cut. Nevertheless, the Eau Brink records amply confirm the existence of both a lock and a staunch at Upware in 1823, confirmed by the Report on the state of the locks etc. in July, and the Report of Thomas Telford and John Rennie of 9th October 1823 (Eau Brink Records). The latter states that the staunch and pound lock upon the River Cam near Reach Lock had been properly executed but the overfall was too high and a lock-keeper's house was required. They also confirm that these structures were different from the lock on Reach Lode, often called Upware sluice or lock in early records, and refer to the structures at Bottisham Locks. The best evidence of the true position of these at Upware is provided by the Wicken Enclosure map of 1840, probably drawn slightly later because it shows Mary Hatch as owner of the land on either side of the New Cut, and she did not inherit from Mrs Sarah Rayner until 1841. This clearly marks a staunch at TL 535698, and shows the New Cut as narrowing at its northern end into an enclosure, which must have been the position of the lock at TL 536700. This position is confirmed by the tender of 1820 as for a lock near Reach Lode.

Use of the old course to accommodate the staunch and overfall is easily explicable in that it had to be maintained to provide the discharge from the pumping station erected in 1821 by the Swaffham and Bottisham Drainage Commissioners and, lower down, the outfalls of Reach Lode and the Burwell Fen drain (Fig. 3). McKnight (1975, 42), states that 'on the best engineered river navigations, the weir is often remote from the lock chamber, with an artificial canal cut constructed for the navigation channel'. The old course provided a channel for the weir, but not for navigation, without requiring any expense, other than for the weir itself.

Construction of the railway line from London to Ely in 1845, and later to King's Lynn, brought about a considerable reduction in the use of the river for navigation, and in consequence the revenue derived

from tolls (Hills 2003, 79 and 160 and Chisholm 2003, 190). This affected the capacity of the various authorities to maintain the works on the river. In 1851, the Swaffham and Bottisham Drainage Commission demolished their pumping station and erected new plant close to the outfall of Reach Lode (Hinde 1971 and RCHM 1971). Save for the weir, this removed the necessity to maintain the south and eastern portion of the old course.

The Eau Brink Commission records contain an Award of the engineers appointed in relation to the navigation of the rivers above Denver Sluice dated 30 January 1852 stating that 'when and as soon as the River between Upware Sluice and the present site of Bottisham Sluice or any other sluice that may be erected below it, shall be deepened to the level shown on the accompanying section of that River, the said Upware Sluice shall be taken up and the Materials removed'.

The South Level Commission

Meanwhile the confusion of authorities having responsibility for maintenance of the Cam was compounded by the creation of the South Level Commission by Act of 1827. This body was required to cleanse and deepen the Cam and Ouse between Clayhithe and Littleport Bridge. Thus it became responsible for the bed of the Cam whilst the Eau Brink Commission remained responsible for the sluices. The Act (not sectioned, p. 64) specifically mentions Upware Sluice in connection with tolls.

At an early stage the South Level Board set to work in deepening the Cam below Clayhithe (Minutes 18 June 1831 and October 1834) and this must have enabled the removal of Clayhithe Sluice and further works on the Cam above it in about 1835 (Chisholm 2003, 188). The South Level Minutes of 4 June 1851 reported that the depth of the river between Clayhithe and Bottisham Sluice varied between 4 ft 6 i. to 6 ft (1.8–2.4m) and between Bottisham Sluice and Upware Sluice from 5 ft to 6 ft (1.5–2.4m). Before then, on 4 April 1851, it had proposed to the Eau Brink Commission that the sluices at Bottisham and Upware be removed, but presumably the engineers' report modified this proposal.

Yet another authority was then created by the Ouse Outfall Act of 1860, its title describing it as an Act for better defining the powers and responsibilities of the Eau Brink Drainage Commissioners. The South Level Board requested that the navigation sluices and works supported by the Eau Brink Commission in the Brandon, Little Ouse, Cam and Lark rivers be transferred to it. Sections 47–50 of the Act provided for this, and gave it power to remove sluices until 1894, when responsibility for these works was to revert to the Eau Brink Commission. The Bedford Level Commission retained the power to appoint sluice keepers, but at the expense of the South Level Commission.

Removal of Upware Sluice

The South Level Board rapidly assessed the position. On 6 July 1860 the Minutes record that

> 'the Committee met at Waterbeach and proceeded to view Bottisham River Sluice, Bottisham Lode Sluice, Swaffham Lode Sluice and Upware Sluice transferred to the Commissioners by the Eau Brink Act lately passed and they directed the Superintendent to estimate the cost of removing Upware Sluice and of opening a sufficient channel through the site of it, and also to value such of the materials of that sluice as it will be necessary or advisable to remove, also to estimate the cost of putting sufficient pointing doors below Swaffham Lode and Bottisham Lode Sluices for the purpose of enabling the Navigations to pen into those sluices without the aid of Upware sluice, also to estimate the cost of lowering the lower cills of Bottisham River Sluice and of putting that Sluice into such effective state as to maintain by that sluice alone the heads of water now maintained by that sluice and Upware sluice together, also to report how far the materials of Upware sluice may be rendered available towards executing the above works.'

The Superintendent's estimates followed on 28th September 1860:

> Cost of removing Upware Sluice and opening the river there excluding the value of materials estimated at £207.10. 6d £301. 6. 0d
>
> Cost of repairing Bottisham River Sluice and lowering the chamber and lower cill 4 ft. £908. 8. 0d
>
> Cost of additional doors below Swaffham Lode Sluice after including part of materials from Upware Sluice £398.12. 0d
>
> Cost of additional doors for Bottisham Lode Sluice after including remainder of materials £362.10. 0d
>
> Cost of scouring out Bottisham Lode and repairing and lowering cills of do. and Bottisham Lode Sluice sufficiently to render additional doors unnecessary £377.15. 0d

The date of completion of these works is not recorded, other than those at Bottisham River Sluice, reported as completed by September 1862. It must be assumed that the remainder were executed within a year.

The old course of the river from the Cam to the discharge channel of the 1851 pumping station was wholly infilled during the twentieth century, but much of its course can be identified from sunken sections in the washland.

The significance of Upware Sluice and the remains found

The extent to which Upware sluice was used is open to doubt. There is no evidence of a bank on its eastern side, which abutted washland, and in its absence the lock must have been covered by water in times of flood. Even a cradge bank would not have protected it against severe floods. The discharge of water from the 70hp Swaffham pumping station of 1850 and the 40hp Burwell plant of 1841 would have caused a considerable surge into the river. Their combined delivery would have been at least 150 tons per minute (Hinde 2006, 31). This could have caused back-up and

consequential silting at the northern gate of the lock, requiring it to be left open to create scour. Thus the lock may have become unusable before its removal. Nevertheless, although there is no evidence of a lock-keeper's house having been built, and no lock keeper is listed by Wells (1830, Vol. 1, 582), the Wicken Census Returns for 1841 and 1861 list Joseph Phipers (b. 1791) as sluice keeper living close to the Burwell Engine and with the toll keeper. The latter almost certainly collected the taxes at Reach Lode lock, and is listed in 1871, but not any sluice keeper. This suggests that the latter operated the Upware sluice.

An exact identification of the 1989 remains will probably never be possible, not least because their early removal prevented detailed examination. Their nature suggests that they were not part of the lock itself. The possibility that they were parts of a cofer dam constructed when the lock was removed is unlikely. The stakes would form no tight dam. Dam boards were customarily shaped boards, about 9in. (23cm) wide and 2in (5cm) thick tapered to a point at one end (Clarke 1987). It is most likely that they formed parts of the side of the lock. McKnight (1975, 35) states 'on river navigations well supplied with water the sides of the chamber were sometimes partly or completely made of sloping grass banks, normally with a row of timber posts to prevent descending craft being stranded on the side'. The present paper may be useful if any further remains are found in the future, although it reveals that parts of the lock, staunch and overfall were to be re-used as far as possible for repairs to the other sluices. In addition, any remains of the staunch and overfall will have been left in the old course of the Cam, long since infilled and situated in the washland, which is unlikely to be disturbed.

Conclusion

The existence and position of a lock and separate weir at Upware can now be definitely established. These were part of the works carried out on the Cam in 1820 by the Eau Brink Commissioners pursuant to its statutory requirements. Those works included excavation of the new cut at Upware and construction of Bottisham River sluice. The latter eventually enabled the Cam Conservancy to demolish Clayhithe sluice and the other sluices from Baitsbite to Jesus Lock (Chisholm, 2003).

It is also clear that the lock and weir at Upware were removed in 1862–3 by the South Level Commission in conjunction with the alteration of Bottisham River sluice, and can well have become redundant before that time. The significant role of Bottisham sluice in controlling the flow of water from Baitsbite to Denver from then up to the present day is thus established. The remains found in 1989, which were indicative of the position of the lock at Upware, most probably formed part of its eastern side.

Acknowledgements

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