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**An Artery of the Industrial Revolution and a Birthplace of British Drainage
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The History and Future of the Idle/Bycarrsdyke Waterway and its Catchment:

An Artery of the Industrial Revolution and a Birthplace of British Drainage Engineering

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Abstract

This paper presents an account of the Idle navigation in northern England, now an obscure waterway but one which was fundamental to the success of the first steps of the industrial revolution which were being taken in north Derbyshire and south Yorkshire during the late 17th and early 18th century. It was also involved in an important part of American history, the exodus of the Mayflower Pilgrims and formation of the Plymouth Colony, and has an important place in the heritage of civil engineering, having been widely modified and controlled by pioneering drainage works initiated by Vermuyden in the 1620s. Competition from the Chesterfield Canal was partly responsible for its decline as a commercial waterway, with the canal benefitting from the labour force displaced from the Idle and many of the markets that it had established. Today navigation activity on the waterway is very scant, the legal rights to navigation have been under threat and there are physical, financial and bureaucratic barriers to vessels entering the waterway from the River Trent. A combination of a tidal sluice across the confluence with the Trent and a large pumping station barrage just upstream is the main issue. There is, however, some hope that proposed changes to jurisdiction over navigation on the Idle may result in improvements to access and, in the long term, tentative proposals to return the Idle to gravity drainage may remove one of the physical and financial barriers to access.

Introduction

Today the Idle's waters flow into the River Trent at West Stockwith about 330m north of a lock which connects the Chesterfield Canal (built 1777), to the Trent (see Figure 1 and Newman and Hunt (2016) for further background). Here the River Trent is tidal and affected by a sometimes dangerous tidal bore called the Agir (or Aegir) (see USRA, 2006) which can occasionally be up to 5 feet high. Figure 1 shows a schematic map showing the spatial relationship of the important waterways in the area. Part of the current River Idle's course, downstream from the town of Bawtry in south Yorkshire,

formed the historic northern boundary of Sherwood Forest, and the Idle has numerous mentions in the Robin Hood stories including the traditional tale of his first meeting with Friar Tuck (where he carried him across the river) and in recent novels and films.

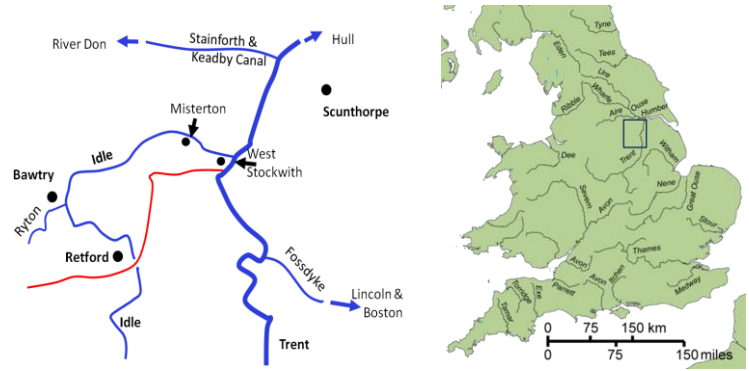


Figure 1: Left, schematic of the arrangement of the current courses of the rivers and waterways in the area of interest. (Chesterfield Canal is shown in red). Right; approximate location of area.

The Idle and Historical Events

Conflict across the defensive line of the River Idle was important in the unification of England. Before England existed as a single kingdom, the Battle of the River Idle took place at a ford on the river in south Yorkshire in about 617AD. Here Rædwald became “High King of Britain” after defeating Æthelfrith, King of Northumbria. After the battle, “Foul ran the Idle with the blood of English Men” (Misson Community Group, 2000). The river has also played a role in the history of America. The British government has provided funds to allow Plymouth (UK) to make preparations for the 2020 celebrations to mark 500 years since the voyage of the Mayflower. What may be surprising is that efforts are being made by representatives of Bawtry, some 300 miles away in Yorkshire, to be included in this event. This has even resulted in a brief debate in Parliament, instigated by the local Member of Parliament (MP), for the official celebrations to take into account the fact that many of William Bradford’s group of “Separatists”, mainly from the area around the town, travelled by small boats on the Idle and Bycarrsdyke (of which more later) from just upstream of Bawtry in the first stage of their exodus. Following several setbacks they eventually took ships from the River Humber to take up a temporary residence in Holland, originally in Amsterdam and later in Leiden. There they stayed for 10 years before the first group moved on to establish the colony in Massachusetts. An earlier but unsuccessful attempt to depart England via Boston (Lincolnshire) (resulting in the men of the party being imprisoned at the port) would logically have started along the same route and thence upstream, on the Trent, to Torkesey, onto the Fossdyke (reputedly the first canal in England, built by the Romans in 120AD) and then via the River Witham to Boston. The rest, as they say, is history but it is a history that is celebrated enthusiastically in the locality including the naming of the Mayflower Junior School where, very unusually in the UK, the children celebrate Thanksgiving. The local museum records the exodus with a diorama which explains the story (Figure 2a shows photographs taken at the Bassetlaw museum in 2016).

Development of The Idle Waterway and Catchment

An inspection of modern maps does not easily reveal the important changes to its course that the river has undergone in its history, although the clues are there. The most important of these changes is related to the fact that the river originally did not connect to the Trent at all. About 7km from the Trent, it turned north to pass through a marshy area, known as Hatfield Chase, to join the River Don. The artificial connection to the Trent, known as Bycarrsdyke, was reputedly (although this is not universally accepted) constructed by the Romans in the second century AD. A small Roman log boat has been excavated from the Idle and is in Bassetlaw museum (Figure 2b). It is suggested that



Figure 2: Exhibits at the Bassetlaw Museum Retford; (a) The story of the exodus of the Mayflower colonists to Holland; (b) Roman Log Boat excavated from the Idle. Images © M Newman, reproduced with permission.

Bycarrsdyke was built to allow transport of materials between Lincoln and York via the North Idle and another Roman canal, Turnbridgedyke between the rivers Went and Aire. This would minimise exposure to the unpredictably-hazardous Agir on the Trent. A waterway with the name Bycarrsdyke certainly existed when the Domesday Book surveyors recorded it as one of the King's fisheries (Domesday Book, 1086). It is known that in 1286 lead was being traded at Stockwith, presumably originating from Derbyshire, and coming down the Idle and Bycarrsdyke by boat (Callendar of Patent Rolls, 1286). The waterway was also used for imports. Steel is known to have been imported from Europe via Bawtry to Sheffield in 1574 (Hey, 2005). However opinions are divided as to whether the Bycarrsdyke mentioned in the Domesday Book is the same channel as the one known as Bycarrsdyke today. A local historian (Cook, 2012) claims the current channel was constructed *ab. initio* in the early 17th century. Cook agreed with earlier opinions expressed by Swinnerton (1910) that the Mother Drain, which runs parallel to the existing Bycarrsdyke course, may actually have been the Roman construction (caution - there is another drain called Mother Drain several miles to the north). The common attribution of the *ab. initio* construction of the Mother Drain to Thomas Dyson in the late 18th century may thus be incorrect since the drain is shown (named as "Mother Flue") on a 1610 map of Nottinghamshire (Cook Pers. Com., 2016). Another possible candidate for the Roman channel is the Heck Dyke about 10 miles north of Bycarrsdyke (Cook, 2012) and shown on figure 3.

Vermuyden's Drainage Works and Civil Unrest

Heck Dyke was used as an attempted means of diverting the waters of the Idle to the Trent in 1337. Edward III was called upon to adjudicate over the diversion of the Idle along this channel (Dugdale, 1662) and required the work reversed and a penalty paid. In the 17th century the Crown took a much more supportive view of drainage engineering. In the 1620s Dutch Engineer Cornelius Vermuyden, who would later be famous for draining the English Fens around Cambridge (see Knell, 1990), started work on the drainage of the area to the north of the Idle's current course with the aim of draining an area of about 80km² of bog, marsh and mere at Hatfield Chase and the Isle of Axholme. Amongst his very extensive works, using much Dutch labour, Vermuyden blocked the natural channel of the rivers Don and Idle. The entire flow of the Don was diverted along Turnbridgedyke to the Aire.

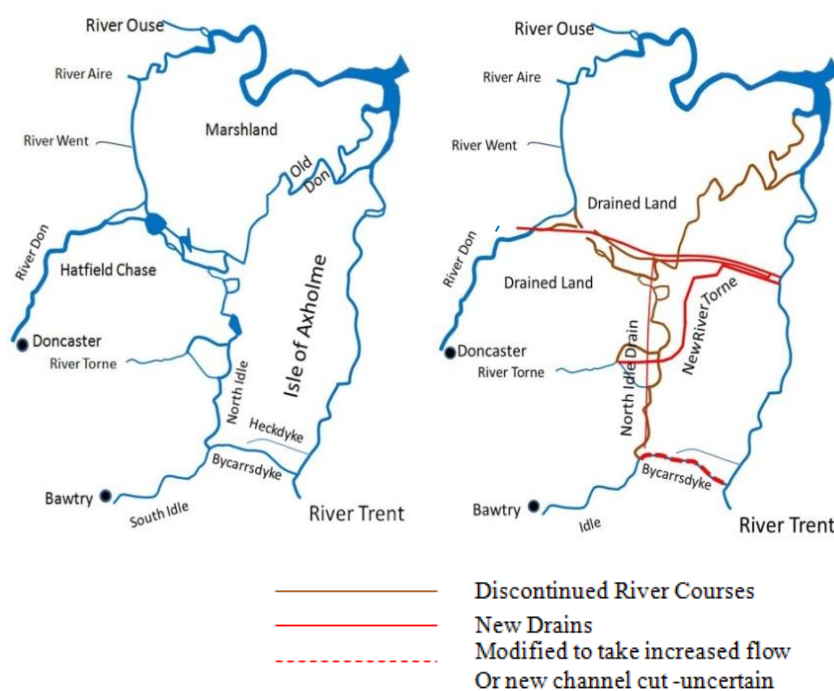


Figure 3: The rivers, canals, drains and wetlands north of the Idle just before (left) and after (right) Vermuyden's original drainage works (the slightly later "Dutch River" is not shown). The northward link between the Rivers Don and Aire is Turnbridgedyke.

Modified from a map at : <https://www.red1st.com/axholme/showmedia.php?mediaID=1375>

At a place, later to be known as Idle Stop, he either modified Bycarrsdyke to allow it to carry the full flow of the Idle to the Trent or, as believed by Cook (2012) and by Stonehouse (1839), cut a new channel alongside it. The agreement with the King meant that (initially) Vermuyden (and his Dutch and Walloon investors or "participants") were

to get a third of the drained lands, the King would take a third with the remainder available to the commoners, displaced from their traditional fish trapping and wildfowling activities (Stonehouse, 1839) and, particularly in drier areas to the east, from common land used for pasture (van Cruyningen, 2016). Despite the commoners' share being increased following a legal challenge, serious friction occurred between the commoners and the participants (and their employees), often resulting in violence. This included several pitched battles between locals and a substantial private militia raised by the participants (Stovin, 1752; Stonehouse 1839). Regular instances of vandalism became even worse when the rule of law was lessened by the English Civil War and the area was temporarily re-flooded (Stovin, 1752; Lindley, 1982). Special land taxes (called "scots") and other heavy responsibilities were imposed on the lands allocated to the participants resulting in much unexpected expenditure on putting right Vermuyden's numerous errors (including a very large additional channel, the "Dutch River", in 1635). This, combined with resistance from the locals, ensured that participants' investments were not as profitable as hoped. The problems with the populace is said to have been caused by Vermuyden's reliance on Crown authority rather than entering into consultation and negotiation, as he would have been forced to do in the (then) Dutch Republic where the administrative arrangements for drainage works were well established (van Cruyningen 2016).

Exploiting the Drained Area

The subsequent history of the area north of the Bycarrsdyke, in the drained former catchment of the River Idle, is fascinating. An important feature of the drained catchment are the "warping drains" built to direct silt laden water controllably from the rivers Don, Ouse or Trent at high tide to improve the agricultural quality of newly exposed land (see Byford, 2005 and Eversham 1991). The water would be retained until the sediment (warp) had settled out. The much clearer water was then drained back on a later low tide. The process was known as "flood warping". The remaining warping drains (Figure 4a) and the highly productive warped agricultural land still form major features of the landscape. Also of great interest are a series of canals constructed to transport peat, exposed by the drainage of Hatfield Chase, either directly for export or to a processing plant which, over the years, produced products as diverse as candle wax (by destructive distillation), animal bedding and horticultural compost. As well as those canals local to the peat extraction areas there were longer canals which extended to the Trent and the Don (Smart, 1983) which were of particular use when peat was simply exported as fuel. This system of canals was known as the "boating drains" or "boating dykes" (Jones, 2010). They initially carried 6 feet wide wooden boats. In the 18th century there were 30-40 boats operating. They also carried farm produce. They were always pointed at each end because there was no room to turn around and the practice, although declining, continued until 1828 when it was decided that navigational use of the boating drains was detrimental to the drainage function (Smart, 1983). A photograph of a boating drain near Sandtoft, taken in 2016, is shown in Figure 4c alongside an image of a similar type of peat boat currently operating in Bremen, Germany (Figure 4b).

In the late 19th century peat exploitation saw a revival (particularly to the north of the area) and with Dutch investments came another influx of Dutch labour. The previous traditional peat extraction methods were replaced by the more efficient “Dutch graving process” (Eversham 1991). A new system of canals (about 22km in total) and larger, double ended, metal boats were adopted (in use until the 1920s). Traffic was confined to the canals directly on the workings and to the canals leading to the factory (Limbert, 1990) which itself had a rail connection. Alongside this the peat company (which had been formed following merger of several concerns) later developed a 3 foot gauge railway system that is now the basis of a heritage railway society. The 19th century peat canal system included a substantial stone and iron aqueduct (which also carried the 3ft gauge railway line) and some interesting images of its remains are available on-line (Townley, 2012).



(a)

(b)

(c)

Figure 4 (a) Swinefleet Warping Drain which connects to the Ouse, © Glyn Drury (Creative Commons Licence, <http://www.geograph.org.uk/photo/488030>); (b) Loaded peat boat, similar to the 18th century Hatfield Chase boats, currently in use in Bremen, image © Carolin Hinz / BTZ Bremer Touristik-Zentrale; reproduced with permission: (c) Boating Drain Near Sandtoft, 2016, image © M. Newman; reproduced with permission.

Completing Vermuyden's Project

Throughout the 18th 19th and 20th centuries the drainage of the area has been under constant improvement, including construction of at least four 19th century, ashlar stone - faced, siphons (Figures 5b & c), used to carry drain waters below both other drains and natural watercourses, and one of the first steam powered drainage pumping stations in the UK (replacing a wind pump), pumping water from Mother Drain into Bycarrsdyke (Figure 5a). There were two 30kw beam engines, each with a 10m diameter scoop wheel, raising the water 3m (built 1828 and 1839). One was replaced by a 101kw twin cylinder steam engine in 1895, with both in operation until 1941. The pumping station is now converted to a luxury dwelling which was once on the market for about \$1¼ million. Of the ongoing developments the tidal barriers on the Idle -Trent confluence at Stockwith are a good example.

The Original Tidal Barrier - Misterton Soss

As a result of a failure in Vermuyden's drainage design a large wooden sluice gate (locally called a "Soss") had to be constructed at Misterton. This was in response to flooding which occurred in the first wet season after the drainage works were completed (Jones, 1991a). The wet weather caused levels of both the Idle and Trent to be higher than normal and the Trent's tide caused water to back up in the Idle. A large embankment had been constructed by Vermuyden, on the north bank of the channel. It protected the drained land to the north of the Idle but caused flooding to the south, an area where flooding was previously unknown. Inevitably, legal complaints were made (Jones, 1991a; Stonehouse, 1839). The Court of Sewers for the Counties of Nottinghamshire, Lincolnshire and Yorkshire was established in 1629. It ordered the installation of a device on the Bycarrsdyke to hold back water from the Trent at high tide (Stonehouse, 1839). John Liens, one of the "participants" (and nephew of Vermuyden), constructed the wooden sluice at Misterton (Jones, 1991a).

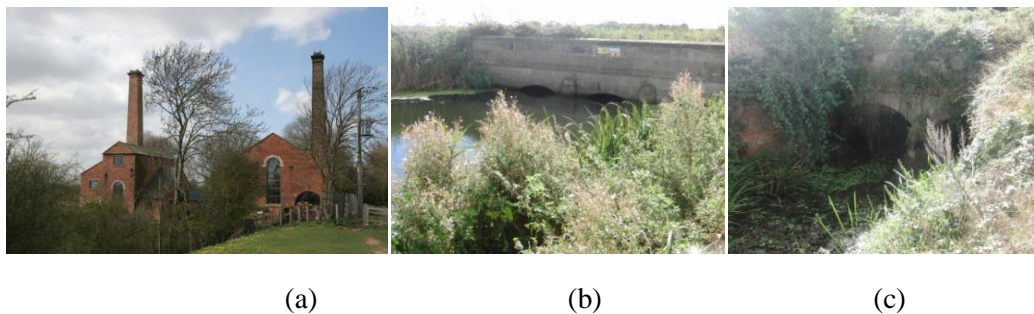


Figure 5(a): Misterton Soss pump houses, image Alan Murray-Rust (Creative Commons) <http://www.geograph.org.uk/photo/2343730> ;(b) Siphon once used to carry South Level engine drain under the river Torne, now the river is diverted and the siphon carries a major road and a very small drain, image © M. Newman, with permission;(c)Siphon carrying North Idle Drain under Hatfield Waste Drain, image © M. Newman, with permission

The sluice was destroyed by locals, opposed to the draining of the chase, during the English Civil War (along with much of Vermuyden's drainage works) (Stovin, 1752; Lindley, 1982). In 1645 the Court ordered the rebuilding of the structure. Initially the Soss removed the dependence on tides to create adequate draught for larger vessels but in the 1720s its mode of operation was reported to have caused barriers to navigation on the Idle and the Court of Sewers ordered that the gates be kept open when there was no danger of flooding (Jones, 1991a). The response to that was that the single guillotine gate was replaced by a more substantial pound lock with masonry sides, probably around 1724 (Jones, 1991a). It had a guillotine gate at the downstream end and mitre gates at the other. The dimensions of this pound lock can be used to imply the size of vessels in use at the time. Jones (1991a) reports an annotation on a map of 1663 indicating that the lock was 60 feet long and 18 feet wide. He presents a detailed appreciation of problems with the Soss, including a reversal of the court of Sewers decision when the mouth of Bycarrsdyke started to silt up. He also reports changes to the structure which took place up to 1833 resulting in the guillotine gate being replaced by mitre gates. In 1883 the Soss was reconstructed as a multi-arch bridge with weirs, with adjustable crest boards, in all but one of the arches and a pound lock within the other (Jones, 1991a). However

Swinnerton (1910) reports that by 1910 the gates were arranged so as to close automatically by the rising tide, a photograph he presents seems to show that this applied to the non-navigable bridge arches as well as the pound lock. The role of the Soss was taken over by a substantial (26 tonne (WWT, 2016)) steel sluice at the mouth of the Idle in 1938 but, in 1940, the plans to demolish the old Soss were put on hold, leaving it as a second line of flood defence in the event that the new tidal sluice was bombed (indicating the structure was still operable). Demolition seems to have started by 1946 since letters from the District Engineer indicate some of the stone was re-used by the County Council at that time (UNMSRC, 1939-1946). Jones (1991a) reports that the massive south wall of the lock in the Soss was removed in 1963. In 1983, the 1938 tidal sluice at the confluence was augmented by a large pumping station just upstream (see below and Figure 6a). This large sluice gate was replaced at the same site at West Stockwith in 2016 (Figure 6b).

Rise and Decline of the Idle Waterway

The UK's industrial revolution is usually taken to have started in the 1760s and if one adopts the widely accepted definition, based on social change, proposed by Arnold Toynbee then this is more or less correct. However the author's view is that the technological triggers to the industrial revolution were associated with changes occurring many years earlier such as in the smelting of lead using "pit coal" in cupola furnaces, the larger scale nucleated use of water power for air blast generation to drive tilt hammers and grindstones in the steel industry in the Sheffield area (Hallamshire) and, importantly, with the adoption of cementation steel production in Sheffield and the later invention of the Huntsman process in 1740. The availability of the Idle for both import of strategic materials and easy export of products played a vital role in encouraging these developments.

Traffic on the Idle at its Peak and the Lister Dynasty

In 1600 Sheffield was the largest centre of cutlery manufacture outside London (The Cutlers Company of Hallamshire was established in 1623) but until 1700 this was almost exclusively achieved using steel imported from Spain, Germany and Sweden, much of it via Bawtry (Hey, 2005). In 1721 the weight of Hallamshire goods sent towards the Humber was 13,000 tons and by far the greatest proportion would have travelled through Bawtry (Pratt, 1912). In 1724 Daniel Defoe wrote (Defoe, 1724) :

“By this navigation, this town of Bawtry becomes the center of all the exportation of this part of the country, especially for heavy goods, which they bring down hither from all the adjacent countries, such as lead, from the lead mines and smelting-houses in Derbyshire, wrought iron and edge-tools, of all sorts, from the forges at Sheffield,Also millstones and grindstones, in very great quantities, are brought down and shipped off here, and so carry'd by sea to Hull, and to London, and even to Holland”

Well before the start of the industrial revolution in the 1760s, trade on the river was booming and it had been critical to development of the new technologies. In a letter to Joseph Whitfield (of the Quaker Lead Company), James Grimthorpe (1769) reported that in 1768 some 6420 pigs of lead and 962 tons of red lead were shipped downstream from Bawtry (and by this time he reports that the traffic on the Idle was past its peak). We must remember that it all had arrived at Bawtry by packhorse (6 pigs per horse) along roads which were largely impassable in winter (Hopkinson, 1971).

The Lords of the Manor at Bawtry have long held both a monopoly on wharfs on the Idle at Bawtry and (arguably) a right to tolls on the river. In 1633 the manorial rights were leased to Sir John Lister, the largest lead exporter in the City of Hull (and MP for the city) (History of Parliament, n.d.), creating a controlling dynasty on the waterway lasting several generations. This ensured the waterway was maintained and that navigation interests were defended against drainage interests but their defence against competition was not so effective. John Lister (grandson of the MP), and other interests in Bawtry, put forward much opposition (via their Parliamentary representatives) to the route of the Chesterfield Canal which missed out their town (Canal Routes n.d.). This opposition in the 1770s to the route of the new canal mirrored both the tremendous efforts that John Lister's father, Thomas Lister, had made to oppose the Don Navigation improvements 50 years earlier (e.g. Lister, 1722) and the opposition, in 1702, by interests in Bawtry, including the Listers, to an Act aimed at making the Derbyshire River Derwent navigable (Bawtry, 1887). When in 1720 an Act of Parliament permitted improvement of the Idle between Retford and Bawtry the legislation ensured the manorial right to charge tolls, on craft using the river (even if originating upstream), was maintained (and even extended). Unfortunately the work was never carried out but the Act is still the basis of public rights to navigation upstream of Bawtry. If the Idle navigation had already been improved under the Act of 1720, by the time that the Chesterfield Canal was proposed in the 1770s the route to the Trent would surely have been via the Idle through Retford and Bawtry instead of the actual route, via Retford but direct to the Trent at West Stockwith.

Decline

The opening of Chesterfield Canal in 1777 is often quoted as being the cause of the end of commercial traffic on the Idle but in fact trade had declined in the years since the, previously mentioned, improvement of navigation on the River Don drew away some of its traffic (Grimthorpe, 1769). The improvements on the River Derwent in Derbyshire, also mentioned previously, were also significant. Before the Derwent improvements the route of lead from the southern parts of Derbyshire had been by packhorse on a steeply undulating route via Alfreton to the Trent at Nottingham (Hopkinson, 1971). The new route would be along an easier route down the Derwent valley to reliable water transport at Derby. This would also have reduced the distance of packhorse transport by over 9 miles and would inevitably have attracted some of the traffic from further north which would have previously been transported on the northern packhorse route via Chesterfield to Bawtry.

Traffic persisted for some time after the opening of the Chesterfield Canal and even after the River Don Navigation was finally extended by a canal to Sheffield in 1819. It mainly carried minerals (Whites, 1837; Piggot, 1828). Coal would have been carried up river for domestic use (in 1837 there was a coal merchants directly next to the wharf (Whites, 1837)), for the gasworks (built next to the wharf in 1834) at Bawtry (Whites, 1837) and for the Misterton Pumping Station. Ironically the coal would have probably started its journey on the Chesterfield Canal, from collieries in Derbyshire owned by the canal company. Piggot (1828) states that the main economic activity of Bawtry in 1828 was still the transport, along the Idle, of dolomite limestone from the Roche Abbey quarries about 8 miles away at Maltby. It is not clear how long this trade persisted but in 1844 a railway stock prospectus for a line to Gainsborough (on the Trent) stated that carriage of Roche Abbey Stone was business to be targeted (that line was never built but a railway to Maltby was opened in 1903). In addition to minerals Jones (1991a) reports that, in the 19th century, the landlord of the Haxey Gate Inn ran a market boat up and down the river supplying vegetables and other groceries, and bricks are known to have been carried up the Idle from a brick works on the Chesterfield Canal. However, commercial traffic did come to an end on the Idle, long before the advent of leisure traffic to replace it. The Bawtry wharf is shown as overgrown on a 1904 plan (HEA, 1904). This was probably caused by diversion of the main course of the Idle away from the wharf in 1849 when the Bawtry railway viaduct was built (the wharf was originally left accessible). In 1959 it was reported that the only navigational use of the Idle was the weed cutting boats that were seen as essential to maintaining the drainage function (Nixon, 1960). The fact that the waterway was then seen as no more than a drain resulted in it not being passed to the British Transport Commission in 1949. Thus it was never transferred to the British Waterways Board in 1963. Had these transfers of jurisdiction occurred the current access problems may have been avoided as the 1960s was the start of the expansion of leisure boating on the UKs inland waterways and access may have been taken more into account when the pumping station was built.

The West Stockwith Tidal Sluice and Pumping Station - Barrier to Navigation

This section draws heavily on the excellent work by Pat Jones (Jones 1991b) and serves to bring it up to date since 1991. The history of this installation is intimately linked with the access problems which are responsible for the current low level of activity on the Idle and the problem with the maintenance of rights to navigation in the late 20th and early 21st centuries. If the body with statutory responsibility for the waterway has no duties with regard to navigation it will naturally give priority to the drainage even if this impedes navigation. In effect this is what happened. The history of this structure involves the numerous reorganisations of the regulatory framework for water in the UK since the 1960s. The Trent River Authority (General Provisions) Act 1971 is widely, but erroneously, quoted as having removed rights to navigation on the Idle. This Act represents a back door attempt to remove navigation rights on the Idle. Rather than including an upfront clause to remove navigation rights (which may have failed in Parliament) the Act gave the TRA the following powers:

(a) to construct at or near the outfall of that river into the river, sluice gates and a pumping station to regulate or augment the flow of water from the river Idle into the river; and

(b) to place screens and other apparatus in the section of the river Idle which lies between the downstream face of Bawtry Bridge and the confluence of that river with the river for the purpose of removing weeds and other similar obstructions to the flow of water in the river Idle, notwithstanding that the works so constructed or the apparatus so placed interfere with or obstruct rights of navigation.

One must bear in mind the lengths to which campaigning organisations in the UK will go to ensure that long held public rights of way, including navigation rights, are maintained. As Jones (1991b) pointed out, the attempt to use the above powers to fit permanent weed screens across the entire width of the river was vigorously opposed by the Inland Waterways Association (IWA) on the basis of the words used in the preamble of the Act: “..... it is expedient that the Authority should be authorised as in this Act provided to exercise those powers notwithstanding that they cause *some* interference with or obstruction to the public right of navigation” (author’s emphasis)

The TRA backed off from their plans, fitting part width permanent weed screens and removable full width booms (see Jones 1991b for a photograph). However it also proposed to install a pumping station across the entire width of the confluence. They made a token effort to maintain navigation capability by constructing a slipway to allow smaller craft to enter the river. This is still accessible at Haxey Gate (Environment Agency, Pers. Com., 2016). In response, an experienced campaigning organisation called the Worksop and Retford Boat Club (WRBC) (see Newman and Hunt (2016) for their origins and previous campaigns), started regular club cruises as a means of demonstrating continuing navigational use. Legislation then overtook the TRA and a pumping station was not built until their powers had been transferred to the Severn Trent Water Authority (STWA) (under the Water Act 1973). The new body decided that the pumping station barrage (built slightly upstream than previously planned) would include a guillotine gate on the southern bank to allow navigation to proceed. When installed the pumping station was the largest all electric-pumping station in the country with a maximum discharge of 3,059 Mld. The existing tidal sluice was retained and along with the pumping station barrage structure (with its smaller gate), this essentially formed an enormous pound lock (only usable when the pumps are not operating) in the space between (Figure 5c). In 1989 the successor authority to STWA, the National Rivers Authority (NRA), are said to have expressed a view that there was no public right of navigation on the Idle but following campaigns by the WRBC they backed off (Jones 1991b) and after the NRA’s duties were transferred to the Environment Agency (EA) by the Environment Act 1995, the EA published the following statement:

“The Idle has a common law right of navigation from its confluence with the River Trent to Bawtry and continues along the River Ryton to Blyth. The Idle also has a statutory right from Bawtry to East Retford, although the statute relating to improving navigation

was never acted upon. The river entrance is blocked by a large tidal floodgate and a pumping station gate and arrangements to enter from, and exit to, the River Trent must be made in advance....” (still the EA position in 2016).

The 1995 Act imposes duties on the EA for promoting recreational use of water bodies. As part of these duties, in 2001, modifications were made to the tidal sluice approaches to allow boats to tie up there whilst waiting for the gates to open (EA 2001). Even so access to the Idle has to be carefully planned as it required at least 48 hours notice for the gates to be opened. In the very different financial climate of 2011 however the EA introduced prohibitive charges to allow passage through the two barriers such that it is uneconomic to pass unless several boats do so together (£185 in each direction). Imposing an economic barrier to a right of navigation on a tidal river is legally questionable (River Access For All Ltd., 2015; see the section on the case of; *The King v Clark, 1702*) but has not been challenged in court.



Figure 6; (a) The 2016 replacement tidal sluice at West Stockwith; (b) The Idle pumping station, sluice gate to the left; (c) The enormous pound lock created between the two barriers. Images 2016 © M. Newman, reproduced with permission.

The Present and the Future

Despite these charges the WRBC initially continued to maintain cruises on the Idle so as to maintain navigation rights. However the last time they attempted the cruise, about 3 years ago, the previous, experienced, sluice keeper had retired and following “an incident” between the two sets of gates caused by the way the pumping station gate was operated, the club have not arranged a cruise since (Richardson H., Pers. Com., 2016). Currently the situation is lamentable, in 2015 the tidal gates were only raised twice (e-mail information from EA 2016). Today tourism on the river is very limited. Although the road signs at the boundaries of Bawtry seem to illustrate civic pride in the fact that the town was once a major inland port there is no information provided at the site of the old wharf. However, just upstream of Misterton Soss, The Haxey Gate Inn, adjacent to the very attractive, late 18th century Haxey Gate Bridge (closed to traffic), does offer a trip boat and canoe rental. On the opposite bank, is a commercial campground which also offers the only commercial moorings on the river. Unfortunately there is no vacation-boat rental available on the Idle.

There is a slight hope that the access situation will be improved in the long term. Plans have been proposed to vest the Canal and River Trust (CRT) as navigation authority for

the 620 miles of rivers currently controlled by the EA (EA&CRT 2016). Although the EA is not the navigation authority for the Idle (it does not have one!), it might be hoped that, as a river with both statutory and customary navigation rights, and where the EA exercises so much control, the Idle would be included in any agreement. However the CRT are reluctant to take on the responsibility for any of the EA's waterways without a government guarantee of the required funding and in the current economic climate this will be difficult to obtain (see IWA, 2015). From the river management point of view the EA has, tentatively, put forward an option (although not yet adopted) of reverting the Idle's outfall to gravity drainage for most of the time. This could have important ecological advantages in the catchment (RSPB, 2011). However it will increase the flood risk to parts of the catchment and major investment in upgrading other pumping stations in the catchment will be required. This would mean that the barrier at the pumping station could be left open and that the sluice will be routinely lifted at low tide on the Trent.

Conclusion

The Idle navigation is of major historical importance and its demise represents a potential lost economic opportunity, particularly for the town of Bawtry. The opportunity to use the 2020 Mayflower celebrations to give prominence to the waterway needs to be taken. The history of the wider Idle catchment is also important. It represents a major step in drainage engineering in the UK. If the history and heritage value of this forgotten waterway and the associated catchment are to be maintained and exploited far more needs to be done. If the potential changes to both administrative arrangements and the operation of the tidal sluice go ahead the future seems bright. Finally one should consider the opportunities of creating a non-tidal link between the Chesterfield Canal and the Idle at or near Stockwith. This could be a turning point for navigation on the Idle and a major boost for the area's heritage based tourism. It would also boost tourism on the Chesterfield Canal at a crucial time for its restoration. At the turn of the millennium much investment (via National Lottery funding) was made in UK waterways infrastructure by way of celebration. This included the first new canal in the UK for 200 years. This was the 20 mile long Ribble Link which, at a cost of £6.54 million linked an isolated canal to the national network. The cost of a 400m channel needed to link the River Idle to the Chesterfield Canal and the re-opening the Bawtry wharf would pale into insignificance compared to that. At the next UK national celebration, where such things might be done to mark the event, this proposal should be considered. Fortunately, in the meantime, the navigability of the river itself will probably be maintained but it is regrettable that this historically important waterway should be relying, for its maintenance, on its importance as a drain.

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