

and engineer', or 'surveyor' (Brown 2007, 612). It is these two engineers who are most closely associated with the Ellesmere Canal, although important contributions were also made by Mathew Davidson, engineer for the stonework on the aqueducts, and William Hazeldine, who was the contractor for the ironwork, having opened an ironworks to the north of the River Dee at Plas Kynaston c.1800. This provided the swivel bridges, ironworks and railings for the aqueducts as well as rails and wagon wheels for the associated tramways, and his ironworks at Shrewsbury provided the large cast iron arches for the aqueduct at Pontcysyllte (Edwards 1967, 135).

Construction on the branch between Shrewsbury and Llanymynech commenced in March 1794, with the main line northwards from this to Chirk Bank commencing in 1795, being completed by 1798 when a wharfinger was appointed there. The main line southwards towards Shrewsbury from the Llanymynech Branch was completed as far as Weston Lullingfields by 1797, but this route subsequently stalled and was abandoned once it was realised that the Shrewsbury Canal (completed in 1797) would command the coal trade in this area (Dean 1985, 234). At the opposite end of the Ellesmere Canal, the Wirral Line between Chester and the Mersey was completed in 1795, save for the connection with Chester Basin, which was finally authorised in 1796 (*Ibid.*).

Beyond Chirk Bank, Jessop and Telford faced the greatest engineering challenges of the route, namely, how to cross the steeply gorged valleys of the River Ceirog and River Dee. Jessop's preferred solution to span the Ceirog Valley was to construct the 10-arch, 20m high and 220m long Chirk Aqueduct followed by the 421m long cut-and cover Chirk Tunnel through the high ground to the north. Work on the aqueduct commenced in 1796 and the route through the tunnel to the Vron Basin on the south side of Pontcysyllte was completed towards the end of 1801 (*Ibid.*).

The Pontcysyllte Aqueduct was Thomas Telford's first major feat of engineering, although in 1797 he had already built a cast iron arch bridge over the River Severn at Buildwas and the cast iron Longdon-on-Tern Aqueduct which took the Shrewsbury Canal over the River Tern. The 19-arch Pontcysyllte Aqueduct extended for over 300m across the River Dee, at a height of 38m above the valley floor, and was, and remains, the longest and highest aqueduct in Britain. The foundation stone for the aqueduct was laid on 25th July 1795, and the navigation over it was opened a decade later, on 26th November 1805. An Act of 1804 allowed for the construction of a navigable feeder canal to bring water to the canal from the Dee beyond Llangollen ay Llantysilio: this was known as 'The Water Line', but wasn't completed until 1808, and in the meantime drew water from local streams (Martin 1999, 56).

However, ultimately the vision of connecting the Severn, Dee and Mersey with a network of inland waterways was not realised, largely as a result of the continued indecision of the shareholders about how to best achieve their objectives, and because of the escalating costs due to inflation (Brown 2007, 616). In addition, the development of the Flintshire coalfields meant that coal could be delivered by sea to Chester and Ellesmere Port at a cheaper price than would be the case via the Ellesmere Canal (Martin 1999, 58). Halfway through the construction of the Pontcysyllte Aqueduct, then, the proposed continuation of the Western Canal onwards to Chester was abandoned. Jessop's report to the ECC in January 1800 following an inspection of the entire route of the canal stated: '*As the many obstacles*

thrown in the way of the original intention, and the change in circumstances which have taken place since the obtaining of the Act, have shown it to be wholly inadvisable to execute a canal between Pont Cysyllte and Chester, and especially since the opening of collieries between Hawarden and Flint which will communicate by means of railways with the Dee, so as to so as to deliver coal at a much cheaper price at Chester than formerly – the great object for immediate consideration is, how to deliver coal at least expense, from the Ruabon Collieries, into the bason on the south side of the Dee at Pont Cysyllte’. The answer to this question resulted in the subsequent construction of the Trevor Basin on the north side of the Dee, and the development of the transport network to serve the surrounding industries.

4.2 The Ruabon Brook Tramway and the Pontcysyllte Branch Railway

The Pontcysyllte Aqueduct officially opened on 26 November 1805, and the following *Report to the General Assembly of Ellesmere Canal Proprietors* issued on the following day described the current state of affairs: ‘*Pontcysyllte Aqueduct is now also completed, and the navigation is thus carried across the valley of the Dee, to the Ruabon Collieries and Trevor Lime Rocks, and connected with the water line from the Dee above Langollen.*

From the north end of the Aqueduct, the Canal is continued for a distance of about three hundred yards, and there terminates in an extensive bason, which is completed and formed so as to afford a double wharfage with iron railways.

From this bason an iron railway has been laid and carried near Plas Kynaston Stone Quarries, through the Acrefair Collieries, and is to be continued to the Ruabon Brook. The length of this railway will be about three miles.’

The construction of the Ruabon Brook Tramway, as described above, had been undertaken by the ECC with the encouragement of Jessop and his partner Benjamin Outram, who were both experienced tramway and plateway engineers. A tender from William Hazeldine to supply the iron rails from his ironworks at Plas Kynaston and to maintain the plateway for a year was accepted in 1802 (Martin 1999, 59-60). The tramway ran northwards from Trevor Basin before swinging southwards past Hazeldine’s iron foundry and thence to two of the Plas Kynaston pits also owned by Hazeldine. The section of the tramway described above as far as ‘The Crane’ at Plas Kynaston was opened on the same day as the Pontcysyllte Aqueduct, and five waggons drawn by one horse bought two tonnes of coal from Hazeldine’s coal pits to be loaded on barges at Trevor Basin and then ceremoniously transferred over the aqueduct to Vron Basin (Pratt 1983, 39). The aforementioned ‘Crane’ at Cefn Mawr may have been needed in order to transfer containers from the trucks (or ‘bogies’) using old-style mineral ‘plateways’ (with ‘L’ shaped rails), onto bogies using Jessops tramway which had an improved design which used edge rails with a ‘T’ shape (Metcalf 2016, 14).

The Ruabon Brook Tramway was extended from a hairpin bend at the Crane as far as Acrefair, and then was extended as far as Afon Eitha (Ruabon Brook) at Wynn Hall in 1809, with a spur to the Afon Eitha Colliery (*Ibid.*, 39-40). Another spur from the Crane was built in 1820 which ran in a southerly direction to William Lacon’s furnace at Newbridge, but this fell out of use after three years and was dismantled and used for repairs elsewhere (*Ibid.*, 40).

By 1829 the trackway was deteriorating rapidly, and the whole tramroad had to be lifted and re-laid between 1830-32, but then in subsequent years mineral traffic utilising it went into decline as coal-mining operations gradually migrated to the east (*Ibid.*, 41-42). Subsequently, however, the arrival of the railways heralded further changes that were to result in significant developments concerning the tramway.

The ECC had merged with the Chester Canal Co. in 1813 to form the Ellesmere & Chester Canal Co. (E&CCC), and in 1846 this was incorporated into the newly formed Shropshire Union Railway & Canal Co. (SUR&CC) which was subsequently leased by the London & North Western Railway (L&NWR) (*Ibid.*, 42). In 1854, the Great Western Railway (GWR), which was the main rival to the L&NWR, incorporated the Shrewsbury and Chester Railway into its system, including its main line at Ruabon. Furthermore, by 1860, the Vale of Llangollen Railway (VoLR) had opened a station at Trevor, and J.C. Edwards Fire Clay Works at Trefnant opened a private line to connect with this sometime after 1862 (*Ibid.*, 43-44). As a result of this burgeoning competition for the custom of the local industries, the L&NWR decided to upgrade and refurbish the canal tramroad, and began the conversion to a standard gauge railway suitable for locomotives in 1861, extending it northwards from Afon Eitha (Ruabon Brook) Colliery to Llwyneinion by 1867, and the opportunity was also taken to connect to the GWR line at Trevor (*Ibid.*, 44). In 1870, the SUR&CC bought in their own locomotive, an ex-L&NWR shunting engine from Crewe, No. 1118 *Acton*, which worked the Pontcysyllte Branch for twelve years (being housed in an engine shed constructed over the canal arm at Trevor Basin) before being scrapped in 1883 (*Ibid.*, 44-45).

In 1896, the GWR bought the SUR&CC's Pontcysyllte Branch and rolling stock for £51,000 but this excluded the track and transfer warehouse at Trevor Basin which remained Shropshire Union property (*Ibid.*, 48). A survey of this property was produced at the time (Lyons and Mountford 1979, 144) which identified that the engine shed/transfer warehouse was leased by the GWR when they leased the branch from the Shropshire Union Railway in February 1896, and had a store, coaling platform, and goods section within a warehouse over the canal which was boarded in, and there was a sand furnace and external water tower associated with the engine shed section of the building. Two lines entered the shed, one passed through the shed to terminate on the central pier of the basin, whilst the other terminated some 32ft from the southern end of the shed. The shed itself measured 125ft 6 inches by 17ft 9 inches and had stone walls and gable styled slate roof with skylights (*Ibid.*).

The engine shed and goods warehouse closed in September 1902 (*Ibid.*), and canal interchange traffic at Trevor Basin had ceased totally by 1920, the navigational state of the waterway having become very poor (Brown n.d., 49). The Pontcysyllte Branch Railway was subsequently abandoned in successive stages during the first half of the 20th century, and by 1953 all but the short section between Trevor Station and the Monsanto Chemical Works (see below) remained open, this finally closing on 1st January 1968, with the tracks being lifted over 1969-70 (*Ibid.*, 49-50).

4.3 The Plas Kynaston Canal and associated industries

The history of the Plas Kynaston Canal has been researched in depth in a paper by historian Peter Brown published online by the Plas Kynaston Canal Group (Brown n.d.), and much of the discussion that follows is based upon this research.

In 1820, the E&CCC gave industrialist Exuperious Pickering junior permission to create a canal from the site of his new colliery to Trevor Basin. His father, Exuperious Pickering senior, was a coal master who had leased mines at Cefn Mawr Common since 1802, and it is possible that it was the Cefn Colliery that this canal was planned to serve, as this was known to have been in operation by the Pickerings in the 1830s and 1840s. However, the 1820 agreement also referred to a possible lime works (PKCG n.d., 1), and a map dating to the 1820s (Figure 2) depicts a short canal of some 250m in length branching off to the north-east from the Trevor Basin and terminating at a basin adjacent to a lime works and a row of limekilns. It is known that Pickering junior leased limestone quarries at Llanymynech in 1825, and the new canal would have provided a direct link with these quarries via the Ellesmere Canal (Brown n.d., 103-104)

Subsequently, in 1825 the E&CCC agreed that Thomas Ward could extend Pickering's canal as far as his new Plas Kynaston Colliery (*Ibid.*, 105). Thomas Ward was another local coal master who was developing the Plas Kynaston Colliery during the 1820s, which was located further to the east of the Pickerings' Cefn Mawr mines. Although Ward was given permission to extend the canal, a plan dating to 1829 held at Denbighshire Archives (Brown n.d., Map 3) depicts a proposed separate canal branching off from Trevor Basin to the south of Pickering's proposed canal. Furthermore, a map of the Plas Kynaston Estate held at the Flintshire Archives (listed as dating from c.1850 but more likely to be contemporaneous with the above mentioned map) depicts the course of this separate canal as if it had been built (Figures 6 & 7). It has been postulated that this proposed route must have been the result of a dispute between Pickering and Ward over the use of Pickering's canal (Brown n.d., 105), however it is not clear whether Pickering ever built his shorter canal or whether the Plas Kynaston Canal was built as a single entity.

The 1838 Trevor Issa tithe map (Figures 8 & 9) illustrates the canal as built, with a single branch extending north-eastwards from Trevor Basin. This 'Branch canal and Towing Path' (Plot 399) was occupied by Thomas Ward, whilst the 'Wharf, lime kilns, part of canal etc' (Plot 396) branched off from this to the north and were occupied by the Executors of the Late Exuperious Pickering. This suggests that the main Plas Kynaston Canal arm was Ward's canal, with a short side-branch off this serving Pickering's lime works, rather than Ward's canal being an extension to Pickering's, although the sequence of events is not certain from the available evidence, and 'it has not been possible to prove exactly who did what and when (*Ibid.*, 104). Ward's canal did not extend all the way to his Plas Kynaston Colliery as he had originally intended but terminated immediately to the north of Cefn Mawr. The final stretch of this was completed by a tramroad which passed through a short tunnel before continuing to the colliery (*Ibid.*, 106).

Following the deaths of Pickering junior in 1835 and Pickering senior in 1838 their lime works were sold, and subsequently, Thomas Ward became the dominant industrialist in the area until his death in 1854 (*Ibid.*, 106). As well as serving Pickering's lime works and Wards collieries, the Plas Kynaston Canal may also have provided transportation for Hazeldine's Plas Kynaston Foundry which continued in operation until the 1930s, although this was also situated close to the Ruabon Brook Railway. Subsequent industries which developed along the side of the canal include the Plas Kynaston Pottery (NMR 408094) which was located close to the southern end of the canal. This was in operation from 1850-1900 and was in the possession of Bayley & Bradley in the late 1860s, but by 1874 was operated by J.C. Edwards,

making 'black and red earthenware of all kinds and sizes, milk-pans, cream-dishes, wash-pans bowls, flower-pots, chimney-pots etc' (Edwards 1987, 76). J.C. Edwards also owned the Tref-y-nant Fire Clay Works (NMR 408088) located c.250m to the north of Trevor Basin, from which he had opened a private rail line to Trevor Station by 1862, as discussed further above.

In 1867, Robert Graesser and Timothy Crowther went into partnership and founded what was to become the Plas Kynaston Chemical Works on the western side of the Plas Kynaston Canal, to extract lamp-oil, lubricating oil and paraffin oil from coal shale. However, this became uneconomic due to an influx of cheap American oil and by 1873 this partnership had dissolved and Graesser set up another chemical works on the eastern side of the canal, both Crowther and Graesser subsequently extracting phenol and cresylic acid from crude tar acids bought by canal from the Midlands. Crowther & Co. was superseded at the Plas Kynaston Works by Corbett & Co., but after 1890 only Graesser is mentioned in the trade directories (Edwards 1967, 128-129). By 1910 Graesser's Cefn Mawr Chemical Works produced more than half of the world's supply of phenol, and in 1920 American firm Monsanto bought a half share in the company. In 1928 Monsanto bought out the Graesser family and the works became known as the Monsanto Chemical Work This industrial plant continued to expand its operations during the 20th century and diversified into the production of industrial chemicals, building a rubber plant in 1930 (*Ibid.*, 130-131). Continued expansion of the site occurred when the Plas Kynaston Foundry was purchased, and then in 1994 Monsanto and Akzo Nobel combined to form Flexsys, but the Flexsys Cefn Mawr site was closed in 2008 (Brown n.d., 107-108).

However, the Plas Kynaston Canal fell out use long before the Flexsys chemical plant was closed. It is reported that part of the canal was cleared out in 1916 to allow boats to access the sodium nitrate store, and the earlier Ordnance Survey map from 1912 showed it full of water vegetation, so it had evidently fallen out of everyday use by this time (*Ibid.*, 107). The Llangollen Branch of the Ellesmere Canal was formally closed by an Act of Parliament in 1944, but remained open in order to supply water to the Monsanto works for cooling purposes, although a separate Act required a different water supply to be found within ten years, and a breach in the canal in 1945 pre-empted this (*Ibid.*, 108).

The full length of the Plas Kynaston Canal was still depicted on the 1963 Ordnance Survey map, but the western end where it branched off from Trevor Basin is understood to have been infilled by 1970, although a short section remained open within the Flexsys plant until c.2005 (PKCG n.d., 17).

4.4 The Site of the UK's First Vertical Boat Lift?

It is recorded that Exuperious Pickering and Edward Rowland, a subscriber to the canal who, like Pickering, was involved in the local coal mining industry, patented a boat lift in 1793, which was described as: '*An Improved Method of Constructing Navigable Canals without the use of Locks or Inclined Planes*' (Dean 2007, 750). On 4th December 1794 the Ellesmere Canal Committee reported in its minutes that it: '*Ordered that Mr. Telford do as soon as he conveniently can point out a place on the line of the Canal between Pontcysyllte and Chester for Messrs Rowland and Pickering to erect at their own expense a Machine for lowering Canal Boats without locks and very little loss of water*' (*Ibid.*, 752). This experimental boat lift was evidently constructed as planned, as it was reported in a newspaper advertisement in