X

On the most advantageous line: the Tyne–Solway Canal

S. E. Thornthwaite

THE HISTORY of the Tyne–Solway canal schemes in many ways epitomizes the history of the canal era in England. Initial schemes for the Tyne Valley involved the improvement of the river, but were successfully opposed by the port of Newcastle. By the 1790s, encouraged by the suitable financial climate and by the canal mania of the preceding decade, several ambitious trans-England canal schemes were proposed to link Newcastle and Carlisle. With the formation of two committees each promoting a different line, support and financial backing was divided between north and south lines. This and the inevitable delays led to a scaling down of the schemes, and Bills were proposed for the first sections of the canal from Newcastle to Hexham and Haydon Bridge. Interest and support were, however, not only divided between the different lines, but also between the Newcastle and Carlisle backers, and following a lengthy fight the Newcastle backed schemes came to nothing, and the only section of the line completed was that from Carlisle to the Solway Firth.

As with other canals, the Tyne–Solway schemes suffered from the arrival of the railway age, and as the Newcastle–Carlisle Railway displaced the need for a canal, so the newly railway accessible ports of Silloth and Maryport, along with railways connecting Carlisle with Liverpool, Manchester and Scotland, adversely affected trade for the Carlisle Canal and Port Carlisle. Despite one last optimistic proposal in 1910, these schemes have been largely forgotten, and although the Newcastle–Carlisle Railway remains in use to date, only the line of the canal across the sands near Drumburgh, and Port Carlisle remain as reminders of these ambitious schemes to complete what was once described as the most advantageous line in the country.

Initial schemes

Before the coming of the canal to Britain, industrial transport was largely confined either to packhorse, or to navigable waterways and coastal trade. The picture of industrial transport by the early eighteenth century was, therefore, one of busy river and coastal traffic with limited commerce and transport inland. One area not well served by inland navigable waterways was the north of England, and although Newcastle and Carlisle were served with both river and coastal trade, traffic to inland areas and towns such as Hexham and Brampton was extremely limited, despite the early realization of the mineral potential in the area, from lead and coal.

River improvements were the forerunner of the canal era, whereby navigable rivers were improved to enable lengthier stretches to be navigated with greater ease, and by about 1730 there were about 1,160 miles of navigable waterway.[1] However, existing river ports did not always profit from such river improvements and in many cases opposed such plans, especially for upstream improvements. Newcastle was one such river port which had a considerable amount to lose. During the early eighteenth century the coastal traffic was considerable along the sea-coal run between Newcastle upon Tyne and London, and Newcastle as the most upstream port on the Tyne benefited from the trans-shipment of goods going to and from London. Yet, as early as 1709 application

was made to Parliament to make the River Tyne navigable from Newburn to Hexham. This proposal was successfully opposed by the corporation of Newcastle on the grounds that it was calculated to injure their port.[2] As Cochran points out, such opposition showed a very short-sighted policy, as, if the project had been carried out, it is likely that it would have been beneficial to both Hexham and Newcastle.[3] Newcastle was not unusual in putting up such opposition to the improvement of a river. Liverpool, in this case vainly, opposed the plans for making the rivers Mersey and Irwell navigable as far as the then burgeoning commercial centre of Manchester.[4]

Further proposals to improve the River Tyne were made in 1778, but again were unsuccessful;[5] there were then no further proposals until the 1790s.

Newcastle–Carlisle: Ambitious Plans

1794 marked the start of a period of proposals to link the towns of Newcastle and Carlisle by means of a canal—a period which was to last for over a hundred years. Although many of these proposals were for extending or bypassing parts of the River Tyne, many were presented as parts of possible canal lines for the whole length of a sea-to-sea canal from Newcastle to Carlisle or Maryport.

By 1794 the "enthusiastic but rather unpractical engineer" Ralph Dodd[6] who had been surveying for the improvement of the River Wear was asked by a group of promoters to make a quick survey for a sea-to-sea canal from the River Tyne to the Solway Firth. He did a rapid reconnaisance of the country through which the canal might pass and addressed meetings in both Newcastle and Carlisle. On the 1 November 1794 Dodd said to the meeting "I never before explored a tract abounding with so rich and ample a variety" and he went on to outline the advantages to the various parties concerned saying "The present local trade from hence to Carlisle though considerable, might still be improved; and when to that we add the immense Lead Trade, the vast quantity of Limestone, Coal, Iron, Iron-Ore, Stone, Timber, Hemp, Flax, Slate, Glass etc. that will employ this Navigation, the ingenious mind, charmed with national improvement, dwells upon the picture before it with astonishment".[7]

At a subsequent meeting in Newcastle on the 15 November, it was resolved that Ralph Dodd be requested to proceed with a more detailed survey to ascertain the practicability of a navigation. The meeting in Carlisle on the 29 November also agreed to this.[8] On the same day it was also reported that "the subscription for that great and public measure . . . goes on with great rapidity".[9]

However, William Chapman's preliminary results of a survey for such a canal were ready before those of Dodd, and on the 12 January 1795 another meeting was held, at Hexham, when Mr Chapman delivered his report, and a separate committee was formed. His plan was for a canal to follow a line on the north side of the river, as opposed to Dodd's southern line. Dodd was absent from this meeting due, reportedly, to illness, and later complained of being treated ungenerously.[10] This meeting also discussed the relative merits of Sandsfield, Bowness and Maryport as the terminus of the canal, with the Northumberland promoters favouring the Solway ports and those from Carlisle, Maryport.[11] It was a debate which was to last several months with strong arguments favouring each. In a letter of February 1795 it was even claimed "that Maryport's an easy harbour to enter both by day and night, and in any wind, whereby going north to Bowness they would labour under every disadvantage and would have little chance of escaping shipwreck"![12]

In his initial report Chapman proposed a canal of 3′ 6″ deep, and where it was crossed by a road there would be a paved ford of 2′ 9″ deep with the downward side of these fords being an overflow "so that the water can never rise materially higher, and horses and carriages may at all times safely pass". He advised that the boats used on the canal be Birmingham trows of 32′ in length and 6′ breadth, which were capable of carrying between 8 and 10

tons, being navigated by one horse and four boys. Chapman's arguments in favour of the canal are persuasive. He predicted that the canal would be used to carry imports of: beef, pork, raw hides and feed from Dublin, oats from Drogheda, Youghall, and Limerick "besides articles of lesser weight as linen etc from Belfast, Newry and Londonderry". He also argued for a canal on the grounds that it would benefit not only Newcastle but also Carlisle, Hexham and Brampton saying that "the facility of communication with both seas and various intermediate ports of the kingdom may probably cause new manufacturers to arise at the already flourishing town of Carlisle, and at Hexham, Brampton, and other interior places, where at present there may not be full employment for the people". Advantages were, he said, also to be gained for Newcastle "And as to Newcastle and its vicinity, which abound with fabrications of heavy articles, such as steel, white-lead, various implements and utensils of hammered and cast iron etc. and with extensive works of earthenware, glass and other bulky but valuable commodities, it is self apparent that great advantages must arise to the manufacturers, to the public and to the proprietors of the proposed canal, from having an easy and expeditious communication with a port on the Irish Channel". Imports from Ireland, he predicted would be carried by the canal "at so low a charge as often to occasion in wartime or in winter the transit of many articles across the kingdom to be afterwards transported to other eastern ports". In this initial report Chapman regarded a larger canal to be "extremely expensive as well as unnecessary" although making no estimates of costs he predicted revenue to be £17,242 per annum. The route of this canal was to leave the River Tyne at a wet dock at Ouseburn, east of Newcastle then going behind Gallowgate, to avoid damage from the keels in use on the river and then via Ovingham, Bywell, Corbridge down the Irthing's valley to Carlisle and Maryport. He also proposed further branches to Ullswater and Cockermouth[13] Chapman issued further details of his canal in three subsequent reports between June and August 1795. In his second report on the 10 July he was more precise on the route, and as shown in (Table 1), the canal was to be 93½ miles in length rising 240′ from the 205′ starting point to the summit, which as he pointed out would be 50′ lower than that on the Leeds and Liverpool Canal, then falling 445′ to Maryport.[14] Chapman had also considered a route further north saying that "had the vale of the river Pont been low enough a line might have gone through flatter country . . . from the Town Moor towards Stamfordham; onwards by Erringburn to the North Tyne" but he considered this to be too lengthy and to take the canal too far from Hexham.[15] This more northerly route was, however, proposed later the same year by Jonathan Thompson in his report in which he suggested a line of canal from Newcastle, but preferably, North Shields, via Woolsington, Prestwick, and Ponteland to Stamfordham, Ryal and Bingfield crossing the River North Tyne near Humshaugh. He argued that this route would be less than four miles longer than the route via Bywell and Corbridge proposed by William Chapman, but he said the additional mileage "is greatly over balanced by the advantages so much nearer the higher part of the canal". Thompson also proposed a branch of this canal to go to Morpeth, Hepscott and on to Blyth—and even a branch to Berwick!, although he provided no estimate of the likely cost of this proposal.[16]

Despite these proposals from Thompson and Chapman, Dodd continued, in his pamphlet of June 1795, to argue for the line on the south side of the river saying "I have carefully explored both sides of the Tyne . . . and have every reason to presume that there is not one fiftieth part of the water on the north side that there is on the south side for feeding the canal". In favour of the canal following this south line he cited the availability of coal, freestone, grindstone, flatstone, grey slate and iron stone as well as different valuable clays. Dodd proposed a canal of dimensions: 27′ wide at the surface, 17′ wide at the bottom and 5′ deep, with three passing places per mile and locks of 19′ 6″ breadth and 90–96′ in length. Such dimensions would, he claimed, ensure

A TABLE OF THE APPROXIMATE DISTANCES and HEIGHTS, ON THE PROPOSED NAVIGATION BETWEEN NEWCASTLE AND MARYPORT

		Distance		Total Dist			Rise.T.Rise	
		M.	F.	M.	F.		Feet.	Feet.
Half rise of spring tides		–	–	–	–		9	
Spring tide height to commencement on the north side of NEWCASTLE, say to the Westgate road							196	205
WALBOTTLE		5	5					
THROCKLEY		1	2	6	7			
Lane south from HEDDON on the WALL*	Fur. (3)	–	5	7	4			
Lane from west end of WYLAM	(5)	2	–	9	4			
Lane N. E. from HORSELY	(6)	–	7	10	3			
Lane north from OVINGHAM	(5)	–	7	11	2			
OVINGTON		1	5	12	7			
Lane north from BYWELL	(6)	1	5	14	2			
Lane south from NEWTON	(4)	1	1	15	3			
STYFORD lane—From river Tyne		–	–	–	–	Level 1		205
	(2)	1	2	16	5			
CORBRIDGE Bason	(1½)	2	2	18	7			
ANICK	(½)	3	2	22	1			
HEXHAM north road, from Tyne		–	–	–	–			
bridge	(nearly 3)	–	5	22	6			
ACOMB		1	5	24	1			
North Tyne aqueduct		–	7	25	–			
Netherwarden		–	4	25	4			
Newbrugh	(2½)	2	6	28	2			
HAYDON BRIDGE. —	(From the	–	–	–	–			
	Bridge 1½)	2	4	30	6			
Ridley-Hall Bridge		2	7	33	5		100	305
Bardon Mills		1	1	34	6		Level	305
Milkridge		2	6	37	4		40	345
HALTWESEL (opposite the church)		2	–	39	4		20	365
Commencement of the summit level		1	2	40	6		80	445
GLENWHELT		2	1	42	7			
Mups Hall		2	5	45	2			
		Summit Level						
Upper Denton		1	3	46	5	Summit Level 1		
Road to Naworth Castle		4	2	50	7			445
West end of summit level and separation of line		–	–	–	–			
to Penrith &c.		1	4	52	3			
Penrith line to Castle Carrick		3	3	55	6			

This distance will be more or less according to where the river Tyne is locked down into.
* The distance between ( ) are from the line of Canal to the respective towns

TABLE
CONTINUED FROM THE
SUMMIT LEVEL,
WESTWARD

	Distance		Total Dist		Rise.T.Rise	
	M.	F.	M.	F.	Feet.	Feet.
West end of summit level M.F.	–	–	52	3		
BRAMPTON from Hollas House (10)	1	1	53	4	57	
GELT-BRIDGE. (From the present	–	–	–	–	–	
quarries 0 6)	1	–	54	4	196	253
HAYTON	1	2	55	6	10	263
AQUEDUCT OVER THE EDEN	2	2	58	–	111	374
CARLISLE, at St Nicholas (branch	–	–	–	–		
03½)	4	6	62	6		
Bason opposite Caldew gate (0 1)	1	6	64	4		
KIRKANDREWS (0 1)	2	2	66	6	Level	374
Separation for Sandsfield	2	–	68	6		
Thrustinfield Lock	1	3	70	1		
Separation below Kirkbanton Lock	–	–	–	–		
to Ravensbank or Bowess	1	4	71	5	18	392
LITTLE-BANTON (0 2)	1	5	73	2	Level	
Separation to WIGTON (as mentioned in note page 33)	1	6	75	–	9	401
GAMBLESBY	–	5	75	5	10	411
Road from Eskrigg to Kirkbridge	–	–	–	–		
(from Wigton 3 2)	–	7	76	4		
Road from Wigton to Abbey-Holm	–	–	–	–	Level	411
(from the Abbey 1 4)	4	1	80	5		
COUPAR	4	3	85	–		
ALLONBY (Road to Wigton)	3	3	88	3		
Separation to Allonby (0 4)	7	1	88	4	12	423
MARYPORT BASON	5		93	4	Level	
Top of spring tides					7	430
Half tide					15	445
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Table 1: (Chapman W., 2nd Report, 12th July 1795)
See Local Tracts d94 Canal Projects. 1795–97.

that the canal would be capable of taking barges of 100 tons, as well as the keels in use on the River Tyne. Dodd advised ending the whole line at the Solway Firth beyond Carlisle, and sensibly proposed that the two ends of the canal be built before the centre section be attempted, as well as using the river bed wherever possible to save the cost of buying land and digging.[17] As early as November of the previous year Dodd had advised the committee that "to begin the Navigation from Newcastle to Hexham" would ease the burden of carrying out the rest as this section would soon be productive.[18] Dodd estimated the cost of this first 16½ mile 5 chain section of the canal from Stella–Hexham to be £35,717 10s 2d with estimated revenue of £9,925 15s 2d per annum.[19]

These rival projects were put into direct competition at a meeting held for the public in

Newcastle on the 2 July 1795, when it was said that the "sense of the public was clearly in favour of the south line'. They proposed that a sum of £400,000 be raised in shares of £100 each and subscription lists towards preliminary expenses were "numerously signed in both Newcastle and Carlisle".[20] However, by the end of July it was reported that the east coast dispute over the line of the canal on the north or south side of the river had become so bitter that there was a possibility of the whole scheme foundering.[21] Yet, by the beginning of August it was reported in Newcastle of the intention to apply to Parliament in the next session for a Bill for a canal from Stella–Hexham on the south side.[22]

On 10 August 1795, W. Chapman published his third report on the canal, examining the relative advantages and disadvantages of the north and south lines. In this he recognized the advantage of the south line in being nearer the coal fields, but doubted the feasibility of Dodd's proposed south line due to its difficult route and steep banks. He also said that boats suggested for use on Dodd's canal were not suitable. Chapman argued that the existing keels on the Tyne were too wide at 19′ 6″ and too keep at 4′–4′ 6″ draught to be used on the canal saying "the keels in use on the River Tyne are of peculiar form, calculated for particular purposes but ill suited for passage through canals". In this report Chapman also put forward a river and canal scheme in preference to a canal-only scheme along the south side of the river, to the coal mines near Eltringham (see Table 2). This he suggested could be built in addition to the canal he proposed on the northern side of the river if required. For this combined river and and canal scheme he advised the use of specially built boats of 50′ extreme length and 3′ 6″ draught enabling them to pass through locks of 15′ width and a canal of 24′ width at the bottom, 44′ wide at the surface and 5′ deep.

However, this third report continued to defend his proposal for a northern line of canal, and he thought that this northern line could be used equally well to carry coal and lead as the southern line "as distance between the two would be very trivial", although he realized the benefit of additional bridges across the River Tyne to assist this. Although in his initial report Chapman had recommended that the canal join the River Tyne at Ouseburn, in this report he preferred to terminate it at the Quayside, but realized the problems of acquiring land and buildings there could be considerable, he said "I only mention this, as a suggestion, for the consideration of gentlemen that may be concerned; as I conceive, that in the beginning, it will be eligible to have the Act, should it ever by applied for, unincumbered with the difficulties of opposition from the proprietors through whose premises it may go, or totally occupy, in its descent from the Haydon Bridge level; and consequently, leave that part to be determined by circumstances".[23]

By 23 September 1795 a meeting of the subscribers to the survey for a canal on the northern side of the river decided that Mr. Jessop, Mr. Chapman and Mr. Whitworth should examine and report upon the several lines surveyed by Chapman in his previous reports.[24]

The debate over the choice of route continued, and in October 1795 William Jessop, in a letter to the subscribers, said "I have no hesitation in saying, that I generally concur with him (Chapman) in opinion, that the line laid down by him on a high level on the north side of the Tyne, is, upon the whole, much preferable to any line that appears to be practicable on the south side: and that any line further to the north, by the vale of the Pont, however advisable it might be for local purposes, can never become eligible as part of a general line across the island". Jessop and Chapman's estimates for the line are given in Table 3. William Jessop basically agreed on Chapman's proposed route for the canal and confirmed that it would be difficult to join the River Tyne at Newcastle due to the lack of available space for the locks, instead proposing that the canal join the river near Benwell. Jessop recommended that his canal be capable of taking boats of 14′ width and 65′ in length, predicting the cost to be £3,737 per mile which

	Distance Miles	Furlongs	Total Distance Miles	Furlongs	Rise Feet	Total Rise Feet
Canal						
Mr Crawford's staith at Stella—	2	–	–	–	level	–
Lock near the end of Ryton Willows	1	2½	3	2½	level	
Stanley Burn foot	2	2	5	4½	6	
River						
Navigation to foot of the shoal below Hagg-Ford	1	2½	6	7	level	6
Canal						
Navigation to head of Ovingham Ford	1	4	8	3	17	23
River						
Navigation to foot of Eltringham Ford	–	6½	9	1½	level	23

Table 2: River and Canal Scheme (Chapman 10th August 1795)
Source: L.T. d94 1795–97

he regarded as being feasible.[25]

Half Measures: but Bills

The long delays which were almost inevitable in the execution of a project of this scale led to its partial abandonment by the end of the eighteenth century; and from full measures the scheme moved to half measures but with somewhat more tangible results.

By the 3 March 1796 it was reported that £86,000 had already been subscribed to the line on the north side of the river[26] and on the 16 April a meeting was held in Newcastle where a scheme for a canal from Newcastle to Haydon Bridge was proposed by Chapman, at an estimated cost of £80,000 following the north side of the river.[27] This canal, it was said, could be built first, as Dodd had earlier suggested for his south line, but would later form part of a sea-to-sea canal whilst meanwhile being viable on its own.

By the 31 May 1796 £110,000 was reported to have been subscribed for the canal from Newcastle to Haydon Bridge and directions were given to solicitors to draw up the Bill.[28] It was also reported that Dodd's Stella–Hexham line had been referred to the Yorkshire engineer John Sutcliffe by the separate committee supporting and promoting a south line. Sutcliffe rejected Dodd's proposals saying "I cannot recommend you to persue that plan at all eligible". He also accused Chapman and his friends of availing themselves of an imprudent survey made by Ralph Dodd, which enabled them to suggest this line as impractical and "with a great deal of art and cunning have endeavoured to pursuade the public that a good and useful line of canal cannot be made on the south side of the Tyne". Sutcliffe, therefore, proposed a slightly different line from Stella–Hexham on the south side, with a canal of dimensions 44′ at the surface, 24′ at the bottom and 6′ deep which he said would be capable of taking 50–60 ton vessels but not keels.[29] Little of Sutcliffe's report is concerned with his own proposals and more is devoted to decrying the other proposed lines and their engineers.[30]

Sutcliffe estimated the cost of his 17 mile canal from Stella to Hexham to be £89,795 5s 0d with an extension to Newcastle increasing the cost to £131,362 10s 4d.[31] He followed this up with a report examining the costs of alternative canals from Newcastle–Haydon Bridge on

both sides of the river and estimated the cost of a canal on the south side to be £152,059 4s 6d, and on the north side £183,450 15s 6d which included £10,677 6s 0d.[32] for an aqueduct over the River North Tyne. (Chapman & Jessop's estimate for this had been £10,500.) Like Chapman, Sutcliffe proposed this scheme to be part of a sea-to-sea canal extended to the West sea "wherever circumstances shall render it expedient".

Meanwhile in August 1796 it was reported of the intention to apply to Parliament in the ensuing session for a Bill "and to have the same passed into an Act for making and maintaining a navigable canal . . . from Newcastle-Upon-Tyne to Haydon Bridge".[33] By 17 September it was also reported of the intention to apply to Parliament in the next session for a Bill, and Act, for a canal on the south side of the river from Hexham to Stella.[34]

The debate between the north and south lines continued and on the 4 June it was reported that Mr. Whitworth had been requested to examine the proposed line of the canal on the south side of the river from Stella to Hexham.[35] In February 1797 he agreed that Sutcliffe's proposals were practicable although he thought the line to be "a rugged one: I never before saw a good line like it, yet so far as I can discover, I believe it is the best the

SUMMARY OF THE ESTIMATE OF THE DIFFERENT PORTIONS OF CANAL FROM THE RIVER TYNE AT NEWCASTLE TO THE IRISH CHANNEL, AT MARYPORT

Locking up from the Tyne to the Haydon Bridge Level, exclusive of any extra expence that may arise from difference between the purchase and sale of the scites of houses, if the Canal should be taken through the town	£ 21,080	
Rise of locks 205 feet.		
Canal to Haydon Bridge from above the West Gate of Newcastle, length 30¼ miles on one level	108,414	
		£129,494
Canal from Haydon Bridge to St. Nicholas, near Carlisle. Length 32 miles Rise 240 feet Fall 374 ditto	145,509	
Branch from the summit Level towards the Coal Fell Length 1430 yards, level	1,404	
Branch to Carlisle from St. Nicholas, Length about 240 yards, level	2,734	
		149,647
Canal from St. Nicholas to Maryport Length 30½ miles		75,926
Fall to Bason at Maryport, about 40 feet TOTAL LENGTH (with branches) 95 miles		£355,067

W. JESSOP
W. CHAPMAN

Maryport, 26th Oct. 1795.

ABSTRACT OF THE ESTIMATE OF A CANAL ON THE SOUTH SIDE OF THE TYNE FROM STELLA TO HEXHAM

BY MR JESSOP AND MR CHAPMAN

Length of Canal to Hexham	17½ miles
Ditto of river from Stella to Newcastle	5½ miles
Rise from low water at Stella	107 feet

EARTH WORK
(Inclusive of walling off the river at the Hag.)

Cutting in the steep bank above Ryton Haughs	£ 1640	
Carrying the Canal in front* of the Hag, at a sufficient elevation above the river	4500	
Cutting in face of Elringham# Scars	3340	
Tunnel thro' the deep part of Farnly Scar	4400	
Deep cutting east of the Tunnel	719	
Cutting in face of the Scar, west of the Tunnel	2426	
Remainder of the earth work, including the embankments and cutting not specified	12218	
		£ 29243
Culverts over the different brooks, including an aqueduct over the Devils Water		1889
Ten Locks		7000
Bason at Hexham		300
Bridges, stop-gates, warehouses, lockhouses, receivers, dischargers, &c &c.		8250
Fences, hauling-path, back drains, &c.		2240
Lining the Canal in leaky soil		3100
134 acres of land		8010
Contingences at 15|. per cent		9009
		£ 69071

* If cut thro' the Hag. the expence will be

117940 yards at 8d. per yard	3931
610 of Tunnel at 20 l.	12200
	£ 16131

The Canal may be carried at less expence by walling off the river in front of these Scars.

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Table 3: Canal Reports Chapman, Dodds, etc.

country affords: it is certainly practicable, and I have no doubt that a good and useful canal can be made (with some variation) upon it; but it will be exceedingly expensive: I am however, told the trade that will come upon this canal will fully answer that expense and were it twice as much". He agreed with Sutcliffe's estimates for costs of £89,795 and said that his line required only minor alterations, although he thought that the canal should be carried below Stella to the mouth of the River Derwent to get a better navigation.[36] In his second report, on

the line from Newcastle to Haydon Bridge on the north side of the Tyne, he regarded Jessop and Chapman's estimate of £108,414 too low and Sutcliffe's estimate of £183,450 too high, giving his estimate as £123,133. In this report Whitworth says of the North Tyne crossing "a very large aqueduct will be necessary", again regarding Jessop & Chapman's estimate too low, and estimating the cost to be £23,500.[37] Subsequent estimates independently given by Donkin & Thompson, Thomas Thompson and Johnson estimated the cost of this aquaduct to be £9,425 8s 6d, £11,325 and £10,745 respectively using the same dimensions.[38] When Whitworth was asked whether he preferred the north or south line he replied "the line upon the south side has certainly very much the advantage both in point of tonnage and expense and safety in the execution".[39] At the time of Whitworth's report it seems to have been decided by the committee that the link between the river and the canal at Newcastle would be by self-acting inclined plane, which was approved of by Whitworth. This inclined plane was included in the Bill which was by then before Parliament.[40]

By the 25 March 1797 it was reported that the Bill for the Newcastle to Haydon Bridge canal on the north side of the river was to be read a second time and parties objecting to the Bill were to be heard by counsel at that stage.[41] Though this canal was supported by men from both Newcastle and Carlisle it attracted a number of adverse petitions from landowners, as well as from the promoters of the south line.[42] The main petitions for the canal came from the proprietors of the lead mines, Greenwich Hospital, and from the burgesses and inhabitants of Newcastle, with those against coming from other landowners, as well as the parishioners of St. John Lee who were worried that the canal would damage the church. A violent Parliamentary struggle ensued between the promoters of the two lines[43] and the Bill got no further than its second reading. By April it was reported that "the intended canal navigation on the north side of the river Tyne is we understand totally abandoned".[44] The Bill for the canal from Stella to Hexham also got no further. Although Dodd's proposals for a south line were initially a sound alternative, following Chapman's north line achieving financial backing, the south line became a convenient way of opposing the north line[45] with Sutcliffe's evidence possessing enough "talent and address to damage most seriously the project" for a canal on the north side and the sea-to-sea canal.[46]

By the turn of the century the financial climate was unfavourable. Britain had resumed its war with France and rising interest rates due to high government borrowing, coupled with the operation of usury laws, diverted funds away from projects such as canals.[47] As costs rose and money became tight, so men were no longer encouraged to speculate and ambitious schemes including the sea-to-sea canal were laid aside albeit temporarily.

The Haydon Bridge scheme was briefly revived in 1802 when Chapman had his anonymous pamphlet of 1796 reprinted with a new introduction in which he repeated the commercial advantages of this canal. In this report he raised his former estimate from £355,000 to £400,000 although he estimated the revenue to be £30,659 per annum. Reflective of the fact that since 1793 Britain had been almost continually at war with France, he stressed the military advantages of having the canal, enabling troops and stores to be transported either way across England, in case of French attack on Ireland or on the east coast. Chapman also suggested that the army might help to build such a canal and government funding be available,[48] as it had been for the Caledonian Canal, but the Caledonian was the exception to privately funded canals in Britain, unlike on the continent where governments had played a considerable role in the development of inland waterways.[49]

On 25 September 1810 it was reported of the intention to apply for a Bill, or Bills, for a canal from Newcastle to Haydon Bridge.[50] Then in October B. R. Dodd (probably Ralph Dodd's son) reported on a canal of 21 miles 63 chains and 30 links on the south side of the river from Newcastle to Hexham, which would be 43′ at top water and 5′ deep. This canal would cost an

estimated £105,800, with revenue of £22,647 9s 10d per annum coming predominantly from coal and lead. In this report he also recognized the advantages of linking Liverpool by inland canal.[51] A prospectus was then issued for this canal, which was envisaged to be extended to Carlisle and the West Sea, with the capital of £106,000 to be raised in £100 shares.[52] In May 1817 B. R. Dodd again reported, but this time on a "great north junction canal" which was to run south-west from Hexham to meet the Lancaster Canal at Kendal with a branch to Carlisle, which provided an inland route to Liverpool rather than using coastal craft from Carlisle.[53] By August "the prospect of a canal between Newcastle and Carlisle" was being seen as a "bright spot on our gloomy horizon"[54] and at a meeting on 29 August 1817 it was proposed that a bill be brought before Parliament for a canal from Lemington and Haydon Bridge with a view ultimately of "carrying it forward to the Solway Firth".[55] In October of the following year Chapman again reported on a canal on the north side of the river, this time for a 17½ mile canal from Lemington to Hexham.[56] However this proposal got no further and the canal schemes suffered from the coming of the railway.

The Carlisle Canal

In his report of 1802 Chapman stated that "the former attempt to obtain subscriptions for the execution of the whole line failed of success not so much from want of spirited subscription at this end (Newcastle) as from an unexpected deficiency at the other which we hope will no longer exist".[57] Yet, ironically, it was at the Carlisle end that the most progress was achieved.

The failure to attract subscriptions from Cumberland men was largely due to the fact that Northumberland men had more to be gained from such a venture, whereas in Cumberland the industries most likely to benefit were more recently established and backing more difficult to obtain.[58] Therefore, Carlisle men had never supported these sea-to-sea projects so enthusiastically as did those in Newcastle. With their interest being more local, they were more concerned with improving facilities for coastal craft from Liverpool, Ireland and the Scottish ports.[59] By the early years of the nineteenth century the leading citizens of Carlisle had decided that the Eden ports were too small and too far from the city and so increasingly became interested in a canal.[60] They started to take action in 1807 when, following a public meeting on the 21 May, a committee was formed to promote a canal from Carlisle to the sea[61] with the aim of not only providing an outlet for Carlisle's expanding textile industry, but to "greatly facilitate the conveyance of coals, lime, goods, wares and merchandizes, to and from the said City of Carlisle"[62] This committee asked Chapman to report on this canal, in which he maintained his 1795 preference for using the existing port at Maryport, but thought that if the likely cost of some £90,000 or £100,000 too great then a terminus east of Bowness-on-Solway would be practical. On 22 August 1807 Chapman added an appendix to this report proposing both a 90–100 ton canal to Carlisle and a smaller branch to Maryport capable of taking vessels of 50 tons. On the 6 February 1808 Thomas Telford also reported on what he called the "Cumberland Canal", in which he proposed a canal with locks of 20′ wide capable of taking coasting vessels from the Solway Firth, at a cost of £109,393. Such a canal he said could later be extended to Eskdale and up the Eden valley as part of a line to Newcastle. Chapman commented on Telford's proposals and regarded locks of 16′×65′×6′ as being capable of taking 100 ton craft and being large enough for the Mersey flats which would be likely to work the Liverpool part of the expected trade.

The idea was then laid aside until October 1817 when at a meeting on the 7th in Carlisle Chapman was asked to survey a canal from Carlisle to the Solway Firth, for craft of not less than 70 tons, for this he was told that he should "strictly adhere to the ultimate objective of connecting the east and west seas". Chapman recommended a canal of 50′ width and 8′ depth

with locks of 74′×17′ at an estimated cost of £73,392, with a smaller canal being extended up the vale of Eden.[63]

The Carlisle Canal Act was obtained on the 6 April 1819.[64] The canal was 11¼ miles long, 54′ wide and 8′ 6″ deep with locks of 18′ 3″×78′. It had a total of 8 locks with a fall of 60′. The canal ran level from Port Carlisle, rising by 6 locks in 1¼ miles and then running level 6″ above the highest known tide along the sands via Drumburgh to the Carlisle basin (450′×120′). Originally no harbour was envisaged at Port Carlisle, only a small basin, however this changed and a harbour was built, with a pier, detached harbour wall, coal staith and tramway.[65] Of the £80,000 authorized in £50 shares, £70,600 had been subscribed, mostly by local interested men many in the textile industry, and some £10,000 had also been borrowed by the time the canal opened on the 12 March 1823.[66]

The coming of the railway

Although railways were still in their infancy, in the 1820s proposals for a railway in preference to a canal had already received attention, and in May 1824 Chapman wrote of his clear preference for a railway.[67] However, Chapman's enthusiasm for a railway instead of a canal threatened to be counterproductive and in August it was reported "Mr Chapman has suddenly become the zealous promoter of a railway, to the exclusion of a canal ... we cannot help thinking that his reasons for the construction of a railway in preference to the opening of a canal are anything but valid or satisfactory",[68] and a fortnight later it was said that "the public cannot be inclined to believe that any great benefits would result from this railway".[69] At a meeting on the 21 August in 1824 in Newcastle "Col. Coulson opened by recommending an easy communication from sea-to-sea by railway; Mr Armstrong, merchant, endeavoured to prove to the meeting the decided advantage of a ship canal over a railway". It was then proposed that "a committee should be appointed to inquire whether this communication would be most desirable by a canal or railway which was unanimously agreed to".[70] In response to this request for an inquiry into the relative merits of each, Chapman reported, coming down clearly in favour of a railway.[71] (The respective costs of each are shown in Table 4.) Although there were claims from Ferrier, engineer to the Carlisle Canal Co. that he had over estimated the cost of the canal by £300,000.[72]

By 23 November it was reported that the committee had resolved to request Mr. Telford to report on the practicability of forming a canal, and upon the cost and expediency of a railroad. "This will give satisfaction to the public and nothing short of another report of some engineer of eminence would have done so. Mr. Chapman's report appears to have been very generally disapproved of at Carlisle. At a meeting of the subscribers there on Wednesday last, it was unanimously voted partial and unsatisfactory; and a resolution was come to strongly recommending some other engineer to be consulted. As Mr. Chapman, however, will be requested to accompany Mr. Telford in making his survey; an opportunity will be afforded him of reconsidering any errors he may have committed in a report, which, it is but fair to admit, he was called upon very hastily to draw up".[73] This dissatisfaction in Carlisle with Chapman's report is unsurprising as Chapman had fallen foul of the Carlisle Company the year before, resulting in his dismissal before the canal opened.[74]

By 11 January 1825 it was clear that Mr. Telford would not be able to carry out the proposed survey before the close of the ensuing session of Parliament and "to enter upon it afterwards would be too late to get a bill into Parliament in 1826, and therefore his assistance, we fear, must altogether be dispensed with. Whether the committee will think it proper to employ any other competent engineer to report upon the points which were to have been submitted to Mr. Telford, or whether, from the opposition which, it is known, any project for a canal must encounter on the part of the landowners, they will now abandon the scheme of a canal as impractic-

Approximate estimate of a continuation of the Ship Canal from the Basin at Carlisle, to the river Tyne at Redheugh, above the bridge at Newcastle

117 locks of about 7 feet rise, including gates, difficulty of foundations, etc. at an average of £3000	£351,000
Aquaducts over the Tyne and Eden	32,000
Aquaduct over the Derwent	7,000
Smaller aquaducts and culverts over lesser rivers and streams, viz. the Caldew, Petterel, Tipple, Devil's Water, at an average of £3,000, and about 25 small brooks at £450	24,500
96 draw bridges viz. three in every two miles, at £500 each	48,000
About 32 miles on an average of level cutting, with towing paths, fences, etc viz. bottom with 33 feet, slope of sides 21 inches to a foot, and depth 9 feet, at an average of 30s per running yard, viz. £2,640 per mile	84,480
20 miles of deeper cutting and embankment, at an average of £4,000 per mile	80,000
10 miles more difficult, at £6,000	60,000
2 miles, viz. 3520 yards, at £10 per yard	35,200
Reservoirs in the high country, on the vales of the Irthing and Tipple, with purchase of land, probably not less than	6,000
Compensation for mill property on the Irthing and Tipple uncertain, may assume it as	3,000
Incidents, superintendance, etc. 15 per cent	109,677
Land at an average width of only 84 feet, will require 10⅙ acres per mile, viz. on 64½ miles, equal to 655 acres, at an average of £60 per acre	39,300
Temporary damage to land, 1/5th of the above	7,860
	£888,017

Approximate estimate of a railway from Newcastle to Carlisle

64½ miles of rails, as in the preceeding statement, at £2,205 10s. per mile	£142,255
Cuts and batteries (excavations and embankments) under the variations admitted by stationary engines, inclusive of the portions nearly sufficiently level for horses or locomotive engines, admit of no accuracy without an actual survey, assumed at an average of £600 per mile on the whole distance	38,700
Short tunnel at Lemington, wooden bridge to Ryton Haughs, over the North Tyne, the Eden, etc. under the same predicament as above, but may be assumed at	20,000
Land inclusive of fences, embankments, and cuts, average width 40 feet on 64½ miles, equal to 310 acres at £60	18,600
Temporary damage to land, superintendance, incidents, etc. 15 per cent	32,933
	£352,488

Table 4
Source: William Chapman 27th October 1824.

able, we cannot presume to say".[75] A week later it was reported that Mr. Josiah Jessop (William Jessop's son) had accepted instructions to survey the line.[76] In March 1825 the Tyne Mercury said "We understand that a meeting of the committee was held on Friday last, and that Mr J. Jessop attended and communicated to the meeting the result of his survey, which was decidedly in favour of the adoption of a railroad. . . . We have been told, but we think we must have been misinformed, that he makes an addition to Mr Chapman's

estimate of the expense of a canal and in the charge for puddling alone of £250,000, a sum amounting very nearly to the entire expense of a canal, as estimated by his father and Mr Chapman in 1797".[77] By the 2 April it was said that at a meeting on the Saturday before of the Northumberland Landowners, "On this occasion the canal mania, which had so long retarded the only practicable project appeared to be extinct, or at least was dumb, and the report in favour of a railway was agreed to unanimously and without debate".[78] By 12 April the report read "we change the word communication now to railroad, since that is the measure determined on".[79]

The Newcastle and Carlisle Railway[80,81] was opened in sections, and opened throughout by 1829. By combining the railway with the Carlisle Canal, it was now possible to travel from sea to sea. Initially the railway connection with the canal, led to an increase in canal trade, especially from Lord Carlisle's mines, and those of the Blenkinsopp Coal Company at Greenhead. However this success was short-lived as severe competition from other ports, notably Maryport, affected coal exports: especially after the opening of the Carlisle & Maryport Railway in February 1845. Further loss of trade came with the completion of the Lancaster & Carlisle Railway which offered an inland route to Liverpool and Manchester in competition with the steamers from Port Carlisle. The opening of the Caledonian Railway, which was opened from Carlisle to Moffat in 1847, and to Edinburgh and Glasgow in February 1848, and the Glasgow Railway, all adversely affected the fortunes of the Carlisle Canal.[82]

By the early 1850s the Carlisle Canal's financial difficulties were a serious cause for concern. Many of Carlisle's leading citizens were prominent amongst the shareholders and were in agreement that they required an independent outlet for their goods, free from the control of the railway companies which were not believed to have the city's best interests at heart. Hence the "Carlisle business élite responded to these pressures by seeking to convert the canal to a railway".[83] In March 1852 the committee minuted "It appears highly desirable and indeed the only means of retrieving the affairs of the Canal Company that the Canal should be converted into a railway". If trade was not to be lost then the conversion to a railway had to be rapid and work began in June and the canal closed on the 1 August, before royal assent was received on the 3 August, 1853, to enable this.[84]

The railway to Port Carlisle opened for goods traffic on the 22 May 1854, and for passengers a month later.[85] However the promoters of the Port Carlisle Dock & Railway Co. were soon turning their interest from Port Carlisle "as the badness of the harbour at that place induced the promoters to turn their attention to the magnificent anchorage of St. Catherine's Hole off Silloth"[86] and following much parliamentary fighting the Carlisle & Silloth Bay Railway Act was passed on the 16 July 1855, and the line opened on the 28 August 1856, leaving the Port Carlisle line at Drumburgh.[87] Thus, Port Carlisle had been largely abandoned even before the building of the Solway Viaduct in 1868 cut the port off from sea going ships.[88]

Recent proposals and the story to date

Despite the closure of the Carlisle Canal, and the replacement of the proposed sea-to-sea canal with a railway, proposals for a canal continued to be advanced.

In 1883 a proposal for a sea-to-sea canal was made by Mr. J. Watt Sandeman, this was updated and revised in 1910. Similar advantages were given by Sandeman as those put forward for previous proposals over a hundred years earlier—those of shorter distances from east and west ports, and from the continent, as well as lower insurance costs due to safer passage. Like Chapman, Sandeman pointed out the benefits to the intermediate towns along the canal and to Newcastle, saying "more trade would necessarily be attracted to the Tyne, to the towns situated upon it and to those along the canal route such as Hexham, Carlisle, Silloth and Maryport". He also emphasized, like Chapman, the military advantages of such a canal.

Date	Route	Engineer	Width Bottom	Width Top	Depth	Cost
1795	Newcastle–Solway (S)	Dodd R	18ft	27ft	5ft	–
	Newcastle–Maryport (N)	Chapman W			3ft 6in	–
	Newcastle–Solway (N)	Chapman & Jessop	capable of taking vessels			£355,069 0s. 0d.
	Stella–Hexham (S)	Chapman & Jessop	of 14ft × 65ft			£69,071 0s. 0d.
	Stella–Hexham (S)	Dodd R	18ft	27ft	5ft	£35,718 10s. 2d.
	River/Canal Newcastle–Eltringham	Chapman	25ft	44ft	5ft	–
1796	Stella–Hexham (S)	Sutcliffe	24ft	44ft	6ft	£89,795 7s. 0d.
	Newcastle–Hexham (S)	Sutcliffe	24ft	44ft	6ft	£131,362 10s. 4d.
	Newcastle–Haydon Bridge	Sutcliffe	24ft	44ft	6ft	£169,059 4s. 6d.
	Newcastle–Haydon Bridge	Sutcliffe	24ft	44ft	6ft	£183,450 15s. 6d.
1797	Stella–Hexham (S)	Whitworth				£89,795 7s. 0d.
	Newcastle–Haydon Bridge (N)	Whitworth				£123,133 0s. 0d.
1810	Newcastle–Hexham (S)	Dodd B R		43ft	5ft	£105,800 0s. 0d.
1817	Lemington–Hexham (N)	Chapman				
1824	Newcastle–Carlisle (N)	Chapman	33ft		9ft	£888,017 0s. 0d.
1910	Newcastle–Solway	Sandeman	148ft		36ft	£55,800,000 0s. 0d.

Other routes proposed: North Shields–Haydon Bridge (N), Thompson (1795)
Newcastle–Kendal, branch to Carlisle (S), Dodd B R (1817)

Table 5: Comparison of Sea to Sea Proposals

The scale of the 1910 canal was considerable—being comparable to the Panama Canal which was being constructed at that time. It was proposed to be 36′ deep and 147′ wide at the bottom, with footpaths of 8′ wide along either side. The canal would have involved significant feats of civil engineering, with a 13½ mile, deep, channel dredged from the sea locks at Cardurnock to the end of the Silloth Channel, and locks 100′ wide capable of taking ships of 1,000′ in length. The most outstanding feature of the canal would have been its 9½ mile long tunnel from near Haltwhistle to near Gilsland, this was proposed to be 100′ wide and 126′ high. (The longest tunnel on any artificial waterway in Britain is Standedge on the Huddersfield Canal which is approximately 3¼ miles long.)

The estimated cost of this ship canal ranged from £44,200,000 for a high level canal with seven flights of locks at either end, which would have limited the size of the vessel using the canal to "mercantile marine", to £49,000,000 if the bottom width of the canal was reduced to 100′ as had been proposed for the Forth & Clyde Canal, to a cost of £55,800,000 for the low level ship canal.[89]

In the subsequent discussion the difficulties of building such a canal, and of making the Tyne navigable to join it, were raised, with Mr. Gedye saying that "undoubtedly at the present time there is very little prospect of even the more moderate and more feasible scheme of a Forth & Clyde navigation coming within the realm of practical politics", although he conceded that "if constructed such a canal would be of real benefit to the Tyne and shipping generally".[90] Despite such impracticalities, this proposal was awarded the Gold Medal of the NE Coast Institution for that year!

Unsurprisingly there have been no further proposals for such a canal. By April 1914 the Dandy services, for which the Port Carlisle line had been famous, were withdrawn and England's last surviving horse hauled passenger service ceased. Dandy No. 1 was then relegated to use as a pavilion for the local bowling club—although later restored and preserved in the National Railway Museum.[91] The Port Carlisle Railway later closed on the 1 June. Although the Newcastle & Carlisle Railway remains open to date, only the former route of the Carlisle Canal across the sands, the Carlisle basin and Port Carlisle serve as reminders of the many ambitious plans to link the east and west seas.

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