Pumping Bristol's water: Part one

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At the opening of the 19th century Bristol's water supply was in a parlous state. From 1696 to 1782 the first 'Bristol Waterworks Company' had used a water-powered pump near Crews Hole, Hanham to supply river water to parts of the City. This system fell into disuse, leaving local springs and 'conduits' which, as the City grew, became inadequate and polluted. The village of Clifton had become a fashionable residential area and private entrepreneurs constructed works to supply the houses from systems of pipes laid under the street, charged under pressure by pumping from wells

Sion Spring, (G R ST 566729) sunk on a corner of ' Caledonia Place in 1811 by a Mr Coates, supplied the main streets of the village, reaching the Promenade, Granby Hill and Clifton Hill. The property, now the site of St Vincent's Rocks Hotel, included 'Baths and Engineer's Residence' as well as an engine house and their possible survival as parts of the hotel makes an interesting line for further enquiry. Richmond Spring (G.R ST 575733) where a public house of that name now stands, was established in 1815 by a Mr Coombe and at about the same time a Mr Hamley developed Buckingham Spring at Richmond Park on the opposite side of Queen's Road. Between them they supplied water to a small area now centred on the University Union. 146 houses were 'supplied by pipes and others by casks'.

In the 1840's the Society of Merchant Venturers proposed a more ambitious scheme retaining I K Brunel as Engineer and seeking Parliamentary powers to supply the whole of the Clifton area. This was opposed by the owners of the existing Springs, and also by the promoters of 'The Bristol Waterworks Company', who prepared a Bill to supply the whole of the City and Clifton, James Simpson, an established London water supply consultant acting as Engineer. A Parliamentary Committee decided the Company should proceed, their Bill receiving the Royal Assent in July 1846, but they were required to compensate the owners of the Clifton Springs and the Society of Merchants.

The new Company had taken over the Springs by September 1847 when they started to apply a water rate to the existing customers. The new mains laid by the Company in the lower levels of the City were filled from 1st October 1847, the water gravitating from Cold Bath Spring, Barrow Gurney. In June 1849 the 'White Ladies Waterworks including engine, engine house and cottage' were bought from a Mr Brooke-Smith at £400. There are no details of the engine, which apparently was not used by the Company, the purchase merely allowing them to supply the consumers concerned. Whether these included the White Ladies Convent is not recorded. Mr Hamley, former owner of Buckingham Spring, plagued the Company's Board with claims for 'rental' and in September 1850 he complained of 'improper violence in opening the well at Buckingham Spring'. Thomas Bell, the Company's Superintending Engineer, was asked for an explanation but it is not recorded. Hamley was told 'that the Company has discontinued use of the engine house and tanks'.

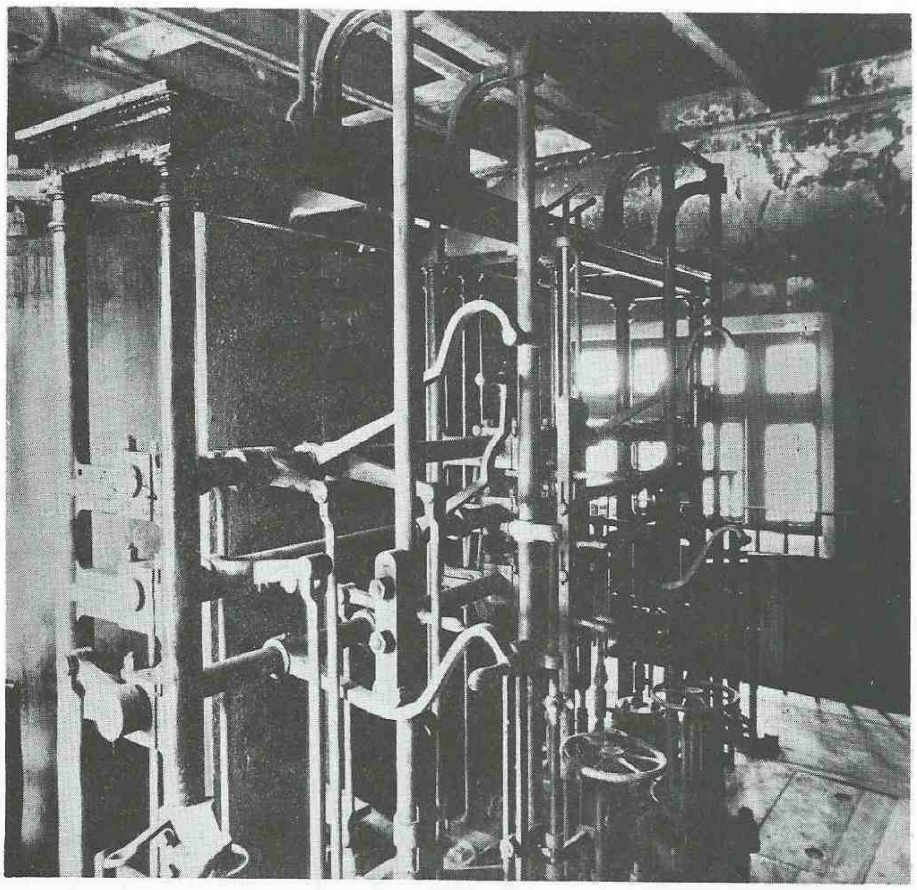
1864 was a year of severe drought, of which more later, and there was public pressure to reopen the Clifton Springs. The Company stated that it was 'impossible to erect engines for the purpose of pumping in less than two to three months'. Clearly, by then, the plant had all been removed. However, the City Council met the expense of installing an engine at Richmond Spring which was ready in October. The Company declined to take the output into their mains so that any use of the water was by carrying from the engine house. In November it rained and the Clifton Springs do not figure again in the City's water supply.

The compensation, in 1846, of the Society of Merchants was more involved. They had started their works, laying pipes in Clifton, building 'The Water Spring Engine House', having first sunk a well at Black Rock in Clifton Gorge and ordering in 1845 a pair of 'Bull' engines from Boulton and Watt's Soho Foundry, Birmingham (B & W Ref. IQ& R/13). In this type of engine, named after its designer, the steam cylinder was positioned directly above the pump, the pump-rod being a continuation of the piston-rod. A relatively light beam oscillating at one end about a pivot fixed to the building structure was moved by the main rod and drove auxiliary pumps.

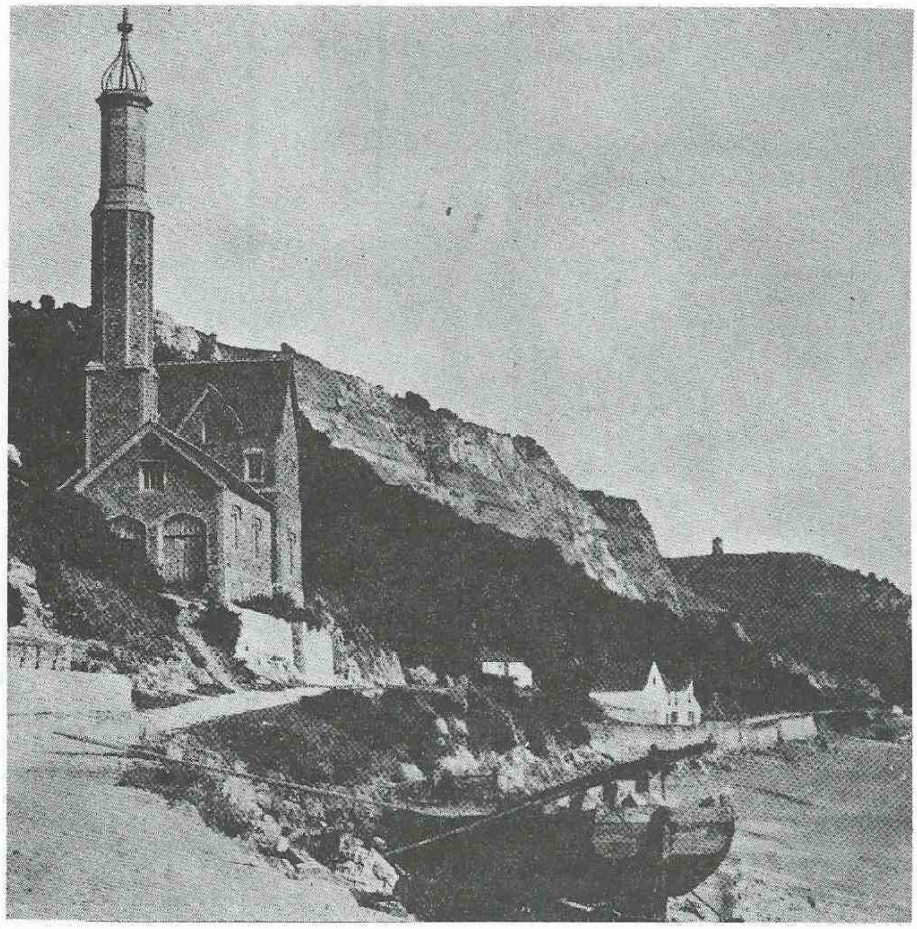
Early minutes record a request to obtain 'Brunel's report of the Society of Merchants' expenses and particulars of engines, pipes, machinery to be given up by them to the Company' and 'a description of the engines to be delivered to this Company' was received in July 1846. The Board, in August 1846 agreed to purchase at a total of £18,000 and shortly afterwards were read a letter from Boulton and Watt assenting to the transfer of their contract. A Folio, with the Boulton and Watt papers at Birmingham City Library, contains many drawings of these engines and a layout for Black Rock, which clearly was not carried out, shows 9 inch lift pumps fifty-two feet below the engine house floor, in a well 11 ft 0 in diameter. These drawings are dated July/ August 1845, marked 'Clifton Waterworks' and one of them shows the River Avon with towpath. The empty engine house stood until 1863-64, when it was removed to make space for the Bristol Port Railway (Hotwells-Avonmouth).

Further drawings dated May 1848 and marked 'Bristol Waterworks' show a different layout with 18 inch plunger pumps, set 16 ft 3 in below floor in a 15 ft 0 in diameter dry well. A detail of pump valves and suction pipes is marked 'not adopted - tee pumps for Bristol'. Another drawing confirms the 'catalogue' entry; 39 inches by 6ft 0ins steam cylinder, a rating of 48.6 HP and the description 'Inverted type SAS'. Notes on the detail drawings further confirm the transfer. Clearly 'Clifton' meant the Society of Merchants to Boulton and Watt and 'Bristol' meant Bristol Waterworks Company.

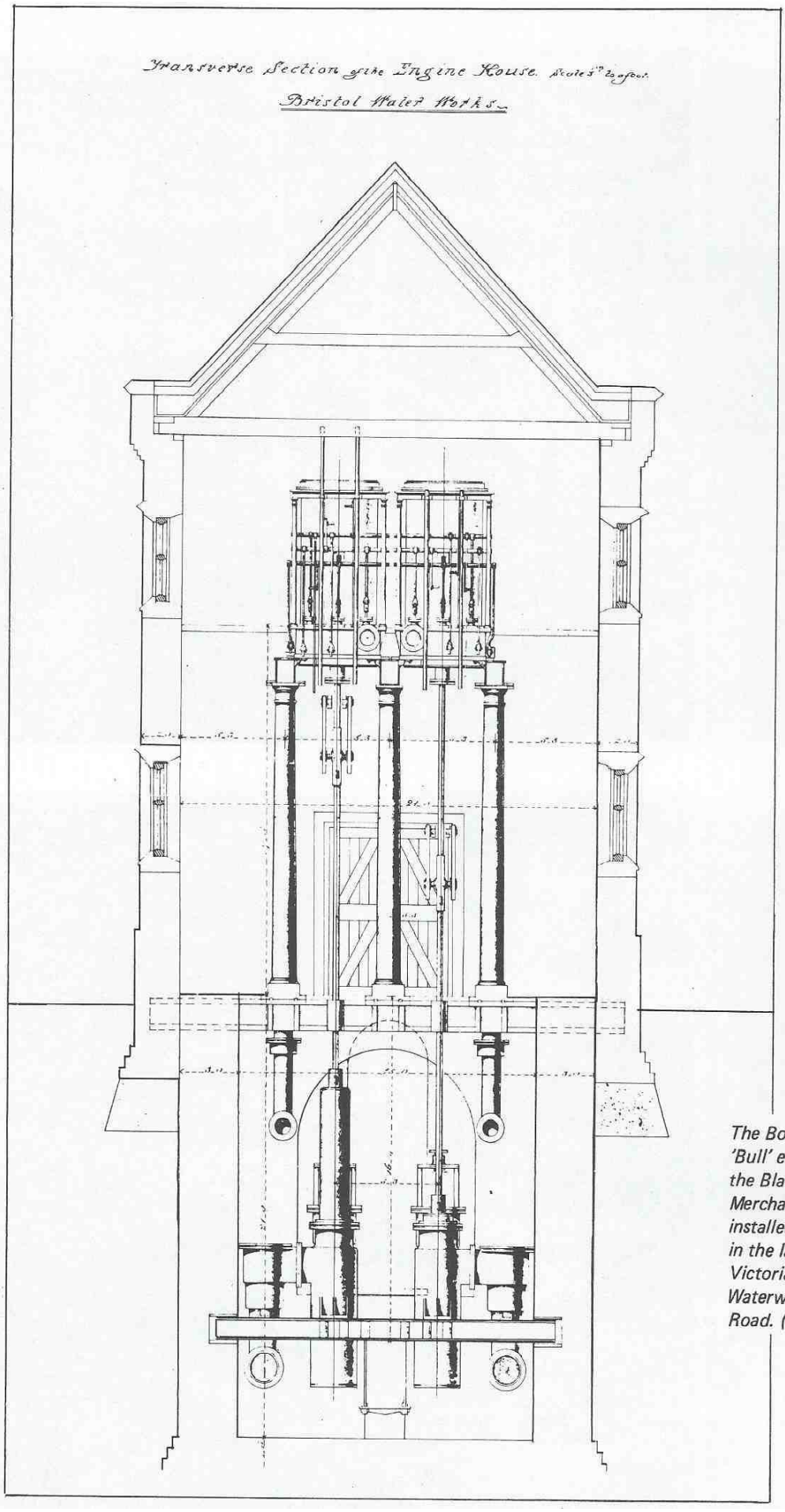
From the summer of 1848 Mendip water gravitated into a storage reservoir near the White Ladies Convent. An engine



The Boulton and Watt 'Bull' engines at Victoria Pumping Station dismantled in 1913



The abandoned pumping station of the Society of Merchant Venturers at Black Rock



The Boulton & Watt drawing of the 'Bull' engines originally intended for the Black Rock Engine House of the Merchant Venturers' scheme but never installed. The contract was transferred, in the layout shown here, to the Victoria Engine House of the Bristol Waterworks Company in Oakfield Road. (B&W IQ & R13)

house was constructed there and in July 1848 the Company was in correspondence with Boulton and Watt over 'slow progress in erection of the engines at Whiteladies Reservoir'. By October 1848 coal was being ordered and whilst no date has come to light one assumes the engines then went into service. The reservoir and pumping station became known as 'Victoria', and the lane passing the site became Oakfield Road. (G R ST 577737).

Running at 12 rpm and using 100 lb of steam per hour at 'slight|y above atmospheric pressure', the engines lifted water at the rate of a million gallons a day to the reservoir on Durdham Down, completed in 1848. The coal was shipped from South Wales to 'The Float' and carted up to White Ladies until Clifton Down station was opened in 1874. As the area developed residentially, complaints against smoke began to arise and experiments were made with 'smokeless' fuels. There are numerous records of repairs to engines and boilers carried out by the Avonside Engine Co. The boilers were probably of Cornish type but details are lacking and when all other Company's steam raising plant was insured from 1902 they were not included. From 1878 the 'Bulls' were superseded by newer pumps presumably being disused after 1902, and were scrapped in 1913. The engine house survived until 1950-51.

A ten mile aqueduct, part tunnel, part masonry culvert and part wrought iron pipe, known as 'The Line of Works' carried up to 11 million gallons a day from springs around Chewton Mendip into a storage reservoir at Barrow Gurney, all of which was completed by 1850.

For almost ten years no other works were necessary, but in the late 1850s the Company's directors realised the expanding City would soon need more water than they could take by gravity from the Mendips. Consideration was given to sinking wells at various locations around the Chew Valley and, meanwhile in the dry autumn of 1857 , an engine was set up 'for pumping the Winford Stream', lifting water into the aqueduct near Winford.

A trial well was sunk in Watery Coombe, Chewton Mendip with a hired engine and 'twelve inch pumps' to de-water the work, which yielded very little extra water. James Simpson the Company's Consulting Engineer, and a Mr William Sanders, a local geological expert, advised on likely spots to find water. After considering a location at Breach Hill, Chew Stoke, it was decided to sink at North Hill, towards Winford and an acre of land was purchased close to the existing aqueduct where today ruined buildings and a thorn covered spoil heap mark the spot (G R ST 553632).

Early in 1858, having secured a contract, partners Phipps and Prigg started sinking. A heading driven to the aqueduct cleared water from the work, but clearly they soon found pumping necessary because in June the Company arranged to pay £3 a week for 'the engine to work day and night'. The water poured into the aqueduct at 2000 gallons per hour, a useful augmentation of the supply. The well reached 220 feet in November when operations ceased because the contractor's engine, which had been suffering various breakdowns, 'was not powerful enough for the work now required' The Board and its Committee appear to have argued with Thos Bell the Superintending Engineer, over the size of the engine required for 'the permanent pumping at North Hill'. The Engineer proposed a 15 or 20 HP engine, but the Board found it possible to purchase a 30 HP engine 'calculated to pump half a million gallons per day' from Messrs Knight & Co of Ashton. In January 1859 the Engineer was instructed to order a 9¾ inch pump from Messrs Cochran & Co and Mr Samuel Phipps successfully tendered to construct a boiler at '£22.00 per ton'. Other contracts were let for the construction of an engine house, so one is led to imagine the well-sinker's engine had worked in the open or in temporary shelter. Clearly the engine, valued at £205 was not new for Mr Phipps was awarded a contract, at £220, 'for removing the engine from Ashton and re-erecting the same at North Hill'

In August Thos Bell was able to report '**both** engines at North Hill are now ready' and he was instructed to 'look out for two men as engine drivers, one for day and the other for night'. Probably the second engine was the well-sinker's engine. There was a succession of problems that autumn; difficulty in getting suitable men, pump rod breakages, fracture of the stone bed-plate of the bell-crank and an argument as to whether it was the Company's business or the Contractor's to ventilate the work. Then Henry Madison, the senior driver 'careless|y in trying to fix it broke the face plate of the engine' and was fired on the spot by Thos Bell. It was resolved 'that the well sinkers do not recommence operations until after Christmas', and on Christmas Eve Henry Madison appeared before the Board of Directors successfully to plead for a week's wages in lieu of notice because the mishap was 'accident and not want of ski|l'.

A whole year had gone by with very little progress but sinking restarted through the first six months of 1860 until a 'clack door in the pump' required repair. Samuel Phipps was then paid off, and the works lay dormant for a twelve-month. To repair the clack, which would have been a leather hinged valve, meant working at the bottom of the well with the pump stopped. If the original well sinkers' pump was available, it had already proved inadequate, and Thos. Bell proposed 'making a pound', ie driving a heading to increase the volume which the water would have to fill before making work on the pump impossible.

Samuel Phipps agreed to do this work at £10 per fathom (5 ft square) and started in July 1861. The pump was already in use to augment the supply to the city and Thos Bell reported 'We get only four hours out of 24 with a 9½" pump at 5 ft stroke'. Apparently the pump could be worked well enough for this. The pound was completed by mid-September and Samuel Phipps was 'entitled to receive the money for 5½ fathoms'. James Simpson strongly recommended the Board to continue sinking to 300 feet. Samuel Phipps tendered, but it was decided to use Company's men. The pump was repaired and a second pump installed; reference to 'the lower pump' suggests they had arranged a double lift. Coal was ordered from Sutton Pit and a weighing machine was installed which revealed 'according to their weighbills less than 19 cwt for a ton'!

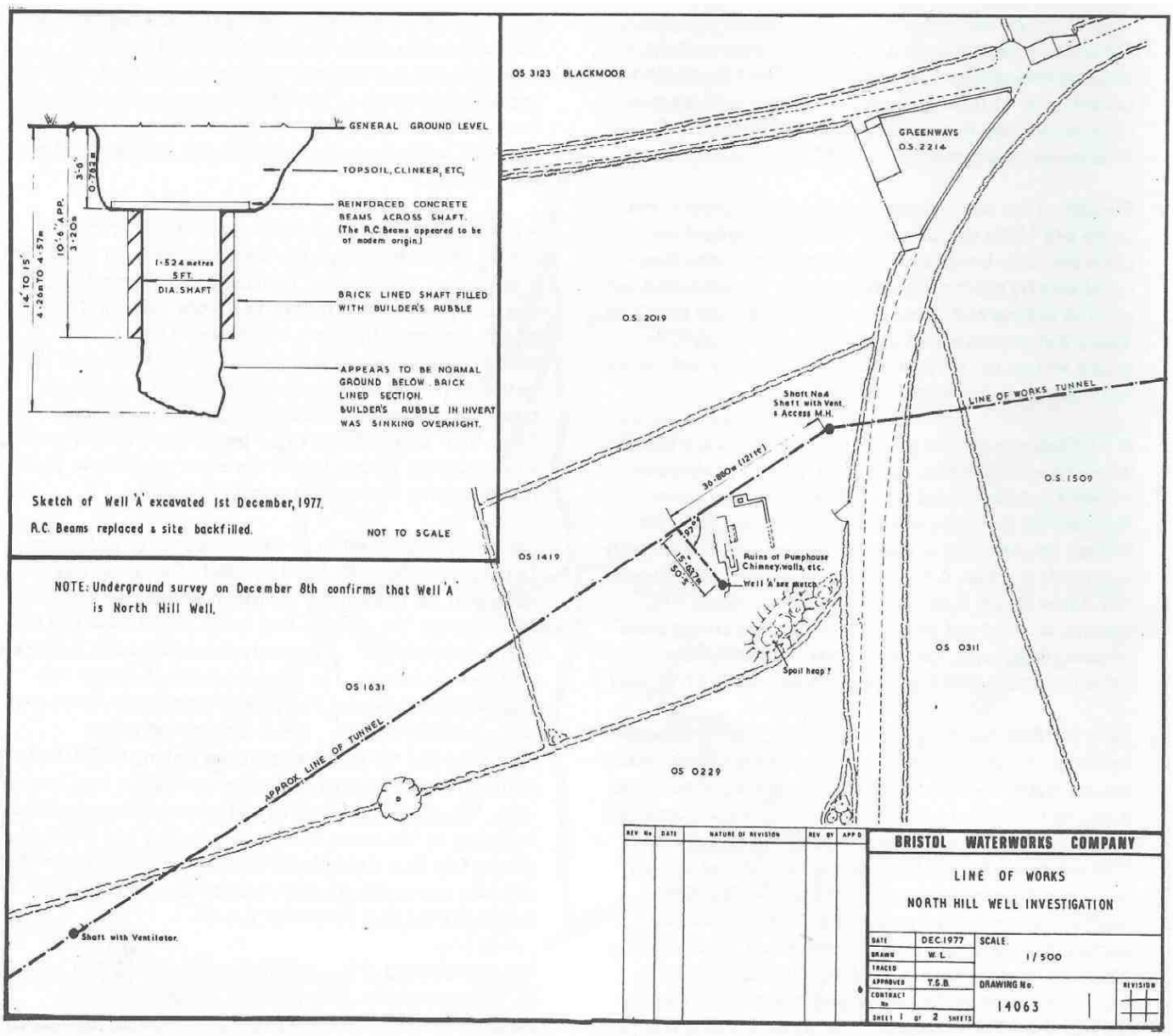
Sinking restarted at the end of November from 232 feet. Mr William Sanders visited the site and examined the material being raised in January 1862, when at 268 feet with

129 gpm coming in, and expressed the view that 'water to a large extent was to be obtained'. They were encountering 'hard gritstone' and it proved difficult to work. At 320 feet sinking was stopped and a borehole was started from the bottom. A stage was erected above water level and 3 inch pipes used, with a 2½ inch bit so that pumping was unnecessary. 'By doing so we shall save £10 per week in coal', said Thos Bell. The men hammered away at the boring rods all through the Summer; one week in July they progressed only 7 inches; until Thos Bell called a halt at 457 feet, total, in October. James Simpson advised the " Board to extend the heading which had been made to repair the clack and Simon Wilson and Michael Hobbs agreed to do this at £7.7s per fathom 'finding powder and candles'.

They set out to 'follow' fissures or springs that had been encountered in sinking the well, hoping to release greater flows of water. By February 1863 they had three headings going and did intercept further springs. In March the pump was lifting 214 gpm and Thos Bell's reports show that he expected any day to make a major break-through. In April, with the engine working 10 strokes per minute, only 150 gpm were raised, but he was convinced 'water can be heard flowing down somewhere' and 'probably two or three fathoms further on they may find more water'. In May, with 223 feet of headings driven, the Board decided they had spent enough money and 'Resolved that the work be stopped'. Thos Bell noted 'The tools and other materials are taken up, and as soon as the stock of coal is burnt out the engine is ordered to be stopped'. Early in July 1863 the engines were 'cleaned and prepared with tallow to prevent rust'.

The next year, 1864, saw the most severe drought that anyone could remember. Thos Bell noted, as early as May 19th 'The Springs at Watery Coombe are getting very low; I find by referring back to May last we are now 218 gallons per minute less at Winford' (in the aqueduct). The Board agreed to his suggestion that North Hill Well be pumped and from 9th June the engine worked 12 hours using two tons of coal and lifting 216,000 gallons each day. The situation became so desperate, with water in the City mains for only a few hours each day, that several other temporary pumping engines were set up and Thos Bell was scouring the country for machinery.

A 'four horse engine . . . well made, with all modern improvements' was set up at Winford, as had been done in



1857, and from early July it was lifting 200 gpm into the aqueduct. The millers in Chew Magna protested, and some compensatory payments were made.

James Simpson calculated that the supply would suffice to give water for 'six hours per diem' and Thos Bell expressed the hope that 'the water carts will be discontinued as I find they are using upwards of 54,000 gallons per diem'.

In August the Company was approached by a Mr Henry Bennett, suggesting the use of the water from the New Pit at Bedminster. It seems the colliery might have been on the point of closing for Mr Bennett was going to dispose of his engines if the Company was not interested. But Thos. Bell found a sample of the water to be 'clear, and about 140,000 gallons per diem can be lifted'. Henry Bennett agreed to leave 'the small pumping engine . . . and the 35 horse engine on terms to be agreed . . . to include the wages of the engineer and cost of coal'.

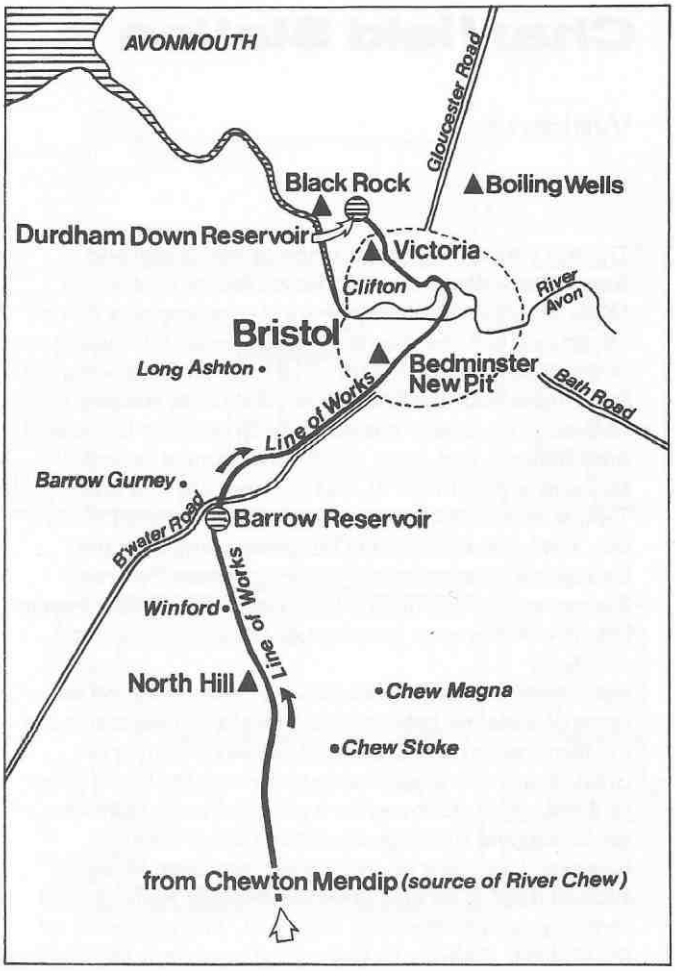
The Company obtained 'a twelve horse engine, 4 inch double action pump and a boiler' which were fixed and ready to work early in September. No doubt the colliery pumps merely lifted the water to surface and the new pump was needed to raise it to the head of Bedminster Reservoir. Thos. Bell noted 'the Pit is about 510 yards from the turnpike road', and the lift would have been about 200 feet. Four inch pipes were laid' across Mr Green's land .. . to the 12 inch main from Bedminster Reservoir'.

Later in September an engine and pump were put in to pump water from the Boiling Wells at Ashley Vale, and again a 4 inch main was laid across fields 'to the 7 inch pipes in York Road, Montpelier'. This pump was fitted with an air vessel which unfortunately 'bursted at 4.00 am the 2nd October'. A stronger one was sent 'from London' and in a few days the pump was 'working admirable and by its aid Clifton, Redland and Cotham are now being supplied and I believe general satisfaction is given. I hope the wet weather is setting in'.

It was and soon the springs were 'rapidly rising'. At the end of November men were busy recovering the pipes laid at Bedminster and Ashley Vale, the engine having been stopped. The Board agreed to leave the engine and boiler at Bedminster New Pit and at North Hill the 'rods were drawn and the pump left secure'.

1865 was a normal summer, with rain in August, but North Hill engine was started in April and from the end of July 'Bedminster New Shaft' was giving '20 hours water per day . . . about 140,000 gallons per 20 hours'. Boiling Wells was also pumped, but they were all stopped by the end of August.

Mr Bennett had written that he was 'about to wall up the pit' and offered to sell, including his engine. The Board agreed 'to purchase certain property at the New Pit and the right to use the water, from the Bedminster Coal Company'. In 1866, again, these temporary pumping stations were used, but only for a fortnight, and in the next year from May, water was pumped from a new source at Chelvey, near Nailsea. How that was achieved and how those works developed to become a major steam pumping station is a separate story.



Early in 1869 the plant was removed from North Hill and placed in store. In August the well was capped with brick-work arches and the buildings partly demolished. The '30 Horse Engine' was used at Chelvey during the sinking of one of the wells, being installed early in 1871 and used later for pumping water to supply, being finally scrapped in 1923. Excavations were made in 1977, in the field OS 1419, which is still Company property, and the well shaft was discovered. The arches built in 1869 could be seen from below, after entering a heading from the Line of Works. information thus obtained confirmed that the heading concerned, leading off the still important 'Line of Works' aqueduct, is the one driven in 1858 and communicates with North Hill Well.

Sources

Bristol Waterworks Company - Board Minutes
Bristol Waterworks Company - Engineer's Reports
Boulton and Watt Collection, Birmingham Public Libraries
Copy of Ashmead's 1833 map of Bristol, marked with mains laid or proposed by private water suppliers (Bristol Waterworks Company)

Acknowledgements

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