THE DEVELOPMENT OF WATER SUPPLIES FOR WIGAN

WORTHINGTON

W.E.ORR.

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Contents

INTRODUCTION

Other than the air we breathe, water is the greatest necessity of life. Yet in the middle of the 18th century when the springs and wells of Wigan could no longer meet the needs of the increasing population, the Corporation of Wigan was reluctant to assume responsibility for water supply, leaving it instead to two businessmen who struggled to raise adequate funds and succeeded only in supplying water to less than a quarter of the population. This was a major contributing factor resulting in the reduction of life expectancy in the working classes to about twenty years by the middle of the 19th. century. The Government sent an Inspector to Wigan and his Report brought pressure upon the Local Board of Health (Wigan Borough) to take over responsibility for water supplies. By the middle of the 20th century it became apparent that individual townships could no longer keep pace with the ever increasing demand for water and amalgamations became inevitable.

My purpose in compiling this relatively non technical document could hardly be expressed more eloquently than in the first paragraph of Dr. Prosser White's notes on page four. The information which follows, by no means exhaustive, has been derived and written from the records listed in the bibliography, personal knowledge and experience.

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THE DEVELOPMENT OF WATER SUPPLIES FOR WIGAN

THE EARLY YEARS

The topography of the Wigan area, a river valley with high ground to the west, north and north east made it ideal, insofar as water supplies were concerned, for the early settlers. Romans, Saxons and everyone else who came to Wigan would have found many natural springs, feeding streams flowing into the river, provided them with copious supplies of good fresh water in all seasons of the year. The relatively small number of inhabitants of these times, whose lifestyles caused little permanent pollution, enabled this mode of water supply to satisfy their needs until the approach of the industrial revolution.

SPRINGS AND WELLS

The population of Wigan increased from c 1,500 in 1540 to c 3,300 in 1640 by which time numerous springs and wells, had been developed, these together with rain were the only potable water resources readily available to sustain the needs of the people at this time.

Each neighbourhood had it's own spring or well from which the people would draw their water. Some were maintained by caretakers and charges were made, others unattended were free of charge but of dubious quality.

The wells derived their water from the porous and fissured sandstones, the Ravenhead Rock in particular, of the middle coal measures upon which Wigan is built. They tended to be sited in areas where the sandstones outcropped at or near the surface and later, depending on the depth to the water level, some of the wells would have hand pumps. The most famous of all the wells was Boys' well in Scholes which yielded about seven gallons of water per minute.

Other known wells, see map on page 3, were;

Mesnes well	-- Park Road
New well	-- New Lodge
Bellingham well	-- Bellingham House
Sugar well	-- Swinley Lane
Holme House well	-- Swinley Lane
Tea well	-- Darlington Street East
Harrogate well	-- Darlington Street
Pump well	-- Queen Street
Lyon well	-- Poolstock
Silver well	-- Silver Street
Westwood well	-- Westwood

Some of these wells were used until the middle of the nineteenth century and in 1889 Dr. Robert Prosser White, a physician and surgeon, of 100, Standishgate, Wigan, recorded some notes about these and they are reproduced here verbatim;


Holme House Well
New Well
Bolting Wood
Old Coal Pit
Swinley Sugar Well
The Hermitage
Sandstone Quarry
Hill Cottage
The Mesnes
Mesnes Well
Boy's Well
ALL SAINTS
Station
Tea Well
Silver Well
Harrogate Well
Pump Well
Lyon Well
Westwood Well
1849 Map of Wigan
Main Wells
Other Wells

THE OLD WELLS AND SPRINGS OF WIGAN
Dr. Prosser White, 1889

Without some stable record ancient facts become blurred or blotted out and fables foul the truth. Memory fails us as time passes, and bygones are dimmed by the receding years. Even outstanding landmarks disappear or are changed out of recognition in the pursuit of progress and the ruthless rush for gain.

It is a pity quite to lose sight of the old links in the social and industrial life, and the history of our town. Many of these are hidden away in old maps and ancient plans, many are locked up in the deed boxes of family lawyers, while others are only retained as fading pictures in the minds of our older inhabitants.

These thoughts came to me upon coming across a few notes jotted down on 4th March 1889, when I saw the Harrogate well exposed by the pulling down of the above two cottages which had been erected over it's site. Some of your readers may doubtless be able to add to or correct some of the following gossip:-

In the garden of the spa stood Harrogate house, where the father of Adam Banks was born and lived, circa 1701. Here he is said to have written a book. James Rylance, solicitor, resided in one of these cottages in the first half of the last century. Adjoining the cottages stood Mr. John Browne's grandfather's spindle and fly works and behind them Cookson's Dyehouse.

When the ground floor of one of these cottages was removed a circular brick chamber was revealed, 12ft in diameter, with walls 5ft in height. An arched brick roof covered the well and partly formed the floor of the chamber. Let into this floor on the Darlington Street side was a large stone with a hole 1 ft square cut in the centre. Under the arch and across the well was placed a massive plum tree beam, doubtless used at some time for the attachment of the winding gear. The well was 10ft deep, and contained 5ft of water. A rough wooden seating encircled the chamber.

Mr Ralph Darlington, formerly Town Clerk of Wigan, informed me that in1745 his relative, the Rev. Clayton, visited the spa and "received much benefit from the application of the water to his sore and inflamed eyes ". The course consisted of bathing the eyes frequently and whilst sitting in the room and taking away the water for home use.

This historic spot is approximately marked by the back of 33 Darlington Street.

Mr Joseph Hilton, the relieving officer, who lived and died in the house almost adjoining these cottages , used to say there was a second more shallow well in the gardens of the bath (Harrogate) partly built over by his house. In the olden days rumour has it that the spa waters were eagerly sought after by the neighbouring publicans to mix with spirits, but whether to counteract the potency of the spirits or to disguise the flavour of the water, is not stated.

Mr Hilton maintained that at one time the Douglas was navigable up to the Douglas Bank Collieries, and that part of the masonry forming the landing place or quay was then standing (1889). Thirty years previously he had himself caught salmon trout below Fairhurst Mill at Parbold. Mr John Browne recalls many happy hours spent with his school mates in catching hundreds of fish with rod and line in the pellucid stream of the Douglas near Cookson's Dyeworks in Wigan (1853-1858).

Silver Well was situated close to Mr White's Cotton Waste Manufactory. The water was noted for it's even temperature, being as cool in the summer as in the winter. Close to the well Mr Eccles built a bath measuring 12ft by 12ft and 7ft deep. "It was much in request by the quality". The bath was covered in and lighted by two windows. A pipe led from the well to the Wigan Brewery and provided it's water supply. A few families had the privilege of tapping into this source en route.

Besides Harrogate another thoroughfare of the town recalls one of these old wells, the lane which led to it perpetuating the "Boy's Well", which for many years was the main unfailing water supply for Scholes. It was a yard deep and flagged at the bottom. The caretaker cleaned it out once a week, and charged a halfpenny a can.

A small spring is said to have existed in the vicinity of the Albion Brewery, Millgate?, another called Tea Well occupied a position near Hartley Street, Darlington Street East.

Baldwin's Tarpaulin Works covered a well approached from Wallgate by Will Gose Lane. A pump in the Pump Yard, Queen Street, owned by Mr Lyon who extracted one penny a day and "wait your turn" from each customer, served Queen Street and Chapel Lane.

Leaving Scholes and crossing the two foot bridges which spanned the conduit to Park's Forge and the weir of the Douglas between Scholes and Standishgate, and proceeding into Swinley Lane, one came across the locally named "Sugar Well". It's very scanty flow through an iron pipe gave ample time for kindly and other gossip.

The wall work of an old reservoir and the attendant's house are still to be seen in Coppull Lane, and in olden days two wells were there to supply the needs of the neighbourhood.

Below and adjoining Sutton Mill, at the foot of Coppull Lane on the Standishgate side of the Douglas in a building about 20ft high with a sloping roof and boarded up windows, stood Bottling Bath. The bath, 20 yards long, 12 yards wide and 6 feet deep, was surrounded by a parapet 12 feet in width. Mr Ambrose, the owner of the mill charged from 6d to 1/- per person for about ten weeks use of the bath.

In the summer months, about 6.00 am, the late Chief Constable Simm and his brothers, Colonel J.D.Murray, Mr John Browne, his brothers and other Wigan worthies, in their early teens assembled here to take their matutinal plunge. But so cold were it's waters that to swim the double length of the bath was a feat rarely accomplished. The original purpose of the bath is not known.

Mr William Ashton informs me that the residents in Wigan Lane were chiefly indebted for their water supply to the indulgence of the Reverend Benjamin Powell of Bellingham House and Mr Park of New Lodge. These two gentlemen allowed free access to their private pumps.

The shallow "Mesnes Well" faced Bull Hey Cottages, on the pathway bounding the Rectory Farm, off which branched Parson's Walk. Opposite the Park Gates in Park Road remain to this day some of the relics of the well. It supplied the wants of this district and Hallgate and part of Standishgate. It is unfortunate that it's water is not available to dilute the turbid liquid of the duck pond in the park. The well was closed in 1870.

Poolstock was supplied from the comparatively recently closed well (Lyon Well), which was recessed in a high Boundary wall and reached by a few wide steps, being located at what is now the entrance to Walmsley Avenue. It was quite an imposing structure in it's later years. How did Lyon Well get it's name?. A small spring near the Poolstock Lane end of Pool Street and another fronting Trickett's Farm were also in request.

The memories of the Barley Brook Well are enshrined in the verse of John Critchley Prince, "The Woodland Well".

Until recent times our public wells and pumps , such as the Wallgate pump, were the popular centres for local news and gossip, besides being the chief source of potable water. Rain water was largely utilised for washing purposes everywhere in those days. The larger houses made collections on the premises of the rain, or the water of handy springs. As a boy I remember the lordly pump in the scullery, a symbol of middle class consequence and exclusiveness. Near by in the yard, a hole was dug for an ash pit, and the prompting of mutual association often led to a commingling of their contents. Interior baths were then coming into vogue, and the dark grey depths of the lead lined wooden bath was one of the terrors of my childhood. Opposite the bath, in the darkest corner of the staircase, the water closet was placed. It was dimly lighted by a small pane of ground glass and devoid of any ventilation. Such a position was ideally arranged to cause the greatest nuisance to the whole household.

Hefty citizens have been doubtless bred and reared under these conditions, but the modern housewife will hardly wish to return to the inconveniences of the good old days.

THE FIRST SYTEMATIC WATER SUPPLY, WIGAN WATERWORKS Co.

Prior to the late 20th century all significant changes in the provision and management of water supplies to Wigan have been necessitated by water shortage crises, the first of which was recorded in the mid 18th century.

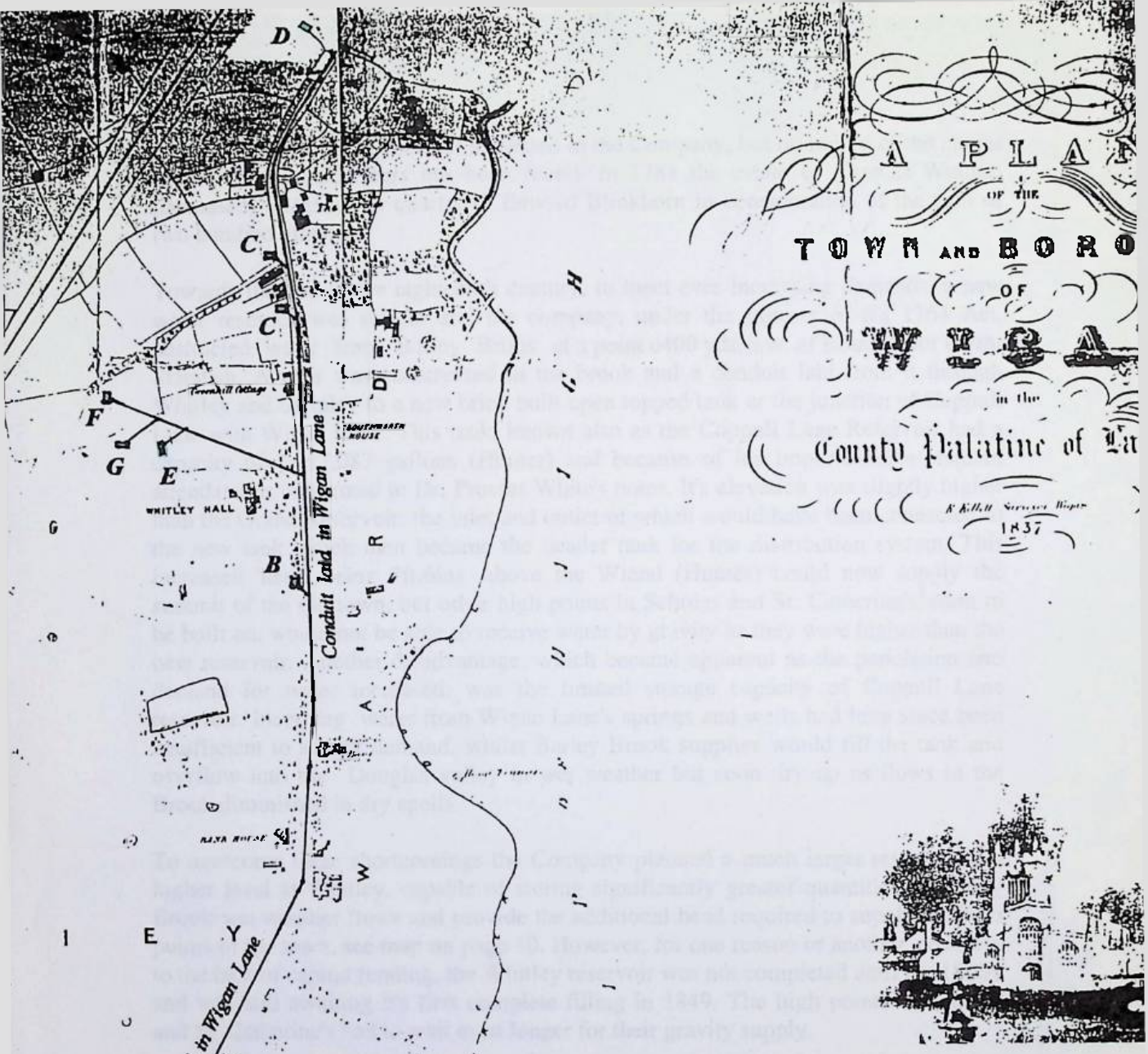
By 1760, whilst the town's population had grown to c8,000 under the influence of the industrial revolution, the water resources remained unaltered and queues at the old springs and wells in the town grew longer. There was insufficient water in that part of

the Borough where the majority of the people lived. This disturbing state of affairs led to two of Wigan's most prominent figures of that time, Thomas Blinkhorn and Thomas Woltum to approach the town's authorities for permission to apply to Parliament for an Act to enable them to reorganise and develop the town's water supplies. David Sinclair, Principal of the Collegiate College, Wigan in the 1880's describes the situation in Volume 2 of his "History of Wigan" as follows:-

Although there was a happy and promising revival of enterprise and ambition in the borough, the sanitary condition in the town was never thought of, and water, the greatest necessity of life, was only obtainable from private sink wells. Indeed, it was not until 1764 that an Act of Parliament was passed for supplying the borough and town of Wigan with fresh and wholesome water, not at the public expense, but merely as a private venture. The preamble of that Act set forth that "Whereas the inhabitants of the borough and town of Wigan, in the County Palatine of Lancaster, not only suffer many inconveniences for want of being supplied with a sufficient quantity of good and pure water for their necessary occasions, but great losses have frequently happened by fire, for want of water to extinguish the same, their being little or no water in the most populous and public part of the said town." The first men to bring water to Wigan at their own expense were Thomas Blinkhorn and Thomas Woltum. They conveyed it from two places, springs in Wigan Lane and the By well or Boy well in Scholes. these speculators then sold water in Wigan, and were only compelled to give it for nothing in case of fire.

The Act also included powers to *"construct such conduits (pipelines) and reservoirs as are necessary for this purpose"*. It was not unusual for springs to discharge into pits, tanks or small reservoirs and a sketch map of "The reservoirs of Wigan Lane between a terrace south of Monument House and Lowbrow House north of Sicklefield", undated but estimated to be mid to late 18th century with additions, states in the references *"The Grand Reservoir in William Dicconson Esquire's land into which all springs raised in Wigan Lane by the Proprietors are collected and afterwards distributed in Wigan"*. Initially, conduits were laid by Messrs. Blinkhorn and Woltum from the most yielding springs and wells of the Wigan Lane district, presumably including some if not all the springs feeding the other eight 'reservoirs' shown on this plan, to a Grand Reservoir from where a cast iron mains and lead pipe distribution system with fire-plugs (primitive hydrants) was laid to pipe the water directly into the houses of the affluent and to standpipes in the streets and courts for the poor. The precise location of the Grand Reservoir is not clear on the sketch map but the 1849 O.S. map shows it as *"Wigan Old Waterworks, (Dry)"* on the site of what is now the Fox and Goose PH in Wigan Lane, see map on page 8. A second branch of the distribution system was laid from and serviced by water from the Boy's well in Scholes. Those people not served by the distribution system, continued to fetch and carry water from these and other springs and wells which, because of their lesser yield or topography, were not connected to it.

In 1767, however, owing to the heavy financial cost of these works Messrs. Blinkhorn and Woltum had to relinquish there sole rights to supply water and The Wigan Waterworks Company was formed. The stock being held in four shares or quarters.



A. The Grand Reservoir in Wm. Dicconson Esquire's land into which all the springs raised in Wigan Lane by the Proprietors are collected and afterwards distributed in Wigan.

B. A small reservoir at the Monument House.

B. A reservoir nearly opposite Copperas House.

C. A reservoir in the said Lane nearly opposite Sicklefield Lane end.

C. Another reservoir to be inclosed by an encroachment of Mr. Leig.

D. A reservoir at the north end of the map.

E. The reservoir at Whitley Fold.

F. Whitley Garden.

G. Mr. Holt Leigh's fish pond in Whitley Fold.

H. Boy's Well.

Map showing Wigan Lane Reservoirs and collecting conduit to the Grand Reservoir.

Work undertaken by Messrs. Woltum & Blinkhorn.

Messrs. Blinkhorn and Woltum remained in the Company, but no record of the names of the other stockholders has been found. In 1781 the estate of Thomas Woltum (deceased) assigned his quarter to Edward Blinkhorn in consideration of the sum of two hundred guineas.

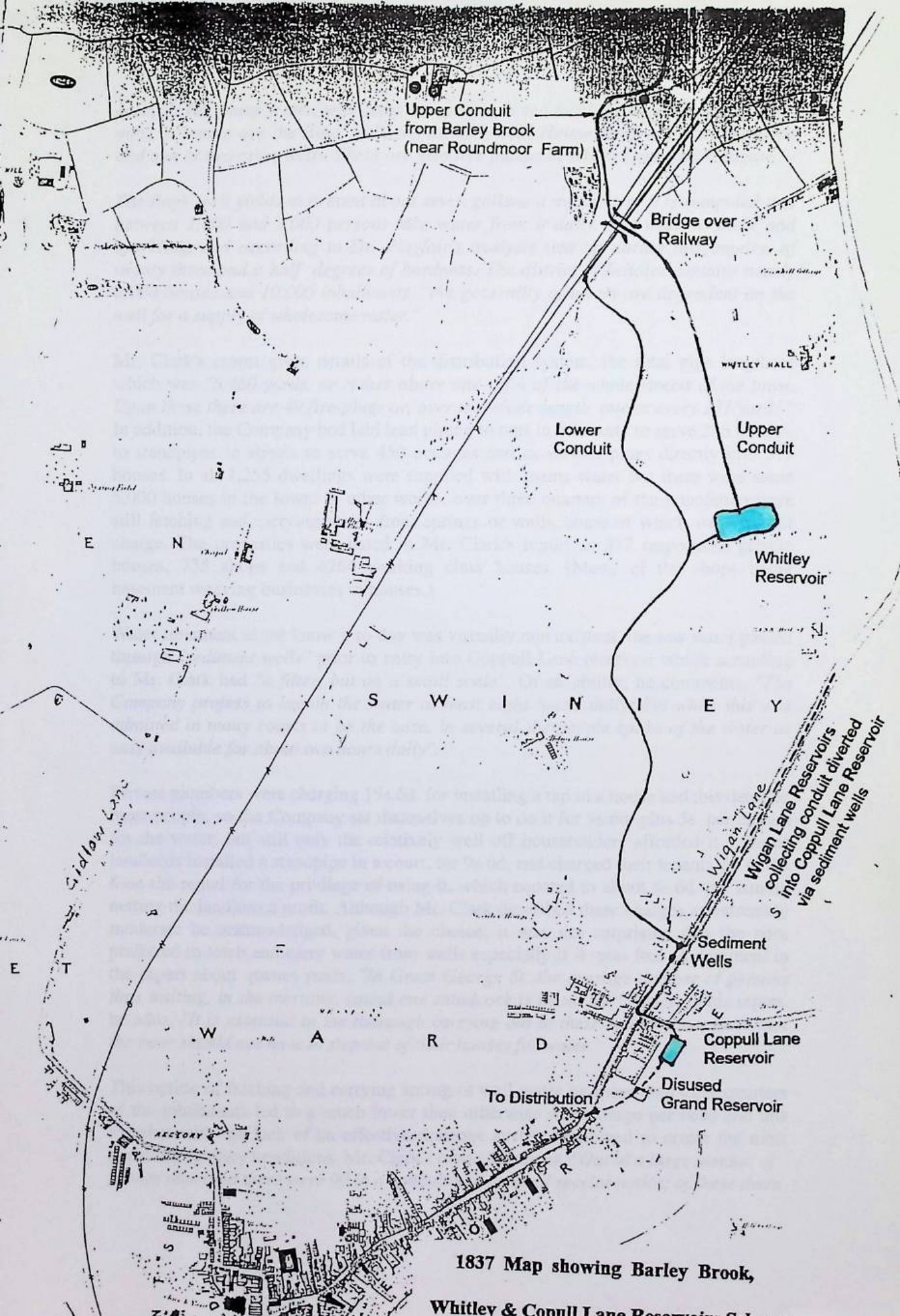
Towards the end of the eighteenth century, to meet ever increasing demands, a new water resource was sought and the company, under the powers of it's 1764 Act, abstracted water from Barley Brook at a point c400 yds. s.w. of Roundmoor Farm, Standish. A weir was constructed in the brook and a conduit laid from it through Whitley and Swinley to a new brick built open topped tank at the junction of Coppull Lane with Wigan Lane. This tank, known also as the Coppull Lane Reservoir had a capacity of 1,417,087 gallons (Hunter) and because of it's importance, a resident attendant, as confirmed in Dr. Prosser White's notes. It's elevation was slightly higher than the Grand Reservoir, the inlet and outlet of which would have been connected to the new tank which then became the header tank for the distribution system. This increased 'head' being 7ft.6ins. above the Wiend (Hunter) could now supply the summit of the old town, but other high points in Scholes and St. Catherine's, soon to be built on, would not be able to receive water by gravity as they were higher than the new reservoir. Another disadvantage, which became apparent as the population and demand for water increased, was the limited storage capacity of Coppull Lane reservoir. Incoming water from Wigan Lane's springs and wells had long since been insufficient to satisfy demand, whilst Barley Brook supplies would fill the tank and overflow into the Douglas valley in wet weather but soon dry up as flows in the Brook diminished in dry spells.

To overcome these shortcomings the Company planned a much larger reservoir at a higher level at Whitley, capable of storing significantly greater quantities of Barley Brook wet weather flows and provide the additional head required to supply the high points of the town, see map on page 10. However, for one reason or another, probably to the lack of capital funding, the Whitley reservoir was not completed until the 1840's and was still awaiting it's first complete filling in 1849. The high points of Scholes and St. Catherine's had to wait even longer for their gravity supply.

The population had increased to over 30,000 and even with a full Whitley the Company could no longer cope with the increase in demand and crisis returned.

THE GREATEST CRISIS

Following the Government's Public Health Act of 1848, the National Board of Health sent an Inspector, Mr. G.T.Clark, to report on the health and sanitary conditions prevailing in Wigan in 1849. This revealed an alarming state of affairs and his comments on water supply commenced thus:- *"The want of an efficient water supply is one of the chief, if not the chief cause of complaint throughout the town. The present supply is either rain water, spring water or water from the waterworks. The rainwater is collected in butts and tanks and as the mill-owners do not consume their smoke, is speedily rendered impure. The rich are able, at a considerable first outlay, to secure a permanent supply; the poor obtain it in wet weather only or for a short time afterwards. By far the larger portion of the supply is drawn from pumps and*



1837 Map showing Barley Brook,

Whitley & Copull Lane Reservoirs Scheme.

springs. The pump water, with some exceptions, is too hard for washing. The springs most in repute are the Boys' well, the Mesnes well, Holme house, Silver, Westwood and one or two other wells. There are also free pumps in Wigan Lane and Wallgate.

The Boys' well yields at present about seven gallons a minute and it is computed that between 2,000 and 3,000 persons take water from it daily. The water is clear and sparkling, and according to Dr. Playfair's analysis sent up during this inquiry, of twenty three and a half degrees of hardness. The district of Scholes contains nearly 2,000 houses and 10,000 inhabitants, "the generality of whom are dependent on the well for a supply of wholesome water."

Mr. Clark's report gives details of the distribution system, the total pipe length of which was *"6,460 yards, or rather above one- fifth of the whole streets of the town. Upon these there are 49 fire-plugs or, over the whole length, one at every 131 yards."* In addition, the Company had laid lead piping to taps in 45 courts to serve 286 houses, to standpipes in streets to serve 450 cottages and as service pipes directly into 519 houses. In all 1,255 dwellings were supplied with mains water but there were some 5,000 houses in the town. In other words, over three quarters of the population were still fetching and carrying water from springs or wells, some of which were free of charge. The properties were listed in Mr. Clark's report as 377 respectable private houses, 735 shops and 4264 working class houses. (Many of the shops being basement weaving businesses in houses.)

Water treatment as we know it to-day was virtually non existent, the raw water passed through *"sediment wells"* prior to entry into Coppull Lane reservoir which according to Mr. Clark had *"a filter, but on a small scale"*. Of reliability, he comments, *"The Company profess to lay on the water at least eight hours daily; but while this was admitted in many courts to be the case, in several the people spoke of the water as only available for about two hours daily"*.

Private plumbers were charging 19s.6d. for installing a tap in a house and this deterred most people, so the Company set themselves up to do it for 9s.6d. plus 5s. per annum for the water, but still only the relatively well off householders afforded it. Some landlords installed a standpipe in a court, for 9s.6d, and charged their tenants 1s. in the £ on the rental for the privilege of using it, which equated to about 6s.6d. per annum netting the landlord a profit. Although Mr. Clark described these charges as extremely moderate he acknowledged, given the choice, it was not surprising that the poor preferred to fetch and carry water from wells especially if it was free. A comment in the report about queues reads, *"In Great George St. the average number of persons thus waiting, in the morning, round one standcock is about 60."* Later, in his report, he adds, *"It is essential to the thorough carrying out of these sanitary measures that the poor should not have to step out of their houses for water."*

This option of fetching and carrying spring or well water by more than three quarters of the inhabitants led to a much lower than otherwise water usage per head and this together with the lack of an effective drainage system combined to create the most appalling sanitary conditions. Mr. Clark's report mentions, *"Out of a large number of privies observed there were 90 in a condition to demand special notice; of these there*

were-- 2 rather filthy, 10 filthy, 45 very filthy, 7 exceedingly filthy and 26 disgustingly filthy". Disease was rife, the mortality rate reached a record 40 in1,000, far greater than any comparable town in Lancashire and the average life expectancy was, in the working classes, about 20 years. Little wonder that nearly half the districts in the town referred to in the report were described as *"fever nests".*

Mr. Clark concluded, with supporting detail, that even when the recently constructed Whitley reservoir and a proposed larger main to the town centre were fully operational, the system would be *"insufficient both in quantity and pressure for the constant supply of water for the whole of the town of Wigan."* No mention is made of the quantity of mains water used by industry and commerce in the report except in assessing the amount of water required to comply with the 1848 Act. He considered that new resources be sought, based on 25 gallons/person/day (including an appropriate allowance for industry and commerce), with a capacity for storing 100 days supply for the current population of 30,000. At this rate of usage a full Whitley reservoir in a dry spell would have lasted less than a fortnight.

Mr. Clark suggested four locations where it might be practicable to obtain this volume of water and recommended that the Local Board, as a first step, retain a competent Engineer to survey and assess the potential of the high ground at Billinge, Up Holland, Haigh and Standish.

In dealing with the Company's accounts, the report states:- *"The Company's gross income was £832* (presumably for the previous year) *and wholly expended in management, payment of debts and improvement upon the works. No dividend had been paid for the last five or six years".* Clearly, The Wigan Waterworks Company did not have the financial resources to remedy this enormous deficiency.

The crisis revealed by this report to the General Board of Health, was by far the worst ever experienced in Wigan, yet nothing appears to have been done to alleviate it until the Local Board of Health, almost certainly prompted by the General Board of Health, instructed the Borough Surveyor, Mr.I.L.Hunter to survey the works of The Wigan Waterworks Company some three years later.

Mr.Hunter's report confirmed that the water supply situation had deteriorated even further and emphasised, for the first time, deficiencies in quality. In particular, he attributed a taint of oxide of iron to the intermittent supply of eight hours per day. This caused the iron pipes in the distribution system to empty and the consequent exposure to the atmosphere accelerated rusting. Also water from Taylor's farm at Standish which by this time had been introduced to the system was described as *" not a desirable acquisition on account of the large amount of oxide of iron it contains; the stones in the brook and even the grass washed by this water in it's course are thickly coated with ferruginous matter. It is very desirable that samples of water, both from the present and proposed sources, should be analysed by some competent chemist; the expense would be trifling, but the result invaluable".* This appears to be the first recognition, in Wigan, of the role of the chemist in water supply. Later the "Chemist and Bacteriologist" would become the leader of the water treatment team.

Mr. Hunter's interpretation of the requirements of the 1848 Public health Act was that water should be made available at the rate of 20 gallons per person per day or 100 gallons per house per day. To supply the present population at this rate would require 640,000 gallons per day and he concluded that *"the present works are quite inadequate to the requirements of the town; and in many important particulars, beyond remedy"*. His report then proposed to divert part of the flow in Seven Stars Brook from a point N.E. of Standish via a catchwater drain to a new reservoir to be constructed in a hollow about half a mile N.W. of Boar's Head. Moreover, he produced detailed estimates for the scheme together with a proposed scale of charges to fund it and suggested that it be independent of Wigan Waterworks Company.

The local Board of Health, reacted to Mr. Hunter's report by commissioning a Civil Engineer, Mr. Robert Rawlinson to inspect and survey the country to the south, west and north of Wigan and report on the options for a new water supply scheme which would satisfy the requirements of the 1848 Public Health Act.

Mr. Rawlinson was an excellent choice for this project, he was a respected water engineer and had recently been appointed head of the Public Health Inspectorate. Later, the Prime Minister Lord Palmeston, was to appoint him to a sanitary commission being sent to the Crimea to alleviate the distressing loss of life there, see page 14. A horrifying 80% of all British Army casualties in the Crimean War were caused by disease and illness due to the appalling sanitary conditions in their camps and hospitals. Over 100years later Bob Otter of Portsmouth Polytechnic wrote a book about him entitled "Robert Rawlinson; father of modern sanitary engineering."

Mr. Rawlinson looked at all the likely water bearing districts within seven miles of Wigan namely ; Billinge, Up Holland, Parbold , Haigh and north and east Standish which he referred to as Seven Stars. He also considered seeking bulk water supplies from Chorley water works company and Liverpool's Anglesarke and Rivington water works. He dismissed both bulk supply options as Liverpool had no surplus and although Chorley did, it would eventually need it, and anyway he *"considered the town of Wigan of too much importance to be made subservient to any prior contingencies."* Of the others he reported that Seven Stars, which had earlier been preferred in turn by Clark and Hunter, was by far and away the best option, stating, *"I have come to the conclusion that no other locality affords the same advantages and facilities for the supply of Wigan with pure and soft water in abundance as the Seven Stars Brook"*.

Seven Stars was the collective name Mr. Rawlinson gave to the main water course draining some 2,207 acres north and east of Standish. He described, *"the water of the Seven Stars Brook rises in elevated ground under Harrock Hall to the east of the Parbold Range and flowing eastwardly falls into the River Douglas below Arley Mill. On the Ordnance Map this stream is called Tunley Brook, west of the Wrightington and Shevington Turnpike Road; Seven Stars Brook, from the turnpike to Hic Bibi Farm; *Hic Bibi Brook, from Hic Bibi Farm to the North Union Railway; and Buckow Brook from the Railway to the river Douglas.* (Later in the 1860 Act two additional names are attributed to the brook between Buckow and Hic Bibi, namely;

* see next page.

SOUTHERN

A Civil's role in Crimea recalled

Florence Nightingale was the renowned reformer who fought hard in the cause of hygiene in the army's squalid Crimean War. But she had strong support from eminent Victorian engineer and eventual ICE President Robert Rawlinson the Southern Association heard.

A horrifying 80% of all British army casualties in the Crimean War of the 1850s were caused by disease and illness due to appalling unsanitary conditions.

It was Rawlinson who insisted that the leaking main sewer that ran directly under the hospital at Scutari had to be diverted if the spread of typhoid and cholera was ever to be contained, for example.

And he campaigned untiringly against the unsanitary living conditions of the soldiers until he was wounded at Sebastopol in 1855 by a 68lb Russian cannon shot and retired hurt to England.

In his luggage he took both the cannonball and a letter of thanks from army chief Lord Raglan both of which are now at the Institution.

Raglan hoped Rawlinson 'would experience no permanent bad effects from what befell you in the ravine leading to the trenches. It is a mercy that your life has been preserved. Few have had such an encounter with a 68lb shot and have escaped so well'.

The engineer's deeds of derring do were just part of a talk given to Southern's spring members meeting by Portsmouth Polytechnic's Bob Otter, author of *Robert Rawlinson: father of modern sanitary engineering.*

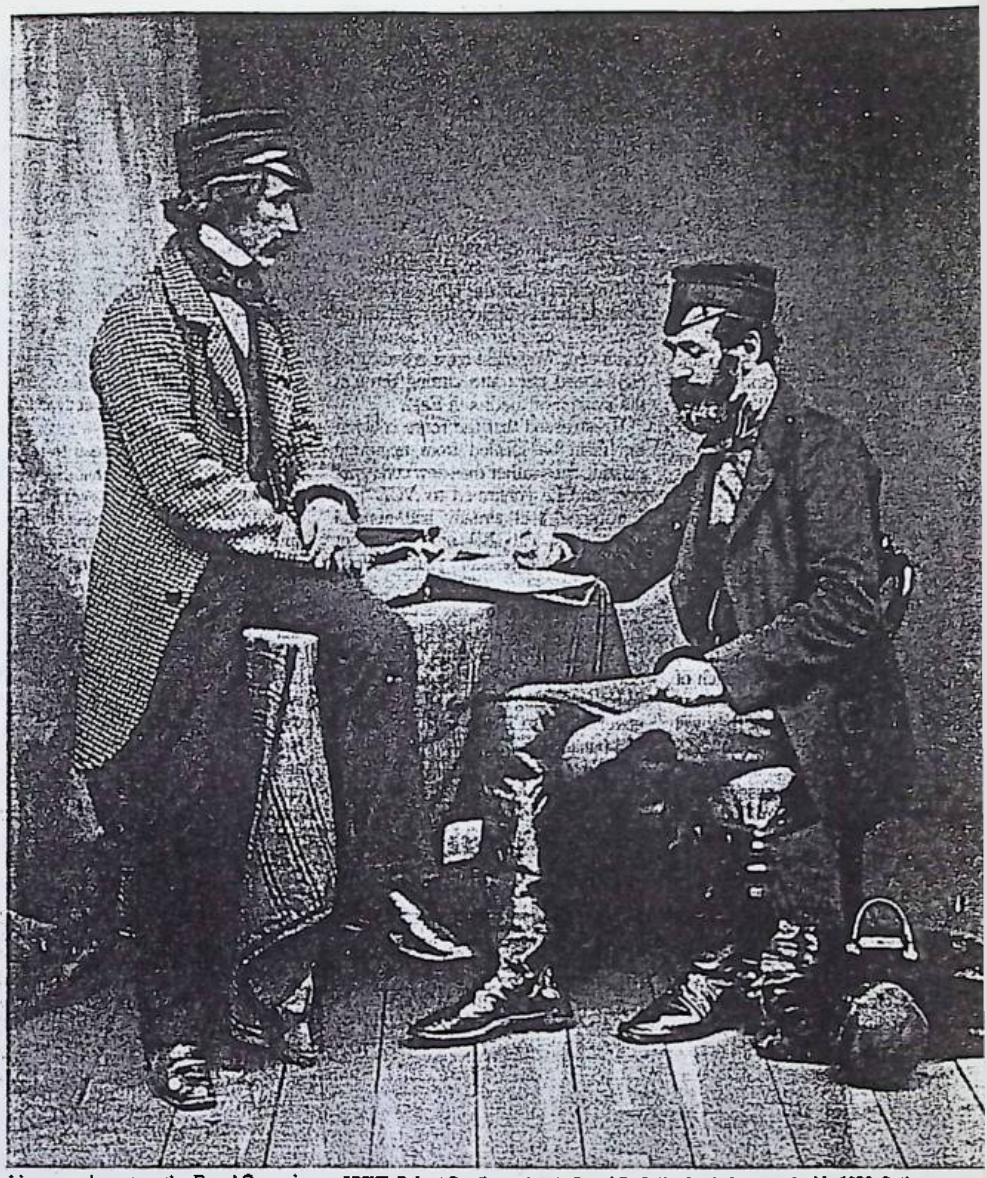
Conditions in the Crimea were mirrored in England's expanding industrial towns, Otter said. There were very few sewers, little main drainage, no piped water, no cleansing services and no control over development which took place in a haphazard and uncontrolled manner. Typhoid and typhus were endemic and four cholera epidemics swept the country in the early 1800s.

The Public Health Act was passed in 1848 and Rawlinson, a respected water engineer, was one of the first inspectors appointed, quickly becoming head of the public health inspectorate. There he met the great reformer Lord Shaftesbury who encouraged the then Prime Minister Lord Palmerston to appoint Rawlinson to a sanitary commission being sent to the Crimea. On his return he sat on the Royal Commission on town sewerage, the Poor Law Board and various other bodies. But his efforts to get more drainage and sewerage systems built were hampered by officials and even some engineers.

The main problem revolved around the question of money. It was the age old dispute as to why ratepayers should pay to improve the squalid conditions of non ratepayers. Rawlinson's proposals for Portsmouth, for example, took over 20 years to implement.

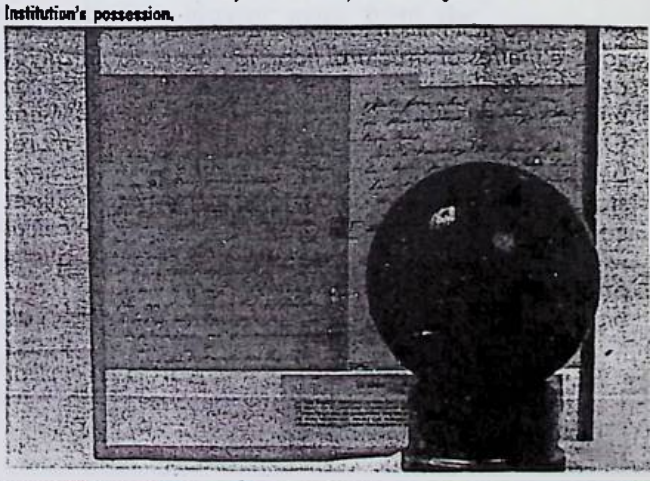
From the engineers the dispute was more over how the work should be done with some professionals taking great exception to Rawlinson's substitution of small bore glazed pipes for brick culverts. One debate on the subject at ICE raged over four days.

Ultimately Rawlinson's ideas were adopted throughout the Empire. And at the grand old age of 84 he finally received the accolade of his profession when he became President of ICE.



ABOVE: Robert Rawlinson (seated) and Dr Sutherland photographed in 1856. Both men were members of the sanitary commission sent to the Crimea.

BELOW: The cannonball which injured Rawlinson, and Lord Raglan's letter – both now in the Institution's possession.



Crew brook and Adlington brook.) .....*The whole of the areas examined are upon the coal measures. In the Seven Stars District the mines are at great depth, and at the point proposed for the reservoir* (the Douglas valley at Worthington) *there is an intervening bed of rock and shale for ninety feet in depth. ..... One feature of the districts around Wigan is, that no adequate volume of pure water can be stored so as to be supplied to the town by gravitation. ..... The water from the proposed reservoir will require to be pumped one hundred feet vertical to command the highest houses in the Borough. The fountain reservoir may be placed on the high land near the Toll Bar in Wigan Lane.* (Wigan's boundary *with Standish).*
** Hic Bibi means "here have I drunk"--This must have been said of the pure waters of this brook by some holy man of old; probably one of the monk-saints of Standish. There is Hic Bibi spring, near Hic Bibi Farm, which name is also given to this portion of the brook.*

A major advantage of the Seven Stars proposal was that there were no mills on the line of the brook and apart from agricultural interests all the water in it was available for impounding, providing it was intercepted prior to it's confluence with the polluted River Douglas. However, there were five mills on the Douglas between the proposed reservoir site and the point on the river where the Borough Engineer intended to discharge the town's sewerage. They all used the river water to drive their mill wheels which powered their machines and any proposal to impound the brooks waters and deprive the river Douglas of them, would need to include a provision for compensatory discharges to the river for the benefit of those mills. In addition the Leeds and Liverpool Canal Company had an established right to divert 555 gallons of water per minute from the River Douglas into the canal via a carrier adjacent to Harrogate street. Downstream of the sewerage discharge point, no existing rights would be materially interfered with as nearly the whole volume (85%) of water abstracted from the brook for water supply would eventually be returned to the Douglas through the town's sewers. The compensation water would in the first place be discharged into the head race of the Worthington Paper Mill and since it would all be returned to the river via the Mill's tail race it would be available to satisfy the requirements of the Act for the other four mills and the Canal Company.

The estimated cost for the whole of the Works, comprising a tunnel to divert the River Douglas, two dams to form the impounding reservoir at Arley, the river compensation flow provision, a water treatment plant, a gravity main from the treatment plant along the Douglas valley to the foot of Thorn Hill, a pumping station there and a rising main up Thorn Hill to a (fountain) service reservoir at the Toll Bar together with a gravity outlet main from the reservoir to connect into an extended distribution system which would take water to all properties in the town was £25,000-£30,000. The responsibility for the validity of this estimate was shared by Mr. Rawlinson and Mr. Hunter, the Borough Surveyor, who appears to have been closely associated with the investigations throughout.

Mr. Rawlinson concluded: *"That taking all contingencies into consideration, Seven Stars Brook offers the most favourable features for the establishment of Works from which to supply Wigan with water at present and prospectively,--by reason of its*

greater relative quantity and purity,--by its being nearer the town,--by the geological site being favourable and by reason of greater natural facilities for the formation of a storage reservoir; as also for the reason that there are fewer rights to be interfered with, and there may be fuller means of satisfying the claims of those who now use the water.

The value of soft water for a town's supply can scarcely be overestimated. There is a saving in soap, in clothes washed, as also in making tea etc. Pure and soft water is better for producing steam, and is much safer to use.

In recommending the Town Council of Wigan to undertake Works capable of supplying the town with water I have the following objects in view, namely:- That the Works may be executed for the benefit of the public, and not as a source of private income. That pure and soft water may be supplied under pressure, and constant, for domestic use within every house, room and tenement at least cost. That pure and soft water may be available for Baths and Wash-houses, public and private. That water may be abundant and available, under pressure, in every street, lane, yard and court, either for surface-cleansing, or for fire extinguishing purposes. The water from the mains of the proposed Works will rise above the highest houses within the Borough; and, in all parts of the town, jets of water may be thrown, on the shortest notice, direct from the fire hydrants into or over any factory, in volume and force equivalent to those of many fire-engines.

The question of cost and income, will, I am satisfied bear the most rigid investigation. as a commercial speculation, Works, such as are proposed will pay, even under present conditions; but the future should be looked to. Every year will, no doubt, add to the population of Wigan; and consequently increase the value of proper Works. The rates will, of course, be offered as security for the money borrowed, but if the Ratepayers complete the Works, and supply the water as the Public Health Act directs, the rental will pay principal and interest, as is provided in the Act; as also the cost of management, so that no water-rate proper need be laid. That is, those alone will be required to pay the water-rates -- or rather water-rents--who use water from the Works, and consequently, receive equivalent for their money. After giving the whole question the fullest possible consideration, I beg to recommend that application be made to Parliament in the next session, for powers to take water from the Seven Stars Brook district for the supply of Wigan."

THE WORTHINGTON SCHEME, WIGAN BORO. WATERWORKS DEPT.

The preamble of the Wigan Waterworks Act of 1853 states; *"Whereas the Inhabitants of the Borough of Wigan in the County Palatine of Lancaster are not at present sufficiently supplied with Water; and it is expedient that a better Supply of pure and wholesome Water should be afforded them: .....*

The Act empowered the Local Board of Health (Wigan Borough) to purchase the assets of the Wigan Waterworks Company and construct the following works; the River Douglas tunnel diversion, an impounding reservoir of 150 million gallons capacity, a treatment works, a gravity trunk main to and a pumping station on the west bank of the Douglas at the foot of Thorn Hill, a rising main to and a service reservoir at the Toll Bar and a gravity outlet main from the reservoir to connect into the existing distribution system and extend it to all properties in the town.

Thus for the first time the responsibility for the towns water supply passed to the elected representatives of the people of Wigan Borough who established the Wigan Borough Waterworks Department under the management of the Borough Surveyor.

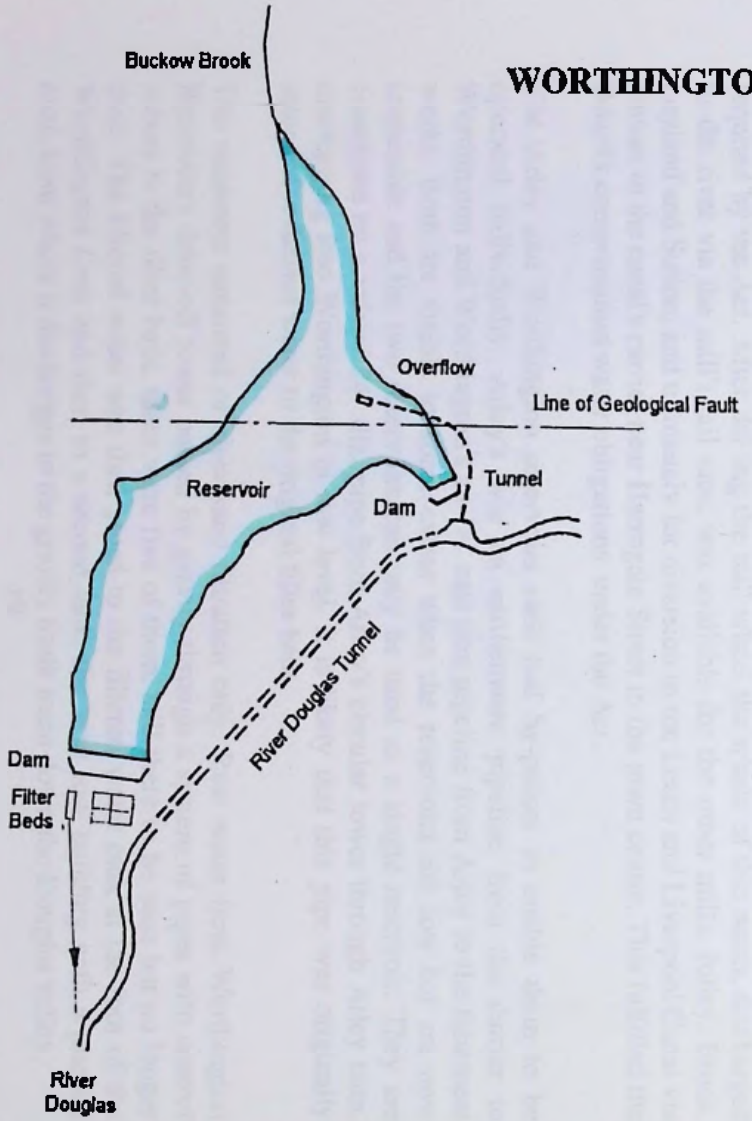
By 1858 the tunnel had been driven through the hill on the east side of the valley at Arley, the River Douglas diverted through it and temporary provision made to discharge Buckow Brook's flows via a shaft and culvert under and around the northern end of the Arley Wood dam into the river upstream of the tunnel. The river valley, thus vacated of water courses enabled the completion of the two earth embankments and the treatment works, all of which were well established. But, whilst the Board were empowered to acquire the lands on which to construct the water works, the mineral rights below ground remained with the original owners, and to protect the tunnel, reservoir and treatment works from the risk of mining subsidence, the Board was obliged under the Act, to compensate the Earl of Crawford and Balcarres for not mining the coal directly beneath those works.

However at this late juncture, a mine owner(s) north of the reservoir, expressed concern at the risk of flooding of mines in Adlington. The concern was based on a geological fault running east west on a line about 50 yards north of the newly constructed Arley Wood Dam. The existence of the fault would have been known during the Parliamentary stages of the Act, yet no objection had been raised at the time otherwise it would have either been dismissed or provision made. Robert Rawlinson, who by this time had returned from the Crimea after being wounded, was consulted and although he had been satisfied that the ninety feet of rock and shale gave ample protection against risk of flooding to any mine workings, he yielded to the objection and proposed that the scheme be modified. On matters of safety which could not be proven one way or the other, without putting it to the test, it was prudent so to do.

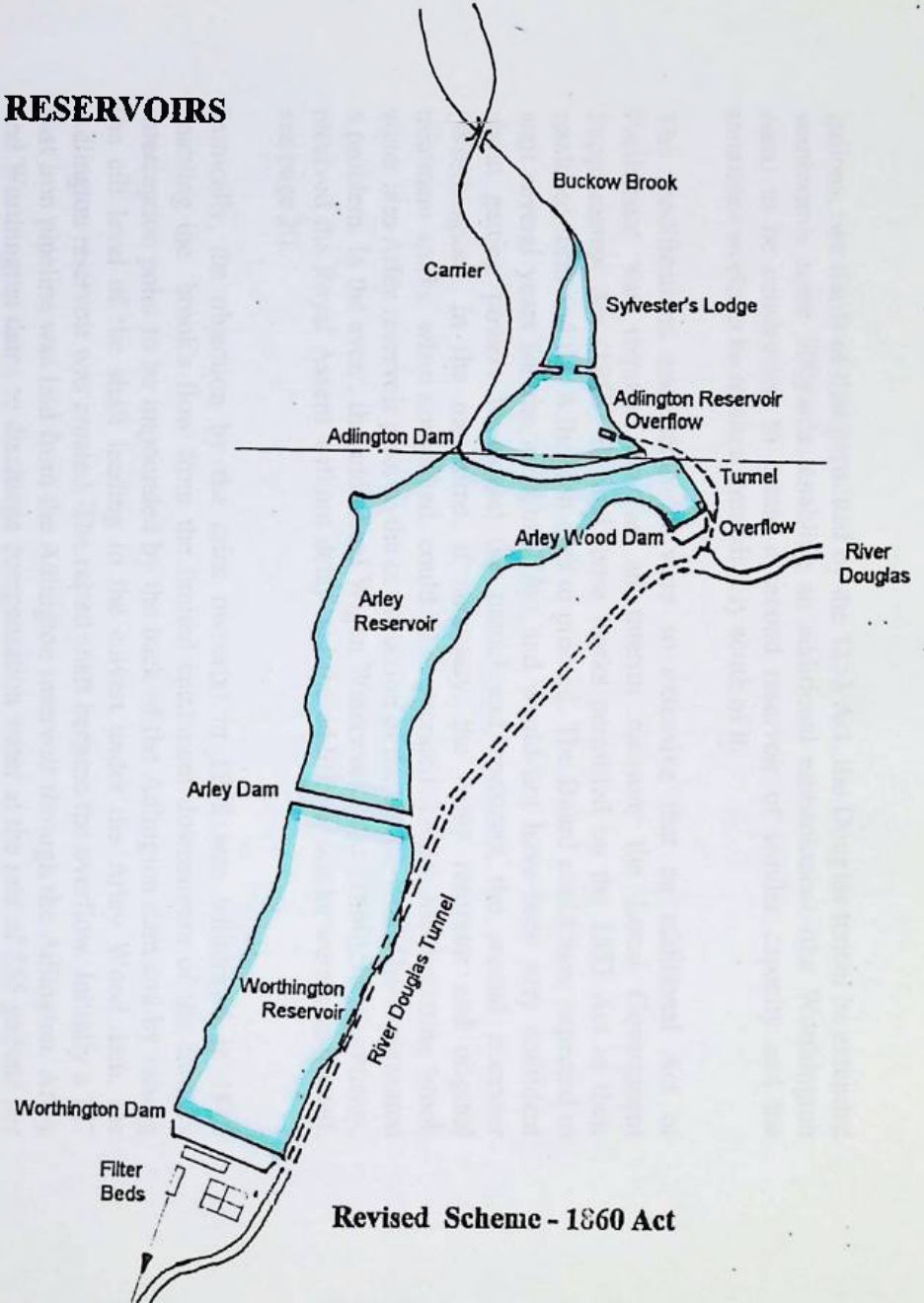
The modifications were substantial, see page 18, he proposed to limit the northern boundary of the reservoir at the geological fault by constructing a further earth embankment (the Adlington dam) along it's line. This would considerably reduce the capacity of the reservoir and to partially compensate for this he proposed that the top water level of the reservoir be raised by 13ft. The Adlington dam would be constructed to this height, the Arley Wood dam raised accordingly but the Arley dam (partially built) would be demolished and constructed anew some 45 yards further south. To enable the brook's water to gravitate over the Adlington dam into the reservoir it was necessary to intercept the Brook's flow at some point upstream where the it's elevation would allow the water to flow along a man made open conduit or carrier at a controlled shallow gradient to the reservoir inlet. The appropriate point in Buckow brook for this purpose was found to be 16 chains (352 yards) west of Coppull Lane bridge near the White Crow P.H.

These proposed modifications would enable the brook's valley north of the fault to remain free of flooding, providing the hitherto temporary works for discharging Buckow Brook's flows into the Douglas during construction, remained. It was further proposed that since the capacity of the reservoir would now be only 100 million

WORTHINGTON RESERVOIRS



Original Scheme - 1853 Act



Revised Scheme - 1860 Act

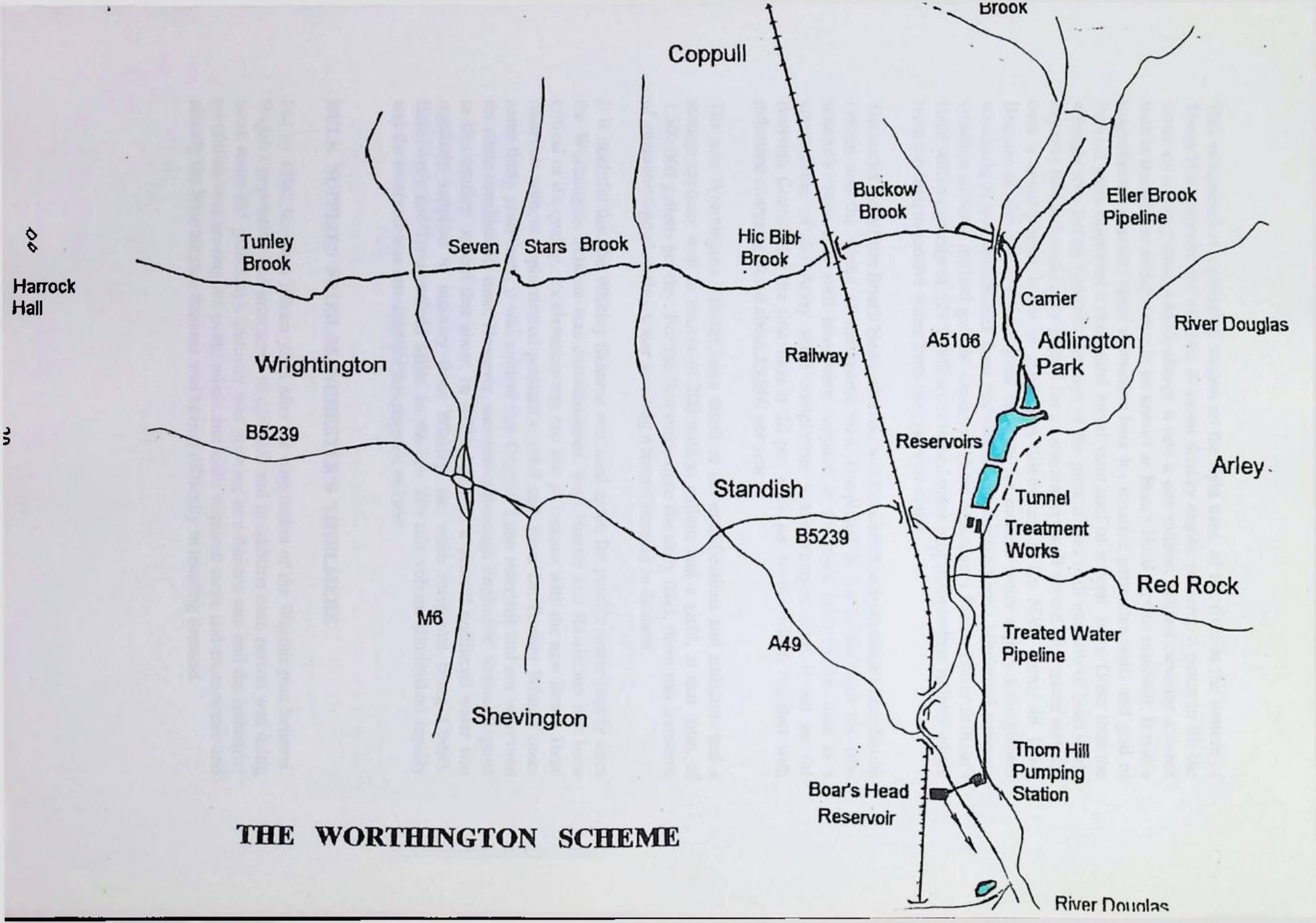
gallons, two thirds of that permitted by the 1853 Act, the Douglas tunnel be extended southwards some 500yards, enabling an additional embankment (the Worthington dam) to be constructed to create a second reservoir of similar capacity and the treatment works to be re-sited immediately south of it.

The modifications and additions were so extensive that an additional Act of Parliament was required but as an interim measure the Local Government Supplemental Act (1858) allowed those works permitted by the 1853 Act in their modified form and the Adlington dam to proceed. The Board could have expected to wait several years for the additional Act and would not have been very confident about getting powers to extend the tunnel and construct the second reservoir (Worthington). In the meantime, if necessary, the Arley reservoir and original treatment works, when completed, could have operated alone. Albeit getting brook water into Arley reservoir prior to the construction of the carrier would have presented a problem. In the event, the additional Wigan Waterworks Act (1860), in it's entirety, received the Royal Assent without delay and the additional works were constructed, see page 20.

Ironically, the objection by the mine owner(s) in 1858 was withdrawn in 1872 enabling the brook's flow from the limited catchment downstream of the carrier's interception point to be impounded by the back of the Adlington dam and by raising the cill level of the shaft leading to the culvert under the Arley Wood dam, the Adlington reservoir was created. The raised shaft became the overflow. Initially a 12" cast iron pipeline was laid from the Adlington reservoir through the Adlington, Arley and Worthington dams to discharge compensation water at the rate of 555 gallons per minute into the modified head race of the Worthington Paper Mill, as specifically required by the Act. After driving the mill wheel the whole of this water, discharged to the river via the mill's tail race, was available for the other mills, Jolley, Brock, Leyland and Sutton, and ultimately for diversion to the Leeds and Liverpool Canal via sluices to the canal's carrier near Harrogate Street in the town centre. This fulfilled the Board's compensation water obligations under the Act.

The Arley and Worthington reservoirs each had by-passes to enable them to be operated individually, Arley's was an earthenware pipeline from the carrier to Worthington and Worthington's an 18" cast iron pipeline from Arley to the treatment works. Both are visible to some extent when the reservoirs are low but are now inoperable and the two reservoirs can only be used as a single reservoir. They are connected by a valved 24" dia. pipe from Arley's circular tower through Arley dam, discharging into Worthington at low level. It is likely that this pipe was originally intended to deliver water to the original filter beds.

The treatment consisted of slow sand filtration only. Raw water from Worthington Reservoir's draw-off tower passed by gravity through a system of pipes with control valves to the filter beds, there were five of them, still there to be seen but no longer used, The filtered water was then piped to the filtered water tank at the foot of the Worthington Dam and then to a second tank, the very low building with a pitched roof, from where it discharges to the gravity trunk main down the Douglas valley.



THE WORTHINGTON SCHEME

This terminated at a pumping station on the right bank of the river at the bottom of Thorn Hill, opposite the toll bar. A steam donkey engine powered a pump to lift the water up a rising main and discharge it into a one million gallons capacity covered tank at the toll bar which came to be known as Boar's Head service reservoir. It was a magnificent structure, upon a concrete base it's massive perimeter walls and grid of internal piers supported a segmental barrel vault roof of several bays. Other than the wrought iron beams between the tops of the piers it was built entirely of brickwork, expertly laid and could have passed for a cathedral crypt. It served the system well for over a century until a severe crack was discovered in it's N.W. corner in 1974. Because of this and it's inadequate capacity for modern water supply management standards, it was demolished soon afterwards and replaced by a reinforced concrete structure of three million gallons capacity. There was also a Water Tower at Boar's Head with a capacity of 5,000 gallons, it served those properties in that vicinity which were too high to receive water from the reservoir outlet.

The outlet main from Boar's Head reservoir was connected to an extended distribution system and the whole of the works were completed in 1867, although the new scheme's water may well have been supplied to the town prior to this date as a consequence of the Arley stage completion. Water charges were levied by the Borough Council for the first time at 2d per week per house, which together with industrial charges grossed about £3,000 per year.

The new Worthington Scheme, as a result of the modifications and additions had a storage capacity well in excess of 200 million gallons and a yield, at that time, of 1,300,000 gallons per day. For the first time, since the early days, there was a reserve of guaranteed good quality water awaiting a future increase in demand.

It is doubtful that the Whitley Scheme was used again for potable water supply once the Worthington Scheme was commissioned, both Hunter and Rawlinson had been critical of it's quality, it's elevation was too low to balance with the new Boar's Head reservoir without sophisticated pressure control and, from Dr. Prosser White's notes some thirty years later, it was evident that Coppull Lane reservoir had not been used for some considerable time. However, successive Borough Engineers' Annual Reports in this century record that about 16 million gallons a year of unfiltered water was regularly supplied to industry from Whitley, the main recipients being Coop's, Eckersley's and Trencherfield Mills. In the late '50s this volume diminished rapidly and the reservoir was last used for this purpose in 1959.

BULK SUPPLIES FROM MANCHESTER'S THIRLMERE

But by 1880, less than fifteen years after the completion of the Worthington Scheme, Wigan's population had increased to c.50,000 and in addition each person was using more water (25 galls./day). Industry was growing at a furious rate and the industrial revolution was nearing it's peak, mines and mills required more and more water and already the Worthington Scheme was having difficulty in meeting demand.

A well was sunk at Wrightington about a half mile south of the spring source of Tunley Brook (Seven Stars). It's contents were pumped into the brook in an effort to increase flows into the Arley and Worthington Reservoirs. Alas, the benefit was only marginal as pumping from the well lowered the water table in the area and this had a diminishing effect on the brook's spring source.

The Pemberton Waterworks Acts of 1875 & 1879 had given Pemberton powers to construct the three reservoirs at Orrell and to bring water to them in conduits from Pimbo Bushes, Sand Brook, Withington Brook, Moor Lane and Pingot Well. Wigan, in a final effort to supplement supplies locally consulted two eminent Engineers, Mr. J.Mansergh of Westminster and Mr. J.H.Walker of Wigan , but they concluded; *"It is impossible to extend the Wigan Water Undertaking by any further development, due to bad ground (i.e. dereliction), pollution, the high cultivation of the watershed and on account of possible subsidence through mining operations".*

However, help was at hand. Manchester's Longendale supplies were becoming over committed and they were looking to the Lake District, and in particular at Ullswater, Haweswater and Thirlmere for a new major resource. After many years of agitated and sometimes stormy negotiations they submitted a Bill to Parliament seeking powers to impound water in Thirlmere by constructing a dam across St. John's Beck at the northern end of the valley which would create an enormous reservoir, over 800 acres in area and contain 8,900 million gallons. The Bill also sought powers to construct an aqueduct to convey the water 100 miles south to Manchester.

One of the objections put forward by the Lake District people was that Manchester should obtain their additional water supplies from nearer home in the Pennines. But the dozens of catchments in those areas were already being developed by the thriving townships in Lancashire, Cheshire and the West Riding of Yorkshire. Liverpool and Birmingham were already involved in developing major resource schemes in Wales.

In a booklet published to commemorate the centenary of the commissioning of the Thirlmere Scheme in 1994 entitled "Thirlmere Water, a Hundred Miles, a Hundred Years", by N. Hoyle and K. Sankey, retired water engineers, they relate: *"While the Bill was before Parliament, H.R.H. the Prince of Wales (who became King Edward VII) raised with the Royal Society of Arts the question of inequity of water supplies throughout the country in general saying: "The smaller towns and villages are dependent on accidental sources of supply, and in many instances these are wholly inadequate for health and comfort. While the larger populations are striving, each independently and at enormous cost, to secure for themselves this article of prime necessity, the smaller localities must make the best shift they can, and in many instances are all but without any supply at all." This royal observation added to the representations brought by several Lancashire towns, prompted the Select Committee to introduce two additional clauses to the Bill, requiring Manchester to make "bulk supplies" of water available to towns and districts along or near the route of the aqueduct from Thirlmere to Manchester, on appropriate payment."* The Manchester Corporation Waterworks Act (*1879*) received the Royal Assent in May of that year.

This timely Royal intervention subsequently enabled Wigan to negotiate a "bulk supply" agreement with Manchester Corporation Waterworks. A connection chamber at the Thirlmere Aqueduct was constructed near Babylon Lane, Adlington and a 12" cast iron pipeline was laid from there to the Boar's Head service reservoir, a distance of five miles. This was completed in 1899 at a cost of £12,201. 1s. 5d. compared with an estimated cost of £12,206. 2s. the records would have us believe.

The pipeline was capable of supplying one million gallons per day by gravity. The initial Agreement was only for a maximum quantity of 200,000 gallons per day, but the event was much more important than that, Wigan had established a new water resource which would prove to be a most valuable asset for the future.

WIGAN EXTENSION ORDER

In 1904 the Wigan Extension Order brought the then sparse local authority of Pemberton U.D.C. into the County Borough of Wigan. The population of the enlarged Wigan was now c80,000. The Extension Order also meant that Wigan Waterworks Dept. also "inherited" the rights and responsibilities covered by the Pemberton Water Acts of 1875 and 1879. By this time ground water was being pumped into the Orrell reservoirs from Nicholson's shaft in Winstanley at some 400,000 gallons a day, a valuable contribution. The raw water from the reservoirs was piped to the Edgewood Treatment Works for filtration before distribution, some of it via. a water tower on Ormskirk Road, Orrell. There was also a shaft in the grounds of Bispham Hall together with a pumping station, filter beds and a filtered water tank from where about 150,000 gallons of water per day was distributed locally. Orrell, and Billinge and Winstanley, local authorities in their own right, were reliant on Pemberton for supplies of treated water for which they paid and continuation of these bulk supplies were two of Wigan's inherited responsibilities. At the time it was claimed that Pemberton's water resources were in good order, but the rapid domestic and industrial developments on the Orrell reservoirs' surface catchment were diminishing run-off and Wigan had to supplement the newly acquired area with c 100,000 gallons of Worthington or Thirlmere water each day. Clearly Wigan could not meet the Pemberton deficit without Manchester's help and a second Agreement was entered into for Wigan to take up to a further 300,000 gallons a day, progressively as required.

Once again Wigan had a reserve of water to meet future increases in demand, but this time it was to last for thirty years. Although by 1911 the population had reached c89,500 and industrial activity was probably at it's peak, soon there was to be the first world war followed by the depression of the twenties and thirties. It was not until 1936, when coming out of depression, that a slight increase in demand was satisfied by a further 210,000 gallons per day Agreement with Manchester. The total take from the Thirlmere Aqueduct was now 710,000 gallons per day.

In 1940, due to an outbreak of typhoid in Croyden, Wigan decided to disinfect all of it's water supplies with chlorine. Hitherto reliance had been placed solely on filtration to remove harmful bacteria.

During the second world war a pamphlet was issued listing a number of resources that could be used in emergencies, as cover for the major resources of Thirlmere and Worthington should they, for any reason, fail or be shut off. The list included wells, shafts and boreholes at Wrightington, Parbold, Roby Mill, Tontine, Shaley Brow, Bispham and Lightshaw. The emergency supplies were mostly of poor quality coming in the main from disused mine workings or the like. No record of the frequency of use, if at all, has been found.

A significant improvement to the output of the Worthington public supply was carried out immediately after the war. The 12" compensation pipeline from Adlington Reservoir via Arley and Worthington Reservoirs to the Paper Mill's (now Bleachwork's) head race had become heavily incrustrated and it's reduced capacity meant that more than half of the compensation water of 555 gallons per minute required by the !853 & 1860 Acts, was having to be made up from Worthington.

In 1946/7 Wigan Water Dept. replaced the iron main by laying an 18" asbestos cement pipeline from the Adlington Reservoir via it's shaft and culvert overflow and the Douglas tunnel to the Bleachwork's head race at the gauging station in the Worthington treatment works. This difficult task enabled the whole of the compensation water to be drawn from Adlington and thus increasing the yield of Worthington water for public supply by over 400,000 gallons per day. In an effort to increase the yield of the reservoirs further, a Statutory Instrument, no.1857 resulted in the Wigan Waterworks Orders 1950 & 1952 giving powers to pump water from a disused mine shaft known as Newfoundland Shaft which is close to the point where Buckow Brook passes under the carrier. The Order also gave powers for Wigan to filter it at the site and pump it direct to Boar's Head but because of it's inferior quality the works were not developed. Instead, for several years water was pumped from the shaft in dry spells and discharged via the carrier for blending with Seven Stars water in the reservoirs. Because of it's convenient location it could also discharge to Adlington via Buckow Brook. The shaft ceased to be used in the early 1960's, the equipment removed and the shaft capped.

H.J.Heinz established a food processing factory in Standish soon after the second world war and in 1950 were desirous of further expanding production in this area. Standish U.D.C. who were supplying water to the existing factory were hesitant at taking on the development at the scale envisaged, as it could not possibly supply the vast quantities of water Heinz would need. Wigan, now a depressed area, offered the Kitt Green site and with Government support obtained yet another Agreement with Manchester to supply from Thirlmere two million gallons per day for initial production, rising to three million gallons per day over a period.

To supply these quantities of water it was necessary to lay a new 24" cast iron pipeline from the Thirlmere aqueduct to a new service reservoir, constructed for the purpose at Prospect. The pipeline was laid via Worthington where a booster pumping station was installed to lift the water up to Prospect Reservoir, the top water level of which was 350ft. A.O.D. From here water was supplied to Kitt Green via twin gravity mains. The cost of these works, which were completed in time for the official opening of the factory in 1959, was borne by Heinz with Government grant aid.

Also at this time the Worthington treatment works were given a major overhaul. The slow sand filters were replaced by a pressure filtration plant and the pumping station being constructed to boost Thirlmere water to Prospect included a less powerful pump unit to lift Worthington water direct to Boar's Head via a new rising main. The old filter beds, the gravity main down the Douglas valley, the old pumping station at Thorn Hill, the rising main up the hill to Boar's Head reservoir were now obsolete. This programme of works, by far the most comprehensive since the Worthington scheme 100 years earlier, also included major improvements to the distribution system throughout the town.

MAKERFIELD WATER BOARD

The smaller towns throughout the country, having already harnessed their local water resources, didn't have the financial resources to develop further major supply projects and were becoming more and more reliant on bulk supplies from the major water undertakings. In Lancashire, Manchester and Liverpool were heavily involved with major new works in the lake district and north Wales respectively. Wigan's water requirements now exceeded five million gallons per day, Worthington and Pemberton produced only 40% of this, the rest came from Thirlmere. Wigan was not part of Manchester and could not be confident that further increases in demand would always be satisfied by increases in Thirlmere bulk supplies.

The idea of amalgamating the water departments of local authorities into Area Water Boards was first put forward in the 1945 Water Act. The intention being to relieve the local authorities of the responsibility of water resource management, thereby making it possible for the area Boards to take a rational approach on a sub-regional basis in resolving water supply deficiencies. A Government Inspector (Mr.Vale) was appointed to conduct a survey of water supplies throughout England and Wales and his findings, published in the Vale Report in 1947, recommended that the local authorities in this part of Lancashire should group themselves to form an area water board on a voluntary basis. Little or no progress was made for a decade but eventually Wigan and Leigh grasped the nettle and agreed to their waterworks departments forming the core of an area water board which would also take over the responsibilities for the supply of water to eleven willing neighbouring District Councils.

A Statutory Instrument No. 2178 submitted to Parliament resulted in The Makerfield Water Board Order, 1960. The Board consisted of 21 members, all local politicians appointed on a proportional population basis, six from Wigan County Borough, four from Leigh Borough, one each from the Urban Districts of Abram, Ashton in Makerfield, Golborne, Hindley, Ince in Makerfield, Orrell, Newton le Willows, Up Holland and Standish together with one each from the Rural Districts of West Lancashire and Wigan. The Wigan C.B. Town Clerk and Treasurer were appointed part time Clerk and Treasurer to the Board which met for the first formal meeting in November 1960, full responsibilities being transferred in April 1961. The Order gave the Board powers to borrow any sums as may be needed as working capital and to maintain a Consolidated Loans Fund. The Board's area was 83 sq. miles and the population was c260,000.

Following specialist staff recruitment and the establishment of a management team, a survey of resources was carried out in the thirteen separate districts covering raw water, treatment, treated water storage, mains, distribution systems, equipment and labour.

In addition to Wigan's water resources there were now several other resources. A bulk supply at Pennington Green from Liverpool's Rivington Aqueduct, which passed through the Board's area en route from Horwich to Prescot, supplied Hindley, Ince, Abram, Leigh and Ashton in Makerfield which also had it's Leyland Green impounding reservoir near Windy Arbour. A second Thirlmere bulk supply, this one from the Aqueduct passing through Chorley, supplied Standish and Wigan R.D.C. via the Green Lane tank and water tower. Green Lane also received a minor bulk supply from Preston and District Water Board to compensate Wigan Rural for it's services to the Parish of Bispham in West Lancs. Rural. Ground water was pumped to supply Golborne and Ince from Lightshaw works, Newton le Willows from Southworth Road and Borren Road works and Orrell from it's Dean Wood works which supplemented it's upland supplies from Pemberton.

The survey also revealed the volume of treated water storage in the service reservoirs throughout the area to be woefully inadequate. With supplies coming in some cases from afar and reliant on pumping machinery and electric power, modern practice required water undertakers to have storage capacity in their service reservoirs equal to at least one day's demand in order to maintain supplies during pump breakdowns, power failures, pipeline bursts etc. In addition, the records of mains and distribution systems in the separate districts were found to be incomplete and of course there were few connection of one with another.

To overcome the deficiencies a programme of works was prepared, known as "The Comprehensive Scheme" and it was approved by the Board in November 1961. The scheme set out to achieve the following objectives:-

1. To integrate the existing and proposed sources of supply.
2. To increase the resources to meet existing commitments and future requirements.
3. To allow the abandonment of unsatisfactory or uneconomic supplies.
4. To provide proper standby arrangements to maintain supplies during periods of breakdown.

The first objective was achieved by the construction of a system of trunk mains between the sources of supply and new/improved reinforced concrete service reservoirs on high ground near the perimeter of the Board's area at Harrock Hill, New Springs, Rose Hill, Tontine, Westhoughton, Daisy Hill, Prospect and Boar's Head. new re-pumping stations were also constructed at Rose Hill and Dean Wood. These works together with the existing distribution systems formed a ring network enabling water from any of the major sources, to be used in any area where it was required. The Board now had a treated water storage facility in excess of 20 million gallons, more than one days demand.

The additional source of supply needed to meet the second objective was found in the bunter sandstone underlying the south of the Board's area from Leigh to Newton le Willows with the help of the Consultant Geologist, Edgar Morton. Local districts had been drawing supplies from a few boreholes in this aquifer prior to the formation of the Board, but additional licences were granted by the Mersey & Weaver River Authority and several additional boreholes were drilled and successfully commissioned. There are three groups of boreholes; at Newton le Willows, Leigh and Golborne which collectively can yield nine million gallons per day.

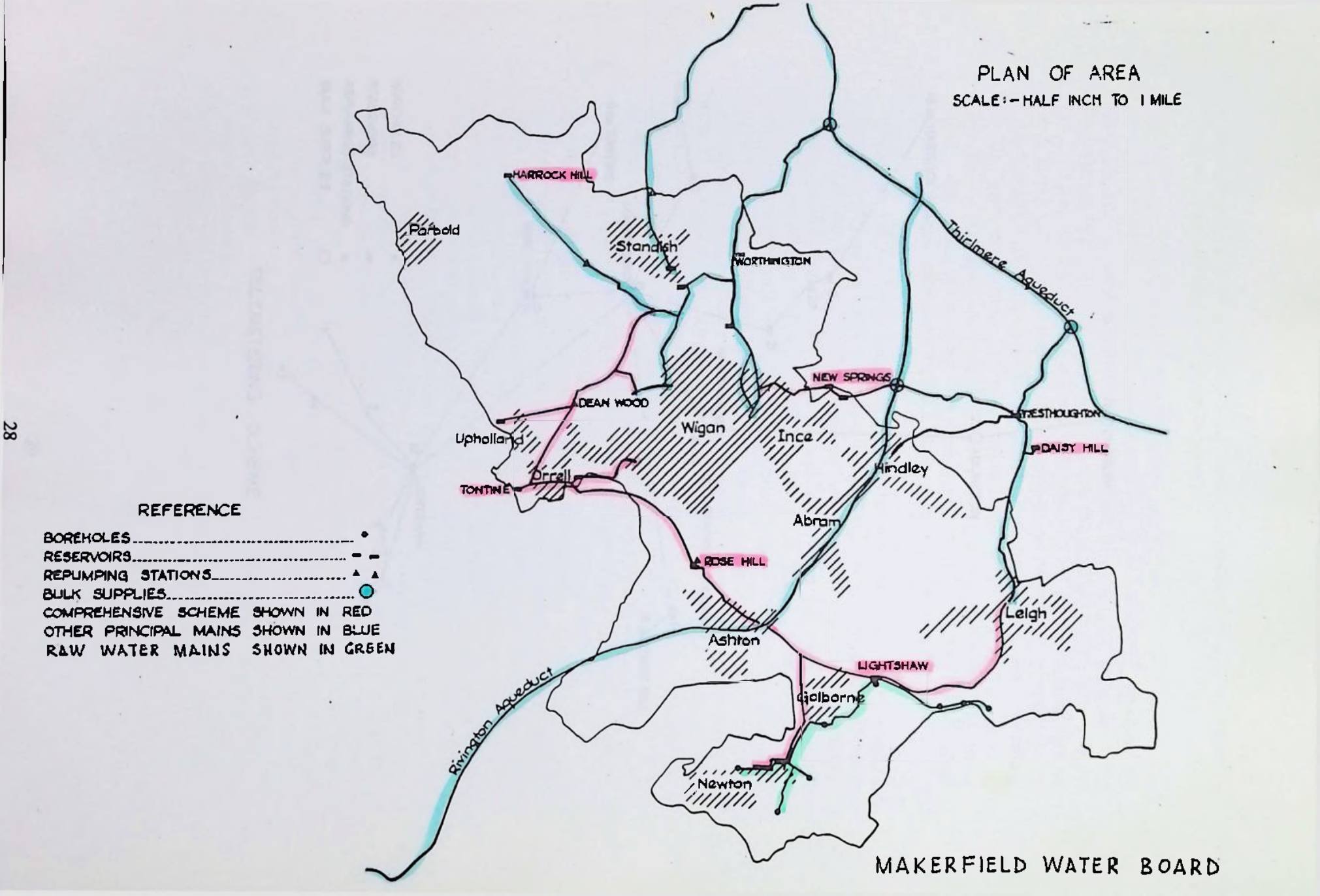
Raw water mains take the pumped water from the boreholes to the Lightshaw treatment works at Golborne, constructed as part of the comprehensive scheme, where it is softened, filtered and sterilised prior to being pumped into supply. With all these works completed, the fourth objective was realised, see diagram on page 28.

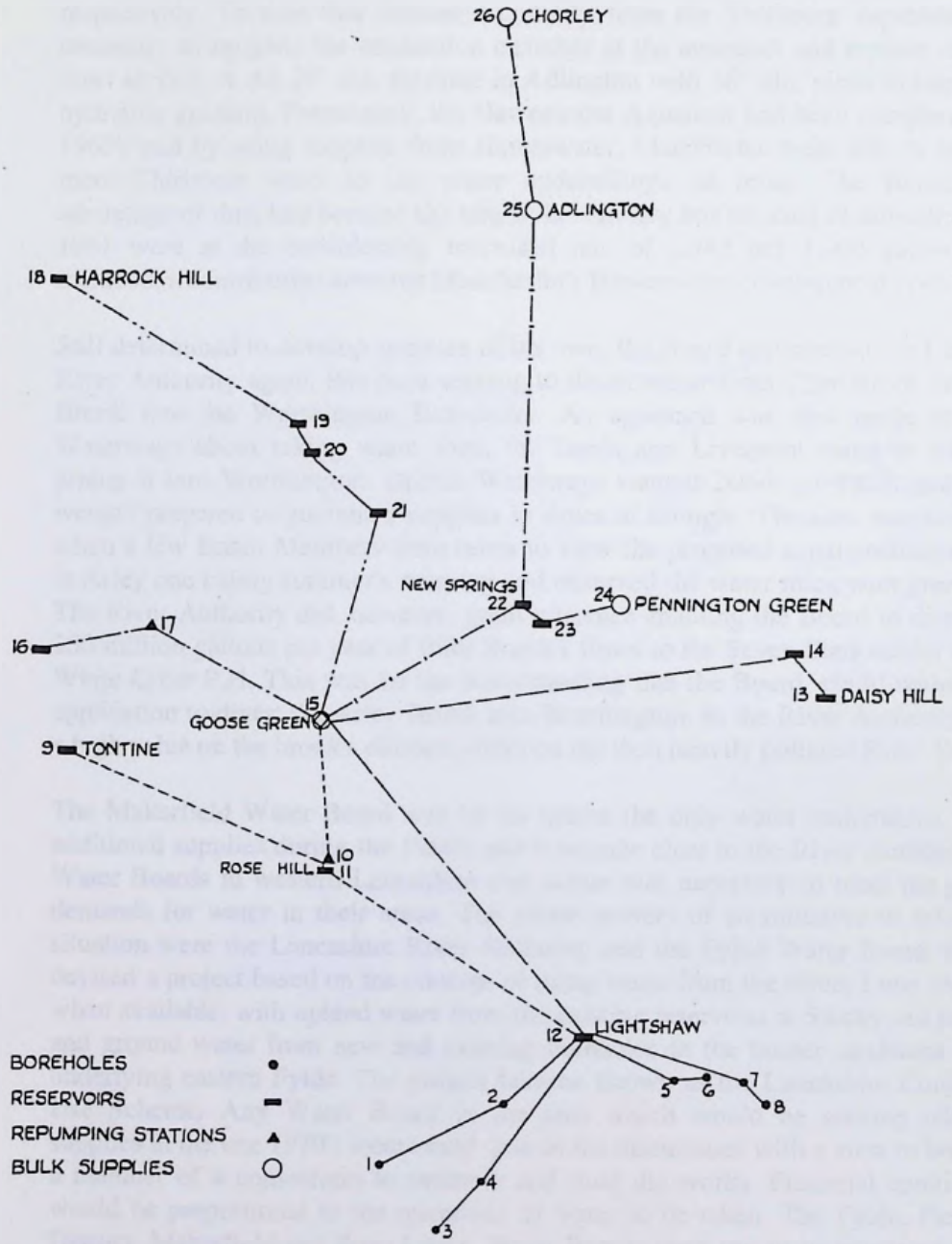
An innovative Telemetry System was installed covering all the key points in the water supply system, see diagram on page 29. This enabled the controller in the central office control room to monitor reservoir levels, trunk main flows and pump performance. Pump failure, low pressure etc. automatically set off alarms in the control room enabling remedial measures to be effected without delay.

Shortly after the substantial completion in 1966 of the Comprehensive Scheme its third objective was achieved. The old Pemberton waterworks was closed down. As described earlier, water supplied from this source was a blend of ground water from the Nicholson and Bispham shafts and surface water from the Orrell reservoirs. The former was from the coal measures and could only meet the required water quality standards by blending it with the water in the reservoirs. Unfortunately, the post war building boom on the catchment area had reduced the yield of the reservoirs to such a degree that the quality of the blended water had deteriorated and this, together with the more stringent water quality standards which had recently been issued by the World Health Organisation, made the decision unavoidable. The Leyland Green and Dean Wood works were also closed down about this time.

In 1968 an automated rapid gravity filtration plant was constructed in one of the old filter beds at Worthington, this was superior to, and had a greater capacity than the pressure filters which it replaced. Worthington treatment plant could now produce up to three million gallons of treated water per day, about twice the reservoirs' average yield. This was a most useful facility which was used to meet peak demands for short periods. It was also planned to augment the Seven Stars Brook waters feeding the reservoirs with water from an additional source in due course and it was expected this would enable a more regular use of the plant's full capacity.

There being no possibility of further licences for ground or surface water supplies from the Mersey and Weaver River Authority, the Board approached the Lancashire River Authority in 1971 for temporary licences to drill and test pump trial boreholes in the bunter sandstone aquifer underlying Mawdesley and Eccleston. These were obtained and three boreholes were drilled and test pumped over a sustained period. The results were encouraging, but unfortunately there was a general lowering of the water table which derogated the "protected" supplies of some of the existing licensed


PLAN OF AREA
SCALE:- HALF INCH TO 1 MILE
REFERENCE
BOREHOLES
RESERVOIRS
REPUMPING STATIONS
BULK SUPPLIES
COMPREHENSIVE SCHEME SHOWN IN RED
OTHER PRINCIPAL MAINS SHOWN IN BLUE
RAW WATER MAINS SHOWN IN GREEN
HARROCK HILL
Parbold
Standish
WORTHINGTON
Thirlmere Aqueduct
NEW SPRINGS
DEAN WOOD
WESTHOUGHTON
Wigan
Ince
Uphollard
DAISY HILL
Hindley
Orrell
TONTINE
Abram
ROSE HILL
Leigh
Ashton
LIGHTSHAW
Golborne
Rivington Aqueduct
Newton
MAKERFIELD WATER BOARD



TELEMETERING SCHEME

industrial and agricultural ground water users. Consequently, the River Authority could not issue permanent abstraction licences.

In 1972 further bulk supplies from Rivington and Thirlmere were obtained which brought the total quantities from those sources to 3.5 and 5.5 million gallons per day respectively, To take this increased quantity from the Thirlmere Aqueduct it was necessary to upgrade the connection chamber at the aqueduct and replace an almost level section of the 24" dia. pipeline in Adlington with 36" dia. pipes to improve it's hydraulic gradient. Fortunately, the Haweswater Aqueduct had been completed in the 1960's and by using supplies from Haweswater, Manchester were able to relinquish more Thirlmere water to the water undertakings en route. The Board, taking advantage of this, had become the largest beneficiary but the cost of allocations since 1961 were at the considerably increased rate of 2s/4d per 1,000 gallons which included, a contribution towards Manchester's Haweswater development costs.

Still determined to develop supplies of it's own, the Board approached the Lancashire River Authority again, this time seeking to divert water from Eller Brook and Arley Brook into the Worthington Reservoirs. An approach was also made to British Waterways about taking water from the Leeds and Liverpool canal at Arley and piping it into Worthington. British Waterways wanted 2s/6d per 1,000 gallons and weren't prepared to guarantee supplies in times of drought. The idea was abandoned when a few Board Members were taken to view the proposed canal abstraction point at Arley one balmy summer's morning and observed the water thick with green algae. The River Authority did, however, grant a licence enabling the Board to divert up to 250 million gallons per year of Eller Brook's flows to the Seven Stars carrier near the White Crow P.H. This was on the understanding that the Board would withdraw it's application to divert the Arley Brook into Worthington, as the River Authority placed a high value on the brook's dilution effect on the then heavily polluted River Douglas.

The Makerfield Water Board was by no means the only water undertaking seeking additional supplies during the 1960's and it became clear to the River Authorities and Water Boards in western Lancashire that action was necessary to meet the growing demands for water in their areas. The prime movers of an initiative to resolve the situation were the Lancashire River Authority and the Fylde Water Board who had devised a project based on the concept of using water from the rivers Lune and Wyre when available, with upland water from the existing reservoirs at Stocks and Barnacre and ground water from new and existing boreholes in the bunter sandstone aquifer underlying eastern Fylde. The project became known as the Lancashire Conjunctive Use Scheme. Any Water Board in the area which would be seeking additional supplies in the late 1970's were could join in the discussions with a view to becoming a member of a consortium to promote and fund the works. Financial contributions would be proportional to the quantities of water to be taken. The Fylde, Preston & District, Makerfield and West Lancs. Water Boards were seriously interested, others, concerned about the likely high cost of the project, were hesitant. But before any financial commitment had to be made the reorganisation of the water industry in England and Wales in 1974 caused the demise of the Water Boards and relieved them of the responsibility.

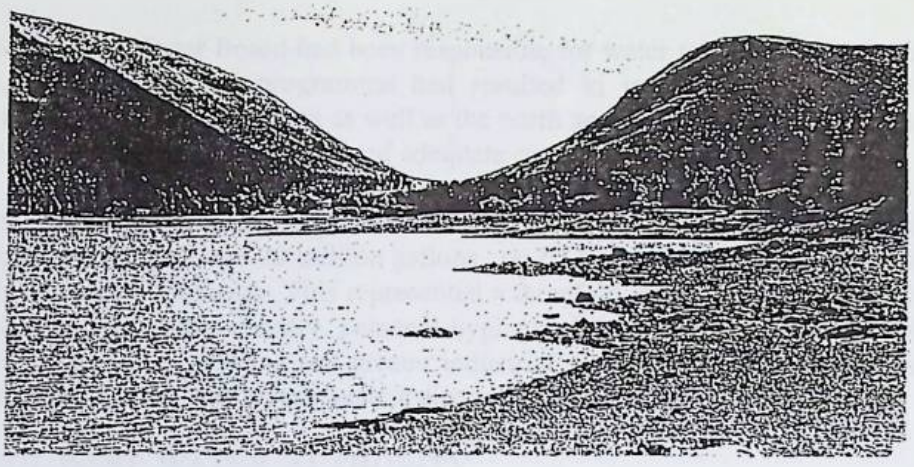
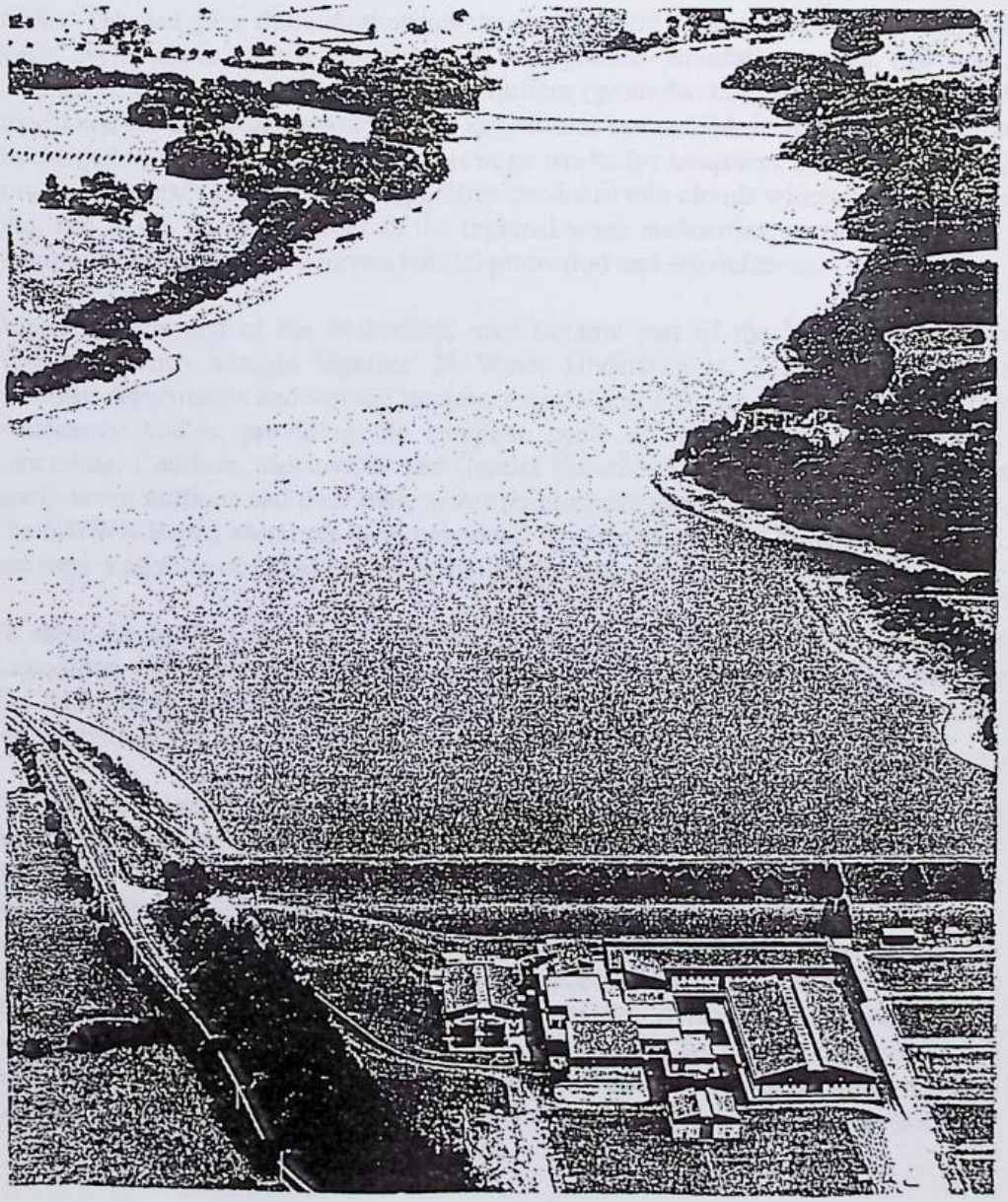


Photo N. Hoyle

Thirlmere - looking south to Dunmail Raise



Rivington Reservoirs - looking north from over Horwich

The Makerfield Water Board had been responsible for water supplies for just thirteen years, it's heavy capital programme had resulted in major supplies being made available in the south of it's area as well as the north and created the flexibility needed in the system to guarantee supplies of adequate quantity and quality.

During the Board's time the population had increased by 25,000 to 285,000 and the average daily demand was 20 million gallons, or 70 gallons/person/day, about half of which was used by industry. This represented a threefold increase in the use of water/ person in a little over a century, personal hygiene, dish washers, washing machines, car washing, garden watering and greater industrial use were the main reasons, albeit the extent of leakage was greatly underestimated at that time.

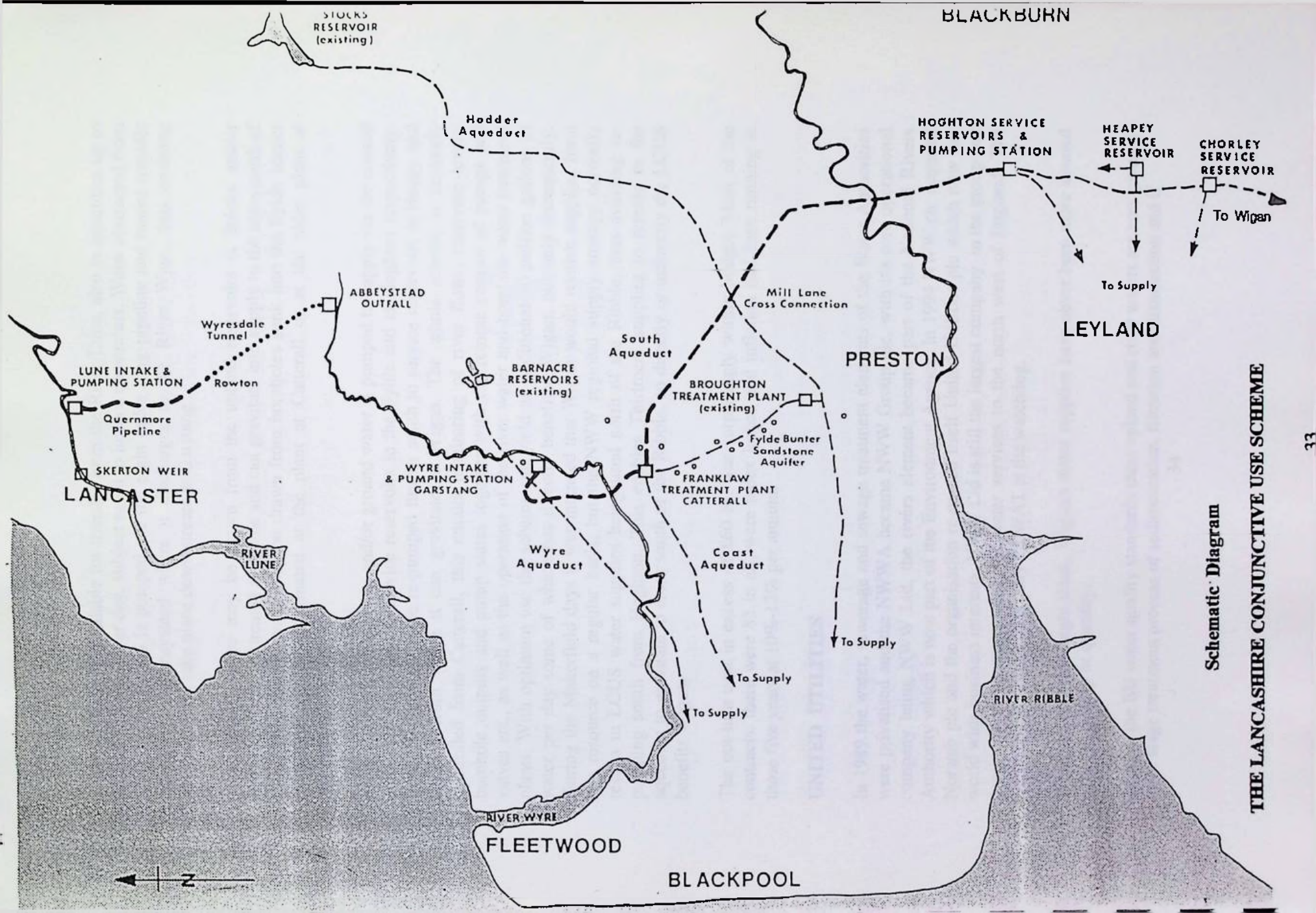
NORTH WEST WATER AUTHORITY

The Water Act 1974 created ten regional water authorities, nine in England and one in Wales. The Act gave these Authorities the responsibility for managing the complete water cycle, albeit with a helping hand from nature. Rainfall provides raw water supplies in reservoirs, lakes, rivers and aquifers (groundwater). After treatment it is distributed for domestic, industrial and agricultural use etc. Most of the used water is discharged to sewers which pass it to sewage works for treatment before discharging it to water courses and the sea. Evaporation produces rain clouds which precipitate the rain, and so on. Other functions of the regional water authorities were land drainage, pollution control of water courses, coastal protection and sea defences.

Wigan and the rest of the Makerfield area became part of the North West Water Authority which brought together 24 Water Undertakings, 221 District Council sewerage departments and sewage treatment works and 3 River Authorities, in all 248 predecessor bodies, providing the complete cycle of water services in Cumbria, Lancashire, Cheshire, Merseyside and Greater Manchester. The total population was nearly seven millions and their daily water requirement exceeded 450 million gallons. The NWWA Board Members were appointed by the Secretary of State for the D.o.E. and were a mixture of Local Authority politicians and N.W. business executives.

To meet the impending supply deficiencies forecast for the late 1970's in most of Lancashire the Authority sanctioned the Lancashire Conjunctive Use Scheme (L.C.U.S.) at an estimated cost of £43 M. (1975) and it was commissioned in 1980 and inaugurated by Her Majesty Queen Elizabeth II, see plan on page 33.

The scheme involves the use of new water abstractions from the Rivers Lune and Wyre, upland waters from the existing reservoirs at Stocks and Barnacre and ground waters from the Fylde Bunter Sandstone Aquifer (new/existing) being used conjunctively. Parliamentary Orders for the works had already been granted to the former Lancashire River Authority and Fylde Water Board. The operation of the scheme involves drawing water from the resource(s) best able to satisfy demand at any given time. Water may be abstracted from the River Wyre at Garstang in quantities of up to 62 million gallons per day, subject to licence constraints and pumped to a new plant at Catterall for treatment. Often there is insufficient water in the River Wyre to satisfy abstraction requirements and, except in long dry spells,


STOCKS RESERVOIR (existing)
BLACKBURN
Hodder Aqueduct
HOGHTON SERVICE RESERVOIRS & PUMPING STATION
HEAPEY SERVICE RESERVOIR
CHORLEY SERVICE RESERVOIR
To Wigan
To Supply
ABBEYSTEAD OUTFALL
Wyresdale Tunnel
Mill Lane Cross Connection
LEYLAND
South Aqueduct
PRESTON
LUNE INTAKE & PUMPING STATION
Rowton
BARNACRE RESERVOIRS (existing)
BROUGHTON TREATMENT PLANT (existing)
Quernmore Pipeline
Fylde Bunter Sandstone Aquifer
SKERTON WEIR
WYRE INTAKE & PUMPING STATION GARSTANG
FRANKLAW TREATMENT PLANT CATTERALL
LANCASTER
RIVER LUNE
Wyre Aqueduct
Coast Aqueduct
To Supply
To Supply
To Supply
RIVER RIBBLE
RIVER WYRE
FLEETWOOD
BLACKPOOL
N
Schematic Diagram
THE LANCASHIRE CONJUNCTIVE USE SCHEME

water is generally available for transfer from the River Lune, also in quantities up to 62 million gallons per day, subject again to licence constraints. Water abstracted from the Lune at Halton is pumped via the eight miles long pipeline and tunnel transfer aqueduct to Abbeystead where it discharges to the River Wyre, thus enabling abstractions to take place down stream at Garstang.

Alternatively, water may be drawn from the upland reservoirs at Stocks and/or Barnacre, these are treated at source and can gravitate into supply to the areas north of the Ribble. Finally water may be drawn from boreholes sunk into the Fylde bunter sandstone aquifer and treated at the plant at Catterall or at the older plant at Broughton.

From Catterall, treated river and/or ground water is pumped to supply via the coastal and south aqueducts to service reservoirs in the Fylde and at Hoghton respectively. From Hoghton it can be re-pumped further south to service reservoirs at Heapy and Chorley from where it can gravitate to Wigan. The whole scheme is remotely controlled from Catterall, this entails monitoring of river flows, reservoir levels, borehole outputs and pump states together with the remote control of pumps and valves etc., as well as the operation of the river water and borehole water treatment plants. With optimum use the scheme can yield an additional 30 million gallons of water per day some of which has directly benefited Wigan, but only infrequently. During the Makerfield days it was intended that Wigan would receive supplies from this resource on a regular basis, but the NWW regional supply strategy normally results in LCUS water supplies being used north of the Ribble, thus avoiding re-pumping south from Hoghton. This enables Thirlmere supplies to remain in the aqueduct to gravitate to areas south of the Ribble, so directly or indirectly the LCUS benefits Wigan.

The out-turn cost in excess of £60 M. was surprisingly within budget. Most of the contracts, there were 83 in all, were index linked and inflation had been running in those five years at 10%-12% per annum.

UNITED UTILITIES

In 1989 the water, sewerage and sewage treatment elements of the Water Authorities were privatised and the NWWA became NWW Group plc, with it's core operational company being NWW Ltd, the rivers element became part of the National Rivers Authority which is now part of the Environment Agency. In 1994 NWW plc acquired Norweb plc and the organisation re-named itself United Utilities plc which now has world wide business interests. NWW Ltd is still the largest company in the group and continues to be responsible for water services to the north west of England. The Government's regulatory body OFWAT is the watchdog.

Whatever else one might think, Wigan's water supplies have never been more assured either in quality or quantity.

To meet the EU water quality standards most upland and river waters are now given a three stage treatment process of sedimentation, filtration and disinfection and if

necessary additional treatment to remove colour, iron and manganese, for more information see pages 36 and 37, a far cry from the zero treatment of waters from the Grand, Coppull Lane and Whitley reservoirs, and the old filter beds at Worthington. In recent years there have been major changes at Worthington including the provision of extensive education and leisure facilities, major reservoir safety works and yet another refurbishment of the treatment plant.

With regard to quantity, despite the low rainfall of recent years, the records show the incidence of supply interruptions has reduced over the years and now, when unavoidable, takes the form of a hose pipe ban whereas in earlier times shortages were overcome by shutting off the distribution system for parts of the day, or even longer and delivering water by bowser.

NWW Ltd now has a regionally controlled network of major aqueducts, those bringing water from the Lake District and the Pennines are referred to as the Northern Command Zone (NCZ) whilst those bringing water from Wales and the River Dee are known as the Southern Command Zone (SCZ). The Rivington aqueduct, originally a cast iron pipeline laid in 1854, has always been able to gravitate NCZ water to SCZ at Prescot but since 1996, when NWW completed the replacement of it with a 900mm (36") dia. ductile iron pipeline and pumping facilities at Prescot and Ashton in Makerfield, SCZ water can be transferred to NCZ. This enables water from Wales, in an emergency, to be supplied to Wigan and other parts of Greater Manchester. (See pages 38 & 39).

Leakage, a nationwide problem, is being tackled more vigorously than ever with positive results. A reduction in excess of 60 million gallons per day has already been achieved this decade. (See page 39).

SUMMARY

This historical account of Wigan's water supplies shows how these have developed in less than 240 years from the early springs, wells and pumps and their Grand Reservoir, to Barley Brook and it's Coppull Lane and Whitley reservoirs, to the Seven Stars Brook and the Worthington Reservoirs' system, Pemberton's Orrell reservoirs' system, Thirlmere and Rivington bulk supplies, the ground water scheme of Leigh, Golborne and Newton le Willows, the LCUS and the Aqueduct Network which, in emergencies, can bring in water from Wales.

Because of the ever increasing complexities of the service and for the reasons mentioned in the introduction on page 1, the responsibility for the provision of water supplies during these times has passed from the caretakers of the wells and pumps, via Thomas Blinkhorn and Thomas Woltum, the Wigan Waterworks Company, Wigan C.B's. Waterworks Dept., the Makerfield Water Board, North West Water Authority, and North West Water plc to the present incumbent United Utilities plc.

W.E.Orr, 1998.

Water treatment

191 water treatment works operate every hour of every day to provide clean, safe, drinking water.

Water in reservoirs, lakes, rivers and aquifers needs treating before it is fit to drink. Each of these sources affects the quality and chemical make-up of the water, and therefore each source will require a different type of treatment.

Water from aquifers
The water we obtain from aquifers is usually very pure. One of the reasons for this is that after water has travelled a long distance through soft, porous rock, most of the impurities have been filtered out. This can be likened to a strainer; the larger particles are caught and the filtered liquid is allowed to flow through. On removal from the rock the water usually only needs disinfecting with chlorine to kill any harmful bacteria.

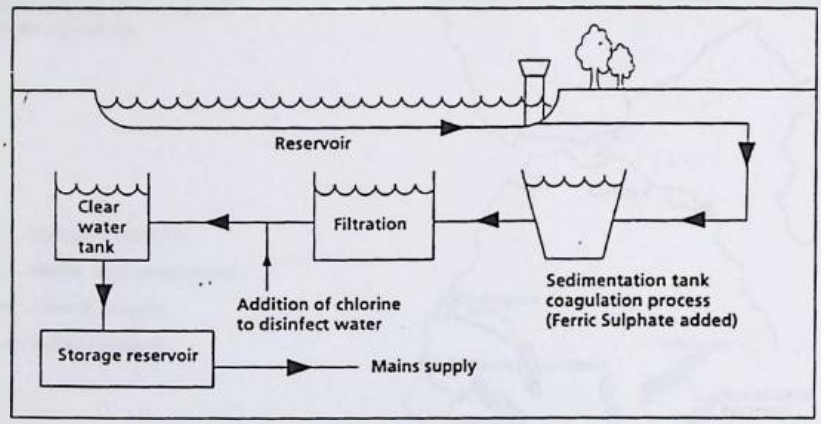
Water from rivers
The quality of water from rivers varies quite widely, as rivers are affected by flooding, low flows, temperature change and weed growth, as well as more complex problems of pollution from communities, businesses and farms. Water from the River Dee in Cheshire needs to be treated in several stages to remove leaves, suspended matter, dissolved chemical substances and colour. The water is also treated to ensure that it is free from unpleasant odours or tastes and disinfected before leaving the treatment works.

Water from upland areas
Water obtained from upland areas is collected in reservoirs and is usually of low mineral content due to contact with hard rocks. This water needs to be treated to remove colour the water has absorbed from the peaty gathering grounds, and also to remove iron and manganese.

continued overleaf

Water treatment

continued



Flow diagram of water treatment process.

How is water treated?

The first stage is a natural purification in the reservoirs. The stillness of the water allows bigger solid impurities to settle, and the large surface area allows oxygen in the air to get to work on the other impurities. From here the water is taken for treatment.

Sedimentation and coagulation

As a first step a chemical compound, usually ferric sulphate, is added to the water. Water then flows very slowly through a settlement tank. The addition of the chemical makes small particles join together to form large particles, (this is called coagulation). These particles become too heavy to hang in the water and so sink to the bottom of the tank (this process is called sedimentation). Sometimes the water flows upwards through the tank, and the coagulated material forms a blanket layer which is then drawn off leaving the water much cleaner.

Filtration

After sedimentation, the water passes through filter beds to remove any remaining material, including iron, manganese and micro-organisms. The filters usually consist of layers of sand and gravel. The filtered water is collected in perforated pipes and taken on to the next stage of treatment. Every day the filter beds are washed by pumping clean water upwards through the sand, and then the process starts all over again.

Chlorination

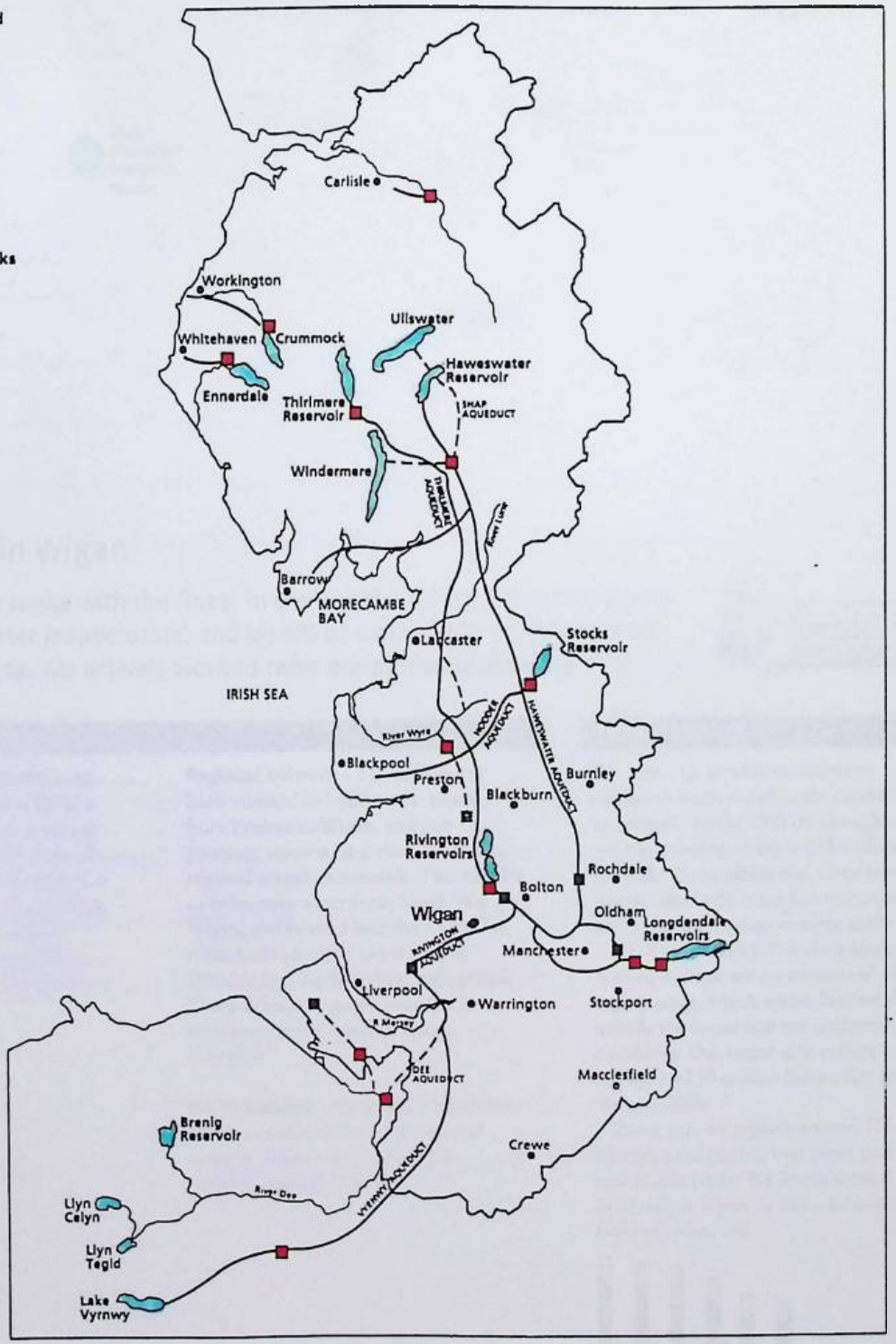
Water is taken to the final stage of treatment. Here, all the water passes through a covered tank where chlorine is added to kill any remaining bacteria. The water is now clear, safe to drink and ready for pumping into the mains.

North West Water has 191 water treatment works and every day samples of untreated and treated water are tested in the laboratories.

F2b Water supply and distribution

Main sources of supply and major aqueducts

- Service reservoir
- Water treatment works
- Gravity supply
- Pumped supply



North West Water Schools Liaison Service

Wigan – at a glance

☐ Wigan constituency area

Where the water comes from

The Lake District – via the Thirlmere Aqueduct

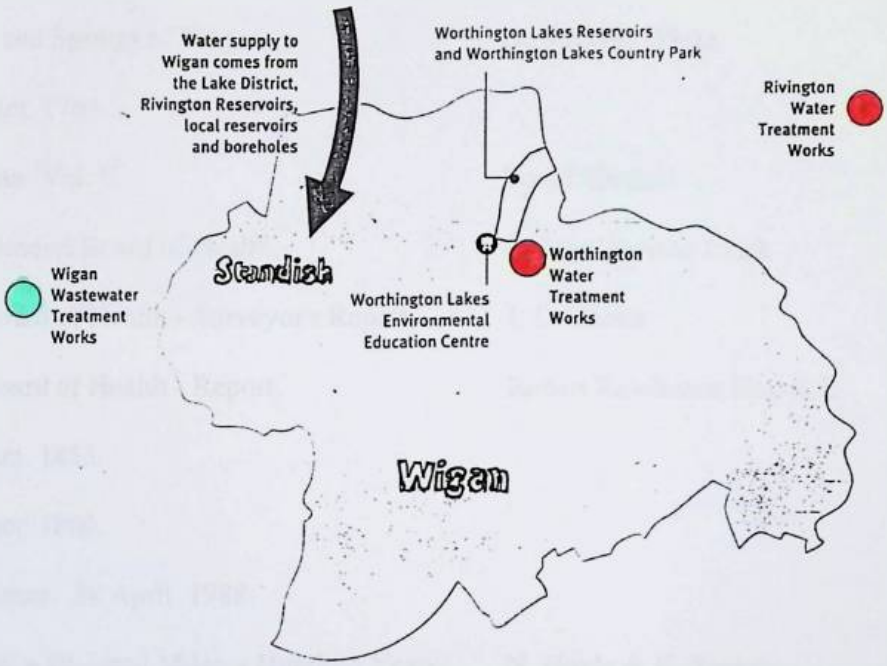
Rivington Reservoirs – treated at Rivington Water Treatment Works

Local reservoirs, treated at Worthington Water Treatment Works

Local boreholes, treated at Lightshaw Water Treatment Works

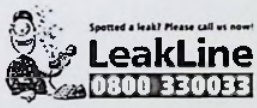
Where the wastewater goes

Wigan Wastewater Treatment Works, at Hoscar



Water supply in Wigan

Our drinking water ranks with the finest in the world. The quality is monitored by the Drinking Water Inspectorate, and 99.6% of water tests comply with all regulatory standards. We actively work to raise our performance each year.



Investment in water supply

Rivington Water Treatment Works – £40 million was invested to build a new three-stage treatment works at Rivington, opened in 1995. One of the most efficient works in the region, it has raised water quality to very high standards for the half-a-million customers it serves in Leigh, Wigan, Ashton-in-Makerfield, Liverpool and St. Helens.

Regional network – £10 million has been invested to build a new pipeline from Prescot to Wigan, and two pumping stations, as a vital link in our regional aqueduct network. This enables us to transfer water from North Wales to Wigan, and beyond into the Thirlmere Aqueduct (coming from the Lake District) and the Manchester ring-main. This will help to secure supplies for customers in the event of future droughts.

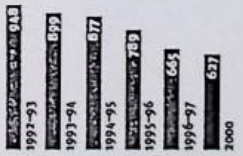
Mains network – Around 20 kilometres of old cast-iron mains in the central areas of Wigan will be relined or replaced during 1997-99.

Water conservation

We have region-wide initiatives to safeguard water supplies for customers. In response to the 1995-96 drought, we are investing an extra £85 million to cut leaks, bring additional water into supply, and build more links to move water around the region more easily.

We fix around 1,000 leaks a week. A third of these are on customers' own supply pipes, which we fix for free if outside the house and not underneath a building. Our target is to reduce leakage by 250 million litres a day by the year 2000.

Every year we replace around 700 kilometres of rusting iron pipes with new plastic pipes. We invest around £100 million a year in this – or nearly £40 per household.



Reducing leakage in the North West (in million litres per day)

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