Liverpool’s drainage history: seventeenth century to MEPAS

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The paper by G.N. Olsen admirably illustrates the breadth of vision of many Victorian public health engineers and the considerable impact which their schemes had on the quality of life in towns and cities.

76. It is not clear why Newlands’ scheme for Liverpool is claimed to be ‘Britain’s first purpose-designed complete sewerage system for conveying foul waste’. At the time when Newlands presented his report to the Corporation (1848), similar proposals were being actively espoused in other towns. Amongst public health agitators there was a growing conviction that sanitation should be hydraulic, arterial and waterborne. Considerable evidence in support of this method had been provided in Edwin Chadwick’s best-selling report on the Sanitary Condition of the Labouring Population. This report identified the lack of effective drainage as a key factor in epidemic diseases, such as cholera, which were the scourge of Britain in the early nineteenth century.

77. Chadwick’s report included a ‘statistical map’ of Leeds (provided by Robert Baker, a local doctor), which demonstrated a clear connection between high mortality rates and bad drainage. Leeds provides an example of towns adopting a ‘purpose-designed’ sewerage system at this time.

78. As a result of the Leeds Improvement Act 1842 it became lawful for the council to cause sewers and drains to be laid under any streets within the limits of the Act. Almost immediately, ways were sought to use the new powers in order to provide a comprehensive sewerage system. Such sewers as were already in place, tended to drain directly to the River Aire near the centre of the town.

79. In February 1845, John Wignall Leather, a Leeds-based civil engineer, acting on the instructions of the council, published a report on the ‘Means of providing an Effectual Sewerage for the Town of Leeds’. The report embodied Chadwick’s principal recommendations and proposed a sewerage system which discharged all of the sewerage to the River Aire well downstream of the town. The council adopted Leather’s report in June 1846 and first contracts were let in 1850. The scheme was completed in 1855.

80. James Newlands undoubtedly made a great contribution to laying the foundations of municipal engineering and may well have been—when appointed in 1847—the first person to have the job title ‘Borough Engineer’. He was not however the only municipal engineer at the time. Many boroughs had a ‘Borough Surveyor’, whose major activity was civil engineering. Chadwick’s report, for example, mentions ‘Mr Roe, a civil engineer, who, much to the honour of the Holborn and Finsbury district of sewers, has been appointed to the care of their sewers’ (p.55). Roe—the inventor of the ‘egg-shaped’ sewer—was surveyor to the Holborn and Finsbury Commission of Sewers as early as 1838.

Author’s reply

David Sellers is correct in saying that there were other town proposals under consideration at the time of Newlands’ first report in 1848.

82. Certainly, Chadwick had been trying to sell his system of arterial water-borne sewerage to towns through a private company prior to 1846, and had enlisted the apparent support of engineers such as Hawksley with whom he was to later fall out. However, Chadwick’s sanitary report of 1842 was more concerned with damp and disease and the need for drains, rather than with sewer or drain design and construction. It may be argued that Chadwick, who was a barrister, and many of his supporters, did not understand hydraulics, nor did some of them understand the need for storm drainage. Chadwick is on record as giving Liverpool’s position and topography as a good reason for not having storm drains, with flows running straight off to the River Mersey!

83. In addition, it was sometimes argued that small pipes could drain large storm flows. This erroneous approach seems to have been based on ignoring friction, and assuming that an ever-accelerating flow in a sewer would occupy an ever decreasing cross-sectional area of flow, thus permitting more and more flow to be introduced to the ever-increasing empty space in a pipe of fixed diameter.

84. Chadwick’s approach to using small pipes, and either ignoring storm flows or assuming that storm flows could be accommodated, was not supported by Hawksley’s hydraulic tables, nor by those eventually produced by Roe based on his own experience after his experiments intended to support Chadwick failed.
85. Chadwick, through the General Board of Health, was able to use his inspectors to criticize the work of engineers implementing schemes under the national 1848 legislation, but was himself to suffer severe criticism when the first scheme fully meeting his ‘design’ requirements failed in Croydon in 1852 due to undercapacity and blocked and broken pipes.29

86. As stated in the paper, we cannot at present be certain as to what form the sewers laid by the Liverpool 1830 Commissioners took; that is, to what degree there was a transition to the ovoid form of sewer prior to Newlands’ arrival. Newlands was working under Liverpool’s own 1846 Act, unaffected by Chadwick, but certainly aware of developments elsewhere. His was a system deliberately designed in its entirety to take water closets, and to drain foundation subsoil. He placed the small-diameter pipes in back passages where they were accessible should the problems reported elsewhere occur, and connected these to ovoid sewers designed to carry a combined flow. This was not a system designed on an ad hoc basis, or a case of connecting WCs to unsuitable existing storm sewers, nor was it a system based upon wrong engineering principles.

87. I am unable to comment in detail on the sewerage history of Leeds, and the Leeds Improvement Act 1842. The question to be asked when looking at any sewerage proposals in this period is what exactly is meant by sewerage at the particular time in question, and whether the system is purpose-designed to convey waterborne household waste. Many early references confusingly refer to soil and the need for manual removal from systems, but do not make clear that the soil has entered the system from highway surfaces indirectly, or incidental to storms or highway cleansing operations.

88. Turning to the question of the first borough engineer, this is the first occasion of the term being used, and being required by law. There were many earlier and parallel posts of ‘surveyor’ or ‘borough surveyor’, including those at Liverpool, but Newlands’ post was specifically dedicated to operating the health-related engineering functions defined in the 1846 Act.

89. Tremendous advances were made in public health and drainage in the middle of the last century, and there were certainly parallels, both medical and engineering, within a very short period of time in many large towns and cities. It can nevertheless be argued that Newlands, the first Borough Engineer, designed, built and commissioned the first comprehensive purpose-designed system for foul and storm waste in Britain.

Note
In the original paper, reference is made to Newlands’ education at Edinburgh University. The university library has recently confirmed the existence of those professors under whom Newlands studied but have no record of him graduating. The dates in Newlands’ obituary may be indicative of Newlands studying privately at a pre-degree level rather than as an enrolled undergraduate.

References

[In the original paper, a further reference to Hamlin (reference 13) should have been inserted at paragraph 38, line 18.]