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Maps, Memories and Manchester: The Cartographic Imagination of the Hidden Networks of the Hydraulic City

Martin Dodge and Chris Perkins

Introduction

An apparently inexorable march of progress towards a regulated, commodified, separate and hidden nature facilitates a process of capitalist accumulation and unproblematic consumption, and simplifies but also fixes a single progressive and functional narrative around the memories of place. To begin to complicate this narrative we explore the role that a particular kind of knowledge and its codification might play in the memorialization of a much more nuanced, partial and contested urban process. Our focus is on hydraulic infrastructures in making modern cities and, in particular, how they have been represented in different kinds of maps over time.

The aetiology of hydraulic map representations is conducted using ideas from science and technology studies, semiology and critical cartography – with the goal of revealing how they work as virtual witnesses to an unseen city, dramatizing engineering prowess and envisioning complex and messy materiality into a logical, holistic and fluid network underpinning the urban machine. Our analysis also concerns the ways in which the spatial representations of the hidden city are themselves hidden, and amenable to multiple, mutable and alliterative interpretations, and explores some of the links in this process. Given this contingent rethinking of infrastructures, cities and mapping, with a shared concern for a situated process, it can be argued that detailed case studies are needed of particular kinds of maps, in particular places and at different times. Here we focus on revealing some of the memories that can be evoked in the mapping of hydraulic infrastructures of Manchester, the emblematic 'shock city' (Platt 2005) of the Industrial Revolution.

The argument rests upon several building blocks. Firstly, we need to comprehend the city in a very material sense, to approach the political ecologies of its networks, but also to recognize *how* urban infrastructure works and *who* it works for. Secondly, we need to appreciate the distinct technicity that hydraulic infrastructure facilitates but also regulates. In pursuing this analysis the main focus of our argument rests upon an awareness of the politics and practices embodied by, and facilitated though, a range of cartographical representations of these networks, the parts they play in Amin and Thrift's (2002) notion of the machinic city, and how the mapping of urban infrastructures is enrolled in different kinds of narratives and memories.

The political ecology of flows: from sanitary reform to mutable urban infrastructure

Natures must be harnessed and enrolled for the effective functioning of the city, and it is a form of *natural* asset that flows through the physical pipework, valves and sewers. Water has inherent physical properties that make it very distinct: it flows, is heavy, leaks, can be dangerous when it moves, and yet its mass is now highly controllable and predictable within known parameters. In another sense, though, the water in the pipe is a social product, manufactured with its natural constituents changed and, after significant labour, capital and technology, turned into a commodity to be bought and sold like other goods.

Kaika (2005) argues that both nature and the city in this context are hybrids: neither is purely natural, nor purely social. Instead there is a dialectical relationship between the production of urban living and the production of nature that can be seen in the political urbanization of nature. In her view, the great nineteenth-century process of public municipal sanitary reform that led to the creation of large-scale hydraulic infrastructures costing hundreds of millions of pounds and the industrialization of large tracts of land was an attempt to free capitalism from nature's constraints, so as to allow ongoing capital accumulation, industrial expansion and urban growth.

Others have read the development of sanitary reform as a Foucauldian exercise of biopolitics, part of the process of governing liberalism, producing and regulating the modern subject. Osborne (1996), for example, links the domestic development of sanitation to the evolution of public systems for waste disposal via sewers, and argues that it facilitated new modes of regulation of bodily conduct based around newly private spaces and revised notions of cleanliness. Joyce (2003: 66)

also highlights the role of sanitary reform as a disciplining device and describes how 'anonymous drains, sewers and pipes functioned as the material embodiment of a political division between public and private'. Without technology, though, and its ability to efficiently transport clean water and remove waste, this shift in personal behaviour and urban governance would have been impossible. The physical networks demand attention, as well as the commodities and social conduct they encouraged and facilitated.

The form and functions of these hydraulic networks and sanitary systems evolves. They offer a technological fix for the demands of different modes of economic accumulation, which morphs in response to political, economic, social and cultural change and itself impacts upon the urban condition. Yet periods of relative socio-technical stability have been identified. For example, Gandy (2004) posits the notion of a 'bacteriological city' emerging in the mid-nineteenth century based upon particular ideologies of cleanliness, and a move away from free-market philosophies and towards more rationalized governance of the city through municipal managerialism. Out of this *zeitgeist* came significant public investment in both sewer systems and drinking-water provision – the focus of our case study. The infrastructure of the 'bacteriological city' significantly altered lives in the Victorian metropolis, facilitating industrial change, allowing new forms of housing to be developed, and fostering new sensibilities and ways of living. Graham and Marvin (2001) also identify a comparable period of stability that they term the 'modern infrastructural ideal', in which an ordered, rationally managed city underpinned by state-controlled infrastructures emerged from the second half of the nineteenth century and survived until the 1970s in the UK. Gandy (2004) argues that the period since 1970 has been characterized by a retreat from this stability, occasioned by privatization, which has led to a more diffuse supply and a sometimes polarized infrastructure and profit-driven operation, echoing the concerns of Graham and Marvin (2001) for the future of what they term 'splintering' cities.

Literal infrastructural functions, engineered in concrete and steel, make urban life possible, but underground networks also feed cultural imaginaries. Dobraszczyk (2008a), for example, details how London's sewers at the time of construction were celebrated as sublime – but troubling – engineering marvels. Analysing engraved drawings published in the *Illustrated London News* as evidence, he argues that '[t]he construction of the main drainage system created a vast, complex and unsettling spectacle in the city, characterised by scenes of both construction

and destruction' (ibid.: 372). Different infrastructures are to a greater or lesser degree visible in the city. Many are mundane, and therefore a ubiquitous and overlooked part of the landscape. Others are an obvious and sometimes dominant visual force, such as the vast railway stations and soaring viaducts cutting across Victorian cities. It has been argued that the visual presence of infrastructure itself depends upon, but also engages with, cultural economy; for example, Kaika and Swyngedouw (2000) discuss how hydraulic infrastructure, such as reservoirs, dams and water towers, was celebrated in a fetishized phantasmagoria in its Victorian heyday, but has been rendered progressively opaque in following decades. Both metaphorically, and literally, it disappeared from view, buried underground or hidden as almost secret places in the urban fabric or, in the case of sewage farms, outside the cleansed city. Meanwhile, newly visible infrastructures like urban motorway schemes and out-of-town shopping centres have gained cultural power.

Infrastructures that facilitate water flow are separate from, but integral to, the fabric and process of the city, and are secured for the well-being of citizens by careful control and regulation. This regulation involves technologies, social actors, labour, natural forces, capital, cultural imaginaries and affects, to exclude and preclude everyday experience of these places, but also conveys a reassuring sense of permanence and dependability. Hydraulic infrastructure can superficially appear well ordered: waste water is flushed away; clean water emerges seemingly without effort from the taps. This secure appearance masks a fragile assemblage, often emerging as a partial solution to tensions (see Kaika's 2005 discussion of water shortages in Athens). Abnormal and unexpected flows may exceed a system's capacity, leading to overflows and floods. Sewers can collapse without warning, disrupting flows in other surface infrastructures. Offensive odours may escape and explosions occur from the confinement of sewer gases. The potable water in the tap may not be as clean and as safe as its clear visual appearance implies (and the growth in sales of bottled water speaks to this fear). Anxieties about the security of infrastructural solutions to the urban condition are much debated in the era of 'splintering urbanism' (Graham and Marvin 2001) and resilience of critical networks in the face of terrorist risks (Graham 2009), paralleling the concerns of sanitary reformers about the lack of infrastructure in the years before the emergence of 'bacteriological city' later in the later half of the nineteenth century (Platt 2005).

Flows through the infrastructure bind places together, or make physical pathways between a city and its hinterland stretched out at varying scales. They may be rhythmic and often repeated, like surges in water

demand at particular times of day; or have directional qualities, most especially the carefully monitored and gravity-driven exit of water and waste products downward through sewers and out along culverts. Or they may be much more random: fluxes caused by localized weather patterns and flood events. Tracking and mapping these flows and relating them to infrastructural capacity has been scripted as an engineering challenge. Indeed, almost all research on hydraulic infrastructure has implicitly adopted this kind of functionalist analysis, rather than acknowledging the potential of more socially hybrid and relational understanding. Only recently have cities been theorized as emergent, hybridized and porous entities, characterized by mutable interconnected, rhizomatic forms, rhythmic demand spikes, spatially unequal flows and uneasy fractured assemblages of socio-spatial processes (see Amin and Thrift 2002). Our analysis suggests that studying representations of the often buried, hidden but interconnected aspects of hydraulic infrastructure particularly invites this kind of Deleuzian view of the city.

Historic trajectories of the hydraulic infrastructure in Manchester

Since the mid-eighteenth century the gradual development of Manchester's hydraulic infrastructures has focused on modifying existing drainage in the city to allow waste water to be removed and to try to eliminate, or at least regulate, flooding; and engineering large-scale solutions to bring reliable supplies of drinking water to widening segments of the populous. Substantial material modifications to natural systems included physical culverting of river courses, construction of sluice systems, significant channel straightening or canalization, and designation of flood overflow zones. Particularly from the mid-nineteenth century onwards, large capital programmes purchased land beyond city boundaries for source reservoirs and extensive water catchments, along with networks of smaller service reservoirs, filtering works, pumping stations, ring mains and distribution systems (see Figures 6.1 and 6.2). More recently, chemical water treatment facilities have been built to deliver improvements in drinking water quality along with more rigorous requirements in processing sewage. Responsibility for these schemes shifted from relatively small private companies to local public control by municipal authorities in the mid-nineteenth century. In 1973 the giant regional public water company North West Water was established, which was privatized in 1989 and now operates as the regulated private utility company United Utilities. Infrastructural

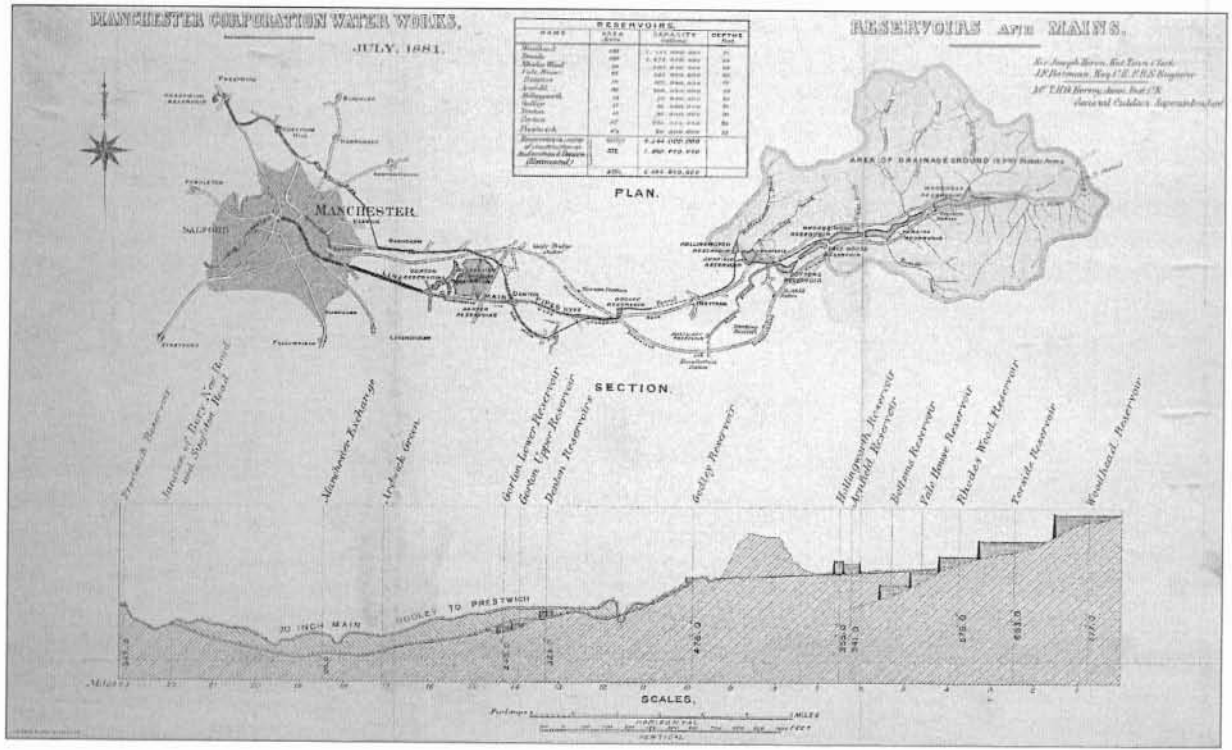

Figure 6.1 Manchester's water supply system reaching into the Longdendale valley envisioned in map, section and tabular form (courtesy of Manchester Archives and Local Studies Library)

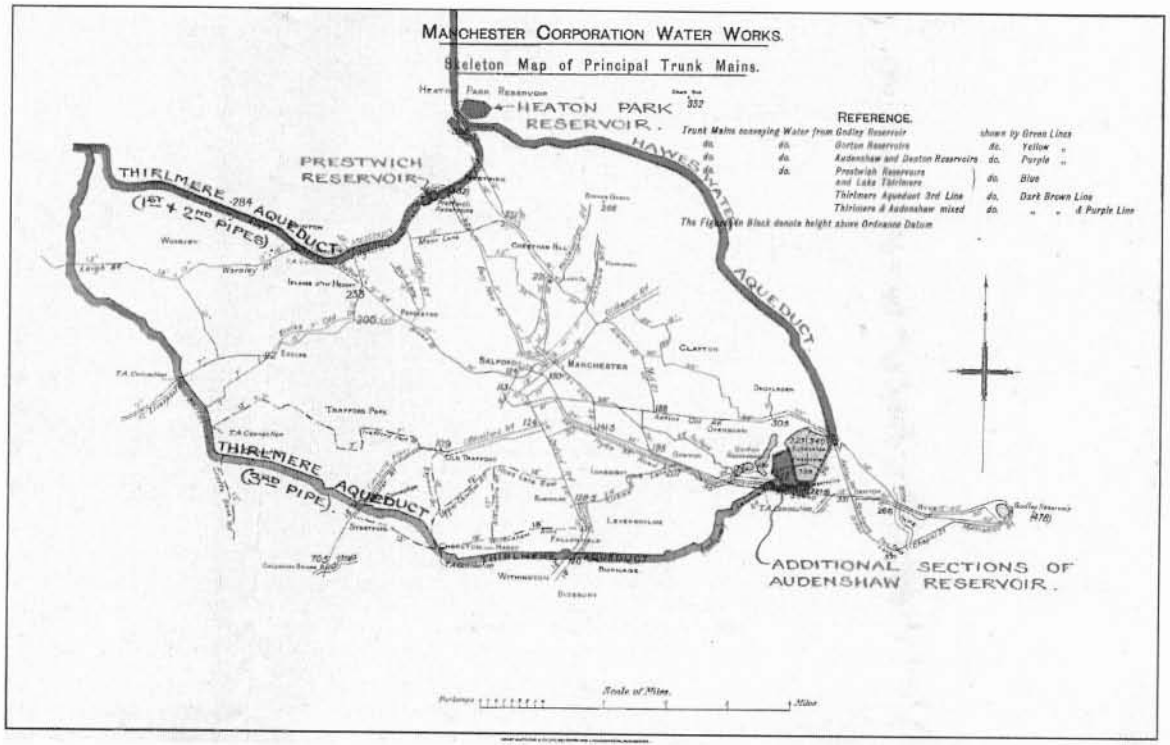

Figure 6.2 Mapping the addition of a major ring main around the city to distribute water from the Lake District (courtesy of Manchester Archives and Local Studies Library)

development and expansion partly parallels population growth and geographical extensions of the city boundaries, but was also spurred by changing expectations of basic sanitary provision and how this should delivered and managed. The incremental growth of layers of infrastructure has resulted in a complex assemblage covering many thousands of kilometres of physical pipework and tunnels, myriad mechanical objects, buildings and other kinds of managed objects, spaces and practices.

Considering the development of one aspect of this assemblage, the waste water system, Read (1979) argues that the earliest sewers in the city were culverted natural watercourses constructed in the eighteenth century. The first artificial sewers were a limited, shallow and discontinuous series of buried drains, constructed under the aegis of the Police Commissioners between 1792 and 1828, which discharged directly into the nearest river and functioned as a local solution at best. Sewer construction picked up and paralleled the rapid urban expansion of the city in the period from 1830 to 1860 (Read 1979). Deeper underground sewers began to carry polluted water further distances to river outfalls beyond the immediate urban environs. The pressures of development and population growth encouraged engineering innovation, and brick construction techniques gradually came to be supplanted by manufactured moulded clay pipes, usually ovoid or egg-shaped. Such technical improvements facilitated better flows, but jointing was prone to failure. The 1840s and 1850s were the period of most rapid growth of the system and a gradual rise in the amount of domestic sewage, along with increasing industrial waste, led to a progressive decline in the quality of Manchester's river water, especially around outfalls. Nearly 50 years passed before a partial solution to this problem was enacted, with the construction of a series of 21 much deeper and larger interceptor sewers, designed to carry effluent to two huge outfall sewers that led out of the city to a newly constructed sewage treatment works at Davyhulme, lying in open country next to the Manchester Ship Canal (itself an archetype of Victorian engineering) (see Figure 6.3). Davyhulme was constructed in 1894 and with subsequent development became one of the largest sewage treatment plants in Europe. Some 56 kilometres of these brick 4.5 metre diameter sewers were laid, and connections made between this and the local networks between 1903 and 1914 (Read 1979). A final phase, from 1911 onwards, saw a second batch of 16 new interceptors constructed, work on which was in the main completed by the 1930s. This main drainage system was, however, not designed to cope with storm flows, which were allowed to overflow into rivers. Its capacity is

Figure 6.3 Overview map of major interceptor sewers in the early twentieth century (courtesy of Manchester Archives and Local Studies Library)

still limited and construction qualities of the local network were until the 1870s not up to contemporary standards (Read 1979).

The second focus for hydraulic engineering in the city lay with drinking water supply. In the early years of industrial expansion there was only a limited engineering intervention to provide clean water to Manchester and until the middle of the nineteenth century the city relied upon local sources of water: from wells, rainwater collection systems or the nearest stream. However, the dramatic environmental

degeneration meant rapidly increased amounts of domestic effluent and industrial pollution in the watercourses (Platt 2005). The quality of river water declined to such an extent that by the 1830s de Toqueville commented on 'Manchester's fetid muddy waters, stained with a thousand colours' and likened the whole city to a cesspool (cited in Ritvo 2009: 45). In the first half of the nineteenth century the private Manchester and Salford Waterworks Company conspicuously failed to improve this situation throughout its 35-year existence, with demand for water frequently outstripping their unreliable system, and even by 1846 piped supply only provided sporadic clean water to around a quarter of households. Not until 1847, when a bill authorized local government control of the company under public ownership, did a realistic mechanism for improving the situation become possible. This saw the municipal city corporation boldly reaching out well beyond its civic boundaries into the upland hinterland of the Peak District, and enacting engineer John Frederic Latrobe Bateman's ambitious schemes for reservoirs in the Longdendale valley, connected to Manchester by an 18-mile-long aqueduct (Figure 6.1). The first Pennine water reached the city in 1851, flowing under gravity, and the scheme grew incrementally to become an impressive chain of seven reservoirs covering about 500 acres. It was finished by 1871 (Bateman 1884) and continues to supply water, working much as it was initially designed.

As the reservoirs in Longdendale were being planned and built, demand for domestic water increased. More homes were connected to a piped supply and it was becoming clear that sources nearby in the Peak District would soon be inadequate. Thirlmere in the Lake District was proposed as a second and even longer-distance addition, in the face of considerable opposition from a nascent conservation movement (Ritvo 2009). The Act authorizing the scheme was passed in 1879, and the project to dam the lake, raise its level, and construct an ambitious 96-mile aqueduct to the city was completed by 1894 (Harwood 1895). Subsequent schemes in the Lake District saw Haweswater dammed, raising its water levels significantly, and the construction of a separate aqueduct south to the city.

Mapping the hydraulic assemblage

Vast amounts of specialist mapping of these major infrastructural projects were compiled, some of which survives in archives and in published reports submitted to council committees, or as promotional booklets and technical monographs about the various schemes.

Different genres of spatial representation may be identified with specifications closely related to particular roles and scale of display. At smaller scales geographical maps envision the state of the whole system at different dates, whilst at larger scales more specialist plans detail the status of particular parts of the network: sewer maps, and detailed architectural and engineering cross-sectional drawings of dams or flood control systems reveal strongly targeted views of the system, but also suggest something of the different stories of the city, in which they played at times significant roles. Yet remarkably little has been written about the mapping of urban infrastructure. Indeed, these kinds of maps and plans receive barely a passing mention in standard guides to maps for local history (e.g., Hindle 1988; Beech and Mitchell 2004) or in the journal literature, where even the critical literature tends to regard them as self-evident icons of fact. They sit overlooked in archival collections, where they are incomplete, often hard to access and poorly catalogued, an opaque reminder of a largely hidden infrastructure. Moreover, detailed contemporary mapping of water supply and underground utilities is typically held as confidential, with overtones of security risks in their release, exacerbating the rather secret nature of the cartographic record. In this section we describe some of the characteristics of these maps as a necessary first step, before moving on to offer an interpretation of their significance.

Numerically, the sewer map comprises by far the most significant mapping effort in Manchester, perhaps not surprising given the geographical extent of the network. John and Guest (1986) provide the only useful introduction to these archived documents, and the following description draws heavily on their paper. By 1986 some 25,000 drawings and related documents survived in the archives of working records of what was then the City Engineers Department of the City of Manchester Corporation, where they were either stored in large plan books or as rolled drawings ranging from under a half to three metres in size. Many were already in very poor condition by the time the City Engineers had them photographed in the late 1980s for storage on microfilm and established a retrieval system to access information they contained. The fate of the originals of these plans is now unknown but it is likely they were thrown away.

The majority of these sewer plans are simple but high-quality monochrome documents, usually charting the line of an individual sewer and a sectional view, but also sometimes recording the name of the draughtsman, surveyor and contractor, reflecting a strong degree of professional pride in the quality of the drawings. From these plans

it is possible to identify the type of sewer, its construction details, and the date of installation. No plans seem to have survived before 1829. They sometimes show additional information like street lines or building layout, or the relation of the sewer to other adjacent underground utilities. Occasionally these plans were supplemented by hand colouring or hand-written annotations. The rationale for their production seems to have been to guide construction of the individual sewer and provide a record of what was in the ground for subsequent road maintenance. In addition to the individual detailed sewer plans there are examples of overviews of the local sewer network, usually overlain onto existing Ordnance Survey maps. A sparse style of technocratic schematic in historic mapping resonates with current sewer knowledge that now resides in the control of United Utilities, as a digital database layer draped across an Ordnance Survey MasterMap backdrop. Smaller-scale sewer maps also exist, for example to map out the location and interrelations of the much larger main drainage system instigated in the programme of interceptor sewer construction in the early twentieth century (Figure 6.3). They were produced as a promotional display to persuade councillors of the merits of ongoing capital investment and to witness the scale of engineering achievement.

The laying of water pipes across the city involved much less excavation, and detailed plan records of the historical installation of this network do not seem to have survived or been deposited into the public records. Coloured overview maps at a smaller scale chart the changing distribution of water across the city though (Figure 6.2), and map the re-scaling of supply from Longdendale (Figure 6.1) and the various large Lake District schemes (Figure 6.4). The detail of these schemes is recalled in elaborate colour and celebratory detail in the volumes published by Bateman (1884) and Harwood (1895). Here the rationale for publication seems to be much more one of celebrating the career of the protagonist authors, and the elaborate engraved cross-sectional plans of dams and reservoir chart a very different motivation from the much more prosaic working sewer maps. Various parliamentary proposals also chart the detail of these schemes in proposal form, focusing in particular on the effects on road routes, details of land ownership and needs for compulsory purchase. The format of these proposal plans in large folios, on heavy paper, with a very particular aesthetic of graphics and copious amounts of white space speaks to the need for a clear display, but also connotes the seriousness and significance of the scheme being proposed for parliamentary approval.

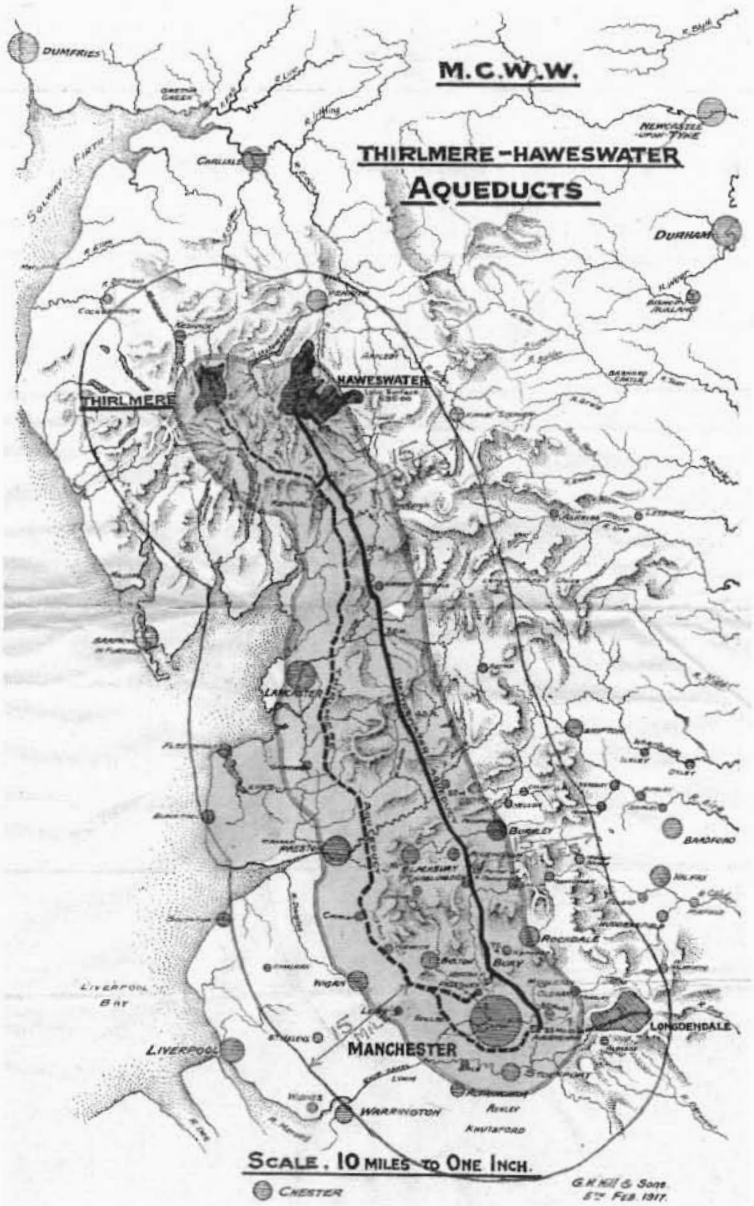

Figure 6.4 Mapping the aqueduct routes from the massive Lake District reservoirs to Manchester, 1917. The sheer scale of the hydraulic engineering being represented is impressive (courtesy of Manchester Archives and Local Studies Library)

Reading the cartographic imaginaries of the hydraulic mapping of Manchester

Precise and permanent portraits of progress, and professionalism

On one level these maps, plans and engineering diagrams might simply reflect many of the values associated with a progressive view of the history of cartography. After all, the large-scale Victorian urban engineering projects were above all else imbued with the spirit of progress: they made the future possible. Histories of cartography in this perspective script changes in the medium as an inevitable progression towards greater precision, and more mapped knowledge, painting a linear narrative of innovation, improved techniques and heroic advances. This kind of scientifically grounded perspective all too often presents the map as a universalist and thoroughly pragmatic tool to represent the world, always separate from it, and a device that can consistently simplify its complexity. The Western model of cartographic progress is assumed to be 'better' than alternatives. In this model every human being can map (see Blaut et al. 2003), everywhere can and should be mapped, and there are standardized ways of mapping and approved cartographic formats. Maps become objects embodying technocratic knowledges, a part of visual culture, but where the vision is employed to encode *useful* knowledge, even if seen as a rather mundane sort of knowing. Surveyors of reservoir sites, engineers plotting aqueduct routes and draughtsmen inscribing sewer systems in this view simply used a representation of 'reality' to communicate information about the world; and their ability to achieve this task *has* improved as advance followed technical advance. They also create an aesthetic: a kind of scientific portrait of what can be made to take place. Draughtsmen enacted the surveys to communicate a simplified view of what engineering knowledge made possible. Many of the contexts in which mapping has been deployed are, undoubtedly, useful: maps of the hydraulic infrastructure *are* now more detailed. Technologies of production *have* changed. The manuscript map was supplanted, in turn, by copper engraving and offset lithography, and photographic reproduction certainly facilitated the making of the huge numbers of sewer maps needed to cover Manchester.

The digital image of a water supply network on screen *is* more useful than the printed paper copy. It can, for example, be associated with mathematical models of flow rate, to predict in which circumstances, and where, a storm overflow will occur. Excavation can be better planned to minimize impact on streets and traffic movement. Data *do* proliferate, collected from GPS receivers, high-resolution satellite images

and automated sensors (e.g., remote rainfall and river-level gauges sending measurements back via radio). Geographic information systems (GIS) facilitate their combination and display by utility companies. New visualization techniques *do* allow different things to be imagined.

In summary, the capacity of cartography was partly confirmed by the connotations of mapping. The fact that something was mapped gave it a sense of permanence, a tangible existence. Hydraulic infrastructure was on the map literally and metaphorically, even if it could not be seen on the surface.

However, this progressive narrative largely ignores the wider social contexts and the more complex nature of the work that the map facilitates. It significantly over-simplifies everyday mapping practices as well. Cartographic representation (like the space of the city) has been rethought in many different and productive ways since the heyday of scientific cartography in the late 1970s (see Dodge et al. 2009).

Power and profit with philanthropy and probity

Social constructivist alternatives to conceptualize the nature of cartography offered by scholars such as Harley (1989) and Wood (1992) focused attention away from the map as practical artefact and onto the political work the objects achieved. The power of maps lay in their ability to affirm with certainty a link between place and a particular interest (Wood 1992). Maps of Manchester's hydraulic infrastructure in this view can be seen to embody cert ain interests above others, often associated with governance or control of the city and its functions. A Foucauldian reading of their role sees such mapping as a significant part of the great sanitary reimagining of the city, necessary because they allowed new modes of rational management of human subjects to be instigated. These maps did not directly discipline their subjects, but they certainly underpinned construction and maintenance of infrastructures which were central to the 'rule of freedom' (Joyce 2003). Municipal governance and the ethos of civic improvement required new ways of living to be fostered. Hydraulic infrastructure was one of the key mechanisms for delivering urban change and these large-scale schemes (which took years to realize) had to be imagined by mapping their possibilities.

Profit was made in and by the process of mapping: profit for the manufacturers of pipes, for the water companies, and for the local authorities able to charge water rates once natural supplies had been imagined into real commodities in the mapping. There was profit too for the surveyors, and for the draughtsmen employed to visualize what could be achieved; profit for the engineering contractors and suppliers

of materiel; and profit for the raft of commercial enterprises that came to depend on the new urban infrastructures that were more affordable and reliable. So in this view specialist genres of cartography were invented to solve particular *social* tasks, which were closely associated with the continuing process of capital accumulation. The various kinds of network cartography, aqueduct charts, promotional diagrams and sewer maps described above were each examples of power-knowledge, deployed to achieve the social work of fostering a more genteel, cleaner and healthy city, or promoting the interests of one point of view or another. Importantly, however, they all *depended* on an underlying economic motive.

Semiological approaches to cartography have allowed meanings of coded imagery to be unpacked; apparently neutral authoritative genres of representation may be unmasked as myth (see Wood and Fels 1986 on maps; and Dobraszczyk 2008b and Medway and Clark 2003 on building design plans). This kind of reading of engineering drawings or individual sewer maps might, for example, highlight their deliberately minimalist and abstract visual rendering of places on the plan view and cross-section as a denial of human context, and argue that the simplification and omission of the social life of the city reifies the civil engineering and functional status of the construction. A schematic network plan might be unpacked as a reduction of the emergent hybridity of the city to a knowable, controllable physical system, through which could flow the unmentionable outcomes of metropolitan life. The hidden function in the diagrams might then be seen to mirror the literal hiding of the infrastructure beneath the city streets. On the other hand, the lavish coloured plans of reservoir infrastructure published by Bateman (1884) and Harwood (1895) could be read easily as affirming the power and achievement of the heroic figures funding their compilation and publication, whilst also celebrating the precision of the engineering science and the aesthetic skills of the engravers and colourists.

The construction of this visual knowledge itself was disciplined: specialist skills and bureaucracies were needed to maintain and devise these coded artefacts of cartographic progress, and they developed their own 'professional visions' (Goodwin 1994). Cartography and surveying, and more recently remote sensing and GIS, invented standardized practices to protect their emerging disciplinary power. These expert fields of knowledge played a role in standardizing the visual forms through which they expressed their ideas. City authorities traded on this emerging specialization in the tendering processes for the contracts to build interceptor sewers, where expert visualizations of schemes in mapped

form were important rhetorical devices deploying established, visual and expert knowledge to win the contract (see Dobraszczyk 2008a and 2008b for an analysis of this process in London).

Performance and practice

More recent theorization has shifted attention away from the cartographic object and from the political work it achieved, or from decoding its semiological patterns, towards the ways in which mapping might be performed (Crampton 2009), and towards the cultures and everyday contexts in which it is deployed (Perkins 2008). Several different kinds of critical cartography are emerging that can usefully interpret the processes of deploying hydraulic mapping of Manchester. Contexts *around* mapping become crucial to the deep explanation: the social activity in which the map is enrolled matters, the places where it is deployed makes a difference, and the historical moment it is part of constitutes the memories, meanings, actions and work occasioned in this unfolding process. So instead of a map representing an interest, or necessarily carrying immutable knowledge to a new location (see Latour 1987), it is seen increasingly as taking on an agency of its own, with a social life, called into being when the need arises to be part of a particular social task (Del Casino and Hanna 2005; Kitchin and Dodge 2007).

There is a need to understand how the same map might be deployed to help build a sewer, maintain it, to recall a sewer repair task, or to plan an imagined new extension to the network. For the draughtsman it might have been the means to gaining a living wage but also a channel through which aspects of creativity could be displayed: a source of pride. It might now be actively enrolled to subvert or imagine alternatives, sometimes for fun and in play as well as for work, perhaps in an illegal urban exploration of what, for some, is an intriguingly concealed part of the urban fabric. It might be acquired by a collector, amassing a private accumulation of materials, fetishistically knowing the past through a quest for placed proxies of its achievements. To the archivist in whose collection it now resides it might be an artefact to be guarded with care or as a source of worry, given space constraints and the budget cuts that leave material embarrassingly uncatalogued. It might become 'lost' in a drawer gathering dust, be framed as a 'pretty picture' on a boardroom wall, or used as a practical tool by contemporary engineers grappling with a problem. It will be part of different narratives (see Pearce 2008), evoking different affective powers (see Kwan 2007). The mapping of urban hydraulic infrastructure in Manchester here becomes so much more than either a scientific transcription or a purely political

device. The frequently quoted view of the rhizomatic nature of cartography seems particularly appropriate for these maps of hidden but often buried infrastructures:

> the map ... constructs an unconscious ... is open and connectable ... detachable, susceptible to constant modification. It can be torn, reversed, adapted to any kind of mounting – reworked by an individual group or social formation. (Deleuze and Guattari 1987: 12)

Epilogue

Our argument in this chapter sought to distinguish mapping as a process strongly separate from other aesthetic endeavours that strive to make powerfully naturalized and tangible scientific visualizations of the engineered environment. We conclude, however, that different groups will deploy the same spatial representation in very different ways and that immutability as a figure explaining the role of mapping as a discourse is increasingly being replaced by mutability. Neutral separation of maps as representations fails to account either for the social power they evoke or their active and powerful embodied performance calling different cities into being. The many different Manchesters matter in the construction of memories of the city, but mapping itself is an active agent in many fields of social life. So rethinking hydraulic mapping of the city echoes rethinking the urban as practice and its infrastructures as emerging within a situated and geographically specific political ecology.

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