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Hard Water: Politics and Water Supply in Milwaukee, 1870-1995

Kate Foss-Mollan

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Hard Water

POLITICS AND
WATER SUPPLY
IN MILWAUKEE,
1870–1995

KATE FOSS-MOLLAN

PURDUE UNIVERSITY PRESS

HARD WATER

History of Technology Series

HARD WATER

Politics and Water Supply in Milwaukee, 1870–1995

Kate Foss-Mollan

Purdue University Press
West Lafayette, Indiana

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Dedicated to Mike Mollan

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CHAPTER 1

A BRIEF LOOK AT URBAN WATER SUPPLY

Water is essential to life—the life of a city as well as the life of a human being. Without water, a man dies. Without water, a community suffers the same fate.—Leonard Scheele, U.S. Surgeon General, Report to Congress, 1952

Access to water is necessary to the modern way of life. The interruption of a city's water supply would have immediate consequences. Water rationing would be instituted to provide minimal supplies for drinking and cooking until sources from outside the affected area could be obtained. In the interim, manufacturing would have to shut down, bathing would cease, dishes would not be washed, toilets could not be flushed. If the supply were not quickly reestablished, foodstuffs requiring water for preparation, such as coffee, tea, juice and locally bottled soda and beer would become unavailable. Disease would soon appear as sewage remained unprocessed and pathogens were spread through insect or rodent vectors. Electricity and heat would cease to be available as power plants would be unable to function without water cooling systems. Media coverage of recent episodes such as the Mississippi

Valley floods of 1993, the Milwaukee *cryptosporidium* episode, and the siege of Sarejevo have brought before the public the concept that a city's water supply can be its most vulnerable point.

Considering the severity of the situation above it is somewhat surprising that until the last three decades urban water supply was a subject in which there was little public interest, although scholars wrote largely unread works on the subject. In the last fifteen years, publicity regarding chemical and biological contamination of drinking water sources forced the issue to public notice, yet it can be argued that the issues involved in urban water supply policy are still not fully understood, even at the political decision-making ranks of local and national government.

The ways in which urban water supply is regarded by those in control of its purification and distribution can reveal much about local attitudes toward a city's individuals, companies, and manufacturers. Additionally, decision-making processes about water supply can have repercussions for public opinion and confidence in local government. Water supply can affect the growth of a city, particularly when it is available in a central city and not in surrounding communities. Finally, the response of water professionals to manufacturing, commercial, and resident concerns over quality and quantity of water available can affect the stability of a city's industrial and financial base. Throughout history, availability of water in urban areas has been shown to affect all these areas, yet it is rarely considered as a major reason for relocation of any person or company to an area. Imagine, however, the repercussions if something should go wrong with a city's water supply.

This work seeks to examine the history and practice of one city's water supply and to interpret from that history how and why policy decisions regarding water supply were made. It is hoped that comparing this history to that of other cities at similar stages in their development will lead to a greater understanding of the process involved in designing and implementing urban water supply. Additionally, in areas where there are common difficulties, the evaluation of various solutions to these difficulties may provide insight for those cities involved in planning new water systems or altering existing ones.

The establishment of a permanent communal water supply is generally considered to be one of the two defining characteristics of a Neolithic culture.¹ In most areas, systemic agriculture requires a steady

source of irrigation water to ensure minimal crop loss during periods of infrequent or erratic rainfall. Therefore it is not surprising that the earliest records of water supply refer to irrigation rather than drinking supplies. While a single well might supply the domestic needs of a village, the larger quantities required for production of grain and fruit crops would necessitate the invention of irrigation canals, reservoirs, and water-lifting devices. Depending on the reliability of these sources, villages might produce enough surplus crops to allow for an expansion of the division of labor, leading to increases in population. Natural agricultural cycles, including climatic variation, insect migration and channel migration in river beds might cause these newly expanded villages to revert to their earlier states or to be abandoned altogether. It is therefore reasonable to expect that the villages that eventually survived to become cities, and later city-states, were those blessed with water supplies subject to minimal variation. Thus we find clusters of cities on the banks of the Euphrates and the Nile² or, less commonly, where copious supply could be obtained from local springs. Jericho, one of the first Neolithic cities to obtain that designation, flourished due to an artesian well.

J. G. Landels's classic work on early technology, *Engineering in the Ancient World*,³ describes the pattern that most cities took in the development of water supply. As cities expanded, the technology invented to ensure adequate irrigation for crops became utilized for domestic purposes within cities. Continuous-flow privies have been found in palaces and houses of the wealthy from as early as the third millennium B.C.E.,⁴ indicating a realization of the potential for pollution of the water table of household wells. By the second millennium B.C.E., technology had advanced to the point where aqueduct systems could be employed, leading to an expansion of domestic water use that included bathing, cleaning, and ornamental uses such as fountains, at least for the wealthy.⁵ The palace at Knossos was supplied by an aqueduct that brought spring water from seven miles away, carried under the palace floor by jointed terracotta pipes. El Amarna in Egypt (ca. 1400 B.C.E.) had individual household wells for drinking water, and aqueduct supply for bathing, sewage disposal, and cleaning uses. Biblical citations include the aqueduct and reservoir of Jerusalem, built around 1100 B.C.E. and primarily constructed to provide drinking water for humans and livestock in times of drought or war.⁶ These systems were primarily gravity fed, since the ex-

isting devices for raising water were cumbersome, slow, and required a large input of human or animal labor.

Landels describes the water-lifting technology that became possible in the first millennium B.C.E. as “absolutely necessary for the continued progress of mankind.” These devices, primarily forms of pumps, made it possible for hundreds of liters of water to be lifted per minute, as opposed to the two to three liter per minute limitation of most Neolithic devices. The placement of several of these devices, whether in series or parallel, allowed the construction of aqueduct systems capable of supplying, at least in part, for the domestic needs of all the cities’ inhabitants. Athens, Sparta, and Babylon all had documented water systems, most likely paid for from booty captured in warfare.⁷

The recent work of Dora Crouch reveals that the Greeks, at least, had sufficient knowledge of climatic changes in the water cycle to adapt their water systems to the seasons.⁸ Athens had sufficient supply in the wetter months to allow users to store the excess in cisterns and use it during the times when the piped supply, which was spring water, was only sufficient for drinking and cooking purposes. Drainage water from roofs and pavements was funneled to sewers, and fountains were equipped with shutoff valves allowing the city to cease their operations when supplies were at their lowest. Her work cites much of the other classical sources on ancient water supply, notably Hill and Robinson’s study of Corinth and Camp’s work on Athens. These sources, particularly those which focus on planned cities such as Syracuse and Pergammon, indicate that the Greeks took account of water needs in the planning stages, placing commercial sites and other large-scale users on lower ground to make most efficient use of gravity. This multiple source and multiple use of water in Greek cities permitted a more complete use of a limited resource.

It would take the Romans, however, to develop the large-scale urban water system to its fullest extent in the ancient Western world. The development of Rome’s water system is well documented. In providing water for a city population of nearly one million, Rome would presage and solve many problems of water supply that would plague cities of the future. Rome would set the three-stage pattern that all other cities would follow in establishing water supply, namely: establishing an initial source of supply and setting up distribution; expanding sources when demand grew too great for the initial stage; and searching for ways to maintain purity of both source and supply.

Romans initially obtained their water from wells and springs and later from the Tiber. Since the Tiber was also the outflow for sewage and runoff, by the fourth century B.C.E., four hundred years after the founding of the city, this source had become inadequate both for quantity (the Tiber is heavily dependent on seasonal rainfall) and from pollution resulting from human and industrial waste. In a city that was becoming increasingly reliant on its slave population, and that was becoming a city of landless proles, it was necessary for the controlling senatorial classes to provide water in order to keep peace. Additionally, the expanding business of the entrepreneurial equestrian classes often required water supply far in excess of what was available from the Tiber, even during the rainy season. As these classes rose in rank and power and entered the Senate, they began to press for increased water supply.

In 312 B.C.E., Appius Claudius Caecus, censor of Rome and independently wealthy, even by the standards of the day, sought to remedy this inadequacy by constructing the first of Rome's aqueducts, the Aqua Appia. Using a gravity feed system, spring water was conveyed almost seventeen miles through underground tunnels and pipes into the city. It emptied into a large basin, from which all citizens could obtain daily supplies. Appius paid for the initial construction, but donated the work to Rome on the understanding that maintenance expenses would be paid for by the sale of water to baths and other commercial users, and from other public sources. Six additional aqueducts had been added by the reign of Augustus to supply the rapidly growing population, estimated to be approximately one million at the end of Augustus's reign. By this time, a major problem with the water supply was not its quantity, but rather its lack of quality. Settling basins were added at the points where the water from the aqueducts entered the city, and the settled water was then lifted by pumps to distribution towers, from whence it could flow into the city. For public use, much of the water was directed to a public fountain, from which it could be drawn by any individual. For those who lived at a greater distance from the fountains, the *aquarius*, or water carrier, could be hired to deliver a daily or weekly supply, even to those on the upper stories of Rome's many apartment buildings. Baths and other commercial customers received a separate supply directly from the distribution tower, usually piped through terra-cotta or lead pipes. Wealthy or powerful individuals could obtain permission to tap into the distribution line to procure household water. These pipes were probably

lead.⁹ When the settling of the water failed to solve the purity problem, it became necessary to locate new sources that were of greater purity.¹⁰ Seven more aqueducts were constructed to improve the supply, and their water was mixed with that of the others in an effort to gain maximum purity without sacrificing the quantity.

Water usage was supposedly strictly regulated by senatorial, and later imperial, decree as to type of use and size of building. The fee schedule reflected the difference. By the time of the emperor Nerva (ca. 92 C.E.) fraud was rampant in this area. Julius Sextus Frontinus, water commissioner of Rome and the author of the classic source *De aquis urbae Romae*,¹¹ found that many households and businesses had paid for the smallest size private pipe but had later replaced it with larger pipes and were drawing water far in excess of what was permitted. In addition, the freemen administrators at the water office had changed the valves at the settling tanks and distribution towers, allowing baths and commercial customers to receive a larger percentage of the total supply than was permitted. These valves were constructed so that in times of fire or drought use by commercial sources could be discontinued until the emergency ended; Frontinus directed that the valves be returned to their original state, the administrators responsible for the fraud be sold back into slavery, and the customers responsible heavily fined.

Theodore Ashby and E. B. Van Deman discuss the construction of the Roman aqueducts.¹² Van Deman estimates that by the time the last one was constructed, the system could deliver over 35 million gallons per day, some of which was recycled. Baths were required to vent their used water into the Roman sewage system in order that waste products from Rome's many public latrines could be flushed well down the Tiber. Water for fire fighting was partially obtained from rainwater cisterns that all households were, by law, supposed to maintain. Since rainwater was preferred for laundering and other cloth processing, these cisterns were often unable to fulfill their purpose. Water from the public fountains was rarely used because of the difficulty of raising it to the upper stories of apartments, which were the most frequent locations for fires. Mostly, the Romans tried to prevent the fire from spreading, but beyond that, they simply let it burn out.¹³

The Romans exported their technology wherever they built cities. During the early Middle Ages much of their water supply technology would be lost, but rediscovery of both Vitruvius's work on the construc-

tion of water systems¹⁴ and the remains of the Roman distribution system in London and York would help these and other cities meet their water needs as they began to expand in the High Middle Ages.

London is perhaps the best-known example of a medieval city that tried to deal with its water problems in a reasoned and practical fashion. In *The Story of Water Supply*, F. W. Robins shows that by the twelfth century, the wells located within the city walls were heavily contaminated. In some cases these wells had been drilled on the site of Roman cesspits, but the major source of contamination probably arose from the dual habits of dumping animal and human waste in the streets and burying the dead in churchyards, even when that churchyard also contained a well site.¹⁵ By 1200, the population had become aware of the lack of purity of the intracity wells and was heavily patronizing those in the wards just outside the wall. Despite the existence of the Fleet, Walbrooke, and Oldbourne Rivers within the city, the practice of utilizing these potential water sources as sewers and as disposal sites for butchering and tannery wastes had made them even more unpalatable than the wells. As the population of London rose sharply in the thirteenth century, the supply from the extramural wells became inadequate to meet demand.

Water from the Thames was available, although deemed of lesser quality than the well water, and it was marketed in the city by water carriers reminiscent of the Roman *aquarii*. During the early years of the thirteenth century, the London mayor and council made several attempts to attain a pure source of drinking water, but the necessity of dealing with the attendant political upheaval of the day was such that little effort, and less money, could be spared to address the issue. A wealthy merchant finally saved the day in 1264 and granted freely to the city his wells at Tyburn, three miles to the northwest of the city walls, to provide a clean source of supply.¹⁶

The source secured, money suddenly became available, and the council constructed a conduit to bring the water into the city, where it would empty into a basin and be available for everyone to take. Brewers, cooks, fishmongers, and other commercial users were assessed fees for use of the water and were prohibited from using it during periods of short supply; these fees were collected by the warden of the conduit and used for maintenance of the system.

By the fifteenth century, the additional water provided by the con-

duit proved insufficient, and over the next two centuries, fifteen additional aqueducts were constructed.¹⁷ As the population continued to grow, it became more difficult to secure a pure supply, as previously unsettled areas attracted industry, farmers, and residents, thus polluting potential sources. The population within the city consumed greater quantities per capita than in earlier years; in 1438 the city granted residents the right to make individual hookups to a conduit and receive water directly in the residence or place of business. As in Rome, this proved to be a constant headache to the warden of the conduits, as he was required to hold daily hearings to address complaints regarding customers who were overdrawing their allotments. A particular culprit was the brewers, who, despite having individual hookups, would send apprentices to the conduit heads to collect additional water, thus depriving households and individuals of their share. Brewers were banned from drawing water from the common basins in 1457, but the recurrence of the complaint in the records indicates that the ban was an insufficient response to the problem.¹⁸

Henry Dickinson, in *The Water Supply of Greater London*, describes how London met the challenge of its water needs. By the late sixteenth century, demand had increased to the point where there were regular shortages of water every summer. At this time the city began to look at the Thames as a possible solution to London's water problems. Advances in pump technology now made it possible to use the river as a major source because the pumps could push the water uphill to the city, whereas previously, gravity-fed systems had demanded it be fed downwards from a greater height. In 1582, the city contracted with Peter Morris to install a water-wheel powered pumping station under London Bridge to supply water to the city. Morris received fees for his expenses¹⁹ and was to receive 25 percent of the fees paid for water delivered to private customers. In return, he was to furnish to the city all the water necessary for firefighting, as well as maintain the basins where the poor and indigent could obtain their water for free.

In 1592, the city, finding that Morris's works were still insufficient to meet demand, even after the addition of a second pump at the bridge, contracted with Bevis Bulmer to construct and operate a second pumping station at Broken Wharf, about two miles upstream from London Bridge. With both stations operating, water was delivered to more sections of the city, and at greater pressure, than had ever been done be-

fore. Despite these successes, the expansion of the population beyond all previous boundaries stimulated demand for yet more water. The Thames, dumping ground for sewage runoff and industrial wastes, was deemed less than acceptable as a source, and the choice was made to look for alternative sources to the north of the city.

In 1609, Hugh Middleton, contracting with the city for New River Company, completed a thirty-eight-mile canal linking London with the River Lea to the north. A second private company, the Chelsea Water Company, began operations in 1721 and was joined by the Lambeth Waterworks in 1783. All of these companies were able to greatly increase the volume of water they delivered after the introduction of the steam engine in 1794. While more costly than a water pump, the steam engine could be operated night and day and did not depend on water levels or tidal flows. By 1822, five more private companies would contract with the city to supply water to various parts of the metropolitan area, not all using such presumably pure sources as the River Lea. In 1822, London received about 28 million gallons per day from these eight companies; about 13 million were from the northern sources and the rest came from either the Thames or the underground stretch of the Fleet River as it flowed under the city.²⁰ The problems of dealing with urban water supply would be carried across the Atlantic as colonial and, later, American cities had to struggle with the same issues that had faced London and Rome.

Both London and Rome were able to provide water due in large part to the generosity of particular members of the propertied and monied classes. The capital expenditure for the construction of a water distribution system far outstripped the financial capacity of most medieval and early modern cities; it would take the development of the private company, generating funds through the sale of stock, to enable cities in the modern era to provide the services that had been available in the earlier cities. As shown above, this was necessary for London to meet the water needs of its expanding population in the seventeenth century. Such a system would also dominate the early years of water supply in American cities.

The history of water supply in American cities is excellently told by Nelson Blake in *Water for the Cities*. American cities began to realize that they had problems regarding water supply in the latter half of the eighteenth century. Population growth had greatly increased demand for

water, but the corresponding pollution from sewage, decaying human and animal bodies, and retardation of run-off replenishment of the ground water table meant that even the existing sources were of dubious, if not plainly dangerous, character.

The relationship between disease and water supply was poorly understood; physicians were aware that bad-tasting or smelly water was unhealthy to the body but were unaware of bacterial and microbial water-borne disease. The development of germ theory and the identification of the typhoid and cholera bacilli were nearly a century in the future. The most reasonable theory, according to these colonial physicians, to explain the periodic outbreaks of yellow fever that plagued the eastern seaboard in the 1790s was a miasma of bad air, resulting either from hygienic conditions or brought along on ships from the West Indies. Medical debate arose on the specific cause; the remedy proposed by both sides required the flushing of street filth and the encouragement of bathing and other hygienic rituals.²¹

Like London in the early Middle Ages, most American cities were served by wells. Some had better reputations than others, and water carriers would deliver this “pure” water directly to households for a modest fee. Small towns had often been able to finance and construct water distribution systems, usually on a cooperative system,²² but these small-town patterns would not be sufficient to supply the needs of the urban areas. Once it was determined by the governments of New York City, Boston, Philadelphia, and Baltimore that an improved water supply was a necessity, the remaining debate centered on whether these water systems should be municipally or privately funded.

London’s recent success with private companies was more familiar to the American cities, yet that success was due in large part to the early municipally funded system that had flourished during the medieval period. Rome’s system, apparently municipally funded, had been possible only because of the generosity of wealthy Romans who had borne the heavy costs of construction and only then turned the infrastructure over to republican and, later, imperial management. Lacking citizens of great wealth, the cities could only follow the example of Rome if they were able to concede that the construction of water works was imperative to the degree that money could be found from the usually straitened municipal coffers. Failing this, private enterprise would have to be relied upon to provide the necessary services.

In Boston, New York, and Baltimore, private enterprise won the day. In part because the councils of those cities were unable to commit to municipal funding of water works, whether from lack of political clout or because these cities were near to or at their allowable debt limits, investors and entrepreneurs were the first to introduce water supply in these cities.

Boston's example is perhaps the simplest. In 1794 a group of investors petitioned the city council for permission to incorporate, the function of which was to provide a piped water supply from Jamaica Pond, about four miles to the southwest of Boston. These investors hoped that many householders would subscribe for shares, thus guaranteeing themselves a lifetime of free water. Given the costs for home delivery of clean well water, this assumption was not unreasonable. The further hope that dividends would be paid to stockholders once the construction was completed and other customers subscribed took a little longer to realize. The investors in what was now known as the Aqueduct Corporation delivered their first water to customers in 1798, but it was not until 1807 that dividends were paid, and then at a rate of only 1.5 percent.

Over the next thirty years the price of stock would slowly rise, along with the dividends paid, reaching a cost of \$1,300 per share and a 4 percent annual return. The major reasons for the early lack of return were that the initial investors had seriously underestimated both the costs of maintenance on the system and the cost of providing water free to the city for hygienic and fire-fighting purposes. Further, Bostonians discovered that even with a large source such as Jamaica Pond, both the pumps used for pushing the water into Boston and the pipes through which the water was conveyed were limited in size. This in turn limited the size of the area that could be served from the source and further limited the number of new customers who could sign up for the service.

Baltimore's experience was somewhat more complex. In 1798 the mayor and council authorized a committee to examine possible sources from which water could be conveyed into the city. Upon receiving the committee's recommendations, the mayor then pushed through a second committee, consisting of himself and seven leading citizens, to contract for rights, construct a pumping plant and distribution system, and contract the necessary funds or secure debt limits to allow for the construction of the works. While the private citizens on the council were expected to lend their financial and business expertise, the works were to be municipally owned.

Problems arose from the beginning. Ignoring the earlier committee's site recommendations, the implementation committee settled on yet another site and began to contract for plant construction and pump engine manufacture before they had obtained written consent of intent to sell from the landowner on whose property the selected spring was located. When the owner revoked his oral consent, the city was unable to continue with its plan, as any other access to the land was blocked by the right-of-way guaranteed to the turnpike road to the north of the city. The mayor and committee, having authorized expenditures, were forced to pay out of their own pockets the costs which they had incurred. Realizing that a successful future outcome would depend upon the city obtaining the rights to seize property under eminent domain and to finance the works through city funds, Baltimore applied to the Maryland legislature for power to both condemn property and raise the debt limit. In the delaying fashion to be shown in New York and Philadelphia, the state politicians failed to act until the shock of the 1800 yellow-fever epidemic moved them to grant the city the powers that had been requested.

It was then the turn of the city to procrastinate. Although a board of commissioners was appointed to look into the water situation, it was more than three years before the board reported that, sadly, the problem of obtaining necessary water rights was too complex to be dealt with, even with the extended powers granted by the legislature. Back where it had begun in 1798, the city advertised for venture capitalists to finance and construct a water system. The Baltimore Water Company was founded in a similar fashion to the Boston Aqueduct Company. Shares could be subscribed to, the estimated dividends of which would pay the expected water charges. From the beginning, insurance companies bought large amounts of shares, not only in hopes that the establishment of a water system would reduce their fire liability, but in the hopes of a good return on the initial investment.

Even after all the shares were subscribed, there was a delay before construction could begin. Fearing a diminution in its recently granted powers, the city delayed granting the necessary approval for the company for almost four years. During this time, the special authority to raise the debt ceiling and condemn property that had been granted by the legislature lapsed, and it was necessary for the company to directly approach the state in its attempt to carry out its stated function. After wrangling over the allowable level of stock subscription and the manner in

which directors of the company were to be selected, final approval was granted in December 1808.²³ Water actually began to flow in May 1809, almost ten years to the day after the city had first undertaken the task of providing water supply.

The story of New York is more closely tied up with politics than in the other eastern seaboard cities. Because of its rapid growth, water quality was more of a problem in New York than elsewhere. Even before the Revolution, the need for a larger supply, and one that was higher in quality, had been recognized. The war and its attendant expenses left a tax burden on the citizens too high for funding a municipal water supply into the 1790s. Prejudice against a private-enterprise system ran high, most residents preferring to believe that such a system would benefit only the corporation, and not the city inhabitants for whom the water was ostensibly being supplied. Several proposals were placed before the mayor and council in the last decade of the eighteenth century; to one²⁴ the council replied: "considering the immense Importance of the Subject to the Comfort & health of their fellow citizens, that it will not be undertaken by a Company unless upon the Prospect of considerable Gain: and that such a Gain must be acquired at the Expense of the City, your Committee have at length agreed that the Undertaking ought to be pursued by and under the Controul of the [municipal] Corporation as the immediate Representatives of the Citizens in General."²⁵ Yet within six months, water supply for New York would be in the hands of perhaps the strangest private utility ever devised.

In January 1799, about two weeks after delivering the above comment, the city petitioned the state legislature for permission to condemn property, raise the debt limits, and to be granted the auction duties for the district in which the city was located as the means to fund a municipal water works. State Assemblyman Aaron Burr, chairing the special committee which was to oversee the request, enlisted the help of Alexander Hamilton and four other leading citizens. Informing the city that there was doubt in the minds of many legislators of the city's ability to manage the proposed system on a long-term basis, he suggested that they allow the legislature to determine what the best course of action would be for the city to follow. Burr's committee answered the council's request for a written statement with an unsigned memorandum, later found to have been authored by Hamilton. In response, the council redrafted its proposal as requested, and the committee returned to Albany.

By delaying action on the request until the last two days of the session, Burr was able to pass his version of the waterworks bill. Instead of a municipally funded works,²⁶ a charter for an institution to be known as the Manhattan Company was approved. The company was to be limited to two million dollars in initial capital stock, had broad powers to seize and condemn land for the purpose of creating a water works, and had a ten-year time limit in which to deliver the water. Most remarkable was the section near the end of the charter that permitted the directors of the company to “use such surplus capital . . . in the purchase of public and other stock, or in any other monied transactions . . . for the sole benefit of the company.”²⁷ Burr and his colleagues had just commissioned what would become the Chase Manhattan Bank, the only bank at the time not under Federalist control.

The company did, however, provide water. Rejecting the plan that the city had submitted to pump water from the Bronx River to a filtration plant, then to a reservoir, and thence to customers, the company found it more expedient, and cheaper, to use the old Colles well as a source and construct a reservoir about one-eighth the size proposed. Fees were set on the basis of the number of fireplaces a building contained; separate rates were assessed for business and commercial properties. The company confidently assumed that these fees would reimburse it for construction costs and generate dividends on the initial stock purchases.

It was doomed to disappointment. The use of bored wooden mains required constant repair, and the mains leaked profusely. Those connected to the system generously allowed their neighbors free water, and people in areas near old well pumps preferred to continue to draw their water from those sources free of charge.

Customers also had complaints. As the water table supplying Colles well was drawn down, those in higher areas of the city could get no water. Additionally, the city had contracted for water to flush the streets, but this too was unavailable. As early as 1804, the city realized that the Manhattan Company’s water supply was inadequate to meet the needs of the city, but effective steps could not be taken to ensure other sources of supply because of the stipulation of the company charter. The company interpreted the ten-year limit clause as the primary foundation upon which its banking charter was based. Allowing competition, they felt, would remove this support and lead to the revocation of the most liberal banking charter in the country. Predictably, the company vocifer-

ously fought any attempts of other companies to provide water. While the water business was expensive and offered a very low rate of return, it was the foundation on which the very profitable banking portion of the business rested. The company managed to not only defeat attempts to charter additional companies; it managed to get its charter renewed for a further thirty years.

Philadelphia suffered as greatly from yellow fever as did the other cities on the eastern seaboard. In 1798, the city resolved to solve its water problems but ran into difficulties with a private company. The Delaware and Schuylkill Canal Company had been granted a charter to construct a canal between the two rivers for the purposes of navigation. It was deep in debt in 1798, unable to attract new investors or to force the investors that it had to contribute further to construction costs. Originally scheduled to have been completed in the spring of 1798, the canal was far behind in construction. The city, after rejecting the Delaware River as a water source, resolved to use the waters of the Schuylkill. The company asserted that the best plan was for the city to invest in the canal, which, when completed, could deliver all the necessary water. Latrobe, the engineer hired by the city to oversee the construction of water works, pointed out that it would take two years for the canal to be finished, leaving the city open to the threat of yellow fever. Further, the canal would be unusable as a source for several months a year from ice blockage.

The city agreed with Latrobe and authorized the sale of bonds for construction of a waterworks. Several times during the construction, financial problems almost stopped the process. The bonds were under-subscribed, costs were greater than expected, and the authorization of a special tax that allowed construction to continue brought ridicule on the city. It became necessary for the city to issue two more bond subscriptions and to sell a bridge and a ferry to private investors to raise the necessary money. Yet the project survived and was formally opened in January 1801.

Financial problems would continue to plague the system. Subscribers to bonds were guaranteed water for three years at no charge, and other paying customers were slow to enroll. As a humanitarian gesture, the works had been designed to provide the poor with the water at the ends of street mains; anyone could simply fill their bucket for free. The existing pumps and wells in the city had not been removed, and many preferred to continue getting their water from a familiar source, which

was colder, if much less pure, than the tepid waters of the Schuylkill. Repair bills for pipe replacement and road repair remained high, as the use of iron mains was rejected on the grounds that a supply would be hard to obtain. Finally, the steam engines themselves incurred a much greater expense than had been estimated. Grossly inefficient, the engines consumed huge amounts of coal and frequently broke down.

Difficulties were gradually resolved. New engines were obtained that were more efficient and reliable. Water rates were raised, and a system for collection was installed that made sure bills were paid. A new system of administration was devised that eliminated bureaucratic conflicts between the superintendent of the works, the engineer, and the pump house operators. New hydrants were installed that prevented passers-by from draining usable fire-fighting supplies. Despite all its problems, Philadelphia had shown that it was possible for a city to provide water to its inhabitants. In the next half century, it would be recognized that this was in fact a responsibility of a municipality, rather than of a private company. Philadelphia's experience would set the pattern that other American cities would follow, leaving behind the reliance on private enterprise for large-scale public works.

In the next half century, New York, Boston, and Baltimore would cease their reliance on private water supply and convert to municipally owned and operated systems. New York, with perhaps the most severe problems due both to its rapid population growth and the dangerously poor quality and amount of water supplied by the Manhattan Company, was the first to make the change, although it was a thirty-year process. The specific history of New York's water system is told in Charles Weidner's *Water for a City*²⁸ and details the political, financial, and engineering details of the change. The major difficulty for the city lay in the troublesome charter of the Manhattan Company. Granted the right to use the waters, both surface and underground, of Manhattan Island, the company's monopoly meant that any potential competitor had to search much farther away to secure a source of supply. Even when this was done by a number of potential investors, the company argued that as long as it was indeed supplying water, other charters to augment supply would violate its rights to exclusivity. Arguments back and forth involving the company, the city, and potential new water companies occupied a significant amount of the legislature's time in the years between 1807 and 1832. Attempts by the city to purchase the waterworks divi-

sion from the company were challenged by both the company, which held out for a much higher price than the city was willing to pay, and by citizens, who felt that the company had already received more of their money than was necessary. Customer complaints abounded in the early years of the century in the areas of quantity and quality. Even when water was available (which, due to leaking or broken mains, drying wells, engine repair, or other reasons, it frequently was not), the purity was less than desirable. Numerous doctors and physicians testified as to the high mineral and filth content of the water and reminded the city that the purpose of the charter had been to find a pure source of supply outside of the city.²⁹

If the wells in the city had been recognized as polluted thirty years before, then how much more dubious was the supply in 1820? Increased sewage, runoff from privies, cesspits and graveyards, and little recharge to the water table from rainfall had all contributed to the degradation of the supply. Clearly something had to be done.³⁰

In 1831, the city established a board of water commissioners to examine the problem of New York's water supply. Its report contained a way out of the problem with the Manhattan Company, pointing out that the company's charter required them to furnish "pure and Wholesome" water, and the water that was supplied was anything but pure. The board then further recommended that the city raise the sum of two million dollars and construct an aqueduct from the Croton River for the purpose of water distribution. The company challenged, still fearful that revoking the water monopoly would lead to a total revocation of its banking charter.

The New York Supreme Court finally ruled in the case in 1832. It overruled the contention that the company had failed to supply water as stipulated in the charter because the petition named no individuals who had been so deprived. Further, it pronounced that several acts of the legislature had confirmed the company as a bank. While upholding the validity of the charter, however, the court ruled that there was nothing in it which granted the company a monopoly in providing water to the city.³¹ The city could build its aqueduct.

Boston underwent a similar transition. The Aqueduct Corporation was providing water, but here it was the quantity rather than the quality which was questionable. There was insufficient head on the water to allow it to flow into higher elevations of the city, leaving from one-third

to one-half of the dwellings in 1825 unable to secure a piped supply. Further, even the addition of more pumps to provide greater head to the supply would not satisfy demand because the water level in Jamaica Pond was simply too low to meet the demands of the growing city. Several proposals were made as to the possible new source, and a new company, the Boston Hydraulic Company, was founded for the purpose of bringing water from Framingham to the city via an aqueduct. The mayor and council were not so sure that another private company was the way to go. Appointing a board of water commissioners, as had New York, the city investigated the Hydraulic Company's proposal alongside other proposals for municipally funded works. The board reported to the city in 1836 that it favored the support of the Hydraulic Company, feeling that water supply was an area in which the city should remain uninvolved. This report was accepted only in part by the council, which upheld keeping the city out but refused to endorse the company's proposal.

It became necessary to seek public opinion in order to resolve the stalemate. In 1837, citizens voting in a referendum approved municipal ownership by 2,107 to 136. Further political wrangling occurred when the existing Aqueduct Corporation and the Hydraulic Company threatened to go ahead with their plans anyway, thus requiring city streets to be dug up three times, at three times the expense. Further referendums confirmed that support was behind the idea of municipal ownership, but new disagreements arose as to the choice of supply. It would not be until 1845 that any of the groups could muster enough support to secure a majority vote in the city council to direct a petition for construction to be drafted.

Baltimore's situation was much like Boston's, but it took even longer to resolve the questions of private versus public control. In this case, the willingness of the private company both to expand its supply and to improve its distribution system delayed significant frustration with the status quo until 1857. It was evident as early as 1835 that the water provided by the Baltimore Water Company was insufficient for the entire city and that it would become even more inadequate with the growth in population that was expected. Debate focused on two points. Should the city build an entirely new system and then compete with the company, or should it buy out the company and simply expand the existing structures? A referendum in 1852 showed overwhelming support for municipal works, and the engineers' report indicated that competition with the

company was impractical, as it would entail digging up the streets and inserting mains beneath the existing company mains, leading to complaints and probable litigation. The city finally agreed to purchase the company's works in 1854 and then began debate on the best source of additional supply. Luckily for the council, it decided to initiate a city water department at once to oversee the transfer of the private works to public control. In the seven years it would take for Baltimore to decide upon and then construct an aqueduct and reservoir system, the work of the water department in improving mains and expanding the distribution system meant that the new supply could be delivered immediately to the customers. Baltimore would need to secure additional supplies in the closing years of the century, but its relatively smooth transition to public control was to be a great benefit to the city.

Philadelphia already had a municipal system, but it too would experience conflict in the area of public versus private ownership. The waterworks in operation were inefficient and costly to operate, while at the same time not supplying all the needs of the growing city. The construction of additional works further upstream on the Schuylkill did alleviate the concern over quantity for the immediate future, but far-sighted city engineers pointed out that this was merely a stop-gap measure. While the new pumps and reservoirs were capable of delivering over three million gallons a day, the limited distribution system, in particular the mains leading from the works, could carry only about one million gallons per day. Further, the new engines were even more costly to operate than the old ones had been, resulting in a deficit of over a quarter million dollars a year. A better solution meant finding a larger source, correcting the limitations of the distribution system, and designing pumps that could operate more cheaply.

The Delaware and Schuylkill Canal Company had become largely moribund in the 1810s. Lack of investors had almost halted construction, but the canal had been completed to a point just above the falls to the northwest of the city. Discouraged, the company applied for a charter from the legislature to reorganize as the Schuylkill Navigation Company and to straighten out the course of the river itself by means of locks and dams. Receiving this authority, the company began cautious negotiations with the city on the proposal of using water power to operate the water pumps. The company, needing funds, granted the city the right to construct a dam and locks at some falls. The company would have

the right to all the water necessary for navigation; the city could use the rest for its engines.

It was not difficult for the water committee to convince the council that this was the way to go. Operating costs would be cut by more than half, and supply would be increased fivefold. The savings resulting from lessened operational costs could be expended in improving the distribution system. Since the available supply was so much greater than current need, excess could be sold to the suburbs, generating even greater income. The council approved the committee's recommendation, and initiation of the Fairmount Works ushered in a "golden age" of water supply in Philadelphia.

The situation, however, would not last long. The company, which had conceded water rights so graciously in 1824, was now much more powerful. By 1832, trade was crowding the river, and the company informed the city that it planned to construct additional locks just upstream of the dam. The city was appalled and pointed to the contract, which allowed the company only the water necessary for its existing locks. The company informed the city that it discharged itself of that stipulation and went ahead with construction. Negotiations continued over the next fifteen years, with the company contending that navigation was the primary use of the river and that it therefore had the prerogative to do as it wished with the river, according to its charter. The city argued that water supply was a more fundamental use of the river and that navigation should take a subordinate role. Finally, in 1847, the Pennsylvania Supreme Court ruled that all uses of the river were equally valuable, and that there was sufficient flow in the Schuylkill to provide for both navigation and water supply. This decision as to common use would have far greater ramifications on the question of water use than the justices ever suspected. Based on this ruling, decisions about harbor improvements, locations of sewerage plants, diversions of rivers, and agricultural allocation of irrigation water in the San Joaquin valley would be made. This decision would form the basis of all later legal opinion regarding American water use.

The example of the four eastern seaboard cities in the eighteenth and nineteenth centuries shows that establishing private water companies was not the only solution to urban water supply. By 1846, there were eight water companies in London, which avoided competition by dividing up the city into eight districts where each had exclusive rights. The

majority of the companies used the filthy water of the Thames as their source, leading to outbreaks of cholera and typhoid in the middle years of the century. These exclusive rights meant that actions taken in one area to improve water quality would have no effect in other areas of the city, allowing disease to spread in spite of action taken to prevent it. The municipal ownership of water works would prove to be the most effective means of ensuring a plentiful and pure water supply for American cities.

New York, Boston, Philadelphia, and Baltimore were not the only cities to construct waterworks. New Orleans had begun providing a water supply in 1822, Pittsburgh in 1826, Richmond in 1830, St. Louis in 1831, Cincinnati in 1839, and Chicago in 1842. By 1860, the sixteen largest cities of the nation had waterworks of some kind, as did many smaller towns. Of the 136 systems in existence, 58 percent were privately owned, but these were mostly in the smaller towns. Only four of the large cities had privately owned systems in that year.

Between 1860 and 1900, water systems would become common in many smaller cities as well as large ones. There were 243 by 1870, 598 by 1880, 1,878 by 1890, and 3,196 by 1897. The trend toward municipal ownership also increased; in 1800 only 6 percent of systems were publicly owned, and by 1897 the percentage was 53.2.³² Letty Anderson discusses the trend in "Fire and Disease: The Development of Water Supply Systems in New England, 1870–1900."³³

The cities of the American East Coast had a history that was unlike that of cities in the interior, a fact which is evident in urban historiography. Seventeenth- and eighteenth-century cities (the term "city" refers to a population of 5,000 or greater) were largely founded as colonial trading sites. Their purpose was to provide for the transshipment of raw materials back to England (or in the case of New Orleans, France or Spain) and to serve as distribution sites for the dissemination of finished products to those in the American hinterland. Manufacturing or industrial production for export was never intended to be a function of these cities, and the ruling classes were largely those who had power either from their relationship with the British political hierarchy or who had amassed fortunes through commercial transaction and middleman activities. Further, these cities were not autonomous but merely a part of the colony or state in which they were located, and their function was to provide for the good of that colony and, ultimately, England. The

political functioning of these colonial cities was in the hands of this same elite, which was concerned with the population and infrastructure of the city only insofar as it enhanced or retarded its commercial function. It was not until the Revolution, when there was a need to supply finished products that were unavailable after hostilities began, that the politicians in the city began to consider the needs of the city itself. Manufacturing and, shortly, industrial production required not only new facilities and amenities but also a new class of workers. Accommodating these needs meant that the city had to place a greater emphasis on its responsibilities to its urban residents rather than act as a “junior level” of administration for the colonial or state government.³⁴

Midwestern cities had the advantage over East Coast cities in beginning projects of public works because they had hindsight to show what was feasible and affordable for a city. Also, the companies that had been founded to construct the infrastructure in the eastern cities were now in operation, so it was much easier to obtain items such as pumps, mains, and pipes than it had been. However, the rapid expansion of these cities left a shorter time for consideration of the need for public works than the earlier cities had enjoyed. New York, for example, took about 170 years to reach a population of 100,000, but Chicago accomplished the same feat in less than 40 years. These Midwestern cities had a correspondingly shorter “youth” to permit the administration to develop methods of dealing with city problems; as a result, the solutions offered differed in many ways from those of earlier cities. Further, changing social and political conditions in all American cities made for particular difficulties in attaining solutions that were acceptable to residents, who enjoyed in the latter half of the nineteenth century a greater voice in city government than had previously been the case.

Eric Monkkonen, in *America Becomes Urban*, defines four periods of urban history: the original city foundation, when commercial elites were the city government functionaries; the democratic period, when new immigrants became involved in the government (this is also the boss or machine period); the reform period, when the middle and professional classes reclaimed the government; and the modern period, when the city was, and is, run by trained bureaucrats. For most cities not on the East Coast, the nineteenth century roughly corresponds to the two earlier periods, with the age of reform beginning around the turn of the twentieth century.³⁵ In the nineteenth century, cities began to gain more con-

trol over their own business, although state legislatures still exercised control over the granting of charters and maintained oversight on large capital expenditures (for an example, see the story of New York's struggle for water, above). Cities founded in the nineteenth century, however, began their existence on a very different level than had their predecessors. Although the cities were still founded as commercial sites, city founders recognized the need for ample locations for manufacturing as well as for the residential needs of a working and noncommercial class. Taking advantage of geographic locations, new cities were not confined in function in the way the cities of the seaboard had been and were freer to adapt in ways that suited their own needs rather than the needs of a state government. Cities began to reflect a new culture, distinct from the rural culture that had permeated the early years of America, and not surprisingly, the literature of American urban history focuses on this culture. Unfortunately, it has, until the past decade, ignored the political counterpart to the development of that urban culture.

The origins of a systematic evaluation of the role of cities first appeared in James Bryce's *The American Commonwealth*, appearing in 1888. Bryce contends that urban governments were characterized by machine politics and riddled with corruption and were "the one conspicuous failure of the United States."³⁶ This pattern remained almost unchanged until the 1940 publication of Arthur Schlesinger's "The City in American History."³⁷ Schlesinger's work, often considered to be the modern origin of the field of urban history, does not, in fact, define what urban history is. In the two decades following Schlesinger, urban political history appeared as virtual marginalia in the works of urban biographers or of those writers seeking to impart local color in a booster-style local history. These were characterized in works examining ethnic or class groups in particular cities or in the biographies of more notorious political bosses. At the same time, writers on the national political scene found it impossible to explain trends in national events without including movements and political trends within cities. Chief among these works is Oscar Handlin's *The Uprooted*, an examination of the effect of immigration on new Americans.³⁸ Handlin theorized that the bosses were a representation of the democratic nature of the city, and that they defended the rights of the lower and working classes, which did not wish the city to be operated as a business. The reformers who replaced them were from the upper and professional classes, which rec-

ognized the need to counter the power of machine politics by replacing it with a more centralized form of government that neutralized the power base of the bosses. The reformer's very isolation from the classes in whose interest they purported to be working, however, meant that the "social range and radical drive" of the reforms were limited.

Meanwhile, the area of urban history continued to be defined in the terms of social history. In 1961, Eric Lampard suggested that the two valid approaches to urban history were "the study of urbanization as a social process" and a "comparative study of communities in a framework of human ecology."³⁹ Even those who were beginning to examine the role of municipal government chose to interpret their findings in these terms. Samuel Hays, writing extensively in the early 1960s, argued that political history, particularly of the urban variety, should be analyzed "on the basis of human interrelationships inherent in these institutions."⁴⁰ In a later study on urban politics in the Progressive Era, Hays concluded that the rise of the reform era in municipal government was the result of a class struggle and that the reformers replaced the decentralized, freewheeling power base of the bosses with a centralized structure that minimized the role of the lower classes. This was necessary, he argues, to ensure that political power would be concentrated in the hands of those who were more able to use it for the benefit of all the citizens rather than just those who had participated in the machine.⁴¹ This argument leads, however, to some unanswered questions. If the ward system of machine politics, in which councilmen were "particularly receptive" to the wishes of their constituents, actually worked, why did the citizens vote to get rid of it? Further, if the desire of the reformers was to replace this system with a centralized structure in order to "advance their own conception of desirable public policy" and if this movement was a product of the upper and professional classes (and therefore a minority of the population), how did it manage to succeed in the polls?⁴² Hays's work is valuable in that he identified a major change in the structure of the urban polity, but his explanation raised many more questions than it answered. A major result of Hays's work was that scholars tried to find answers to the problem of urban political systems by examining the city in a structural functionalist framework.

This group of scholars became known as the "new urban historians." While they have discovered much about the nature of social and economic processes and interactions within the nineteenth-century Ameri-

can city, the question of power and the political manipulation of that power has remained largely unexamined by this group. Instead, the placement of social relationships has been analyzed on the assumption that cities were the best example of the democratic exercise of power—without, however, checking to see whether power was indeed distributed in a democratic fashion in that century.

Cities in the early nineteenth century resembled in many ways their medieval predecessors. Political power was concentrated in the hands of those with economic power—the merchants and the commercial class. Cities were, after all, established and allowed to grow because they made the movement of goods and capital easier and because the concentration of commercial activity in a relatively compact area allowed for a concentration of political control in the hands of those responsible for economic control. American cities, with very rare exceptions, were founded as commercial sites, not as industrial producers. It would not be until the mid-nineteenth century that the rise of industrialism would affect the American city, forcing a change in the power base.

In the early 1800s cities were run very much in the form of a business. Things that were good for the survival and continued health of a city were approved of and paid for in various ways. The above discussion of the implementation of water works in the eastern seaboard cities is an example of this. The manner in which each city chose to adopt water supply—through public or private means—was a function of the relative control of the capitalists within the city. If the question of water supply implementation had not been seen as absolutely vital to the continued existence of both the city and its chief function—that of allowing a place for economic and commercial transactions to occur—it would not have taken place.

As the cities of the eastern seaboard expanded and new cities were founded in the Midwest, a different structure arose. In addition to acting as centers for transport, wholesale and retail trade, and finance, the new cities were also producers of goods, manufactured and industrial. Unlike Boston, where goods were imported from outlying towns such as Lawrence and merely marketed or transshipped to other points, cities such as Chicago, St. Louis, and Milwaukee found it more expedient to manufacture their own goods, for domestic use as well as export, rather than to import them from the east. These cities were not wholly industrial in character, of course, but the strength of their commercial

enterprise was enhanced because they could offer goods for export as well as import, in addition to serving as transshipment points for the agricultural products of the expanding plains states.

As the new cities differed in character from their older counterparts, they differed too in population. With much greater emphasis on manufacturing, there was a concomitant greater portion of the population that was working-class. These people, either transplanted from eastern states or direct immigrants from Europe, added a new flavor to the mix of people that had previously been part of urban populations. They settled in the new cities; founded neighborhoods, churches, and schools; and established themselves and their culture upon the pattern of urban life. As they entered into the arena of American urban life, they began to make their presence known in the political arena by electing one of their own as ward or council representative. In fact, wards or council districts were often drawn to represent the ethnic or cultural characteristics of a particular neighborhood.

On the surface, this appears to uphold the assumption of the new urban historians that the nineteenth-century city was, in fact, democratic. Did not these new types of urban dwellers have the opportunity to seek one of their own as a political representative, and therefore did these representatives not exercise political power on behalf of their constituents? In the cases of cities where a machine arose, the boss often assumed the position of representing the new ethnic groups at a level above that of their own elected representative. This idea appears in much that has been written in the past two decades by scholars of this type. Three works in particular, Amy Bridges's *A City in the Republic*, Stephen Erie's *Rainbow's End*, and John Allswang's *Bosses, Machines and Urban Voters*, contend that the bosses and machine politics were just what they had insisted that they were all along—the poor man's friend.⁴³

The problem with the work of the new urban historians lies in the focus on the individual. With the advent of computers—and graduate students willing to manipulate data using them—the picture of everyday life for the common urban inhabitant in the nineteenth century became clearer. It is true, however, that focusing on the individual tree makes it more difficult to appreciate the functioning of the forest; similarly, the emphasis on the role of the individual in urban society obscures the true relationships of power in municipal government. Since machine politics and bosses appeared to play a role in making the voice of the

individual heard (at least if that individual was of a group in the boss's power base), the city appears to be more democratic than it really was.

Yet the functioning of nineteenth-century cities did not reflect the democratic surface that they presented. Prohibited by state charters from making political decisions regarding finance and taxation, cities often designated these functions as "administration" and therefore confined them to a much less democratic decision-making process. Political power might now be in the hands of the people, at least for appearance's sake, but financial power remained in the hands of those who were the most affected by it, the commercial and financial figures of the city.⁴⁴ These individuals were often the members of appointive committees and acted as trustees or commissioners of public works or of other special tasks that cities had undertaken but wished to administer in a nonpolitical fashion. In theory the appointment of nonpoliticians removed the consideration of the role of any machine in the implementation and management of said projects; in practice it simply allowed the priorities of the appointees to take precedence over those of the boss and his followers. Ultimately, the participation in the political arena by influential private citizens would give rise to the reform movement of the late nineteenth and early twentieth centuries in the attempt to regain the form of power as well as its operation.

Writing about the same period as the new urban historians, a second group of historians examined another facet of urban life. Recognizing the influence of public works expenditures on the functioning of government, these scholars, called "post-new" historians, examined records from health and public works departments to determine how government responded to the problems of infrastructure. They found that the record of cities in devising responses was highly successful, yet implementation of these solutions was often blocked by special interests seeking either to secure the solution for private capital or to block the reform altogether on the grounds that public expenditures to increase property values of those unable to pay for the improvements violated the fiscal role of the city. Sam Bass Warner called this pattern of retarding city action "privatism," and he concluded that it was essential to the development and functioning of nineteenth-century American cities.⁴⁵ Works in this group are Nelson Blake's *Water For the Cities*; Eugene Moehring's *Public Works and Urban History*; Christine Meisner Rosen's *The Limits of Power*; Terrence McDonald's *The Parameters of Urban Fiscal Policy*; Jon Teaford's *The*

Municipal Revolution in America, and *The Unheralded Triumph*; Joel Tarr and Gabriel Dupuy's *Technology and the Rise of the Networked City*; Joanne Abel Goodman's *Building New York's Sewers*; and Robin Einhorn's *Property Rules*.⁴⁶ These authors conclude that American cities worked on the principle that those who owned taxable real estate should control the services for which they were taxed. Those with less or no property could only influence decisions about services to the extent that they contributed to the expense of providing them. However, the varying motives of these groups, particularly commercial versus residential desires, occasionally meant that the only solution to urban public works problems came in the creation of an extraurban structure, including metropolitan and regional boards of professionals to oversee major projects. This conclusion only partly contradicts that of the "new urban" historians that the disadvantaged groups had a voice in urban government. The voice may have been there, but it was not heard. Even though bosses and machine politics had surface control of the political structure of the city, the fact that administration, and not politics, determined the ordering of services prevented the bosses' clients from receiving services financed by taxation or the general fund. Einhorn refers to this as the "segmented system" and postulates that it arose as a preventive to the redistribution of wealth in a downward fashion. Taxing the rich so that services might be provided to the poor was not the intent of nineteenth-century cities. In the same fashion, the poor were not expected to subsidize the provision of services to the rich, either domestic or commercial. Each segment of society was to control its own assets and their disposition.⁴⁷

This situation was not permanent. Most successful in the provision of such services as street paving, police and fire protection, and the provision of sidewalks, the segmented system collapsed with the rise of large-scale public works projects such as citywide water supply and sewerage and especially transportation systems. The period at which different cities made this change varies and is seemingly most dependent on when a city decided that such services were a "common good" to the entire city. In many cities, this change in ideology came about at the same time as the rise of reform government. Through lobbying state legislatures, city officials were able to amend charters to allow for general fund expenditures to finance projects that had previously been paid for through special assessments. This was particularly useful in cases

where public works projects required interconnecting infrastructure, as in the cases of water mains, connecting sewers, and horse-drawn rail cars. As the nature of these works prohibited piecemeal adoption, allowing individual property owners on a specific block to prevent the improvement meant that the entire project would have failed. Only by the adoption of a new ethic—that some things were so beneficial to the common good of all the individuals in the city that they deserved to be paid for by the city at large—was the nineteenth-century city able to construct the amenities that would take it into the twentieth century.

New York, Philadelphia, Baltimore, and Boston had discovered this through their early experiments in water supply and were well on the way to general funding of public works expenditures by the 1850s. For the newer cities of the Midwest and the Plains, this transformation would require varying periods of trial and error before they gained the experience with which to proceed along the path of modernization. Interference from conflicting economic needs, differing political factions, and inadequate bureaucratic oversight would have an enormous impact on the implementation of public works in these newer cities. For the city of Milwaukee, Wisconsin, these factors would plague the operation of the water department for more than 125 years.

The story of Milwaukee's history is best told in Bayrd Still's *Milwaukee: History of a City*. Published in 1948, this work describes in great detail the founding of Milwaukee and its eventual rise as one of the great manufacturing centers of the United States. Still's position as director of the Wisconsin State Historical Society ensured his access to necessary documents and sources that illustrate the complex history of the city and the role that its competition with Chicago played in its development.

Two works tell the history of Milwaukee's water supply; the first, *A History of Water Supply in the Milwaukee Area*, by Charles Beveridge,⁴⁸ was prepared for the Metropolitan Study Commission in 1958, the second, *A Century of Milwaukee Water*, by Elmer Becker,⁴⁹ was commissioned by the water department in 1971 to celebrate its centennial.

Another work which mentions water supply is Judith Leavitt's *The Healthiest City*. Leavitt's book is concerned with the origins of the Milwaukee Health Department and the changes that occurred in the years from 1870 to 1930 that enabled the city to evolve from an epidemic-prone urban area to the multiple winner of the United States Health

Commissioner's Healthiest City Award. Along the way, she discusses the struggle that took place between the city health commissioners and the entrenched city hall politicians who felt that the expenditure of public money for so "ephemeral" a good as improved health was beyond the scope of city government. How that attitude changed with time and with the perseverance of several prominent physicians shows the changes in public opinion as well as political opinion occurring at the same time.⁵⁰

A major work examining Milwaukee in the late nineteenth century is Roger D. Simon's *Milwaukee: Expansion of an Industrial City*. Simon's work is more of the nature of social, rather than political, history. The author focuses on three neighborhoods (four wards) that were on the periphery of the city between 1880 and 1910. Unlike those of old-line cities, Milwaukee's new immigrants in the late nineteenth century occupied land on the city periphery, rather than replacing more established groups, which would, with upward mobility, have moved out toward the suburbs. Simon's look at these peripheral neighborhoods is therefore a unique glance at a city whose development did not occur according to normal patterns. For these neighborhoods, he examines populations and housing stocks through the use of an immense and complex data base prepared by combining census records with building permits and public works records. His investigation and evaluations of the rate of service provision to these peripheral neighborhoods make it possible to analyze much of the history of water policy management in Milwaukee from 1880 to 1910. Simon's work evaluates the residents of his three neighborhoods in the wake of the physical infrastructure which they created and analyzes their attitudes towards urban life as a result of their environment.⁵¹

Scholarship regarding urban water supply in the past quarter century has expanded greatly with the development of the field of environmental history. Much recent scholarship on water supply has dealt with the issue on a regional, national, or international scale rather than on a localized one. For particulars, see the article by Jeffrey Stine and Joel Tarr entitled "At the Intersection of Histories: Technology and the Environment";⁵² as well as Abraham Hoffman's *Vision or Villainy*;⁵³ Robert Sander's *The Lost Frontier*;⁵⁴ *Groundwater Exploitation in the Great Plains*, edited by David Kromm and Steven White;⁵⁵ William Ashworthy's *The Late, Great Lakes*;⁵⁶ and EPA yearly reports of the effect of the Clean Water Act.⁵⁷

Other valuable sources are the multiple publications of the American Water Works Association, including the *Journal of the American Water Works Association*, *Water World*, and several books, especially Mark Baker's *The Quest for Pure Water*.⁵⁸ Most urban water departments issue annual reports, which may be consulted for specifics about individual cities. Finally, in the area of textbooks for civil and environmental engineers, two examples stand out from the rest. These are John William Clark and Walter Viessman's *Pollution and Water Supply*⁵⁹ and the *New York State Manual of Instruction for Water Works Operators*.⁶⁰ These classics, now both in multiple editions, remain the standard by which the science and engineering of water treatment is judged.

In this work I examine the Milwaukee Water Works at four times in its history. In chapter 2, the foundation of the water works and its early years are examined, and the pattern in which the supply of water was provided leads to some interesting questions as to the motivation of those responsible for that provision. This chapter covers the years from 1867 to 1910. Chapter 3 discusses the effect of new political control on water works development and operations. Milwaukee shocked the nation in 1910 by electing socialists to the positions of mayor and a majority of the council seats. Despite the socialists' platform, which demanded the construction of a water treatment facility, this facility was not built until the 1930s and then only because of the input of a large amount of federal dollars. This chapter examines how the political agendas of the socialists and their opposition affected the drive for a cleaner water supply, and covers the years from 1910 to 1940. Chapter 4, which covers the years from 1945 to 1965, is also concerned with the effects of politics on the operation of the water department. Shortly after World War II, the city realized that it needed expanded water treatment facilities. Despite studies recommending against it, the new facility was placed on the south side of the city, with its intake directly in the outflow from the sewage treatment plant. How did the political makeup of the city government, the state, and the surrounding communities permit this decision to be made? Chapter 5, the last highlighted period, covers the workings of the water department and its relationship to city government since 1975. It examines the changes in the structure of the city's administration and has as its major focus the *cryptosporidium* outbreak of April 1993. The steps taken at that time by the department and by the city and the aftermath of the case are also analyzed. Chapter 6 summarizes the

pertinent points of the four preceding chapters and offers some comments as to alternate scenarios for each case. It will also offer some comparisons between the problems of the Milwaukee Water Works and other examples of government technological policy.

I first became interested in the history of the Milwaukee Water Department in the years 1980 to 1984, while employed by that department as a water chemist. In 1983, an old closet, long thought empty, was pried open and discovered to be full of photographs and journals related to the construction of the Linnwood Plant. Later, as a graduate student, I read Roger Simon's report on the disparity in service provision to the south side Polish wards and decided to investigate the topic using internal water department records. I was able to show that the disparity in service not only existed but that it was rectified immediately after the accession of the socialists to a position of political power, and thought that there might be more to the story.

When I chose to do research on the Milwaukee Water Works, I did not know what I would find. Much of the material was new to me, and I was struck by the seeming dichotomy between the motives of the local politicians and the presumed motivation of the waterworks, to provide clean, plentiful water to the residents and businesses of the city. My experience as a chemist at the Linnwood Treatment Plant gave me an advantage others did not have, in that I was aware of, and able to correctly interpret, many available sources from among department records. Additionally, my husband, Michael Mollan, continues to be employed as an operator in charge by the department. This has kept me aware of the many issues and changes which have occurred since I left its employ in 1984. The records cited herein were obtained through the permission of the water department, with gracious assistance from Jesse Cooks, superintendent, and Carrie Lewis, quality control manager.

Notes

1. Lewis Mumford, *The City in History: Its Origins, Its Transformations, and Its Prospects* (New York: Harcourt Brace Jovanovich, 1961), pp. 6-55, passim.
2. In the interest of brevity, discussion is limited to those cities more commonly cited as being in the "Western sphere of influence."

3. J. G. Landels, *Engineering in the Ancient World* (Berkeley: University of California Press, 1978).
4. H. W. F. Saggs, *Civilization Before Greece and Rome* (New Haven, Yale University Press, 1989), pp. 120–22. M. Lichtheim, *Ancient Egyptian Literature* (Berkeley: University of California Press, 1975), vol. 1, p. 20.
5. Saggs, *Civilization*, pp. 120–22.
6. 2 Kings, 20:20, Authorized (King James) Version.
7. Saggs, *Civilization*, p. 124.
8. Dora P. Crouch, *Water Management in Ancient Greek Cities* (Oxford: Oxford University Press, 1993).
9. For a discussion on whether Romans suffered from lead poisoning as a result of water pipes, see A. T. Hodge, “Vitruvius, Lead Pipes and Lead Poisoning,” *AJA*, 85 (1981) 486–91.
10. A common complaint was that the water smelled fishy, and there were occasional reports of small fish actually coming through distribution lines. Theodore Ashby, *The Aqueducts of Ancient Rome* (Oxford: Oxford University Press, 1935), p. 28.
11. Julius Sextus Frontinus, *De aquis urbae Romae*, Loeb Classical Library (Cambridge: Harvard University Press, 1934).
12. See Ashby, *Aqueducts*; and E. B. Van Deman, *The Building of the Roman Aqueducts* (Washington, D.C.: Georgetown University Press, 1934).
13. John Stambaugh, *The Ancient Roman City* (Baltimore: Johns Hopkins University Press, 1988), pp. 129–32.
14. Vitruvius, *De architectura*, Loeb Classical Library (Cambridge: Harvard University Press, 1932).
15. F. W. Robins, *The Story of Water Supply* (London: Oxford University Press, 1954), p. 79.
16. *Ibid.*, p. 151.
17. Corporation of the City of London, *Letter Book F*, ed. Reginald Sharpe (London: John Francis, 1904), p. 102.
18. *Ibid.*, p. 129.
19. The city paid him grudgingly. At several points during the construction, he had to advance costs out of his own pocket, and nearly went bankrupt twice. Henry Dickinson, *The Water Supply of Greater London* (London: Newcomen Society, 1954), p. 41.
20. *Ibid.*, p. 67. Recall that the Fleet had been abandoned as a source and covered over in the fourteenth century because of its pollution. Five centuries of underground seepage and sewage runoff had not improved the water quality.
21. Nelson Blake, *Water for the Cities: A History of the Urban Water Supply Problem in the United States* (Syracuse: Syracuse University Press, 1956), p. 8.

22. Ibid., p. 16.
23. Ibid., p. 76.
24. Ibid., p. 47. The proposal was Dr. Joseph Browne's.
25. *Minutes of the Common Council of the City of New York, 1784–1831* (New York, 1917), vol. 1, p. 129.
26. Blake, *Water*, p. 47. The plan included a filtration plant, an idea which was very futuristic, as no other city would propose such a structure for over a century.
27. *Laws of the State of New York*, 22 Sess. chap. lxxxiv, pp. 810–17. Blake, *Water*, p. 49.
28. Charles H. Weidner, *Water For A City: A History of New York City's Problem from the Beginning to the Delaware River System* (New Brunswick, N.J.: Rutgers University Press, 1974).
29. Blake, *Water*, p. 46.
30. The contrast between the efficiently run water system established by the state to oversee the Croton Aqueduct and the city's poorly run system of sewer establishment is told in Joanne Abel Goodman's *Building New York's Sewers: Developing Mechanisms of Urban Management* (West Lafayette, Ind.: Purdue University Press, 1997).
31. Ibid., p. 135.
32. M. N. Baker, ed., *The Manual of American WaterWorks* (New York: The American Water Works Association, 1897).
33. *Technology and the Rise of the Networked City in Europe and America*, ed. Joel Tarr and Gabriel Dupuy (Philadelphia: Temple University Press, 1988).
34. Charles Glass and Theodore Brown, *A History of Urban America*, 2nd ed. (New York: Macmillan, 1976).
35. Eric Monkkonen, *America Becomes Urban* (Berkeley: University of California Press, 1988).
36. James Bryce, *The American Commonwealth*, 1st ed. (New York: Macmillan, 1888), vol. 1, p. 642.
37. Arthur Schlessinger, "The City in American History," *Mississippi Valley Historical Review* 27 (1940): 43–66.
38. Oscar Handlin, *The Uprooted* (New York: Grosset and Dunlap, 1951).
39. Eric Lampard, "American Historians and the Study of Urbanization," *American Historical Review* 66 (1961): 49–61.
40. Samuel P. Hays, "History as Human Behavior," *Iowa Journal of History* 58 (1960): 193–206.
41. Samuel P. Hays, "The Politics of Reform in Municipal Government in the Progressive Era," *Pacific Northwest Quarterly* 55 (1964): 157–69.
42. Ibid., 168–69.
43. Amy Bridges, *A City in the Republic: Antebellum New York and the Ori-*

- gins of Machine Politics* (Cambridge: Cambridge University Press, 1984); Steven P. Erie, *Rainbow's End: Irish Americans and the Dilemmas of Urban Machine Politics* (Berkeley: University of California Press, 1988); John Allswang, *Bosses, Machines and Urban Voters: An American Symbiosis* (Port Washington, N.Y.: Kennicat Press, 1977).
44. L. Ray Gunn, *The Decline of Authority: Public Economic Policy and Political Development in New York State 1800–1860* (Ithaca: Cornell University Press, 1988), p. 257. “A whole range of issues, mostly economic, had been either depoliticized or privatized. At the same time, the rise of administration and adjudication, almost by definition, imposed limits on the power of popular majorities. Together, these developments drained political participation of much of its substantive meaning.”
 45. Sam Bass Warner, *The Private City: Philadelphia in Three Stages of Its Growth* (Philadelphia: University of Pennsylvania Press, 1971).
 46. Eugene Moehring, *Public Works and Urban History: Recent Trends and New Directions* (Chicago: Public Works Historical Society, 1982); Christine Meisner Rosen, *The Limits of Power: Great Fires and the Process of City Growth in America* (Cambridge: Cambridge University Press, 1986); Terrence McDonald, *The Parameters of Urban Fiscal Policy: Socioeconomic Change and Political Culture in San Francisco, 1860–1906* (Berkeley: University of California Press, 1986), Jon Teaford, *The Municipal Revolution in America, Origins of Modern Urban Government, 1650–1825* (Chicago: University of Chicago Press, 1975); and *The Unheralded Triumph: City Government in America, 1870–1900* (Baltimore: Johns Hopkins University Press, 1985); Joel Tarr and Gabriel Dupuy, eds., *Technology and the Rise of the Networked City in Europe and America* (Philadelphia: Temple University Press, 1988); Joanne Abel Goodman, *Building New York's Sewers: Developing Methods of Urban Management*, Robin Einhorn, *Property Rules: Political Economy in Chicago, 1833–1872* (Chicago: University of Chicago Press, 1991).
 47. Einhorn, *Property Rules*, pp. 15–27.
 48. Charles E. Beveridge, *A History of Water Supply in the Milwaukee Area* (Milwaukee: Metropolitan Study Commission, 1958).
 49. Elmer W. Becker, *A Century of Milwaukee Water* (Milwaukee: Milwaukee Water Works, 1971).
 50. Judith W. Leavitt, *The Healthiest City* (Princeton: Princeton University Press, 1975).
 51. Roger D. Simon, *Milwaukee: Growth of an Industrial City* (Ann Arbor, Mich.: University Microfilms, 1972).
 52. Jeffrey Stine and Joel Tarr, “At the Intersection of Histories: Technology and the Environment,” *Technology and Culture* 39, no. 4 (October 1998).

53. Abraham Hoffman, *Vision or Villainy: The Owens Valley-Los Angeles Water Controversy* (College Station: Texas A&M Press, 1981).
54. Robert A. Sander, *The Lost Frontier: Water Diversion and the Growth and Destruction of Owens Valley Agriculture* (Tuscon: University of Arizona Press, 1994).
55. David Kromm and Stephen White, eds., *Groundwater Exploitation in the Great Plains* (Lawrence: University of Kansas Press, 1992).
56. William Ashworthy, *The Late, Great Lakes: An Environmental History* (New York: Knopf, 1986).
57. Environmental Protection Agency, *Our Nation's Water* (Washington, D.C.: Government Printing Office, 1972)—(issued annually)
58. Mark N. Baker, *The Quest for Pure Water: The History of Water Purification from the Earliest Records to the Twentieth Century* (Albuquerque: American Water Works Association, 1949).
59. John William Clark and Walter Viessman, *Pollution and Water Supply*, 4th ed. (New York: Harper and Row, 1995).
60. New York State Department of Health, *Manual of Instruction for Water Treatment Plant Operators*, 5th ed. (Albany, 1986).

CHAPTER 2

THE WATER THAT MADE MILWAUKEE'S BEER FAMOUS

“Our next landing was at Chicago . . . no business was going on; many were leaving the place on account of the pestilence . . . from 20 to 30 dying daily. . . . The thick greasy water that stands in the streets looks as if it were full of pestilence. . . . After leaving we reached the young and flourishing city of Milwaukee. . . . Its future destiny is not problematical. It is bound to become one of the largest and most delightful cities in the whole country.”—*Chicago Democrat*, Sept. 3, 1850

The village of Milwaukee was granted a charter by the territorial government of Wisconsin in 1836. Originally three settlements—Juneau’s village on the east banks of the Milwaukee River; Kilbourn’s settlement on the west bank of the same river; and Walker’s trading post on

the north bank of the Kinnickinnic River—the unification did little to reconcile the three founders to each other or to convince them to operate as a team. While the powers of the new village heads were severely limited, infighting and rivalry as to which section of town was to become the location of the central business district led to serious rivalry between Kilbourn and Juneau. The most famous result of the rivalry was Kilbourn's refusal to lay streets in his section that lined up with those in Juneau's village; the result was that even today, bridges spanning the Milwaukee River in the downtown area run at an angle. Additionally, each section was attempting to compete with Chicago to the detriment of the others. Kilbourn, assisted by speculators' money, built a bridge across the Menominee River in 1841 to divert traffic from Chicago that had previously terminated at Walker's Point and then traveled by ferry to the east side.¹ In order for Milwaukee to succeed in becoming the premier city of the Midwest, as city boosters hoped it would, greater powers to assume a centralized government were necessary.

By 1845 it was clear to many that Milwaukee needed to take steps toward cityhood to allow for growth. In that year, the editor of the *Milwaukie Daily Sentinel* [*sic*] called for waterworks, public wharves and docks, street improvements, sewers, and the cleaning of small water courses.² All of these required more governmental power than was permitted under the village charter; and indeed, prominent townsmen had tried to draft a city charter granting those powers the previous year. This earlier attempt had foundered in its limitation of suffrage to American citizens, depriving almost one half of the adult male population of a vote.³ A compromise was reached in 1845 which required alien residents to state their intentions of becoming citizens and limited suffrage to those who had fulfilled their obligation of paying taxes, serving as firemen, or working on the public roads. The charter eventually passed muster in Milwaukee and was approved by the territorial legislature on January 31, 1846. Milwaukee was a city and could compete with other cities for the premier honors in the Midwest.

The framers of the charter, however, had not managed to eliminate the sectionalism that had plagued Milwaukee since its founding. While the new city government possessed powers very similar to those granted Chicago in its charter of 1837, this government resembled a confederation more than a real union. Each ward remained autonomous, re-

sponsible for its own debts and only responsible for general expenditures if a majority of its own aldermen so voted. Aldermen for each ward were authorized to levy special taxes for public works expenditures and to borrow money and issue bonds for such improvements. Individual wards could sue or be sued, and petition the legislature to make improvements on its own behalf. Since these improvements were contracted for, and supervised by, the aldermen of those wards, the potential for graft and corruption was high.⁴

Commerce is the foundation of any city; for Milwaukee, hoping to overtake Chicago, it was of premier importance. It became clear to many during the village period that urban development depended upon the farmlands to the west and north becoming cultivated and profitable. By 1850 this development had largely occurred, and the area surrounding the city was far more settled than it had been in the days when it was a village.⁵

In 1850 Milwaukee, Wisconsin, was already in competition with her neighbor to the south, Chicago. Chicago's population by 1850 was larger than Milwaukee's, but Chicago's lesser growth rate gave hope to Milwaukee boosters that they might surpass the southern city in population.⁶ While Chicago had the benefit of being located at the tip of Lake Michigan⁷ and was thus able to serve as a commercial center for the northern areas of Indiana and Ohio as well as for southern Michigan, Milwaukee supporters recognized that its position ninety miles to the north was a benefit to those in the northern plains states. Not only did this ninety miles mean less transport time to take goods to market for goods being transshipped to the east via the Great Lakes, it meant a shorter, hence cheaper, water voyage. City boosters, hoping to make Milwaukee the center of industry, trade, and commerce that Chicago was beginning to be at this time, sought by many methods to improve the amenities and the image of their town. Business owners, in particular, were eager to expand physically and economically, serving a wider base of customers as well as increasing their own profits. During this same period, Chicago was not idle. Granted a city charter in 1837, just four years after the area had been purchased from the Potawatamis, Chicago boosters had a step up on those in Milwaukee in that they were promoting a unified settlement. Unhampered by sectionalism, businessmen and boosters concentrated on forming commercial and political ties with their peers in New York, Boston, and Philadelphia.

Despite the major drawbacks which plagued Chicago—such as its low-lying central business district, which resulted in much of the settlement being knee-deep in mud throughout the year; the annual silting up of the harbor and the lack of deep-water access at the shoreline; and the failure to receive federal funding for harbor dredging and the canal to connect the Illinois and Chicago Rivers—the unity of the city's boosters allowed Chicago to get a major head start on city formation and enhanced its name recognition in the markets of the East. The personal relationships that were established with the elite of the eastern seaboard meant that when Chicago was ready to take the steps to enhance its viability as a central marketplace, there would be not only money available from eastern speculators, but customers as well.⁸

Chicago as well was trying to attract customers and businesses. In the late 1830s, Chicago politicians and businessmen had solicited funds to build a canal that would connect the harbor, which was the outflow of the Chicago River, with the Illinois River, thus making it possible to transship goods to the Mississippi by water.⁹ Additionally, funds were sought to dredge and expand the harbor, which had the unfortunate habit of silting up yearly as the result of deposits brought in by the Chicago River. This silting required lake vessels to anchor one mile off shore and transport cargo and passengers in small boats, a hazardous undertaking in inclement weather. Businessmen and politicians cooperated in this effort, in part because the businessmen relied on the politicians to secure federal aid in order to increase their client base. The Chicago boosters placed a great deal of hope on the passage of the National Harbor and River Bill, which would provide federal money for the purposes of waterway improvements. President Polk's veto of the bill in 1846, on the grounds that federal dollars should not be expended on purely local improvements, was a severe blow to the boosters.

The rise of railroads as goods carriers had greatly expanded by the 1840s. After the setback of Polk's veto, Chicago boosters as well as Milwaukee supporters began to examine the possibilities of a unified transportation system, combining water and rail. Beginning in the 1850s and continuing throughout the next decade and a half, a major effort in both cities was made by city officials, businessmen, and entrepreneurs to attract railroads.¹⁰ To support this effort the cities made several deals in which they agreed to partially finance the construction of these railroads. In Milwaukee this resulted in the city lending, in some cases, up

to half a million dollars to the speculators in return for promises that would ensure subsidized freight service to city industries.

But Chicago had something extra. While Juneau, Kilbourn, and Walker were still squabbling over street and bridge alignment in 1836, Chicago broke land in that year for the construction of the long-proposed Illinois-Michigan Canal. Despite many setbacks in construction, including a financial panic and a concomitant collapse in the real estate market in which lay the collateral for the loans with which the project was financed, the canal was eventually completed in 1848. Also in the 1840s, Chicago businessmen began to investigate the possibilities of running a rail line up to the ore-rich mines around Galena, in southwestern Wisconsin. Due to the collapse of the real estate market and the loss of funds to East Coast investors in the canal scheme, eastern money was largely unavailable for this proposal. By the end of 1848, only ten miles of track had been laid, but over those ten miles, farmers were transporting into the city thirty carloads of wheat a week, more than had been brought in by wagon in a month. Chicago now had the advantage over any other Midwestern city, in that it could provide water transport to the east via the lakes (a plus it shared with Milwaukee) but could also use water transport to transship eastern goods to the Mississippi, and the Chicago and Galena railroad meant that farmers could more easily bring their grain to Chicago than any other city in the Midwest.¹¹

Milwaukee did not, however, give up. Convinced that the ninety miles of difference in location would be a bonus to grain buyers on the east coast, Milwaukeeans began to agitate for railroads of their own. Lacking the ties to east coast financiers enjoyed by Chicago, city boosters and politicians, beginning to think of Milwaukee rather only than of parts of it, began to negotiate with railroad promoters to bring the railroad to town. To counter the advantage of Chicago's canal, boosters focused on the condition of the harbor. To ensure that the railroads would choose Milwaukee as their primary terminus, it was necessary to improve the harbor facilities to allow the western grain to be transported eastward. Dismayed by President Polk's veto of the 1846 Harbor and River Bill, which would have provided federal money to cities to improve facilities along inland waterways, Milwaukee joined with other lake and river cities to form a political coalition to further push the issue. Primary responsibility, however, remained in the hands of

the individual city, and Milwaukee eventually ended up spending almost half a million dollars to develop the port facilities. By 1857 the improvements to the harbor and the rail linkage to the Mississippi were complete. By 1862 the flow of western grain through Milwaukee overtook that of Chicago, and Milwaukee became the world's primary grain export port.¹²

Such success was not without its costs. To encourage the railroads to develop, many businessmen and politicians had pledged support to the railroads, and the city had granted credit on the hopes that their particular lines would win construction approval. To the city's chagrin and financial upheaval, most of these deals failed to materialize. The city found itself overextended by several million dollars. Further, the city's debt had risen to such a degree that it was unable to meet some of the normal and necessary obligations that it faced. In despair the city turned to the state legislature for relief. In 1861 the legislature responded with the Readjustment Act, allowing the city to refinance its debt and stretch out payments, and forbade the issuing of bonds until the debt load should be reduced below \$500,000. This effectively prevented any expenditures on improvements such as waterworks or sewerage for several years; the outbreak of the Civil War put a further stop to any capital planning.

It was during this period that Milwaukee's rivalry with Chicago reached maturity. In 1850 Milwaukee was two-thirds the size of the city to the south; by 1870 it was only a quarter as large and felt the loss keenly. Chicagoans claimed that Milwaukeeans had distributed handbills to eastern immigrants implying that cholera was endemic in that city (see the quotation at the beginning of this chapter); Milwaukeeans responded that comparisons were "odorous" [*sic*] and that they were only doing to Chicago what Chicagoans had previously done to them.

Despite losing the battle for Midwestern preeminence, most city officials and many residents retained the feeling of competition with Chicago. If Milwaukee could not be the larger city, then it would be the better city, with the amenities of Chicago without the size, noise, and congestion. But the fragmented foundations of the city would prevent the introduction of those "amenities" on a citywide basis, and the pattern of individual ward power that would characterize Milwaukee's neighborhoods in the 1850s and 1860s would hinder the ability of the city to establish city services. Further, a major shift in political parties

would foster the feeling that Milwaukee really had no business being involved in supplying services, and it would be this final development that would overshadow the century and a quarter of Milwaukee's water supply story.

To keep their businesses expanding, manufacturers and businessmen in both cities relied on a steady supply of immigrant workers from the east and from Europe. In the 1860s and 1870s, the largely German-born population of Milwaukee gave it a European flavor quite unlike that of Chicago or St. Louis, its major Midwestern rivals. This dominance of the population by a single ethnic group meant that the German-born and -speaking citizens represented a significant economic and political power base in city affairs. The role of the skilled German worker in maintaining and expanding the industries of the city meant that employers had to be sensitive to issues which affected their workers, including political views that were often diametrically opposed to those of business owners. Many of the German immigrants, as refugee "forty-eighters," had a liberal background that predisposed them to support the Democratic Party. That party, recognizing a potential power base, in turn took steps to secure the loyalty of the German immigrants by arguing for liberal suffrage rights for new immigrants.¹³ Additionally, their predominance in the skilled occupations established a working base for trade and industrial unions, groups which were traditionally linked with the Democrats. As these immigrants achieved the franchise, the Democratic Party rose to predominance in Milwaukee politics—at least temporarily. To ensure the continued support of this ethnic power base, the Democrats in turn unofficially supported the cultural and artistic organizations sponsored by the German community. These organizations, emphasizing drama, music, and parks, increased the European feel of the city and in turn attracted even more immigrants. The city and its business community were thus able to expand even further in production and in customer base to the point where many prominent residents felt they had the opportunity to usurp Chicago's place in the hierarchy of Midwestern cities.

In the 1860s in Milwaukee, as in many other cities, services were funded mainly by subscription. As with musical and dramatic societies, which were funded by individuals wishing to see these opportunities continue, services such as paved roads, sidewalks, policing, and fire protection were largely operated by voluntary contributions. When

conditions became a public nuisance, the city might step in and correct the fault, but improvements would be charged to the land owners affected through special assessment. In general, each home or business made its own arrangements for fire protection, policing, water supply, sidewalks, and waste removal.¹⁴ The coming of the Civil War and the reduction in the number of men available to perform these services gradually forced the city to take action in some of these areas. For a city wishing to attract new residents, safety from fire and crime; the availability of parks, schools, and clean streets; and a healthy population all became necessary components to the city's image.

Milwaukee's divisive ward system, in which each individual ward was responsible for services, led to the enriching of ward officials and sometimes substandard work performed at a premium.¹⁵ Each alderman was responsible for overseeing the work done in his district and usually delegated it to the ward supervisor. These men, in turn, collected the fees for the improvements and contracted for the materials and labor necessary. Large numbers of complaints over the quality of the work done suggest that it was common practice for the ward supervisors to secretly arrange with the contractor for a cheaper quality of materials, the difference in price to be divided between the contractor, ward supervisor, and alderman.¹⁶ This divisiveness made it difficult for private capitalists to secure contracts to provide citywide services; any proposal was likely to meet with a counterproposal from another area, supported by another politician from a different party who claimed that he could not only perform the service more cheaply, but that the first alderman had engaged in fraud and corruption in making the initial proposal.¹⁷

Although annual elections of ward officials¹⁸ and surprisingly broad powers for those officials meant that aldermen and ward supervisors had a great deal of independent power, it also meant that they were much more responsive to the needs and desires of their constituents than was common in nineteenth-century cities.¹⁹ These officials, despite party affiliation, tended to concentrate heavily on the needs of their own districts as opposed to the general welfare of the city. Because expenditures for each ward were controlled by the aldermen for that ward rather than by the city as a whole, there was little attempt to agitate for citywide services, which would be under the stern fiscal eye of the city comptroller rather than the alderman, who might be

able to make a little on the deal. The interests of the city, which focused on increasing new business, and city prestige differed from those of the ward residents, who wanted good living conditions.

With the rapid increase in the proportion of German-born and ethnic German citizens in the 1850s, party politics became more important. Even after the birth of the Republican Party in 1856, with its emphasis on preserving the union, Germans in Milwaukee continued to vote heavily Democratic.²⁰ National boom years in the middle of the decade were attributed to the sound fiscal policies of the Democrats then in national office, and the resulting prosperity meant that most Germans were content with the status quo. The gathering storm in the years immediately before the civil war was a further impetus to support their party—war was not good for business unless one happened to be in the profiteering game. This all helped to ensure that Milwaukee enjoyed a steady reign of Democrats in City Hall, even if the Yankees on the east side stubbornly persisted in voting for Whigs or Republicans. Of the sixteen mayors who served the city between 1846 and 1870, only one was elected on anything other than a Democratic ticket. Some, admittedly, whose adherence to traditional Democracy had lessened with the acquisition of property, were elected on a coalition People's Ticket with the aid of moderate Whigs—or, later, Republicans. These more conservative officials tried to initiate reins on the independence of the alderman and a curtailment of municipal expenditure in general. That they rarely remained in office long was a reflection that most voters preferred things the way they were.²¹

Milwaukee's political behavior was democratic as well as Democratic. Mass meetings and heated arguments in debates and in letters to the press kept public sentiment expressive and vigorous. Annual elections kept politics continually before the voters, and officials who were unresponsive to their constituents found themselves out of office rapidly. From 1848 to 1870, an average of only two alderman per year succeeded themselves in office; while this was in part due to rotation of duties in city management, it also had the potential for making officials more responsive to the wishes of the voters. Officials who failed to respond to the wishes of their constituents quickly found themselves out of office. Although major political office was usually held by commercial and professional leaders, small businessmen made frequent appearances on the council, and by the 1860s tradesmen and representatives

of service industries also made an appearance. Given the high proportion of brewers and related industries among the German population, the Democrat's rejection of a temperance stand probably did more to ensure the loyalty of their vote than anything else. The Germans were rewarded by having the position of city treasurer "reserved" for one of them whenever a Democratic mayor was in office.

Time, war, and financial difficulties began to have an effect on the liberal attitudes of the Germans, as well as on the rest of Milwaukee. While the financial panic of 1857 had little effect on Milwaukee directly, decreased orders from other cities had a dampening effect on the city economy. The onset of the Civil War provided a boom as the closure of the Mississippi River meant that much larger amounts of grain and other foodstuffs were shipped through Milwaukee and other Great Lakes ports.²² The debacle of the railroad loans, however, would provide the stimulus that would encourage Milwaukee to embrace a more conservative fiscal policy. Despite the continued victories of the Democrats in their control of city politics, businessmen trying to maintain their customers with a lessened workforce had found themselves unable to contribute as greatly to the tax coffers. The combination of railroad debt and the carryover of ward indebtedness from aldermen whose zeal for local improvements had in many cases exceeded the ward levies allotted made the financial position of the city precarious.²³ The Readjustment Act precluded the traditional graft of the ward politicians by moving the power to finance improvements from their hands into that of the city comptroller. New improvements had to be approved by a council majority and were subject to the strict limitations of the budget, which was itself set by the state legislature. Despite their continued loyalty to the Democratic Party, and unhappiness with the national Republicans, Germans began to become disillusioned with their local politicians.²⁴ The former responsiveness was a thing of the past as fiscal curbs made the financing of neighborhood amenities impossible.

Although the Democrats would remain in office through the election of 1870, this was to be the end of their "regime." Despite the accusations of corruption, fiscal irresponsibility, and nonresponsiveness to business needs made against them, the decade of the 1860s showed that the Democrats were able to manage the city effectively. From a debt of \$2,825,850 in 1861, with empty city coffers, by 1869 the debt

had been reduced to \$200,000 in railroad bonds.²⁵ An area not addressed, however, was the power of the ward councilors, supervisors, and alderman in regulating public works expenditures. A proposed elective board of street commissioners had remained in office for only a year,²⁶ but the Public Debt Commission had been very successful in its efforts to reduce the debt facing Milwaukee. A proposed charter revision in 1867 would have eliminated the councilors and replaced the supervision of public works expenditures presently in the hands of ward officials with a Board of Public Works; this proposal was soundly defeated. The idea of a board continued, however, and in 1869, after continued public demand that something be done about the state of public works in the city, the proposal finally passed. The realization that the public's ability to vote the ward aldermen and councilors out of office if such a board were not established was likely the reason for this change.

Chicago, on the other hand, had a much more diverse ethnic and cultural mix in the 1860s and 1870s. While different groups occupied distinct neighborhoods, the multiplicity of ethnicities in Chicago prevented any one group from dominating politics in the nineteenth century. The tradition of Irish Democratic politics in the Chicago City Hall was largely a product of the postreform era in the twentieth century and depended in large part on the personal magnetism of Richard Daley, Sr.²⁷

It was in the context of the Chicago-Milwaukee rivalry that the Milwaukee water system was finally developed, but the debt problems that Milwaukee faced would lead to at least a decade of delay in the ability of the city to finance such a system. Milwaukee's indebtedness had arisen in large part because of the refusal of different political groups and classes to work together for the betterment of the city; instead, each group or individual believed that, with luck, it could gain pre-eminent status among the financial and business elite of the city or, alternatively, secure political power. The failure of these groups to cooperate, a holdover from the age of the three villages, would ultimately delay the provision of services in Milwaukee.

Milwaukee was similar in many ways to Boston, New York, and Baltimore in the establishment of its water system. Agitation for waterworks began decades before there was any concerted effort on the part of the city to supply such an amenity. Various private schemes were proposed, with dismal results. Unlike Chicago, in which a municipally

owned works was established in 1852 as the only practical solution,²⁸ Milwaukee's sectionalism would deprive the population of a citywide system for thirty more years. Chicago had attempted to resolve its water problems by licensing a private company to provide service, as had the cities of the east coast. In the ten years after the founding of the Chicago Hydraulic Company in 1842, troubles with fish-clogged water intakes, ice storms, and high water turbidities prevented the firm from turning a profit; the city purchased it in 1852. Chicago took an aggressive approach to supplying the city with water. Within nine years the city had a system that included 600 feet of intake pipes, an elevated standpipe, a 95-mile-long distribution system, and a total of 1.5 million gallons of reservoirs. The average daily pumpage in 1861 for Chicago was 4,842,000 gallons, which supplied 120,000 residents.²⁹

Water in Milwaukee was available from a private vendor as early as 1840. In that year, James Rogers, who built the United States Hotel at the corner of Huron and East Water Street noticed that an abundant spring was located on his property. Rogers built a spring head and had wooden mains constructed that led water into his hotel. He also served businesses along Michigan Street. Rogers's spring waterworks remained in operation until the hotel burned down in 1849.³⁰

The first call for a municipally owned works came with the above-mentioned *Sentinel* editorial. Agitation on a larger scale began in the 1850s, as city boosters were sure that a city waterworks would be necessary in order to compete with Chicago. In 1852, a private company headed by John Lockwood proposed to build a waterworks using his company's funds as well as \$75,000 borrowed from the city. Lockwood was to have a fifteen-year monopoly on the water, after which the city was to have the option of either buying the works or continuing to allow Lockwood to operate them for a further ten years. When no action was taken by Lockwood to construct any works, the common council authorized city bonds and a grant of seven acres to the Milwaukee Hydraulic Company in 1857. The financial panic of that year prevented anything definite arising from this action, but the company remained in business. Frustration with the inaction continued, and in 1859 Hubbard and Converse of Boston proposed to construct a waterworks for the city, including distribution system, for \$450,000. Just as it appeared that action would finally be taken, the Civil War broke out.

By 1867 Milwaukee's water supply was in the forefront of debate.

High levels of filth in the city, particularly human and animal wastes, were allowed to remain on the streets, from which they were eventually washed into the water table. Most houses had unlined privies, further contributing to the pollution of the supply, and the practice of obtaining water from a neighborhood pump, even when it was located in the midst of domestic and industrial wastes, was common.³¹ In 1866 the *Milwaukee Sentinel* noted that it was necessary to walk more than half a mile from the business district to find a pump to supply water that was “pure and wholesome to the taste and smell.”³² High rates of diarrheal diseases were endemic in Milwaukee, and while the link between water supply and disease had not yet been clearly demonstrated, many health practitioners recognized the relationship between pure water and health in a general fashion.³³

Lockwood had again petitioned the city in 1867 to renew his earlier grant of a monopoly; the city refused. By this time, the quality of Milwaukee water was so bad that liquid filth was coming out of the pumps on Grand Avenue. The use of backyard privies and the failure of citizens to restrain their animals from dropping wastes in the main streets contributed to massive pollution of the ground water. The Milwaukee, Menominee, and Kinnickinnic Rivers were also heavily polluted by tannery and slaughterhouse wastes. Any proposal for water in Milwaukee would have to draw water from Lake Michigan or from inland lakes.

There were other pressing reasons for implementing a water supply. Fire protection, despite the presence of several fire-fighting units, was minimal. The pump trucks, owned first by volunteer units and later by the city, had a limited capacity, and their tanks could not supply enough water to stop even a moderate house fire, much less a full-scale conflagration in the business district. City ordinances requiring house and business owners to maintain rainwater cisterns on the roofs of buildings were largely unsuccessful because the cisterns rusted and broke, or the water was utilized for drinking and bathing purposes in hot weather or periods of drought.³⁴ Bucket brigades bringing water to the pump trucks from public pumps could not deliver a sufficient quantity of water to augment the trucks' supply and ensure successful firefighting. Other needs for water were for washing and cleaning streets, for metal finishing and other industrial uses,³⁵ and the aesthetic use of water for fountains in parks. For all these reasons, city boosters, businessmen,

and the city hall hierarchy deplored the lack of a citywide water supply and encouraged the adoption of some system that would improve the city's image among potential immigrants.

In the meantime, Chicago had been experiencing water problems of its own. When sewers had been introduced in the 1850s, they had been designed to empty into the Chicago River, which flowed into Lake Michigan. This river also received massive amounts of industrial discharge, including slaughterhouse and brewery waste, from businesses located along its banks. During rainy seasons, the river's load of filth was carried into Lake Michigan, where it contaminated the drinking water source. Cholera and typhoid death rates skyrocketed, and residents besieged the city government in 1866 with demands that something be done to remedy the situation.

By 1871 a massive engineering program had been largely completed. Under the direction of E. S. Chesbrough, a two-mile-long underground tunnel had been extended into the lake to provide a clean source of drinking water. Chesbrough also attempted to reverse the course of the Chicago River, causing it to flow westwards to the Mississippi, but this would not be entirely successful until 1900. The Chicago Pumping Station and Water Tower were also completed in 1871, permitting the city not only to pump more water out of the lake but also to send it to areas of the city at higher elevations, and with greater pressure. This permitted industrialists needing an ample water supply to locate themselves further away from the center of the city, reducing the effects of air and water pollution on the downtown area.³⁶

Back in Milwaukee, the common council in 1868 petitioned the legislature for permission to raise taxes to provide five thousand dollars for a survey and estimate of possible solutions to their water problems.³⁷ The consultant chosen was E. S. Chesbrough, chief engineer of Chicago, who had been overseen the waterworks improvements there. After all, if Milwaukee was to compete with Chicago, it made sense to use the same engineer who had done so much to improve its rival to the south. Late in 1868 he submitted five proposals for consideration. Two used either Lake Michigan or the Milwaukee River as sources or supply, the other three proposed the use of inland water from Pewaukee Lake, Big Muskego Lake, or Lake Denoon. All five proposals were debated both in the common council and in the newspapers, with the middle classes living in the western wards of the city favoring the in-

land lake system as it allowed for a gravity fed supply, lessening initial reliance on pumps to lift the water up the steep lakeside bluffs. Chesbrough's preferred recommendation, that of installing a seven-hundred-foot intake into Lake Michigan then lifting the water to a reservoir located in the sixth ward, required high construction and operation costs. Given the geography of Milwaukee, with its steep bluffs at the lakeshore, it would require a great deal of power to lift water up the bluffs and from there to the reservoir. While the wards on the east side and downtown could be assured of a plentiful supply, being downhill from the reservoir, those on the west side would require additional booster pumps to ensure sufficient pressure to lift the water to those greater heights.³⁸ The cost of running these extra pumps would increase the cost of water, possibly beyond the ability of less economically well-off citizens to pay.

The inland alternative, proposed by William Wehr of the Holly Pump Company, recommended that water be obtained from Pewaukee, Denoon, or Big Muskego Lakes and gravity-fed into the city. The cost of extra pipe to bring the water fifteen miles into the city would still be about the same as that of constructing an underwater intake pipe, and the greatly decreased costs for initial pumping, as well as the elimination of the need for booster pumps and a reservoir, would mean lower capital and maintenance expenditures.

Debate was heated and often acrimonious. Letters extolling the virtues of one plan over the other appeared several times a week in the *Sentinel*, and members of the council who served on the Watering Committee were under constant barrage from both sides as the time for decision-making approached. Although neither plan could be undertaken until the city's debt was reduced to the levels stipulated in the Readjustment Act, public outcry that something be done about the water problem forced the committee to decide on an option to be undertaken as soon as it was financially feasible. Remembering the example of the 1850s, when local groups had been able to obstruct efforts towards a waterworks, the councilmen decided a quick decision was in their own best interests. After all, the sooner a decision was made, the sooner public support could be directed towards the plan selected. In 1870 the council decided to adopt Chesbrough's Lake Michigan system and recommended that construction begin as soon as it was financially possible.³⁹ While the debate continued, action could not be taken

until more of Milwaukee's debt was retired. It was not until 1871 that enough of the money owed was paid so that a decision could be made on a water system.

A lingering problem from the railroad fiascoes of the 1850s had been fraud and corruption on the part of city officials hoping to make a quick return on minimal investments. Further scandals relating to procurement of supplies and materials for road paving and improvements came to light in the 1860s. While the procurement system had been restructured so that contracts were let citywide from a single municipal office, public opinion on the trustworthiness of any municipal official was very low. As a consequence, when the city was finally ready to begin construction of its waterworks, it made sure that the ability of city officials to receive graft and kickbacks would be eradicated and requested that a board of water commissioners be empowered to oversee the works and, further, that these commissioners be private citizens.

A major stumbling block with earlier proposals had been the ability of citizen groups to obstruct efforts to get construction underway by petitioning the common council for delays or injunctions. To insure maximum trust and reliability, the council and mayor recommended to the legislature that the seven leading citizens of the city comprise the board. Alexander Mitchell, financially the foremost citizen, was to chair the board and was to be joined by John Plankinton, Frederick Pabst, Edward O'Neill, Guido Pfister, Edward Brodhead, and George Burnham. The commissioners would have the power to draft plans, award contracts, condemn property, and authorize expenditures, but the common council had the power to amend any of the above actions, subject to the approval of the board. The works were to be funded by the sale of water bonds, taxes levied for construction, water rates, and any other revenues that might derive from the system.⁴⁰ The legislature authorized the board on March 12, 1871.⁴¹ When the initial construction of the works was complete, authority was to be handed over to a board of public works, whose commissioners would serve at the pleasure of the mayor and be under the jurisdictional control of the common council.

Chesbrough had recommended that the initial system should consist of a pump station at North Avenue, a 700-foot intake into the lake, a high service pumping station, a reservoir, and a 135-foot-tall

standpipe. The capacity of the system was to be 16 million gallons per day. By 1888 this would be insufficient to meet the needs of the city.

Milwaukee in 1870 was a city divided socially and ethnically, continuing its original pattern of division. The separate settlements originally comprising the city had developed differently; Solomon Juneau's east of the river settlement on bluff land above the lake was largely inhabited by the English or native-born privileged business owners. The west side originally founded by Bryan Kilbourn in the later nineteenth century was the home of middle class German immigrants and their families. The south side, formerly Walker's Point, sited on marsh land south of the Menominee River, was the least pleasant district in Milwaukee. Unskilled workers, largely of Polish, Russian-Polish, and Bohemian extraction, would soon find refuge here and on the limestone bluffs beyond, as this less-desirable land provided lots and housing that they could afford. Despite the lack of East Coast-style tenement housing, the south side would be characterized by many of the physical symptoms of slum housing, including poor sanitation, crowding, and high infant and epidemic mortality figures.⁴²

But in 1870 these areas were mostly vacant, or in some cases farmland. In 1870 Milwaukee was a city with an expanding industrial and manufacturing base and relied heavily on the influx of skilled and unskilled labor that arrived from the east and from Europe. Since industrial expansion depended upon attracting and maintaining this supply of workers (at least the skilled workers; unskilled workers were, after all, available from anywhere), water supply to provide not only for industrial use but also for domestic needs of these workers was a necessity. Initially, water would be regarded not as a right but as a privilege, and one that individual property owners would have to pay for.

The Board of Water Commissioners held its first meeting in the mayor's office on April 18, 1871, to determine the terms of service of each of the members. O'Neill was elected president of the board, to serve a term of seven years; the terms of the remaining members were drawn by lot.⁴³ The second and third meetings were largely concerned with the adoption of rules and by-laws for the operation of the board; on June 5 the commissioners informed the common council that they were ready to function and requested the allocation of \$2,500 to hire an engineer.

By July the board had determined how the waterworks financing

was to be handled. Water bonds were issued by the city with a rate of three percent per annum; citywide taxes were to be assessed for operations and maintenance costs; water rates were to be assessed on all subscribing customers; and other fees, such as fines for the wasting of water, could be charged if deemed necessary.⁴⁴ All monies were to be held by the waterworks treasurer, who was to be hired by the board, and no payments could be made except at the order of the city comptroller.

Work proceeded slowly. The only other actions of the board between July and November were to hire an engineer to oversee construction and to vote \$10,000 in water bonds as a thank-you to Guido Pfister for his work as secretary pro tem. The common council had approved the issuance of water bonds to the limit of \$500,000.⁴⁵ In February, after receiving a recommendation from Moses Lane, the newly hired engineer, that the reservoir be 20 million gallons in capacity, the board authorized the city attorney to purchase the land necessary to accommodate the reservoir site. The land chosen was a six-acre plot willed to the city by the late Byron Kilbourn; other sites considered included land owned by Pabst, Pfister, and O'Neill. A secretary and a treasurer were hired in February 1872, and bids were placed for the manufacture of distribution pipe. Edward Allis's foundry won the bid for the pipe casting after making a last-minute bid just slightly lower than the next cheapest offer.⁴⁶

Map 1 shows the Milwaukee landscape, with the location of the pumping station and reservoir. Also noted are the location of the residences of the Board of Water Commissioners, all of whom were among the earliest citizens to receive piped water. Although there were many high bluffs available on the east side of Milwaukee that were appropriate for a reservoir, it is interesting to speculate whether the board would have been quite so enthusiastic about an alternate site that would not have led to their homes' receiving an early water supply.

During the rest of 1872, the board reviewed bids for the construction of hydrants and other valves and for the construction of the reservoir. The board, despite public complaint that it had as yet made no effort to build a pumping station, intake, or otherwise begin water supply, issued a statement on April 8 that it was to the advantage of the city that they proceed in the fashion that they had undertaken. "Surely," the statement read, "it is more sensible to have the system in place, so that when the water is ready for delivery, there will be no appreciable

delays in its availability to the public.”⁴⁷ By this well-reasoned method, the board hoped to avoid complaints common in New York, Boston, and Philadelphia that water, even when delivered to a pump house or waterworks, was not available to the public because other necessary components of the distribution system were not completed.

Once the necessary materials had been contracted for and delivered, the board determined the order in which wards were to be fitted with distribution pipes. While the sale of water bonds had been successful, providing the funds essential for the procurement of capital expenditures, the fees for main and individual distribution systems had to be collected to pay for the labor of installing them. Downtown business properties, in large part responsible for the adoption of a waterworks, were the first to signal readiness to pay for watering. Additionally, the physical location of the business district downhill from the pumping station meant that water could be delivered downtown without resorting to additional pressure pumps.⁴⁸ Since water pipes, unlike street paving, cannot be installed piecemeal, the initial distribution system was laid out in a pattern west from the North Avenue pump station to the reservoir and thence southeasterly to the downtown area. As these large mains were installed, neighborhoods adjoining the mains were “encouraged” to subscribe to the water supply.⁴⁹ From this first pipelaying, distribution was to be extended to other wards in an order determined by the board.⁵⁰

After the initial piping of the business districts, the order of piping was not, in fact, determined by the number of willing subscribers in a ward but by the board’s own determination. In 1873 the board ordered a survey of all streets in Milwaukee and determined that, for financial reasons, distribution pipe would be installed in streets that were either unpaved or scheduled for paving in the near future. This would eliminate the need for opening already paved streets to install the pipe, as well as the expense of repairing the excavations. The order of distribution was: first ward, followed by third, seventh, fourth, second, ninth, and tenth. (See map 2 for city wards.) This break in the earlier pattern of ward improvements—that of a individual block or group of blocks petitioning the ward supervisor or alderman for the improvement and then raising the funds to pay for the improvement—marked the end of the pure subscription phase in Milwaukee’s history, at least for a time. It would reappear in a manner that allowed city officials to deny

services to areas where less desirable immigrants lived before the century was out.

Since many property owners in these wards had not requested or subscribed for water, the board issued special assessments against the property owners that abutted on the streets where mains were laid to absorb the charges. While these assessments were in the process of being collected, the city obtained from the legislature the power to pay these charges from the city general fund, thus providing the necessary money up front.⁵¹ This action of the board was an indication that the city had moved out of the “subscription” stage defined by Einhorn, and recognized the concept of public good and the necessity of providing services whether or not the parties receiving those services were willing to pay for them. This plan of financing was largely followed by the successor to the Board of Water Commissioners, the Board of Public Works, which began its operations in 1875.⁵²

The basic question that the city had to answer in regard to its waterworks was whether it should be managed in a governmental fashion or in a proprietary one. In the first, a city provides a service to its residents, usually paid for out of tax dollars, for the convenience and common good of those residents. In the second form, a service is provided to a known group of customers who are expected to pay for the service. In the first type of service provision, profits are not to be expected, and any that actually materialize are rolled back into the system to reduce the taxes necessary to keep the system functioning. In a proprietary service, profits can be made and may be used for whatever purpose desired by the managers of the service. Although the Milwaukee Water Works may have appeared to be a governmental service and may indeed have been intended to be such a service, during all of the years of its existence it has been regarded by the common council as a proprietary service. This dichotomy between those actively managing the waterworks and those in a position of political control over it would result in several instances where necessary steps in service provision were ignored in order to provide a profit to the city as a whole. In cases when epidemics were rampant, this would result in fatalities.

From 1870 to 1910 Republicans and Democrats experienced an equality of power in city politics. One reason for the rise of Republicanism was that national politics began to have an effect on Milwaukee. No longer the isolated community it had been, interested prima-

rily in the affairs of its own geographic region, Milwaukee began to realize that national economic and political affairs played an increasing role in the well-being of the city. Another reason was completely local in nature. As new immigrants, often of limited means, the Germans had supported the Democrats, who promised them the benefits of modern city life, such as street paving and sewerage. With the institution of special assessment replacing the earlier subscription, now middle-class Germans began to resent having to pay for others to receive services that they had in their turn to pay for on their own.⁵³ This helped to spur a call for more conservative fiscal policies regarding municipal expenditures, long a hallmark plank in the Republican platform.

In some ways, this period in Milwaukee would echo the experience of Chicago. From an initial era when improvements to infrastructure and public works were charged in a uniform fashion across the city, the new phase, which I call the “benefit” phase, meant that only those wishing a service should have to pay for it. While individual block residents no longer had the sole power to determine whether they would receive a service, they were at least spared having to pay for anyone else’s receipt of service. In return for their initial investment, these same owners would receive the added property value from the improvements, whether street repair, sewerage, gas lighting, or, eventually, water supply.⁵⁴ This system gradually became the special assessment, whereby the individual owners lost the choice of whether they were to receive a service but were still directly assessed the costs. Further, individual wards and their officials could prioritize or stall a given service, depending upon the wishes of the ward’s residents.

The subscription idea did not, however, totally disappear from Milwaukee government. Over the thirty-year span from 1880 to 1910, city Board of Public Works (which received the responsibility for operating the waterworks and distribution service from the Board of Water Commissioners in 1875) extended water service to existing areas of the city, to new city districts, and even outside the city limits to areas that the city hoped would eventually become annexed land. Some areas, however, would remain without water for far longer than others. This lag was not because of low population; in fact some of the nonwatered blocks had high populations at the same time that other blocks with no population at all were being piped. These waterless wards were concentrated on the south side of Milwaukee, which were

mostly settled by new immigrants arriving from Poland after 1880. With the exception of streetcar service, these blocks, comprising much of the fourteenth ward (also the eleventh and twelfth wards), experienced a lag in the supply of city services that was up to thirty years behind that of other city wards. Several historians have noted and explained this gap; it is my hope to reexamine the data and these explanations in the face of the city's proprietary attitude toward water supply to determine which most accurately reflects the true circumstances.

Roger Simon's work in *The City Building Process* and *Milwaukee: Expansion of an Industrial City* looks at the eighteenth ward on the east side, the twentieth and twenty-second on the west, and the fourteenth on the south. All were largely subdivided and settled in the years from 1888 to 1910. These wards reflected the characteristics of their general areas in ethnicity, type of housing, and population density and are therefore excellent representations of the diverse neighborhoods of Milwaukee. Simon concluded that conditions in the south-side ward were substantially below those in other areas of the city. Low wages, crowding, and a lack of urban services would contribute to a prolonged substandard level of health, leading to an excess mortality among its residents.⁵⁵

It is Simon's contention that the poor economic status of these south-side Poles explains the gap in service provision. Since water supply had to be requested and the installation costs paid up front, he argues that the Poles deliberately delayed requesting this service because of its costs, despite the effect on health. The dollars expended on water service could be better spent, in the opinion of the Poles, on paying off their mortgages more rapidly. Because many of the south-side residences were duplexes that were made into triplexes by the renting out of basements as flats, housing was at a premium in the Polish neighborhoods.⁵⁶

Judith Leavitt offers an alternative theory in *The Healthiest City*. Her work, which examines the infancy of the Public Health Service in Milwaukee, contends that until the advent of the Socialist government after 1910, there was not much support for the use of city funds to improve sanitary and health conditions in individual neighborhoods. Even after the Socialists established themselves in City Hall, there was constant debate about and struggle to implement necessary improve-

ments, such as citywide garbage removal, introduction of sewage treatment, and neighborhood health clinics offering well-baby exams and immunizations. In the case of the Poles, these innovations were also seen as invasions of privacy and accepted only reluctantly and over time.⁵⁷

It is my contention that it was the lack of political power held by the Polish community, combined with the proprietary attitude on the part of the city government, that was responsible for the delay in water service. A discussion of the research that led to this argument follows.

Milwaukee's new immigrants differed from the older, established community in occupation, national origin, and language. Coming largely from Poland, these individuals were displaced agricultural workers with little or no industrial skills. Staunchly Catholic and reluctant to relinquish the use of their native tongue, they tended to concentrate in exclusive urban communities when they found a new home in America. In Milwaukee, this community was concentrated on the (then) southwestern boundary of the city, where property values were low. These neighborhoods were characterized by fairly dense housing (25 to 40 houses to the block, as opposed to 16 or 18 in other areas). Many of the houses were duplexes, and a particular habit in the immigrant neighborhoods was to rent out the basement as an apartment for new immigrants. This arrangement allowed the house owner to pay off the mortgage more quickly and allowed the newest immigrants to find cheap, if dismal, living quarters at a time when their financial condition was at its most precarious.⁵⁸

The center of every neighborhood was the Catholic church. From the church came most of the interaction between the community and the larger city. The priest was often the most literate man in the neighborhood, able to speak English as well as Polish. The role of the priest was to act as intermediary between the immigrants and the outside world. He advised them where to find work and to shop, recommended the local parochial school as the best educational choice, and informed the parishioners how to vote. Given the strong ties of the Democratic Party in Milwaukee, and elsewhere, to the Catholic Church, this recommendation in Milwaukee was uniformly to vote Democratic. Although the centrality of the church provided a close-knit community for the immigrants, this exclusivity also delayed the assimilation of the

Polish community into the larger American culture. With the availability of members of religious orders of teaching nuns to teach the children in their native tongue, children in parochial schools did not learn English as rapidly as did other immigrants, who attended public schools. This aura of exclusivity also made other urban ethnic groups less likely to associate with the Poles, and delayed their assimilation into the political and commercial arenas of the city. A culture of suspicion on the part of the immigrants also arose, and initially, at least, this prevented the amelioration of some of the harsher conditions under which the immigrants suffered.⁵⁹

The isolation and exclusivity were not all on the part of the Polish. Because Poles had long been regarded as inferior to true Teutonic stock, many of the German residents of the city, immigrants or children of immigrants themselves, shunned the newcomers. Politically, despite the strong support of the Polish for the Democratic Party, there was little or no attempt to use any of the party's power to accommodate the Poles or to take steps to improve their conditions.⁶⁰ Suspicion on the part of the Yankee business owners was perhaps highest. Accustomed to professional guilds because of the large German skilled population, the owners were not as accepting of the unions that arose among the unskilled workers of the south side. In the turbulent decade of the 1880s, repeated strikes in other cities, including the famed Haymarket Riot in Chicago in 1886, led police to respond to working-class strikes in Milwaukee by firing on the crowd in an effort to force dispersal and to vigorously pursue the ringleaders. When caught, these men were charged with inciting to riot, imprisoned, and black-listed among employers. Within a year, many of the Polish workers, fearful of job security and warned sharply by their priests about the evils of associating with socialism, had left the unions.⁶¹

Just as the Poles chose not to embrace socialism, socialism, to a large extent, at least in Milwaukee, also left out the Poles. The influence of Victor Berger and other traditional Germans in party leadership meant that the social hierarchy to which they subscribed, in which the Slav and Jew occupied a lower rung on the ladder of humanity, became the operating standard for the Milwaukee Social Democratic Party.⁶² The departure of the Polish workers from the Trades Union Council after 1886 was seen as a rejection of the principles of social-

ism by a party whose platform was growing increasingly close to the goals of the unions. However, the divisions in priorities between those who wished to focus on political action and those who wished to address the state of the workplace would delay a true unity between these groups until the early twentieth century. Sally Miller's work, *Victor Berger and the Rise of the Milwaukee Socialists, 1910–1920*, acknowledges that the failure of the Socialists to embrace the Polish population's largely unappreciated political power was a major delaying factor in the Poles acquiring political clout. The Socialists would, however, make up for their omission in the early years of the twentieth century.

By 1890 the European flavor of the city of Milwaukee was becoming evident to even casual outside observers examining the political structure of the city. In this year, the proposed Bennett Law, threatening the parochial school, would mark the entrance of the Polish community into political participation beyond the voting booth. Republicans, backing the issue, emphasized the need for its passage to ensure that future generations would be educated in the language of their country, and endorsed the "right of the state to make and enforce suitable legislation to secure compulsory education."⁶³ The Democrats, remembering their power base, came out against the law and urged its repeal; hoping to make sure of the Polish vote, they nominated a prominent Polish merchant, Roman Czerwinski, for comptroller. They also encouraged other Poles to run for alderman, resulting in the repeal of the Bennett Law, election of the Democratic candidates, and the installation of five Poles on the common council. Despite this lesson, the Democratic Party continued to largely ignore the needs of the Polish population. Mayor Franklin Somers, elected to office in the Democratic victory of 1892, ignored the Poles in appointing offices, especially Martin Schubert, the eminently qualified Warsaw engineer who desired to be made a commissioner of public works.⁶⁴ At a mass meeting at St. Hyacinth's Hall, Polish leaders aired their objections to being regarded "as so many cattle, useful only for piling up Democratic majorities."⁶⁵ They determined to teach the Democrats a lesson by staying away from the polls; the result was a strong Republican victory in 1893.

The passage in April 1895 of a nonpartisan civil service commission applicable to all Wisconsin cities had a sharp effect on partisanship and the power of politicians to make appointments.⁶⁶ By 1897,

1,300 positions had been removed from political control, and municipal government was without question more efficient. In the 1894 election, all three parties had made reform a major plank in their platforms. Dissension among Poles over whether to vote for the Democratic or the Labor candidate led to another Republican victory, and that party was also able to capture a majority of council seats.

In 1896 the provision of services was a major campaign issue. The Republicans, in their usual support of free enterprise, called for "improvement by private enterprise and competition in street railways, telephone services, gas and electric lighting."⁶⁷ The Democrats, Populists, and Socialists countered that these services should be provided by city-owned plants and asserted that the Republican candidate had interests in the major competitor for the streetcar franchise. The resulting Republican victory was a result of a three-way split in the liberal vote, but that campaign marked the emergence of a labor party that was capable of attracting enough interest to make for effective political action. Few Poles supported the Socialists or Populists, but their increasing frustration with the Democratic Party's continuing to ignore their desires resulted in a large number again staying away from the polls. While the issue of streetcar provision was of critical importance to the Poles, who needed the transportation to reach their places of employment, the pattern that all the parties had established of not providing the eleventh, twelfth, and fourteenth wards with services made the Polish population suspicious of supporting any party.⁶⁸ The Democrats, who heretofore had expected to receive the Polish vote without really having to campaign for it or by rewarding the Polish community with any substantial service, responded by cutting the community largely off from any benefits from City Hall.

During all this time, the city was gradually being piped for water distribution. The procedure was for a block that did not have water to petition to the Board of Public Works Commissioners to receive it. The board would then, as required by state law, verify the names and property-owning status of the petitioners and pass the petition on to the Common Council Water Committee with a recommendation that it be approved. The committee would then present the petition to the common council, which would hold the petition for three meetings, during which time it would be read at each meeting. At the third meet-

ing a vote to approve or deny the petition would be taken, and if it was approved, an ordinance would be enacted, directing the Milwaukee Water Works to install water supply to the petitioning block. This process took an average of five months from petition to ordinance, and from 1882 to 1910, the common council never went against the recommendation of the board regarding approval of petitions.⁶⁹

For the Polish areas of the eleventh, twelfth, and fourteen wards, however, a different procedure was followed. From the years 1890 to 1910, a total of 452 watering petitions were submitted, with 189 being from the three Polish wards. From 1890 to 1900, 90 Polish petitions were filed, only 3 of which were approved by the board and sent on to the common council for official action. The others were simply stamped as received by the board and filed. In contrast, the petitions filed by the non-Polish wards during the same decade were almost unanimously approved (144 out of 147 cases).⁷⁰ This indicates a distinct disparity in the way water distribution was carried out for the different wards. Table 1 shows a summary of these petitions. The number in parentheses indicates the number of petitions granted for each time period.

	1890–94	1895–99	1900–1904	1905–10
Polish	18 (0)	72 (3)	43 (11)	46 (19)
Non-Polish	86 (84)	61 (60)	79 (79)	37 (37)

Table 1: Water Petitions Filed and Approved in Milwaukee, 1890–1910. Source: Minutes and Proceedings of Aldermen's Committees, 1890–1910, City of Milwaukee Archives, Boxes 1–80.

Why did this disparity exist? An engineering explanation accounted for the lack of distribution on the south side prior to 1889. Because the water mains had to be installed under the Menominee River, and then carried uphill to the southern wards, a booster pump station was necessary to raise the pressure in the mains to a sufficient level to ensure that the water would flow. This was addressed in 1889 by the construction of a booster station in the Menominee valley that carried out this function.⁷¹ With the construction of this facility, distribution piping of the south side could have occurred but did not.

Also at this time there was considerable doubt as to the quality of the water being provided. The intake mouth was located well within the band of turbid water along the lakeshore and was suspected of

being contaminated by sewage and shore currents. In 1889 a commission of engineers decided that water quantity was of much greater concern than quality but attempted to address both issues by recommending that a new intake be constructed off North Point. The intake was over 3,000 feet long, and its maximum capacity was 95 million gallons per day. Its construction took five years and cost the lives of fourteen men.

The financial attitude in which the city held the water department was also a subject of some controversy at this time. When the Board of Water Commissioners had been established, it had held the opinion that money received from the sale of water were to be used to pay off the bills of the department and to retire the bonds that had been used for initial construction. If surpluses were obtained in some years, this should be used either to finance new construction or to reduce the water rates for the following years.

This was not, however, how the system ended up functioning. Between 1871—when the water department was founded—and 1893, the financial relationship with the city was all one-sided. But by the end of 1893, the city had raised \$1,880,000 in taxes to finance the construction of the waterworks and had issued bonds in the amount of \$1,430,000, for a total contribution of \$3,310,000.⁷² When the works produced enough revenue in 1893 to become self-supporting, the nasty little question of what to do with the money arose.⁷³ The Board of Public Works, which had oversight over the waterworks, recommended in its 1893 annual report that self-sufficiency was all that could ever be desired from the service. The report stated: “The department should never be operated as a money-making investment. It is sufficient when all legitimate expenditures chargeable to the department are met by its receipts.”⁷⁴

The controversy over what to do with the surplus revenues remained low-key until 1900; in the interim two other fiscal issues became important. The first of these was what kind of rate schedule (flat or stepped) should be imposed, and the second was the question of whether other city departments should have to pay for the water they used. The board favored charging the departments, the city engineer favored free water for the city departments, and the battle raged until 1896. In that year a compromise was reached in which all charges

made against other departments for water prior to January 1, 1895, and remaining unpaid at the end of that year were canceled.⁷⁵ In return the city authorized payment for water used in public buildings and for such services as sprinkling streets, flushing sewers, or for fountains or bubblers in parks. These services were to be paid to the water fund out of the city general fund.⁷⁶ This ordinance did not work in the way it was intended, for in 1896 the waterworks received no credit for the provision of its services to the other city departments. The Board of Public Works Commissioners decided it would not, in this case, then turn over the surplus to the general fund, as they had been doing since 1893. The identical situation occurred in 1897, but with Democratic mayor David Rose's election in 1898, the city departments began to pay their water bills. The mayor was thus able to announce that he had saved other water customers over \$70,000.⁷⁷ Clearly, the proprietary attitude of the city toward its water department had begun to make its mark publicly.

Rose implemented another change in the waterworks' fiscal policy. Previously, rates for water had been a two-step scale, with the first step 1¢ per hundred gallons (13.1 cubic feet) for the first million gallons and the second step ½¢ per hundred gallons for over one million gallons' annual usage. That initial rate had been replaced in 1882 with a five-step scale ranging from 15¢ per hundred cubic feet for the first 25,000 cubic feet to 3½¢ per hundred cubic feet for users over 500,000 cubic feet. Rose replaced this with a rate of 4½¢ per hundred cubic feet for all users, making water for the small consumer much more affordable.⁷⁸

This reduction in rates reduced the amount of revenue coming into the water department beginning in 1899, but this was partially offset by the fact that the city continued to reimburse the waterworks for its own use. This cost was passed along to the consumer in taxes, a less evident form of paying for the rate reduction.

In 1900 Mayor Rose appointed a Polish engineer, Frank Niezorawski, to the Board of Water Commissioners. This appointment, for a four-year term, which was followed by that of another Pole, Stanley Czerwinski, for a three-year term, did little to change the provision of services to the Polish wards. As Rose was elected to his second term, he began to agitate for the transfer of the \$300,000 surplus in the water

fund to the general fund. Throughout his career as mayor, Rose would continue to argue that the surplus water revenue should be used to provide other city services and that further extension of water service was unnecessary within the city.

But he did not take a similar stand on supplying water outside the city. Beginning in 1894, the Milwaukee Water Works had begun to provide water service to areas outside the city limits on a wholesale basis. In these cases water was delivered to the suburbs through the nearest large main and then carted to a central distribution point, where suburban residents could purchase it by the barrel.⁷⁹ The most extensive case was that of the Village of East Milwaukee (now Shorewood) which contracted with the waterworks to provide it with water service. The village would in 1905 extend its contract with the city to provide it with retail service, where water would be piped directly to residents' homes. Shorewood reimbursed the works for the cost of laying mains and feeder lines and, by a provision of Rose's rate decrease of 1899, paid for its water at 1.25 times the cost to customers within the city.⁸⁰ Because it required no more cost to make the water for outlying areas than for those within the city, the provision of water to extramural areas meant more profit. Rose proposed that if the city were to extend its water services to areas such as Wauwatosa, Cudahy, and West Milwaukee, many new projects, some admittedly proposed solely for vote-getting purposes, could be built at no expense to the city.⁸¹ If this water had been used to supply the Poles, there would have been city expense for extending mains, construction expense for the excavation of the lines and street repair, and a lesser fee for the water used than if it were sold on a wholesale basis to suburbs.

The surplus water funds were spent in many ways. Aldermen allocated some for the construction of a pavilion in the second ward Haymarket, funded band concerts in Kilbourn Park, took over from the ward funds the payment for ash removal, and had schools freshly painted. Not everyone was happy with this state of affairs. Alderman Heath, the council's representative on the Board of Public Works Commissioners, argued that the waterworks was not designed to make profits "but to render the people an acceptable municipal service. The surplus revenue should be used to extend and install this worthy municipal convenience in the interest of public health and convenience."⁸² He

proposed that the revenues be used to subsidize loans to poorer citizens to install indoor plumbing and that public urinals be provided in the business districts to prevent the spread of disease from privies or urination or defecation in the street, as was still occurring. The common council substituted for his proposal a resolution that the surplus be utilized for the remission of water rates for all city departments and that any excess be used for the erection of school buildings and for no other purposes.⁸³ This became Chapter 469, Wisconsin Laws of 1905, which provided that Milwaukee might so distribute its surplus funds as long as there remained on hand enough to pay two years' principal and interest on any bonded debt of the department. The amount of the surplus could not exceed the amount charged in any one year from taxes and had to be used for the payment of any new waterworks construction before it could be used for remission of city department water fees. The water bills of the parks department were thus canceled from 1905 to 1910, ward funds were exempted in 1906, and most city departments, excepting schools, were exempted in 1909.⁸⁴

Rose further contended that the water bonds still outstanding be refunded rather than paid, as they retired. He argued that since 1883 the waterworks had paid almost \$3 million of its debt, and he found this a "deplorable state of affairs. It is not fair or equitable that the entire burden of paying for our waterworks be laid on the shoulders of one generation. I believe that the next generation should bear its just share of this expense and that the whole amount should not be borne by the people of this city within the short period of 25 years."⁸⁵ As politically expedient as this policy proved to be in the short run, it ignored the problems of depreciation and new construction and assumed that the status quo as regards quality and technology would continue. In the long run, Rose's actions would cause delays in the construction of a new intake to deliver higher quality water, delay the construction of a necessary filtration plant, and cause needless suffering among the immigrant Polish community on Milwaukee's south side, as surplus funds were spent on items other than the extension of water service to that area, despite action on the part of its residents to obtain it.

The Milwaukee Water Works Office of Water Engineering maintains a record called *Report of Pipe Laid, Hydrants, and Gates Installed*

for all distribution pipes laid in the city. Using this record, along with official city maps and census reports for the time period, it is possible to determine the exact number of feet of distribution mains laid in the wards of the city from 1871 to 1910. Since much of the south side underwent street paving in the last decade of the nineteenth century or in the first decade of the twentieth,⁸⁶ water supply should have been introduced at that time, just as it had been in the northern wards. Further, the cost issue becomes less significant when it is remembered that the waterworks had been generating surpluses since 1893.

One reason for this lack of action by the board, even with Polish representation, was that it oversaw other functions as well. After 1900 the implementation of streetcar service was a major focus of city politics and had a decided impact on the attitudes of citizens towards government. Heated arguments regarding the siting of car lines, the method in which these should be paid for, and the ultimate public or private ownership of the service dominated common council discussions, board meetings, and the media. Ultimately, the board forced streetcar service through the Polish wards at an early stage of development, at a time far earlier than those wards received other services. While the board may have been motivated by a genuine desire to provide the service out of political altruism, the fact that many board members owned stock in the company and, realizing the high potential ridership, decided to maximize returns in an early stage of implementation probably contributed to their decision. The result was that south-side residents could at least travel more swiftly to their places of work, even though at home they were denied the amenities other parts of the city enjoyed. It is interesting that although streets had to be paved in order that streetcar lines could be introduced, water service was still not introduced in these areas. It would have been far less expensive to lay the water mains before street paving; the policy of City Hall to distribute water where it could generate more revenue, that is, to the suburbs, was in the long run fiscally foolish.

Tables 2, 3, and 4 show this more clearly. Table 2 shows the population of the fourteenth and eighteenth wards from 1890 to 1910 and indicates the rapid population growth and density of the south-side ward. Table 3 shows characteristics of these two wards, including nativity, health statistics, and threshold populations for services. Table 4 shows the feet of distribution pipe laid in each ward for the years from 1873 to 1910.

Year	14th Ward	18th Ward
1890	11,337	7,923
1895	17,145	11,122
1900	20,651	13,907
1905	25,300	15,483
1910	32,542	19,602

Table 2: Populations of 14th and 18th Wards. Source: Roger D. Simon, The City-Building Process, 1880–1910.

Item	14th Ward	18th Ward
% Polish Born	98	1
% Unskilled Labor	92	21.7
% Skilled Labor	2	43.5
Index Disproportion: Children	132	120
Cholera Death Rate*	0.6	-0.005
Threshold Pop. for Water	46.6	3.4
Threshold Pop. for Sewer	47.4	2.3
Threshold Pop. for Street Pave	45.9	4
Threshold Pop. for Streetcar	10	2.1

Table 3: Characteristics of the 14th and 18th wards, 1905 (as varying from the average). For the eighteenth ward, fewer than 25 percent of the blocks had threshold populations above zero for any services. Source: Roger D. Simon, The City-Building Process, 1880–1910.*

As can be seen in table 4, the number of feet of pipe laid in the eighteenth ward by 1910 exceeds the feet laid in the fourteenth ward by approximately 3 to 1, despite the fourteenth ward's population being 60 percent greater in that year. The years from 1875 to 1885, when little pipe was laid in either ward, was when the great industrial plants in and around the Menominee River valley were being supplied. As mentioned in the note to table 2, fewer than 25 percent of the streets in the eighteenth ward had threshold population greater than zero for receiving services, meaning that most of this area was supplied with water mains, sewers, paved streets, and access to transportation before there was anyone living on the street and often before any lots were even sold. The large figure noted for the eighteenth ward in 1905 indicates the piping necessary to connect Shorewood to the Milwaukee water system. Since many feet of major street mains had to be laid to complete this task, a majority of blocks in the area adjacent to these major mains were also piped in that year.

Year	14th Ward	18th Ward
1873	0	6,551
1874	0	3,405
1875	0	2,856
1876	0	0
1877	0	0
1878	75	0
1879	0	0
1880	0	0
1881	686	0
1882	0	0
1883	0	0
1884	0	80
1885	20	0
1886	0	1,474
1887	4,202	7,591
1888	0	7,340
1889	1,842	4,833
1890	36	5,926
1891	3,513	10,344
1892	3,537	19,289
1893	10,964	11,338
1894	17,243	18,252
1895	13,788	9,255
1896	10,900	11,380
1897	5,964	5,784
1898	4,026	5,069
1899	3,039	7,465
1900	11,860	8,353
1901	4,499	6,759
1902	0	4,649
1903	3,291	3,564
1904	7,603	6,286
1905	1,567	172,036
1906	4,332	1,200
1907	1,368	5,424
1908	6,797	18,725

	Year	14th Ward	18th Ward
	1909	660	17,776
	1910	11,330	15,066
Feet of pipe	1910	133,198	398,070
% of ward piped	1910	48.6	99.8
Miles of pipe	1910	26.01	77.74

Table 4: Feet of Distribution Pipe Laid in 14th and 18th Wards, 1873–1910. Source: Record of Pipe Laid, Hydrants and Gates Installed, Milwaukee Water Department, 1871–1915.

Roger Simon argued that the high threshold population for water supply on the south side was because the residents of the fourteenth ward delayed receiving service in an effort to pay off their mortgages more quickly. If his analysis is correct, we would expect to see many feet of distribution pipe laid prior to the paving of the streets and the introduction of streetcars, just as in other city wards. Instead, we see an almost total lack of distribution pipe laid at all, indicating that the service was never offered. The lack of distribution pipe also meant that the fourteenth ward was largely without water supply from hydrants for fire protection, despite the largely frame construction of buildings. An examination of fire insurance maps for the two areas shows that in both 1895 and 1910 fire insurance hazard categories were significantly higher on the south side, possibly indicating that the money Simon speculates was being saved by not subscribing to services was instead being paid out in higher insurance premiums.⁸⁷ Further, as shown above, there were petitions for service.

As early as 1877, water supply to prevent cholera and typhoid was urged by the city health commissioner.⁸⁸ Leavitt's discussion of this issue stipulates that the delay in the provision of services was because of a lack of commitment on the part of the city government as a whole to consider the needs of the poorer residents of the city. While this explains the political response of City Hall to the largely Polish community, it does not account for the provision of services such as street-car transportation.

Only by considering the economic benefit to the city of selling water to suburbs (to the detriment of the Polish community) can a true picture of the attitude of city hall officials be gained. The rush to provide water to the suburbs instead of to city residents was not only shock-

ing, in that it prevented a large segment of the population access to an amenity enjoyed by almost all of the rest of the city, but was also shortsighted in that increased firefighting expenses in the nonwatered areas could be expected to eat up part of the profits gained from the extramural sales. The political shortsightedness would, however, prove to be more profound a shock to Rose's government.

By 1908 the debt of the waterworks had been reduced to a level where Rose thought it judicious to seek another rate decrease, this time to four cents per hundred cubic feet. He also sought remission of the meter fee of twenty-five cents per quarter; this action came in response to calls from south-side residents who were complaining about the high cost of the service. When he made his proposal to the council, however, he found that such decreases were impossible because the aldermen had already applied the expected surplus from the rates as they were to specific "pork-barrel" projects in their own districts. Since Rose had treated the waterworks as a proprietary service, where profit-making was the ultimate good, he could not reverse his position and treat it as a government service by reducing the rates, no matter how popular this might be politically. Rose's actions left him hoist on his own petard, and his failure to address the needs of the south side Polish constituency would ultimately cost him the mayoral seat in the next election.

Milwaukee's story of water supply is similar to that of many other cities. The lapse in time from the recognition of the need for a piped supply to the delivery of such a supply echoed the situations of New York, Baltimore, Detroit, and Boston.⁸⁹ Only in Chicago, Cleveland, and Minneapolis, among major cities founded by the mid-nineteenth century, were comprehensive, citywide water systems implemented at an early time in the cities' histories.⁹⁰ The failure to adequately provide water to the poorer residents, those whose health might most benefit from it, was also not unusual. New York, Philadelphia, and Detroit experienced similar lags in the provision of service to newer areas; the financial benefits of providing services to extramural customers were more enticing and financially advantageous than extending service to areas where it might be only minimally utilized. However, many of these new areas in these old-line cities were inhabited by the middle class and wealthy, who could afford to live farther away from their

places of occupation. Particularly in New York, new immigrant populations tended to concentrate in the older areas of the city, from which they would join the suburban migration as they assimilated and rose in economic status. Despite these lags, none of the above cities failed to provide service to areas that were mainly populated by those of a specific ethnic group, as did Milwaukee.⁹¹ Immigrant tenements might have only a single water pump for each building, with non-sewer connected sanitation located in a common courtyard, but the water was available. What is most surprising about Milwaukee's case is that in a city renowned for its democratic government, given the rapid assimilation of residents in the mid-nineteenth century, withholding of basic and necessary services could have continued for the length of time that it did. The practice of political control by the mayor and council over the operations of the Boards of Water and Public Works Commissioners, and the disunity of that control because of the divisive ward system, allowed the Polish residents to fall through the cracks.

The example of Chicago, which began its waterworks almost thirty years prior to Milwaukee and which prided itself on the extensiveness of its distribution system, reflected the differing political structure of that city. As rich in ethnically diverse neighborhoods as Milwaukee, Chicago's unified political system allowed the more rapid political assimilation of new immigrants, and rewarded their political loyalty with services in a manner which Milwaukee was unable to duplicate. Juneau, Kilbourn, and Walker's legacy was reflected not only in crooked bridges but also in their city's failure to unify quickly enough to allow the city to achieve its true potential.

Notes

1. Bayrd Still, *Milwaukee: The History of a City* (Madison: Wisconsin State Historical Society, 1975), pp. 97–101.
2. *Milwaukee Daily Sentinel*, August 22, 1845.
3. *Milwaukee Courier*, January 22, 1845.
4. Still, *Milwaukee*, 105–8. See also Lawrence Larson, *A Financial and Administrative History of Milwaukee* (Madison, 1908), pp. 26–28.
5. Still, *Milwaukee*, p. 168.

6.	Year	Milwaukee	Chicago
	1840	1,712	4,470
	1850	20,061	29,963
	1860	45,256	109,260
	1870	71,440	298,977
	1880	115,587	503,185

Comparative Populations of Milwaukee and Chicago. Source: United States Census, Fifteenth, 1930. Population, 1:280, 1180.

7. William Cronin, *Nature's Metropolis: Chicago and the Great West* (New York: W.W. Norton & Co., 1991), pp. 23–40.
8. Cronin, *Nature's Metropolis*, pp. 23–63.
9. Robin Einhorn, *Property Rules: Political Economy in Chicago 1833–1872* (Chicago: University of Chicago Press, 1991), p. 30. The two rivers were separated by an eleven-mile portage. To ensure that Chicago would be the premier city of the Midwest, as its boosters desired, it was essential that this link be made.
10. Still, *Milwaukee*, pp. 101–20.
11. Cronin, *Nature's Metropolis*, p. 67.
12. Still, *Milwaukee*, pp. 178–80.
13. Kathleen Neils Conzen, *Immigrant Milwaukee, 1836–1860* (Cambridge: Harvard University Press, 1976), pp. 196–200.
14. Still, *Milwaukee*, pp. 178–79. In lieu of taxes, many lower-income men were required to spend a certain amount of time per year working on city improvements. Originally conceived to spur the building of roads, the expansion to other duties came as road building slowed with the introduction of rail. This requirement was eliminated in 1862.
15. Still, *Milwaukee*, p. 181. One well-known case was when residents of the fourth ward paid four times to have the same street paved. Each time the contractor had to pay such large kickbacks to the alderman that the materials used were of substandard quality, leading to premature cracking and settling. The residents eventually paid an outside contractor to do the work. This case occurred in 1859 and is documented in *Common Council Proceedings*, 1858–59, p. 223.
16. Larson, *A Financial and Administrative History*, p. 74.
17. Still, *Milwaukee*, pp. 169–79, passim.
18. *Ibid.*, p. 168. Originally city officials were all supposed to be elected for three-year terms. Prior to approving the city charter, the legislature amended this to provide for annual elections. Since each district had multiple aldermen, this quickly became unwieldy. In 1861, the charter was amended to provide for two-year terms for aldermen, staggered so

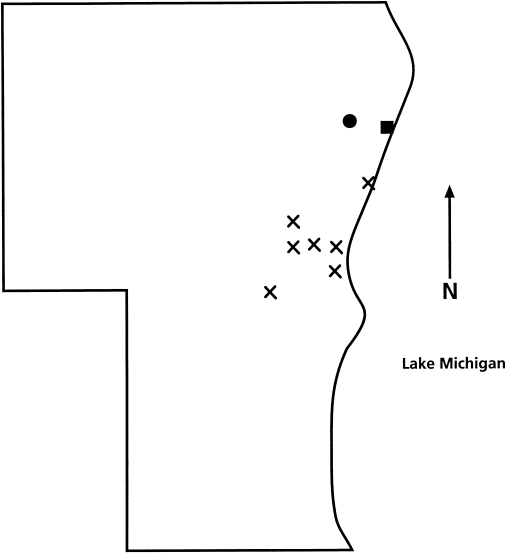
that no ward had both its officials up for election in the same year. Ward supervisors and treasurers, as well as the mayor and city comptroller, continued to be elected on an annual basis until 1904, when their terms were also extended to two years. See Still, *Milwaukee*, for details.

19. Einhorn, *Property Rules*, pp. 13–14.
20. Conzen, *Immigrant Milwaukee*, pp. 194–210, passim.
21. Still, *Milwaukee*, p. 133.
22. *Ibid.*, p. 143.
23. Charles E. Beveridge, *A History of Water Supply in the Milwaukee Area* (Milwaukee: Metropolitan Study Commission, 1958), p. 2.
24. For the first time Republicans began elections for alderman and ward supervisor in the German wards. Although this political change began slowly, it would accelerate over the next four decades. See Still, *Milwaukee*, pp. 166–84; and Larson, *A Financial and Administrative History*, pp. 80–86.
25. In the amount of \$100,000 each to the Milwaukee and Superior Railroad and to the Milwaukee Beloit Railroad. Still, *Milwaukee*, p. 164.; Larson, *A Financial and Administrative History*, pp. 81–88.
26. Larson, *A Financial and Administrative History*, p. 87. That year was 1859.
27. Steven P. Erie, *Rainbow's End: Irish Americans and the Dilemmas of Urban Machine Politics* (Berkeley: University of California Press, 1988), p. 12.
28. James C. O'Connell, "Technology and Pollution: Chicago's Water Policy, 1833–1930" (Ph.D. diss, University of Chicago, 1980), pp. 10–11.
29. *History of the Chicago Department of Water* (Chicago: Chicago Water Department, 1997). This figure represented almost all of the city's residents. See note 1 for Chicago population figures.
30. *History of Milwaukee, Wisconsin*, 4 vols. (Chicago: Western Historical Company, 1881), vol. 1, p. 414.
31. Judith W. Leavitt, *The Healthiest City* (Princeton: Princeton University Press, 1982), p. 24; Beveridge, *History of Water Supply*, p. 21.
32. *Milwaukee Sentinel*, January 6, 1866.
33. Leavitt, *The Healthiest City*, p. 27.
34. Still, *Milwaukee*, pp. 109–11.
35. Still, *Milwaukee*, pp. 199–201. Manufacturers that had previously relied on river water to fulfill their needs were increasing wary of the polluted water in all three rivers. Besides, these rivers were often frozen during the winter, making it difficult to keep some operations going.
36. *History of the Chicago Department of Water* (Chicago: Chicago Water Department, January 27, 1997).
37. Beveridge, *History of Water Supply*, p. 2.

38. *Milwaukee Sentinel*, January 1, 4, 7, 10, 11, 1869. It should be noted that this was one of the major problems facing Boston, New York, Baltimore, and London in their efforts to provide water to their citizens. Because water does not naturally flow uphill, artificial means are necessary to provide water in districts above the supply (or in this case, the reservoir), requiring fuel and maintenance on these auxiliary pumps. Steam engines are not cheap to operate, so a water supply that is located on higher ground than the area it is to serve will always be less expensive to operate.
39. Nathan Becker, *A Century of Milwaukee Water* (Milwaukee: Milwaukee Water Works, 1971), p. 7.
40. Larson, *A Financial and Administrative History*, p. 109.
41. Sections 1 and 2, Chapter 475, *Wisconsin Private and Local Laws*, March 22, 1871.
42. Leavitt, *The Healthiest City*, pp. 14–16; and Roger Simon, “The Expansion of an Industrial City: Milwaukee 1880–1910” (Ph.D. diss., University of Wisconsin, 1971).
43. “Minutes of the Board of Water Commissioners of the City of Milwaukee, 1871–1875,” in the archives of the Milwaukee Water Department (hereafter referred to as Minutes). Pabst’s term was six years, Mitchell’s five, Plankinton’s four, Pfister’s three, Brodhead’s two, and Burnham’s one. Pfister was also elected secretary pro tem until a permanent position could be filled.
44. Minutes, July 5, 1871. The fine for wasting water was set at \$5.00 and applied to citizens’ opening fire hydrants. There is no evidence that this fine was ever assessed during the reign of the commissioners.
45. Pfister’s bonus was therefore 2 percent of the total bond issue.
46. Minutes, February 19, 1872; March 2, 1872; and March 7, 1872. The manner in which Allis won the bid is interesting. All the other proposals were received by March 1; Allis’s bid arrived March 6 and had a total cost of \$160,995, just \$490 less than R. D. Woods’s, the next-lowest.
47. Minutes, April 8, 1872. The construction of the reservoir also involved a bit of nepotism. Mitchell recommended that S. W. Johnson of Sockport, N.Y., be hired to solicit bids for the reservoir. His recommendation for awarding the bid was J. Peterson, also of Sockport, and Johnson’s brother-in-law. Johnson was Mitchell’s wife’s first cousin.
48. Becker, *A Century of Milwaukee Water*, p. 14.
49. Minutes, June 3, 1872. Notices were placed in newspapers and flyers were posted in the relevant neighborhoods to encourage subscribers. From an engineering standpoint, it was more efficient to pipe an entire area than to install primary mains in major streets and then secondary and service mains in a hit-or-miss fashion as individual blocks opted for service.

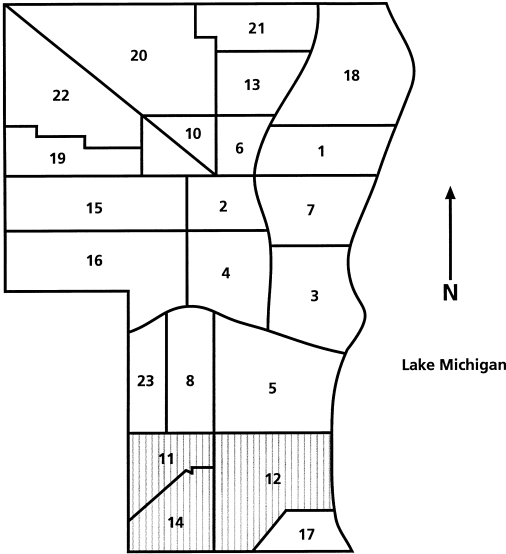
50. Minutes, July 26, 1872.
51. Minutes, *ibid.*; Simon, "Expansion of an Industrial City," p. 109. The Legislative Act was an amendment of the chartering of the waterworks in 1871.
52. *Proceedings of the Common Council's Aldermanic Committees*, April 4, 1875; see also *Proceedings of the Board of Public Works Commissioners, 1875–1910*. Hereafter, these works are designated, respectively, as *C.C.A.C. Proceedings*, and *B.P.W. Proceedings*. Neither of these holdings are paginated or indexed, comprising instead the contents of file drawers, somewhat randomly archived.
53. The special assessment called for two-thirds of the costs to be borne by the abutting properties and for one-third to be paid for out of the property tax. Under subscription, the entire cost was borne by the benefiting properties. Still, *Milwaukee*, p. 268.
54. Einhorn, *Property Rules*, pp. 1–27, *passim*.
55. Leavitt, *The Healthiest City*, pp. 31–35; Simon, *Milwaukee*, pp. 221–55.
56. Roger D. Simon, *The City-Building Process, 1880–1910* (Philadelphia: The American Philosophical Society, 1995), p. 36.
57. Leavitt, *The Healthiest City*, *passim*.
58. *Ibid.*
59. Simon, *City-Building*, pp. 36–46; Still, *Milwaukee*, pp. 310–15.
60. Still, *Milwaukee*, p. 313. When some Polish residents complained to their priest about his endorsement of the Democrats, given their lack of support for the Polish community, the priest replied that they would receive even less from the Republicans.
61. This information is courtesy of Dr. Dorota Praszalowicz of the Polonia Institute in Krakow, who is currently researching the relationships between Poles and Germans in fin-de-siècle Milwaukee.
62. Sally Miller, *Victor Berger and the Rise of the Milwaukee Socialists, 1910–1920* (Westport, Conn.: Greenwood Press, 1973), p. 23.
63. *Sentinel*, March 23, 1890.
64. Still, *Milwaukee*, p. 299. Schubert had an extensive career in public works engineering in his native land and had been the supervisory official for the implementation of water and sewerage in Warsaw. See Thaddeus Borun, *We the Milwaukee Poles* (Milwaukee: Casimir Pulaski Society, 1946).
65. *Sentinel*, June 22, 1893.
66. *Wisconsin Session Laws, 1895*, chap. 313, "An act to regulate the civil service of cities."
67. *Sentinel*, March 19, 1898.
68. Borun, *We the Milwaukee Poles*, p. 181.
69. *C.C.A.C. Proceedings, 1884–1910; B.P.W. Proceedings, 1875–1910*.

70. *C.C.A.C. Proceedings*, 1890–1900; *B.P.W. Proceedings*, 1890–1900.
71. Becker, *A Century of Milwaukee Water*, pp. 110–11.
72. *Milwaukee Water Works Annual Report*, 1913, p. 5.
73. *Milwaukee Board of Public Works Annual Report*, 1893, p. 6.
74. *Ibid.*, p. 7.
75. *Proceedings of the Milwaukee Common Council* (hereafter *C.C. Proceedings*), City of Milwaukee, 1895–96, p. 766.
76. *City of Milwaukee General Ordinances*, 1896, Chapter 29, Section 8. This was amended in 1898 to have each department pay for its water use out of its own funds. See *C.C. Proceedings*, 1897–98, p. 278.
77. *C.C. Proceedings*, 1900–1901, pp. 4–5.
78. *Milwaukee Water Works Annual Report*, 1899, p. 6.
79. West Allis and Shorewood were the two communities that accounted for the great majority (over 90 percent) of this wholesale water).
80. Rose's rate decrease even required those suburbs receiving water on a wholesale basis to pay the 125 percent fee.
81. Beveridge, *History of Water Supply*, p. 36.
82. *C.C. Proceedings*, 1904–5, p. 876.
83. *C.C. Proceedings*, 1904–5, p. 1016.
84. *C.C. Proceedings*, 1909–10, p. 1242.
85. *C.C. Proceedings*, 1902–3, p. 929.
86. Simon, "Expansion," p. 110.
87. *Sanford Fire Insurance Maps for Wisconsin*, vols. 13–17 (Baltimore: Sanford Insurance Company, 1895 and 1910).
88. Leavitt, *The Healthiest City*, passim.
89. For Boston, New York, and Philadelphia, see Blake, *Water for the Cities*; for Detroit, see *History of Detroit, Wayne County and Early Michigan*, Silas Farmer, ed. (Detroit: Silas Farmer and Co., 1899, reprinted Detroit: Book Tower, 1969).
90. Anthony Orum, *City Building in America* (Boulder: Westview Press, 1995), pp. 62–63, 149. Cleveland built a waterworks in 1846 and considered provision of service to new immigrants and new city areas to be a necessary city service. For Cleveland, see *The Encyclopedia of Cleveland History*, David D. Van Tassel and John J. Grabowski, eds. (Bloomington: Indiana University Press, 1983).
91. Examination of the budgets for the twenty largest American cities possessing public waterworks will confirm this. Access to most budgets can be made by consulting each city's page on the Worldwide Web. For example, Chicago's budget can be accessed at <www.ci.chi.il.us>.



Map One: Milwaukee ca. 1875

- Key:
- Reservoir
 - Pumping Station
 - X B.O.W.C. Residence



Map Two: Milwaukee Wards ca. 1900

CHAPTER 3

THE TYPHOID COCKTAIL HOUR

“The filtration of the water supply, with disinfection when necessary, is the most efficient and economic means of assuring its purity and that sewage purification should be carried out only so far as to prevent undue contamination of the rivers and the bay.”—Harrison Eddy, Sewerage Commission Report, 1911

The era of Rose government and the Democratic machine came to an end in Milwaukee with the 1910 elections. Slowly gaining in votes during the years from 1902 to 1908, in 1910 the Socialists managed to capture not only the mayor’s office but the positions of city attorney and comptroller as well as a majority of the seats on the common council. This victory was in large part possible because the Socialists had finally overcome their perceptions of inferiority regarding the south-side Poles and campaigned heavily in that district. The distribution of campaign literature in Polish helped to push the Socialist message, and the Poles’ frustration with a Democratic regime that had relied on their votes but done little to earn them led to a mass exodus of Polish voters

from the Democratic Party. Emil Seidel, the new mayor, had in his newly elected government established the first and only Socialist government in a major American city. Fearing that the Socialists would win the election, the Democrats, Republicans, and Progressives had combined their parties into a single “Nonpartisan” group. Although the new party retained more of its Republican origin than its Democratic one, its eventual legacy would be that all municipal elections in Milwaukee would be officially nonpartisan. The formation of the new coalition, however, was unable to stop the Socialists from gaining power in 1910.

With the victory of the Socialists in Milwaukee government in 1910, a major new era in the waterworks began. The provision of pure water to all city residents had been a plank in the Socialist platform since 1908; given the difficulty of the south-side residents in obtaining water, it was not surprising that they gave the Socialists their support on this and other issues. Water supply and the construction of a water filtration plant were important policies of Seidel’s administration and would continue under the 1916–40 administration of Daniel Hoan, the first multiterm Socialist mayor. Due to the length of Hoan’s term much more was done to achieve these goals during his tenure; Seidel’s administration, however, despite its two-year length, was responsible for the introduction of reforms that would make substantial changes in city water operations.

Although the Socialists argued that citywide water service was necessary, this would not mean that supplying service to the south-side neighborhoods that had been denied it so long would be allowed to completely derail the proprietary attitude that the city held toward its waterworks. The sale of water to suburbs would continue; within a very few years the Socialists would argue that the supply available from Lake Michigan should be expanded.

The first reform was the creation in 1910 of the office of the superintendent of waterworks. This officer, appointed by the commissioner of public works under city civil service procedures, took over the operation of the water works, under the control and supervision of the commissioner.¹ The operation of the department was at last under the control of a single individual, and the four divisions—collections, pumping, mains, and meters—were made accountable to the superintendent rather than to the Board of Public Works, although the board

retained oversight. Additional positions created were those of water waste engineer and water chemists, whose duties were to oversee, respectively, the flushing of mains and disposal of sludge and debris from the Kilbourn reservoir, and the daily testing of the water for impurities. A new central accounting system was also installed in 1910, eventually replacing the position of water registrar with that of the city comptroller.²

Other reforms focused on how water should be distributed and whether any customers should receive free water. During Rose's administration, it had been common practice to remit the water bills of churches, convents, orphanages, and other charitable institutions, in part because of the votes the Democrats would gain from the gesture. Seidel directed the new city attorney, Daniel Hoan, to look into the matter, and Hoan concluded that remitting the water bills for anyone, whether residential, commercial, or charitable, was a violation of the city charter.³ The practice of remitting the water bills of other city departments in return for the water department not being charged tax on its properties was also deemed to be in violation. Most departments were quick to pay up, but the Board of Park Commissioners did not begin to pay their water bills until 1915.⁴ These interpretations reflected the goals of the Socialists' management style, namely that cities should be operated for the maximum benefit of the residents of the city rather than for the convenience of those doing the governing and administering. By remitting the water bill of city departments, the waterworks generated less revenue that in turn could be applied to the general fund for the good of the citizens. Despite the charitable nature of the remission of bills for orphanages and other benevolent institutions, it was Socialist practice to make everyone contribute to the betterment of all. Thus the idea of the water department being operated as a proprietary service continued, even under the aegis of the reform-minded Socialists.

The Seidel administration's most successful reform was the introduction of universal metering of all water service. An evaluation completed in 1911 showed that the water department was losing 23 percent of production due to leakage and wastage, and since the locations of these losses could best be determined by the installation of meters, the Board of Public Works recommended the change.⁵ The city engineer had first recognized the problem of unmetered service as early as 1898, when he pointed out that although 70 percent of the customers were

metered (including all commercial and industrial users) the remaining 30 percent of residential unmetered users accounted for over half of all the water used.⁶ While various proposals had been considered to address this issue, no action was taken until the Seidel administration's proposal was made in 1910, because the costs involved were seen as too great.

The water department could not, however, simply order installation of meters on all customers that did not have them. It was necessary to prove first that wastage or leakage had occurred, and this proof was obtained by inspection of unmetered dwellings. One hundred ninety-four of these houses (about 2 percent of the total) were found to be letting the water run continuously, resulting in what should have been water bills of from \$200 to \$500 per year, rather than the \$8 to \$10 they were paying for an unmetered tap. The inspections generated orders for meters to be installed in the private homes that had proved to be wasting water, and all city departments were required to have meters installed on all their taps as well. The cost was to be borne by the consumer.⁷ Final approval of all this action was granted by the Wisconsin Railroad Commission, as required by Wisconsin law regarding all public utilities, on May 1, 1913.⁸ Metering proved extremely effective. In 1913, the first year that it was required, losses from leakage and wastage dropped to 11.43 percent from their earlier value of 23 percent. Revenues per million gallons rose concurrently, from \$46.76 in 1912 to \$49.84 in 1913.⁹ The department was not only reducing wastage, it was making money by doing so.

By making money from selling water and transferring that money to the general fund, it was possible to keep property tax rates in Milwaukee artificially low. While other cities might have to seriously question expenditures for parks, new street lighting, fountains, and other aesthetic improvements, Milwaukee was able to use the water department surplus to finance these items directly, giving city residents the amenities of a better life without the bills for them.

An evaluation was also performed of the waterworks itself. The city's Bureau of Economy and Efficiency, which during its brief eighteen months of existence examined many areas of city government, did three studies on the waterworks. The first recommended the construction of a new pumping station on the Milwaukee River near Locust Street, to boost pressure and to replace the old high-service station,¹⁰

and the construction of new feeder mains across the river; the second recommended an additional booster station on the south side, where low pressure was failing to deliver water to some areas; and the third recommended a reservoir be constructed on the south side. All but the third were done within the next twelve years.¹¹ The bureau also recommended that a new intake be constructed to replace the North Avenue intake, which had been plagued with several episodes of filthy water. While the Socialists had campaigned for this in 1910, they faced opposition from Nonpartisans, who wished instead to construct a sewage treatment plant. A halt in construction during the First World War would delay the intake's completion until 1918. A final recommendation was that a water treatment plant utilizing filtration be constructed. The struggle for this plant would be a major political field of contention for the next quarter century.

In addition to quality issues, controversy over the schedule of water rates was marked during Seidel's administration and would prove to be a major point of contention in the second Socialist government, that of former city attorney Daniel Hoan, as well. This battle was between the city and the state regulatory commissions and concerned not only what rates could be charged and how the fee schedule could be arranged but, ultimately, who was to have control over the financial operations of the city's waterworks.

Problems with the purity of Milwaukee's tap water had first become evident in 1892. In that year, a Milwaukee resident named James Holton, upon arising from bed, turned on his water faucet and received not the clean tapwater he was expecting but "a very dark colored material filled with a number of brown and green globules of gelatin like substance."¹² Other episodes in following weeks alerted Milwaukee residents to the fact that the practice of dumping garbage into Lake Michigan was adversely affecting the water supply. Other sources contributing to the pollution were garbage-littered streets, where manure and other animal droppings were left to decay, rotting wastes left in back yards near to privy pits and household wells, where they could seep into the ground water supply, and the practice of dumping sewage from the new system directly into the lake.¹³ Although physicians were beginning to accept the germ theory of disease, many still recommended that, for the purpose of improving the general health of citizens, clean streets and the disposal of wastes would be necessary.¹⁴ The story of

how Milwaukee obtained a garbage disposal plant is told thoroughly by Leavitt, and it is important in that it shows the difficulty of obtaining resolution of a major health problem through the auspices of the Milwaukee government.

As long as there was a strong Republican presence on the council (and there was in the decades of the 1890s and 1900s, even when David Rose was in office), there was great reluctance to the city's stepping in and providing any service for which there appeared to be private interests ready to provide that service, despite the fact that Milwaukee was making a tidy profit from running its own waterworks. Garbage was only one example; others were streetcar service, gas lighting, the provision of electric power, health services, and testing for tuberculosis in milk. This reluctance was not unusual in nineteenth-century cities; witness the difficulties of initiating water supply in East Coast cities, as mentioned above, as well as in Milwaukee. What was remarkable about Milwaukee, however, was the length of time that this attitude persisted. Despite the victories of the Socialist Party in the 1910 election and the strong representation of the progressive wing of Republicanism in Wisconsin in general, reforms just seemed to take longer in Milwaukee. During Seidel's administration, and during the following administration of Gerhard Bading, the city health commissioner and a nonpartisan, advocates for reform and service provision frequently cited the examples of Chicago, Detroit, Minneapolis, and St. Louis as cities that had taken steps in these areas.¹⁵ Given the reforming nature of the Socialists, it must have been galling to see Milwaukee falling behind other cities with more "traditional" politics.

Back in 1905, Mayor Rose had attempted to get the common council to investigate the purity of the lake water supply after being informed by the health department that it was contaminated.¹⁶ No action was taken until three years later, when city health commissioner Bading urged that consulting engineers be hired to determine the scope of the problem.¹⁷ Finally, in February 1910, facing a Socialist attack contending that the council had deliberately avoided dealing with the issue of pure water, the council appropriated the money and directed that the report be done under the auspices of the sewerage committee of the common council. While the report was being prepared, Socialists on the council in the summer of 1910 drafted a resolution asking the city engineer to determine whether, in the interests of obtaining a cleaner

water supply, the present intake should be extended, a new pumping station constructed, or filtration equipment installed.¹⁸ The engineer, Charles Poetsch, replied that, due to the intake being located so far from the harbor and the discharge of sewerage, “the probability of delivering even slightly contaminated lake water to the city is too remote to deserve further consideration.”¹⁹ Poetsch further recommended chemical treatment with hypochlorite of lime before the question of construction be addressed.²⁰

Water purification and sewage treatment are two very different processes that are often confused. Water purification involves removing small amounts of impurities from the water, rendering it safe and potable. Sewage treatment, on the other hand, involves reducing the quantity and harmful quality of large amounts of liquid and solid wastes and ideally discharging into the water supply levels of bacteria and other pollutants that are no greater than the ambient. Since the 1940s sewage treatment has used an advanced technology known as tertiary treatment, but this was unforeseen at the time. The goal of sewage treatment at that time was to reduce the odor and bacterial levels to a “tolerable level”; this meant that about 50 to 75 percent of the solids and pathogens were removed. Dumping the remainder into the same source from which water for drinking purposes was obtained meant that untreated or chemically treated but unfiltered water would eventually become contaminated by sewage waste.²¹

Unhappy with the lack of support they had received from the engineer, the Socialist majority used their position to expand the commission of the sewerage committee’s consulting engineers, John Alvord, Harrison P. Eddy, and George C. Whipple. Instead of simply determining whether the water was polluted, they were, if possible, to determine the source or sources of that pollution and devise methods to eliminate it.²² The report was delivered in April 1911 and recommended

That the filtration of the water supply, with disinfection when necessary, is the most efficient and economical means of insuring its purity and that sewage purification should be carried out only so far as to prevent undue contamination of the rivers and bay.²³

Despite this strong recommendation, the council did nothing further to implement these steps during Seidel’s term. This did not, how-

ever, mean that Mayor Seidel took no action. Poetsch having retired at the end of 1910, Seidel directed the new engineer, John Mesiroff, to investigate the possibility of improving or replacing the North Point intake. Mesiroff held a very different view on the purity of Milwaukee's water supply than had his predecessor. He informed the council that to ensure a clean supply depended upon "the urgent necessity of immediately taking steps towards the construction of a new intake."²⁴ This was not only because the water was increasingly dirty in appearance and had a greasy taste but also because providing service to the western and southern areas of the city was putting a strain on the amount of water available.²⁵ At about this same time, the Bureau of Economy and Efficiency, which the Socialists had established upon taking power in 1910, was beginning to release its reports on the waterworks, and this provided an additional voice to urge that steps be taken to safeguard a pure water supply. The council approved a \$6,000 grant from the water fund for preliminary borings and surveys for a new intake, but arguments as to the best way to actually preserve the purity of the source soon arose between the Nonpartisans and the Socialists. Seidel did get the new water intake approved. It consisted of a concrete tunnel 12 feet in diameter, extending 6,565 feet into the lake in a northeasterly direction measured from the foot of Linnwood Avenue. Sunk 67 feet below the water surface, it was designed to be less vulnerable to surface contamination caused by adverse weather conditions.²⁶

Seidel and his fellow Socialists were also dealing with the question of water rates. Controversy had begun in 1909, when the Beaver Manufacturing Company, Filer and Stowell Co., and twenty-three individuals filed a complaint with the Railroad Commission claiming the city's water rates were excessive. No action had been taken on this claim until 1912, and in the meantime, becoming aware that the Railroad Commission had recently imposed a stepped fee schedule on another utility, that of the University of Wisconsin-Madison's water plant, the common council hired a consultant to advise them. This consultant, John R. Commons, was a well-known labor economist, and his task was to examine the records of the water department, determine the actual costs of water production, and prepare the city's defense.²⁷

Two months later the city also authorized the hiring of a water waste survey engineer, under the direction of the commissioner of public works, to consult with the city attorney and serve as a witness in any

litigation involving the waterworks.²⁸ This engineer, Ray Palmer, presented their evidence to the Railroad Commission in September 1912, but to no avail. On September 13, 1913, the commission tentatively ordered a sliding service charge from \$.90 to \$325.00 per quarter and an output charge ranging from 1.8 to 1.5¢ per 100 cubic feet, to become effective on January 1, 1914.²⁹ The city raised so much objection to this rate schedule that the decision was never published.³⁰

By forcing the Railroad Commission to back down, the city had won the first battle in what was to be an extended war for jurisdiction with the state. Retaining the existing flat fee schedule did not accurately reflect the costs of production, but it allowed the city to continue to treat the water department as a source of revenue that could enable the remission of residents' taxes. Because many large companies required only one meter and because the costs of chemical treatment were negligible, it was more economical to serve larger customers, and the city made a greater profit from them.³¹ The question of what was to be done with the excess money would be a source of contention for the next twenty-five years.

The dispute between the Socialists and the Nonpartisans over whether to build a filtration or a sewage plant was also tied up with another Socialist plank, that of a municipally owned lighting plant. This disagreement was not as altruistic as it appeared, for it had its base in politics. Construction of a sewage treatment plant would necessitate a large bond issue. When combined with the bonds being issued in 1908 for necessary harbor improvements, these sewerage bonds would raise the city above the allowable debt limit. As long as the city was above the limit, no other major projects could be funded, and this would prevent the Socialists from pushing through their pet project of a municipal light plant.³² In 1908 a local referendum had approved the immediate construction of such a plant, by a vote of 11,858 to 5,709. Such a vote was anathema to the Nonpartisans, who, retaining much of their Republican character, felt that such improvements should remain in the private sector. An additional referendum in 1910 had approved the issuance of \$300,000 in mortgage certificates and \$250,000 in bonds to finance the light plant. Despite the Socialist majority in the council, the presence of Nonpartisans violently opposed to the lighting plant prevented definitive council action from being taken on its construction. One of the last actions of Seidel's administration was to direct the

city attorney to take “any and all steps he may deem necessary to establish the right of the City of Milwaukee to construct and maintain an electric light and power plant for municipal purposes.”³³

Seidel was defeated in his 1912 bid for reelection by Doctor Gerhard Bading, the same former health commissioner who had determined that the water was impure in 1908 and who had urged for a study of the pollution of the lake and harbor. With the return of noncorrupt politics to City Hall (with the unseating of Rose), many of the voters who had put the Socialists into office just two years earlier felt that they could now return to their previous party allegiance. Many of these voters resented the “working-class focus” of the Socialists and felt that the representation of other classes was being overlooked. With the endorsement of nonpartisanship by such groups as the Westminster City League and the City Club, and the support of the *Milwaukee Journal*, voters reduced their support of Socialism to 40.6 percent of the votes and gave the Nonpartisans fifteen of the council seats.³⁴ While party positions on how to address the issue of water purity were well defined at this time, Bading did recommend that the water be treated to eliminate germs. Following Poetsch’s 1910 recommendation, the waterworks installed a device to treat the water supply with hypochlorite of lime in 1913, resulting in a marked decrease in the rate of deaths from typhoid.³⁵ In 1914, with hypochlorite treatment in operation year-round, the rate dropped even further.³⁶

The Alvord, Eddy, and Whipple report, which had recommended both water and sewage treatment plants in 1911, failed to generate much more enthusiasm among the council members after Bading’s election as to additional steps to ensure water purity. Although the need for a sewage treatment plant (along with the threat of a city-owned lighting plant) had largely passed with the defeat of Seidel in 1912 and the removal of the Socialist majority from the council, the fact that such a report had been issued finally required the state to step in. In 1913 it created the Milwaukee Sewerage Commission, much as forty years earlier it had been forced to create the Board of Water Works Commissioners. The function of the sewerage commission was to be the same as that of the water commissioners: get in, figure out how to build it, build it, then hand the plant over to a city department and cease its own existence.³⁷ That plan, however, would not be accomplished in the way the legislature had foreseen.

Bading's implementation of chemical water treatment, with the resultant decrease of typhoid in the city, helped him to gain reelection in 1914. By 1916 the situation had changed, bringing the same questions of water purity to the forefront of the campaign. On January 14, 1916, the chlorination equipment meant to purify the water stopped functioning for seven hours when parts of the machinery froze in severe weather conditions. Due to strong winds from the southeast, which blew heavily polluted waters into the area of the North Point intake, the water pumped to consumers was untreated and heavily contaminated. Within days an estimated 25,000 to 100,000 cases of diarrhea resulted, accompanied by over 500 cases of typhoid fever.³⁸ Bading co-opted the issue and blamed the Socialists for the outbreak, contending that it was their obstruction of the issuance of bonds to finance the sewerage treatment plant that had been responsible for the outbreak.³⁹ Sixty deaths from typhoid followed, and the resulting panic led to the approval of a referendum in the April elections of the bond issue for the sewerage plant, 30,631 to 12,658. During the campaign, Bading argued strongly for the necessity of the sewerage plant, calling Milwaukee's water "a typhoid highball."⁴⁰ Daniel Hoan, Bading's Socialist opponent, mentioned the water issue only once in pointing out that even had the bonds been issued earlier, the plant would not have been completed and the episode could not have been thus prevented.⁴¹

Hoan won the 1916 mayoral election but politically was not in a position to implement much of the Socialist platform. The Socialists held only eleven of the thirty-seven council seats, and the approval of the sewerage bond issue had placed the city in a financial situation where it would be extremely difficult to fund many of the proposed Socialist programs. Utilizing other options, he wrote to the Wisconsin Railroad Commission, requesting that they join him in asking the U.S. Public Health Service to examine the condition of Milwaukee's water and ultimately to see if they would recommend a filtration plant. Additionally, he directed that work be resumed on the Linnwood Avenue intake, which had begun in 1912 but had been halted when the Non-partisans under Bading refused to authorize further funding.

The Public Health Service sent sanitary engineer Henry Letton to survey Milwaukee's waterworks and harbor in January 1917. The letter from the surgeon general accompanying the report stated:

The methods which are presently in use for the purpose of rendering the water safe for human consumption are entirely of a makeshift nature and it is recommended that the City of Milwaukee take immediate steps toward the installation of an adequate filtration plant which will furnish the city with a palatable and safe water supply. In view, however, of the fact that this water supply is apparently always potentially dangerous, orders have this day been issued to common carriers by lake or rail to discontinue the use of this water supply for passengers in interstate traffic.⁴²

The report that accompanied the letter came to a similar conclusion:

In order to safeguard the health of the citizens of Milwaukee by the prevention of the morbidity and mortality from typhoid fever now caused by the polluted water supply, it will be necessary to construct a modern water filtration plant.⁴³

Hoan had his report supporting his views, but he did not yet have the power to make these views law. He appointed a committee to evaluate the report consisting of two aldermen, the public works commissioner, the past and present city engineers and health commissioners, the chief engineer of the sewerage commission, and the superintendent of the waterworks. This plan may have had an ulterior motive, as Frederick Olson points out. Until the report was evaluated, work on the sewage treatment plant was delayed, but work on the new water intake, also a long-time pet project of the Socialists, continued.⁴⁴ The committee served a political purpose as well. Except for Seidel, who was one of the two aldermen on the committee, all the other members were Nonpartisan. If Hoan could get a Nonpartisan committee to recommend the Socialist position, many of the accusations that Hoan's projects were politically motivated would lose much of their sting. Hoan himself described the health service report as a "sledge-hammer" with which to pound the Nonpartisans in line. According to the Hoan papers, he met with the committee, showed them the federal reports, and threatened to publicly hold them responsible for any additional typhoid deaths if they did not ratify the report and recommend a filtration plant.⁴⁵ Considering Bading's finger-pointing in the 1916 campaign, when he had accused the Socialists of causing the typhoid epidemic because of their stonewalling the issuance of bonds for the sewage treatment plant, such a threat would have been sweet political revenge.

In May 1917, the report committee recommended that William Copeland, a prominent chemist, be hired to experiment with filtration.⁴⁶ This recommendation was referred to the committee on waterworks and sewerage, where it languished until September. On September 10, the majority report of the committee recommended that the filtration report be placed on file. A minority report, however, from the two Socialists on the committee,⁴⁷ recommended that \$30,000 be immediately appropriated for the filtration study. Two months of vicious political wrangling followed, until November 19, when the Socialists managed to have the minority report substituted for the majority by a vote of nineteen to eighteen. The federal study supporting a filtration plant was then adopted by a vote of twenty-four to thirteen.⁴⁸

On December 31, the money for filtration studies was appropriated, and Socialist alderman John Doerfler introduced a resolution directing the public works commissioner to appoint a seven-person panel to conduct experiments in water purification and filtration. Doerfler's resolution remained unacted on until March 1918, when Hoan opened his mayoral campaign. He bitterly attacked the council for its inaction, pointing out that it had been nearly a year since he had appointed his study committee. He charged that "this branch of statesmen in the common council have made a football of the matter of pure drinking water for this city. They have proved by their dilly-dally tactics that they are the ones who in fact are willing to let the people of this city die of typhoid, if this is possible, from our water supply."⁴⁹ This stinging speech did the trick; the council unanimously voted to adopt Doerfler's resolution on March 25.⁵⁰

The filtration studies took two years to complete. In the interim the Linnwood Avenue intake was completed, delivering cleaner water to the city with higher volume and pressure.⁵¹ There was a small decrease in the typhoid death rate in 1919, but the concomitant influenza epidemic may well have obscured some of these fatalities. In March 1920, the results of the filtration studies were finally released, with the chief experimenter, Joseph Ellms, recommending the immediate construction of a rapid sand filtration plant at the cost of \$4.5 million.⁵² Released conveniently close to the election, the report was used by Hoan, who claimed that the reason the Nonpartisans had preferred the \$10-million sewerage plant was that they wished to prevent monies from being available for the purchase of the street railways, amending the

earlier argument that the sewerage plant was a ruse to prevent the financing of a lighting plant.⁵³

As plans for the filtration plant advanced, it became evident that there was not enough money in the waterworks coffers to pay for its construction. Accordingly, the Board of Public Works announced new rates that would be effective as of January 1, 1921, raising the cost for one hundred cubic yards of water to seven cents, with an additional charge of two dollars per meter. This was immediately challenged by the Pabst Brewing Corporation on the grounds that the Public Utility Law of 1907 required all schedules of new rates to be submitted to the Railroad Commission for approval before they could be implemented. The corporation filed the suit in Milwaukee County Circuit Court, asking that the rates be reduced to what they had been in 1907 and further requesting triple damages as recompense.⁵⁴

The city's position was simple. The provisions of the charter gave it jurisdiction over the operation of its waterworks, which was inconsistent with the Public Utility Law of 1907, and thus the city was exempt from submitting to the commission's jurisdiction. More particularly, the city claimed:

Ever since the passage of Chapter 279, Laws of 1919, [Milwaukee] has considered itself as far as its water works is concerned as independent from the jurisdiction of the railroad commission, because said law, in fact, had a repealing clause.⁵⁵

The city, because of this belief in the inconsistency of the two statutes, had "asked for and received additional powers from the legislature of the State of Wisconsin throughout the years since 1919, which additional powers were inconsistent with any belief that the Milwaukee Water Works was in any way subject to the control of the Railroad Commission."⁵⁶

The cited statute, *Chapter 279, Laws of Wisconsin, 1919* gave broad authority to commissioners of public works in cities of the first class. The most inclusive definition of these powers is in section 927-9 (2). It states:

In any city of the first class, however incorporated, which owns its own water works, the commissioner of public works shall have power, from time to time to make and enforce by-laws, rules and regulations in relation to the

said water works, and, before the actual introduction of water, he shall make by-laws, rules and regulations, fixing uniform water rates to be paid for the use of water furnished by said water works, and fixing the manner of distributing and supplying water for use and consumption, and for withholding or turning off the same for cause, and he shall have power from time to time, to alter, modify or repeal such by-laws, rules and regulations. No by-law, rule or regulation, and no alteration, modification or repeal thereof, shall have any force until approved by the common council of such city.⁵⁷

In 1922 the Milwaukee County Circuit Court would rule in the city's favor on the Pabst water rate litigation. The rate increase stood, but pending appeal, Pabst refused to pay. The state supreme court reversed the ruling, but not until 1926. It held that "language could not have been chosen which would have evidenced a clearer legislative intent to subject the Milwaukee municipal Water Works to the regulation of the Railroad Commission."⁵⁸ It further ruled that the Public Utility Law of 1907 and the city's charter were not in conflict, and the two could "stand together."⁵⁹ The city had to submit its rate increase to the Railroad Commission before it could be applied; the city did so in 1926.

Another "misunderstanding" arose from the 1921 rate increase. According to waterworks superintendent Henry Bohmann, when the rate increase was discussed before the common council, "it was definitely understood that there would be no further transfers to the city general fund, as the new water rate did not contemplate further transfers."⁶⁰ Instead of being abolished, these payments would increase to \$225,000 per year in 1921 and to \$300,000 in 1925.

After Hoan's reelection in 1920, the topic of filtration continued to be politically contentious. In October 1920, the Milwaukee Section of the American Chemical Society requested that Hoan invite the society to form a committee to comment on the Ellms report. Hoan did so and must have sincerely regretted this action when the society's report was issued on February 14, 1921.⁶¹ The society concluded that while some type of filtration was desirable, it could "safely be deferred until additional chemical and experimental work has been done on the problems of precipitation, filtration, and chlorination, or even until the sewage plant has demonstrated what influence it will have upon these prob-

lems.”⁶² Hoan immediately returned to the federal agencies to counteract the uproar over the American Chemical Society’s report. On February 18 he wrote to the surgeon general, requesting an investigation of municipal water systems to determine whether the public health service was still of the opinion that Milwaukee needed a filtration plant; and if so, whether the plant proposed in the Ellms report would suffice.⁶³

In May Hoan received a reply from the sanitary engineer of the U.S. Public Health Service, Robert Tarbett, in which it was clearly stated that a filtration plant was still recommended and would be necessary even after the completion of the sewerage plant. Tarbett did not dismiss the chemical society’s recommendation that further physical chemistry studies be performed but countered that if immediate plans were drawn up for the construction of the filtration plant, these plans could be altered if necessary, depending upon the results of those studies.⁶⁴ Hoan also requested comments from Ellms on the American Chemical Society’s report on his study. Ellms concisely refuted most of the arguments put forth by the society and pointed out that while new innovations in chemistry were rapidly occurring, much time and money would need to be expended before new scientific discoveries could be made applicable to water treatment technology. In the interim, a filtration plant was still the best solution, and he urged that Milwaukee take immediate steps to provide one.⁶⁵

Hoan also took local steps to mitigate the damage from the society’s report. Pointing out that the chair of the committee was George Prentiss, an employee of the Milwaukee Road, Hoan questioned whether the fact that the railroad would have to pay much larger water bills if a treatment plant were to be put into operation might be a reason for Prentiss’s conclusions. Two tanneries—Trostel and Gallun—and the Pabst brewery, all large water users, also had their chief chemists on the committee.⁶⁶ At least one other professional scientific society joined in condemning the American Chemical Society’s report. In July 1921 *The Engineering News Record* observed that if the report were accepted as valid, it would stop work on every filtration plant in the country. It went on to say:

Such an argument for a halting policy has rarely if ever been brought forward seriously in an important engineering matter. Because of its nature and because of its being brought forward by men without experience in water

treatment, it must inevitably arouse decided objections on the part of the sanitary engineers, men who have given their whole careers to the study of the very subject into which the chemists lightly leap.⁶⁷

Hoan's other line of attack was to revive fear of the water supply's being a source of disease. Although typhoid death rates had fallen dramatically since 1916 and were now under one per 100,000, the death rate for children suffering from gastroenteritis was still high, although it too was declining. Health commissioner George Ruhland had given several speeches during March 1921 claiming that the city's infant death rate was high in comparison to other cities and was directly attributive to the polluted water supply.⁶⁸ Prentiss immediately objected to Hoan, claiming that Ruhland had said no such thing when he had met with the American Chemical Society's committee. Ruhland replied to Hoan that his statements were accurate but provided no specific statistics to support his statements.⁶⁹

The mayor then called on Harrison Eddy, who had compiled the initial report calling for a filtration plant back in 1911, to comment upon the situation. Eddy, at this time consulting engineer to the sewerage commission, replied in June 1921 that firstly, the city should provide a filtration plant, and that secondly, its construction should not be delayed to see what effect the sewage treatment plant had upon the water situation. Eddy pointed out that in conditions of heavy rain the sewage plant would have to discharge large amounts of untreated waste into the lake, and because the chlorination of the water supply had proved not entirely reliable, filtration was a necessity. Additionally, because there was a marked lag from the time when a water sample was selected for study and the time when, analysis complete, changes in the chemical dosage could be made, chlorination alone was unreliable, even in normal circumstances. Echoing the federal engineer Tarbett, he further suggested that while the filtration plant was under construction the city proceed with experiments on the effects of colloidal chemistry on the water treatment process and alter the filtration plant design should this become advisable.⁷⁰

During the summer, opposition to a filtration plant continued, with the *Milwaukee Journal* in the forefront. In an August 13, 1921, editorial, the paper strongly urged waiting until the sewerage plant was com-

pleted to determine whether filtration was really necessary. In a letter appearing the same day, Kotecki, the city comptroller, said that due to cost overruns on the sewage treatment plant, even with the increase in water rates that had been implemented in January, there would not be sufficient income to begin construction of a filtration plant for at least two years.⁷¹

A special session of the common council called to deal with the issue produced nothing but temper tantrums between the Nonpartisans and the Socialists. In the meantime, meetings of the Committee on Water Works and Sewerage were well attended, with the very visible presence of the president of the Milwaukee Government Research Citizen's Bureau, John C. Davis. The Milwaukee Government Research Citizen's Bureau was a private group that purported to research urban issues and their effect on the taxpayers' pockets. Founded in the late 1890s, it arose primarily as an opponent to the reform-minded and vaguely socialistic Municipal League and the Fabian Society.⁷² In addition to showing up at meetings and taking vociferous positions on issues, they issued bulletins from time to time on subjects in which they had an interest.

This continued and expanded opposition led Mayor Hoan back for the third time to the federal agencies. In December 1921 he again addressed the U.S. Public Health Service, asking for a study and report. In reply the new surgeon general cited the studies performed in the previous decade, all of which had concluded that filtration was necessary to ensure a clean water supply, even after sewerage treatment plants were in operation. His conclusion stated: "Such unanimity of opinion among various experts during the past ten years shows conclusively that what is needed for safeguarding the purity of the water supply of Milwaukee is a water filtration plant."⁷³ In the same month Ruhland again attacked the chemists' committee, using economic arguments this time rather than unsubstantiated medical ones. He contended that most of the members, who were employed by the larger businesses in the city, were against the plant simply because their employers' water bills had been increased in an effort to raise funds for the proposed plant.⁷⁴

Despite Hoan's and Ruhland's actions, the council took no steps toward addressing the issue until November of the following year. At that time the Committee on Public Utilities and Health voted in favor

of a resolution by Socialist alderman John Doerfler that all further considerations regarding a filtration plant be placed on hold until the sewage plant was completed and placed into operation. A countering proposal from fellow Socialist Strehlow that the first motion be placed on file was defeated by a vote of sixteen to nine, and Doerfler's resolution was approved by the council by a vote of twenty to five.⁷⁵

The Jones Island Sewage Treatment Plant went into operation on June 26, 1925. For over a year after its opening, no further mention was made in city government of the need for any additional water treatment. In 1925 the waterworks had begun construction on a subsidiary pumping station to replace the outdated and inadequate pumps at North Point, and this new station, Riverside, used up the excess water funds that had been collected from 1921 for the construction of the filtration plant. In that year, Bohmann had voiced his objection to the transfer of surplus water funds to the general fund, warning that if it continued, the new construction necessary to keep up with annexation could only be financed with bonds, "which would be contrary to the policy of the Common Council as it is desired that business be done on a cash basis if possible, in order to avoid interest charges."⁷⁶

In fact, no bonds were issued. The last bonds had been issued in the amount of \$300,000 for the construction of the Linnwood Avenue intake in 1913 and were repaid by 1921. The construction carried out during the twenties was paid from the cash revenues of the water department, but because no reserves had been built up prior to or during World War I, the waterworks was actually operating in the red from 1919 to 1931. That is, the comptroller's figures, which included all indebtedness, showed a deficit. The department itself, which ran on a cash basis, was able to meet all expenses due to the fact that revenues arrived in time to pay the bills, but they were never enough to pay off the debt. The comptroller's figures show a deficit in the waterworks accounts from 1921 to 1931 of between \$220,000 and \$890,000.⁷⁷ This violated the statute that the city had incorporated into the Wisconsin laws of 1905 which stated that sufficient income must always be on hand to cover two year's payments on indebtedness.

With Prohibition in full swing, the greatly reduced demands from breweries for water meant that the waterworks could focus on internal quality improvements, with new metering and loss-prevention techniques. Additionally, the waterworks began treatment of the water in

Kilbourn Reservoir with copper sulfate to deter and control the growth of algae that caused bad taste and odor in the summer months. Although the copper treatments did nothing to improve the actual health of the water, the improved aesthetics caused a marked decrease in customer complaints.⁷⁸ Thus the next health warning about Milwaukee's water quality would come as a shock to the government and the citizens.

Because of the state supreme court's ruling in *Pabst*, the city submitted a new proposal for rates to the Railroad Commission on July 19, 1926. Because the surpluses had been depleted in the construction of the Riverside Pumping Station, it was necessary for Hoan to refill the coffers if he was ever to get the council into a position where it might support a filtration plant. Shortly after, in August, four corporations—Pabst Brewing, Pfister and Vogel Tanning, Trostel Tanning, and the Palmolive Corporation—filed objections with the commission because the proposed schedule retained a flat-fee schedule. In their turn, they proposed a stepped schedule, with reduced charges for large users.⁷⁹ The common council filed its own objections to the corporations' arguments, contending that a stepped scale would increase the water rates paid by small consumers for the benefit of the large corporations.⁸⁰

In December 1926, a hearing was held by the Railroad Commission regarding the question of the proposed rate increase, which had been delayed since 1921 because of the lawsuit. During the hearing an important jurisdictional point was raised. Through an error, the commission had not actually received a copy of the proposed rate schedule and therefore had not ruled upon it. The hearing had been planned since the new rate schedule was proposed in 1921 and was postponed until the court case was settled. The hearing was then held, despite the lack of an actual schedule being available to the commission. The city maintained that it had fulfilled its duties by filing the proposal, and that in lieu of action, the proposed rates had gone into effect ten days after the change was filed. The commission overruled this claim, saying that "even if such a schedule had been filed, it could not become the lawful schedule until after formal investigation and order by the commission."⁸¹ The city accepted the ruling, but it was not until 1931 that a law was passed making this so.⁸² The commission then quietly accepted the city's rate schedule without holding a further hearing.

On October 9, 1926, the new health commissioner, John Koehler,

submitted a letter to the common council concerning the condition of Milwaukee's water and the need for a filtration plant. He stated that the water was undrinkable by medical standards about one-third of the time and also pointed out that there had been a rise in typhoid cases since the sewage treatment plant had gone into operation. In 1925 there had been ten cases of typhoid, with three fatalities; thus far in 1926 there had been twenty-six cases, with six fatalities.⁸³ This information shocked the council into action. Two days later, on October 11, Alderman Carney proposed a resolution that a board of estimators be appointed to alter the proposed 1927 budget "so that sufficient funds with which to begin the erection and installation of a water filtration plant might be found."⁸⁴ The resolution passed unanimously, but the board was never appointed, and no commitment to actually begin construction was made.

City business interests took no further action against the rates until September 1928. At that time the city filed an action against the Palmolive Company, which had refused to pay the new rates and had continued to pay the old. The city requested the payment of the difference between the two rates, \$17,790, plus interest and costs.⁸⁵ The four original corporate petitioners from the Pabst case then filed suit in Dane County Circuit Court seeking to vacate the commission's approval of the new rate schedule. The court remanded jurisdiction to the commission, which reaffirmed its order on November 28, 1928. The petitioners then appealed to the Wisconsin Supreme Court, which handed out its decision on October 8, 1929. Citing the case of *Waukesha Gas and Electric v. Wisconsin Railroad Commission*, 1923 (181 Wisconsin 281), the court upheld the commission, stating:

Having regard to the statute solely, it is apparent that the determination of the commission cannot be disturbed unless it shall be made to appear to the court by clear and satisfactory evidence that the rate established is either unreasonably low or unreasonably high. The court is not called upon to substitute its judgment for that of the commission as to what the rate might be.⁸⁶

The city was no more thrilled with this decision than were the corporations. It viewed the reaffirmation of the jurisdiction of the Railroad Commission as an unreasonable check upon its powers as a city of the first class and upon the stipulations of its charter. The city attempted to

remedy the situation by having the legislature pass a bill amending section 196.20 (2) of the Statutes, which gave the commission jurisdiction. Milwaukee submitted to the legislature Bill 508S, which provided

That any city of the first class owning its water plant may determine for itself by ordinance or by its water and light commission the type or form of the schedule of rates to be charged by such city, whether such form or type provides flat rates, metered rates, block or sliding scale rates or any other type that is not regressive or discriminatory.⁸⁷

The bill died in committee and was not refiled in the subsequent session.

The issue of water filtration remained quiescent until 1931. Early in that year, the question of a filtration plant was again taken up, as it was thought it might provide jobs for workers on relief. With the area in financial panic, the project now took on the politically motivated aspects of a community benefit beyond that of providing a clean water supply. Health Commissioner Koehler took on the job of public relations, focusing on health and community pride. He pointed out that two cities that were nationally recognized as having excellent water were Racine, Wisconsin, and Buffalo, New York, both of which were equipped with filtration plants, but neither of which had sewage treatment facilities.⁸⁸ Harrison Eddy, called upon to address the issue with which he had become very familiar in the past two decades, proved to be not altogether helpful in Koehler's opinion. Eddy felt that with so much effort invested in the sewage plant, it would be more advisable to spend five million additional dollars to improve that plant, and then only to construct a filtration plant if it still proved necessary. This would give time to raise money to build the water plant, which was not likely to be affordable in the near future anyway.⁸⁹

Hoan then enlisted the support and participation of civic groups and established an advisory council with delegates elected by forty-four different civic and service clubs of the city. This council recommended filtration by a vote of forty-two to two, and Hoan triumphantly took this sign of support to the common council. He proceeded to ask for immediate action on the filtration issue and for a government advisory council consisting of the superintendent of the waterworks, the commissioner of public works, the commissioner of health, the president of the common council, two aldermen to be selected by the

council, and the mayor.⁹⁰ He did not get his wish. Citing the severe economic difficulties affecting the city and the nation as a whole, the council determined that a filtration plant was not in the best economic interests of the city at that time.⁹¹

In 1931 thoughts of a rate increase again surfaced in Milwaukee government. This time the impetus came from the city attorney's office in the wake of the Wisconsin Supreme Court's decision in *Waukesha Gas & Electric* and *Pabst Brewing* and also the United States Supreme Court's decision in *McCardle v. Indianapolis Water Company*. These decisions had clearly established that in figuring the fair market value of a waterworks due consideration must be given to the costs of new construction necessary to maintain the system as well as reconstruction costs for improving existing facilities. This had not been done by the city's tax commission in 1911 when it set the fair market value of the waterworks at \$17 million. Since, by the U.S. court's decision, the city was entitled to earn 8 percent a year on the fair market value, the city attorney decided that Milwaukee was losing \$240,000 per year, even on the inadequate figure of \$17 million. The common council took no notice of the attorney's recommendation that a new valuation be performed and a new rate schedule prepared.⁹²

Over a year passed before any action was taken on the issue of the filtration plant. On September 6, 1932, Socialist alderman August Strehlow introduced a resolution to investigate the construction of a filtration plant, with the proviso that funding be obtained from a loan through the Reconstruction Finance Corporation. The major purpose of the project was to be listed not as a method of cleaning the water but "to offer such immediate relief to the unemployment situation as is possible by the undelayed construction of a water purification plant."⁹³ Strehlow's resolution was forwarded to committee by a fifteen to eleven vote along party lines, with all the Socialists dissenting.⁹⁴ Why the party that had fought for twenty years to build a water filtration plant should suddenly abandon its stated platform is unclear. The most likely reason is that the city did not want to take on any more debt when faced with severe financial difficulties as a result of the Depression. There, in the depths of the waterworks and sewerage committee, it was effectively buried. The committee's recommendation was much watered down from Strehlow's initial proposal, directing that "the City Engineer be instructed to submit to the common council

all information and data which he has gathered on water purification plants to date.”⁹⁵

In 1932 the water rates finally changed, but they went down, not up. The Public Service Commission, the Railroad Commission’s successor, asked that they be reduced in a voluntary manner as an emergency measure in response to the Depression. On July 25, 1932, the common council complied, passing a temporary measure, effective for one year, that lowered water costs by one cent per one hundred cubic feet. When the year was up, the rate was extended and, with other periodic extensions, remained in effect until 1939.⁹⁶

Another Depression measure taken by the waterworks was to transfer additional funds from the water fund to the city’s general fund to help with tax relief. From 1932 to 1935, \$880,000 per year was transferred in this manner. The first year it was done it reduced the city’s tax rate by 96¢ on each \$1,000 of valued property. From 1932 to 1935, the monies transferred averaged about 40 percent of the total department revenue, and in 1932 and 1933, the amount transferred was greater than the amount retained by the department for operating expenses. In 1936 the transferred amount was reduced to \$750,000, and in 1937 to \$600,000. In 1938 declining industrial water use dropped the pumpage by seven million gallons per day, and the money transferred rose to \$650,000; in 1939 it was \$950,000. In 1937 the Public Service Commission set up a formula for payments in lieu of taxes to be made by municipal utilities, and in 1939, \$600,000 of the transfer was given this designation.⁹⁷ The water department was clearly attempting to relieve Depression-induced poverty, but not everyone saw it that way.

Despite the rate reduction, the citizens of Milwaukee made it clear that they had had enough of the council’s procrastination regarding a filtration plant. Since 1931, with Hoan’s establishment of a citizen’s advisory council, increasing pressure had been brought to bear on the common council relative to the construction of a filtration plant. On September 13, 1932, a week after Strehlow had made his proposal, the advisory council submitted a report and resolution favoring immediate construction.⁹⁸ Similar communications followed from several organizations, including those who had previously been strong political supporters of the Nonpartisans. These included the Engineer’s Society of Milwaukee, the Teutonia Avenue Advancement Association, the Citizen’s Unemployed Clubs, the Federated Trades Council, and the Glaziers

Union Local 1204. The Milwaukee Association of Commerce, however, remained opposed, urging that construction be delayed.⁹⁹

The Nonpartisans remained bitterly opposed to the idea of a filtration plant. The Citizens' Government Research Bureau and John C. Davis again came in on the side of the Nonpartisans. Using as a primary argument that Milwaukee's water could not possibly be polluted because the city had in 1929 and 1931 won the Healthiest City award among cities over 300,000 in the Inter-City Health Competition sponsored by the U.S. Chamber of Commerce, Davis and the bureau urged the council to reject the "machinations" of the Socialists to attack the pocketbooks of hard-working citizens.¹⁰⁰ The engineer's office wryly replied that the award had been given because of Milwaukee's excellent health department and for the many unusual health services provided by the city, not for the quality of its water.

Davis in turn submitted evidence that the yearly averages for Milwaukee's water since 1927 were far superior to the U.S. Treasury Department Standards.¹⁰¹ The city engineer countered that the important figures were not the annual averages but rather those for the months when the water was polluted or bad tasting, requiring frequent issuance of warnings that all water for drinking, cooking, and bathing purposes be boiled.¹⁰² Davis fired back with a bulletin that said 75 percent of the filtration plants in the country were constructed before or during the years from 1911 to 1915 when chlorination became widely adopted, a time when sewage treatment plants only attempted to maintain 30 to 50 percent removal of wastes. Filtration was thus an outmoded technique, and chlorination, combined with Milwaukee's advanced sewage treatment plant (which removed about 75 percent of wastes), was sufficient to protect the population's health. The city engineer's office investigated this statement and found that of the eighteen filtration plants on the Great Lakes, only two had been built before 1915. They replied to Davis and the bureau that 90 percent of the filtration capacity on the Great Lakes was built after the adoption of chlorination, therefore recognizing the foolhardiness of a one-line defense that utilized only chlorination.¹⁰³

In February 1933, Joseph P. Schwada, the new city engineer, published the requested data on filtration plants, as he had been asked to do by the common council. It was accompanied by a warning to the council stating: "this report shows that a water purification plant is neces-

sary to safeguard and improve the city's water supply and that the city can finance the building of a plant at this time when such work will aid in the relief of the unemployed."¹⁰⁴

The council's response was, as usual, to delay. They requested additional information from Schwada, which he supplied on April 17. In personally delivering the information to the council, Schwada lost his temper and let the council know exactly what he thought of their delaying tactics, particularly as the previous few months had seen several episodes of industrial waste contamination of the water supply. When the water was chlorinated, the combination of the chlorine and waste produced such a noxious taste and odor that "turbid, impure and dangerous" boil orders had been issued for all drinking, cooking, and bathing uses. Schwada told the council:

Events have again forcibly demonstrated that the advice and information furnished periodically to your Honorable Body by various engineers in the past twenty-two years is sound and constructive, and that the people of this community will not receive water that is fit for human consumption until the Water Department is equipped with a modern water purification plant.¹⁰⁵

Schwada was not finished. He then delivered a strongly worded message concerning the way the council was operating the waterworks compared with the way in which other utilities were operated.

If other public utilities used equipment and methods that would not ensure to the utmost good service at all times, if equipment and methods produced incombustible gas at any time or failed to produce sufficient electric current to properly light our homes throughout the city, or if the telephone company periodically failed throughout the city for several days, what would be the attitude of the people? What would be the attitude of the company's board of directors? Would not the people severely condemn the company for not providing adequate equipment and methods? Would not the company's board of directors speedily arrange to borrow money to purchase suitable equipment to improve their product and service? Why then should the Milwaukee Water Department be forced to distribute, at intervals, water that is not fit for human

consumption while the other utilities are required to serve the people according to reasonable standards of quality?¹⁰⁶

During the months when he had gathered information for the council, Schwada's office conducted an educational campaign on filtration. This campaign was serial, each week releasing information on a different aspect of the filtration question, from how it operated to costs involved, to efficiency, to comparisons with other cities that either did or did not have filtration.¹⁰⁷ This campaign, which he continued even after his outburst before the council, had a marked effect. Public opinion in favor of a filtration plant was expressed in newspaper letters to the editor, letters to council members, and pleas from workers' associations to build the plant not only as a means of ensuring a clean water supply but as a means of providing jobs for the unemployed and included comments that council members not supporting the plant might find themselves on the unemployment line. Responding as it always did to pressure that might affect members' tenure in office, the council capitulated at the earliest possible occasion. On May 15, 1933, August Strehlow, the Socialist alderman who had fought for a filtration plant for twenty-three years, submitted a resolution to the council that the filtration plant be built. On June 14 a substitute resolution was adopted unanimously, with the proviso that the project be partially funded with federal dollars; 30 percent of the loan was to be paid with a grant from the National Industrial Recovery Act. The measure passed unanimously. After a quarter century of political wrangling, the filtration plant was finally authorized.

Opposition to the project did not end. Instead of directing their opinions to the common council or one of its committees, the opponents tried to work through the state's Public Service Commission (PSC), which had the year before replaced the Railroad Commission and which had jurisdiction over all state utilities, and later through the state court system. Chief opponent of the project was John Wilson of the American Chemical Society, who was head of the local ACS section. The PSC approved the construction in January 1934, and the State Court of Appeals upheld the decision in May of the same year. Wilson then went to Washington to petition before the Public Works Authority and tried to convince them to deny the loan. Milwaukee's water problems, however, had become too well known

in Washington, thanks to Hoan's correspondence with the health service, and Wilson's attempts failed.¹⁰⁸

Construction began in 1934. The facility, the Linnwood Avenue Water Purification Plant, went on-line in 1939, almost thirty years after agitation had begun for it and twenty-two years after the first U.S. Public Health Service report had strongly urged it be built. When completed, it had the capacity to filter 290 million gallons of water per day, provide chlorination before and after the filtration process, and add coagulant chemicals to the water before filtration to aid in the removal of organic matter. Construction costs finally totaled 5.5 million dollars, about a quarter of the final cost for constructing the sewage treatment plant and roughly twice what the estimate for construction had been when first proposed in 1910.¹⁰⁹

Although the general rate reduction of 1932 helped to ease some of the burden of water bills, it did nothing to pacify those who felt that the city's rate structure as a whole was flawed. Beginning in 1933, several groups began to take action to change the rate schedule. The first group to take formal action was the 110-member Milwaukee Sprinkler's Owners Group (MSOG),¹¹⁰ which filed a complaint in May with the PSC that the city's rate for connection of sprinkler systems was "unjust and unfair and should be abated and abolished."¹¹¹ Soon after, Standard Laundry and others petitioned for an investigation of the city's water rates. The complaint stated that the city was misappropriating the money that was transferred to the general fund, that the city paid too little for fire protection, and that water rates were in general too high.¹¹² On February 4, 1934, the PSC issued notice of a general investigation of water rates in Milwaukee and of the practices of the Milwaukee Water Works. They spent five years on this investigation, holding twenty-three hearings, and looked into all aspects of the city's water production for both city and suburban service.

In its decision, the PSC determined a new rate base for the utility, the first change since 1911. The 1931 attempt by the city attorney to increase the rate base had never been submitted, due to lack of action by the common council, but the PSC was able to use its oversight powers to change this. The evaluation presented a series of cost apportionments covering public and private fire prevention as well as general service, but the new rate base did not include the new filtration plant in its calculations because it had not yet been completed. They determined

a value of \$23 million. When the commission invited the city to submit a new rate schedule based on this valuation, the council demurred, suggesting that any rates it named would meet with much more opposition than would suggestions from the commission itself. The city later agreed to submit a schedule, in which it retained a flat annual service charge of \$3.00 per meter, to cover reading purposes, and flat water rates of 7¢ per 100 cubic feet in the city, with 10¢ in the suburbs.

As it turned out, the careful calculations of the commission in figuring a new rate base were unnecessary, because the city did not request anything near to the allowable 8 percent return on its investment. The commission was quite surprised at this, and commented upon it:

The consideration of a rate base dwindles to insignificance in the face of exhibit 187. In this exhibit, the respondent finally submitted its recommendations of reasonable rates for filtered water designed to yield adequate and sufficient earnings. These recommendations have the approval of the city commissioner of public works and five members of the public council. According to this exhibit, the net earnings believed by the respondent and city officials to be sufficient are so far below what is ordinarily considered to be a reasonable rate of return for a water utility that the problems of determining a rate base and rate of return thereon become matters of merely academic interest.¹¹³

The city declared that it would be satisfied with an annual revenue of \$2,734,302.83 for filtered water, figured on a rate base of \$23 million. This allowed for a return of \$92,462 per annum, or a 4 percent return. The commission had figured on settling for a return of 5½ percent, allowing for \$126,500 per annum, considerably more than the city had requested.¹¹⁴

Most of the commission's decision concerned the allocation of costs to the various classes of services. Considered first was fire protection. Under the old rate, the city had paid an annual fee of \$10 per hydrant, for a yearly total of \$77,040 in 1934. The commission decided that the actual cost of this service, based on the return that the city had requested, was \$190,310.¹¹⁵ The city argued that return and payment in lieu of taxes should not be included in the calculation of payment for hydrant service. The commission argued strongly and over a great length of time with the city on this issue, eventually settling for \$15,000 less than it had originally calculated.¹¹⁶

The second area of investigation was that of rates to be charged large commercial and industrial customers. As they had since the imposition of flat rates in 1898, these companies felt that the city's rate schedule was unfair because it imposed rates solely on the amount of water used. The schedule did not recognize that peak industrial use came at a different time of day than did peak residential use and did not take into account the true costs of supplying large consumers who used a consistent amount of water for a large number of hours each day. Additionally, because most companies felt they did not need filtered water, they argued that the cost of filtering the water be charged only against the small customers, who needed it for drinking and cooking purposes.¹¹⁷ The commission rejected this last point, although it did exclude cost of filtration from the cost of water supplied for fire prevention.

Another consideration was the claim by Milwaukee and by Whitefish Bay that the determination of the type of rate schedule was a power of the municipality, not the commission. The PSC might have the right to determine the amount of the rates, but the form in which they were charged was to be determined by the city operating the waterworks. The PSC disposed of this argument by citing *Pabst*, in which the commission's authority had been declared.¹¹⁸ Because of this, it was able to use, for the first time since its creation, the power to set forth and enforce a formula for making rates. The analysis divided the cost of the utility's service into three component parts: customer costs, which was dependent upon the number of customers connected but was independent of the amount of water used; demand, depending on the rate of use of the water; and output costs, which depended on the total volume of water used. The PSC contended that it was demand that was responsible for the bulk of service costs, since the utility had to maintain a system that was capable of providing peak demand, even if that demand occurred only 1 percent of the time. Accordingly, the commission decided that a stepped rate was appropriate, since the 2,100 large-scale customers were hitting their peak use at a time other than when the system as a whole experienced its peak. The PSC determined that there should be stepped rates depending not only on the amount of water used but on the size of the meter. The latter was to include both a demand charge and the cost of servicing the meter. It set rates for water use at 6¾¢ per 100 cubic feet for the first 500,000 cubic feet, at 6½¢ for the second 500,000 cubic feet, and at 5½¢ per 100 cubic feet

for all use over 1,000,000 cubic feet per year. The service charges for meters were also stepped, ranging from \$3.00 a year for the standard residential meter to \$600 per year for a large industrial connection. With this schedule, the commission proved that it had finally won the battle that it had been waging with the city since the *Beaver Company* case of 1909.

In the case of the MSOA (formerly MSOG), the plaintiffs were unhappy with the commission's decision. Previous rates for a four-inch connection had been \$25 per year, and for a six-inch connection \$50. The commission raised these to \$40 and \$80, respectively, and established a rate of \$120 for the newer eight-inch connections. The rationale used to justify the raise was that ownership of a sprinkler system lowered fire insurance rates by a considerable amount, and the commission believed "the rates should not be so low as to place on other users an unreasonable share of the costs incident to such services."¹¹⁹ The MSOA was furious about the rate increase and filed the first of twenty-two complaints that were eventually filed against the schedule. Accordingly, the commission reversed this section, reimposing the rates that had been in effect in 1911. It did so with the consent of the city, which simply made up the loss by adding the \$12,000 thus lost to the public fire protection provision of the total water bill, where it would be paid by the property tax levy. The commission was willing to have the public pick up this part of the private fire protection bill as long as it was charged to something in the same general category.

Of the remaining twenty-one complaints against the rate schedule, nineteen were filed by the city. Of these, seventeen were dismissed with no discussion, and the remaining two were dismissed with short explanatory paragraphs. The majority of these had to do with the provision of water to suburban districts. The rates established were for filtered water, but the rate base of \$23 million did not include any of the \$5.5 million that the city had invested in the filtration plant.¹²⁰ Instead, the commission ruled that within one year following the completion of the plant and its placement into service the city should submit evidence "upon the investment in said filtration plant, and the expense of operation and maintenance thereof" to the commission.¹²¹ The PSC retained jurisdiction and was willing to adjust the water rates upward to reflect the costs of the city in the filtration plant's construction. The city never submitted the evidence, choosing to leave rates as they were,

providing filtered water at a rate that reflected none of the costs involved in construction of the plant or of operating it. Hoan wanted the rates kept low so that suburban customers and residents of nonincorporated areas would be convinced to annex themselves to Milwaukee in order to obtain water at cheap prices. The results of that strategy are discussed in chapter 4.

Notes

1. *Common Council Proceedings*, 1911–12, p. 1279.
2. Beveridge, *History of Water Supply*, p. 6
3. *C.C. Proceedings*, 1910–11, p. 105.
4. Beveridge, *History of Water Supply*, p. 39.
5. *Ibid.*
6. *Report of Milwaukee City Engineer*, 1898, p. 87. Universal metering was required as of March 13, 1913. Previous to that time, annual usage had increased by an average of 2.8 million gallons per year; in the year after universal metering the increase was only 370,000 gallons, indicating that about 2.2 million gallons per year were wasted through unmetered service.
7. *Annual Report of Milwaukee Water Works*, 1912, p. 3.
8. *Wisconsin Railroad Commission*, vol. 12, 1913, p. 195.
9. *Annual Report of Milwaukee Water Works*, 1913, p. 5.
10. A high-service station is a booster pump station that raises the pressure of water to be delivered to large-scale customers or to areas that are at higher elevations. This particular station supplied industry in the Menomonee River valley as well as in the downtown area.
11. City of Milwaukee Bureau of Economy and Efficiency, *Bulletin No. 11, Water Works No. 1*, 1912; *Bulletin No. 14, Water Works No. 2*, 1912; *Bulletin No. 17, Water Works No. 3*, 1913.
12. *Milwaukee Sentinel*, January 27, 1892; Leavitt, *The Healthiest City*, p. 122.
13. Leavitt, *The Healthiest City*, pp. 122–23.
14. *Ibid.* Although Leavitt points out that this was a throwback to the miasmatic disease theory of the eighteenth and nineteenth centuries, these doctors had a point, although not all of their colleagues would agree with their argument. Rotting waste was washed into the ground water supply, eventually running into the lake. Uncovered garbage attracted flies, which then carried filth into the homes and the food of the residents. Although

- garbage, with its accompanying odor, was not a primary cause of disease, it was a vector through which disease could be transmitted.
15. See Anthony Orum, *City Building in America*, for a discussion of Minneapolis; Silas Farmer, ed., *History of Detroit, Wayne County and Early Michigan* for Detroit; David Van Tassel and John Grabowski, eds., *Encyclopedia of Cleveland History* for that city; and James O'Connell, "Technology and Pollution: Chicago's Water Policy," for a discussion of Chicago's water reforms.
 16. *C.C. Proceedings*, 1907–8, p. 698.
 17. John Alvord, Harrison P. Eddy, and George C. Whipple, *Summary of the Report of the Sewerage Commission*, 1911, p. 1. Ironically, the report investigated and rejected the suggestion of ozone treatment. Since ozone leaves no residual in the water, its application can have no interruption or gaps. The haphazard reliability of electricity in 1910 Milwaukee was such that ozone was deemed too unreliable to be used.
 18. *C.C. Proceedings*, 1910–11, p. 290.
 19. *Ibid.*, p. 354.
 20. Poetsch was expressing an opinion that was becoming outdated in 1910. The United States Public Health Service, the American Association of Civil Engineers, and the National Organization of Microbiologists all endorsed water filtration by 1910. The American Chemical Society recommended chemical treatment in lieu of filtration as late as 1938; this was in large part because filtration plants did not employ chemists. The construction and operation of water works was seen as being in the sphere of sanitary and civil engineers; a technology issue rather than a scientific one. The ACS was until the early 1950s primarily a business and manufacturing chemistry society.
 21. Joseph A. Salvato, *Environmental Engineering and Sanitation*, 2nd ed. (New York: Wiley-Interscience, 1972), pp. 103–387.
 22. *Ibid.*, p. 662.
 23. Alvord, Eddy, and Whipple, *Summary of the Report*, p. 13.
 24. *C.C. Proceedings*, 1911–12, p. 660.
 25. Becker, *A Century of Milwaukee Water*, p. 22.
 26. Beveridge, *History of Water Supply*, p. 7.
 27. *C.C. Proceedings*, 1910–11, p. 1646.
 28. *C.C. Proceedings*, 1911–12, p. 105.
 29. Harry Breimeister, *Milwaukee Water Works Chronological Summary of Events Relating to Water Rate Litigation between the City, Suburbs and Large Consumers* (Milwaukee: Milwaukee Water Works, 1947), p. 2.
 30. *Ibid.*, p. 3.
 31. The same amount of water was pumped no matter what the fee schedule was.

Many large businesses used their water during the day, when people were at work, and at night, when there was little residential use. With on-site water storage facilities, which many industries had, they could confine their water use to nonpeak hours. Further, since many companies had a single meter, the time and expense involved in reading meters was greatly reduced. The city therefore made more money supplying big customers than small ones.

32. *Milwaukee Leader*, September 25, 1915; Beveridge, *History of Water Supply*, p. 16.
33. *C.C. Proceedings*, 1911–12, p. 1458.
34. Still, *Milwaukee*, pp. 519–21.
35. *Milwaukee Water Works Annual Report*, 1914, p. 9. This rate was 11.54 per 100,000 cubic feet, the lowest rate in thirty-nine years.
36. *Milwaukee Water Works Annual Report*, 1915, p. 7. The rate was 8 per 100,000 cubic feet.
37. *Wisconsin Laws of 1913*, chapter 608.
38. Joseph P. Schwada, “Milwaukee’s Water Purification Problem,” *Journal of the American Water Works Association*, October 1934, p. 1464.
39. Fred Olson, “The Milwaukee Socialists, 1897–1941” (Ph.D. diss., Harvard University, 1952), p. 328.
40. Olson, “Milwaukee Socialists,” p. 329.
41. Sewage treatment would not have prevented the outbreak in any case. The treatment of sewage is not sufficient to prevent typhoid infection if the raw drinking water is not disinfected. All sewage treatment can do in this case is to help prevent secondary spread of infection through the sterilization of wastes from those already infected.
42. Surgeon General A. H. Glennan to Daniel Hoan, February 21, 1917. In the Hoan Papers collection, Milwaukee County Historical Society (hereafter MCHS).
43. Daniel Hoan, “History of Important Events in the Development of Sewage Disposal and Filtration in Milwaukee,” Typescript Report, ca. 1931, Hoan Papers.
44. Olson, “Milwaukee Socialists,” p. 425.
45. Daniel Hoan, Campaign Speech, March 9, 1920, Hoan Papers.
46. *C.C. Proceedings*, 1917–18, p. 78.
47. Seidel and Hoan were the two Socialists. Hoan was an ex-officio member of all committees.
48. *Ibid.*, p. 445.
49. Daniel Hoan, Campaign Speech, March 1, 1918, Hoan Papers.
50. *C.C. Proceedings*, 1917–18, p. 592.
51. Beveridge, *History of Water Supply*, p. 7, Becker, *A Century of Milwaukee Water*, p. 23.

52. Joseph P. Ellms, *Report on Experimental Water Filtration, Milwaukee, Wisconsin*, March 1921.
53. Daniel Hoan, Campaign Speech, March 9, 1921, Hoan Papers.
54. Beveridge, *History of Water Supply*, p. 42. The Public Utility Law of 1907 made all publicly owned and operated water, electric, gas, and sewage utilities subordinate to the State Railroad Commission in the matters of rate setting and bond financing. This was done under the influence of the Wisconsin Progressive Party to lessen the possibility that public utilities might begin behaving like commercial monopolies.
55. *C.C. Proceedings*, 1925–26, p. 1911.
56. *Ibid.*; Beveridge, *History of Water Supply*, p. 42.
57. *Chapter 279, Laws of Wisconsin*, section 927-9 (2), 1919.
58. *Pabst Corporation v. City of Milwaukee*, 190 Wisconsin 349, 1926, p. 355.
59. *Ibid.* The question of how two such seemingly opposed pieces of legislation could be reconciled remained a controversy for many years, particularly in regard to the Milwaukee waterworks' furnishing water supply to outlying suburbs. The jurisdiction of the Railroad Commission over the waterworks rates was, however, established as of this date. The Railroad Commission was later merged with, and became, the Public Utility Commission.
60. Henry Bohmann to John Doerfler, November 19, 1925, Hoan Papers.
61. Daniel Hoan, "Brief Summary of Steps Taken by City of Milwaukee to Improve Its Water Supply," Typescript Report, ca. 1926, Hoan Papers.
62. *Report of Committee of Milwaukee Section of American Chemical Society on Water Purification*, February 14, 1921, p. 3.
63. Daniel Hoan to Rupert Blue, U. S. Surgeon General, February 18, 1921, Hoan Papers.
64. Robert Tarbett, U.S. Public Health Service, *Report to Honorable Daniel Hoan, Mayor, upon the Need for a Water Filtration Plant, Milwaukee, Wisconsin*, May 10, 1921, Hoan Papers.
65. Joseph Ellms to Daniel Hoan, February 26, 1921, Hoan Papers.
66. *Wisconsin News*, February 21, 1921.
67. *Engineering News Record*, July 7, 1921, p. 5. In 1956 the *Engineering News Record* and its Society of Chemical and Sanitary Engineers merged with the American Chemical Society and its journal, the *Chemical News*. The journal is now called *Chemical and Engineering News*.
68. George C. Ruhland to Daniel Hoan, March 16, 1921, Hoan Papers.
69. *Ibid.*
70. Metcalf and Eddy, Consulting Engineers, *Report to Daniel Hoan on Milwaukee's Water Condition*, June 6, 1921, Hoan Papers.

71. *Milwaukee Journal*, August 13, 1921. The new estimates for the cost of the sewage plant were \$16 million, up \$6 million from previous estimates.
72. Still, *Milwaukee*, pp. 297–307.
73. *Milwaukee Journal*, December 23, 1921.
74. *Milwaukee Leader*, December 19, 1921.
75. *C.C. Proceedings*, 1922–23, p. 901.
76. Henry Bohmann to John Doerfler, November 19, 1925, Hoan Papers.
77. Beveridge, *History of Water Supply*, p. 45.
78. Becker, *A Century of Milwaukee Water*, pp. 34–35, 71–74.
79. *Wisconsin Railroad Commission*, vol. 30, 1926, p. 139.
80. *C.C. Proceedings*, 1926–27, p. 667.
81. *Wisconsin Railroad Commission*, vol. 30, 1926, p. 149.
82. The law was Chapter 183, *Wisconsin Laws of 1931*, section 196.20 (2).
83. *C.C. Proceedings*, 1926–27, p. 712.
84. *Ibid.*, p. 714.
85. Breimeister, *Chronological Summary*, p. 8.
86. *Pabst Corporation, et al., v. Wisconsin Railroad Commission*, 199 Wisconsin 536, 1929.
87. *Wisconsin Legislature, Bill 508S*, 1927.
88. Racine both drew its water from and discharged its raw sewage into Lake Michigan, but Buffalo drew its water from the Niagara River and discharged its waste into Lake Ontario. John Koehler to Daniel Hoan, January 13, 1931, Hoan Papers.
89. Harrison Eddy, *Statement before Milwaukee Common Council Joint Committee on Public Utilities-Health and Buildings, Grounds and Bridges*, January 13, 1931, Hoan Papers.
90. Daniel Hoan to Milwaukee Common Council, April 19, 1931, Hoan Papers.
91. *C.C. Proceedings*, 1931–32, p. 12.
92. *Statement Before Milwaukee Common Council Joint Committee on Public Utilities-Health and Buildings, Grounds and Bridges*, January 13, 1931, Hoan Papers.
93. *C.C. Proceedings*, 1932–33, p. 621.
94. *Ibid.*, p. 919.
95. *Ibid.*, p. 1090.
96. Beveridge, *History of Water Supply*, p. 46.
97. *Milwaukee Water Works Annual Reports*, 1932–39.
98. *C.C. Proceedings*, 1932–33, p. 797.
99. *Ibid.*, pp. 810, 895, 982, 1120.
100. Schwada, “Milwaukee’s Water Purification Problem,” p. 1479.
101. The Treasury Department maintained water quality standards until 1940,

- when they were transferred to the Department of the Interior. The EPA took over the oversight position upon its creation in 1970.
102. Schwada, "Milwaukee's Water Purification Problem," p. 1480.
103. Ibid.
104. *C.C. Proceedings*, 1932–33, p. 1344.
105. Ibid., p. 1509.
106. Ibid., p. 1510.
107. Schwada, p. 1481.
108. Ibid., p. 1482.
109. Beveridge, *History of Water Supply*, p. 29.
110. Later the Milwaukee Sprinkler Owner's Association (MSOA).
111. *Public Service Commission of Wisconsin Report*, vol. 194, p. 202.
112. Ibid., p. 203.
113. Ibid., p. 215.
114. A major reason for the city's willingness to settle for such a low rate of return was that the Socialists attempted to use provision of water service as a lure to get suburban industries and residents to support annexation by the City of Milwaukee. If rates were too high, the targeted customers might be tempted to go without water or obtain water elsewhere, defeating the purpose of the lure. See chapter 4.
115. *PSC Wisconsin Report*, p. 224. Based on the original calculation of a 5½ percent rate of return, this would have been \$432,600.
116. Ibid., p. 228.
117. Ibid., p. 238.
118. Ibid., p. 247.
119. Ibid., p. 252.
120. Ibid., p. 214.
121. Ibid., p. 262.

CHAPTER 4

IF YOU CAN'T JOIN 'EM, BEAT 'EM

Somebody in city hall has permitted the extenuation of water mains and water service into numerous industrial plants outside the city's boundaries. . . . Milwaukee does not want to adopt a dog in the manger attitude. . . . But if the withholding of essential services is the only way to break the anti-annexation iron ring, then the city will have to protect itself...Apparently, there must be annexations, a complete county wide consolidation, or a change in income tax distributions if this is not to happen.—*Milwaukee Journal* Editorial, June 25, 1946

By 1940 Milwaukee had managed to extend water service to all residents currently within the city borders and, with the construction of the filtration plant, had ensured that the water provided was of high quality and should no longer be a factor in episodes of waterborne disease. The fractious relationship between the Socialists and the Non-partisans had made these two accomplishments take far longer than

they probably should have, but the political consensus reached in the fight for the filtration plant would prove to have less positive results in the area of providing service to extramural customers. The idea of generating extra water to sell at a profit had begun on a small scale prior to the advent of socialism in Milwaukee, but the supply of water to suburban industrial and residential customers would be more fully developed under the Socialists than had been foreseen by earlier administrations. This policy had already produced serious ramifications for the financial and administrative health of the waterworks and for the entire city. It was also responsible for greatly expanded state regulatory power over the waterworks as well as for creating a need for the construction of a second water filtration plant. The inability of the Socialist administrations, particularly that of Daniel Hoan, to foresee the consequences of their push to provide suburban water, both for profit and as a lure for annexation, would also severely damage the financial relationship that had been established between the waterworks and the city general fund. Finally, the need to provide water for a growing customer base outside the city would help to foster a relationship of mistrust between the city and its surrounding suburbs.

The supply of water to surrounding communities was first made possible by an act of the legislature in 1887 that stated:

It shall be lawful for the Board of Public Works of the City of Milwaukee, subject to the approval of the Common Council of said city, to issue a permit to the county of Milwaukee, the National Home for disabled soldiers, or any other party, to obtain water from the water works in said city: and for that purpose to connect any pipe that shall be laid outside the city limits with any water pipe within said city.¹

This law also stated that any person or agency wishing such service had to apply for a permit and place on file a bond stating that they agreed to the rules of the Milwaukee Water Works regarding water use and that they agreed to pay full costs for the water, which, because they were outside the city limits, would be 25 percent greater than those for customers within the city. Further state legislation came in 1897 in an act authorizing cities of the first class to extend water services beyond their borders to adjoining towns, villages, and cities.² In that same year the legislature also authorized a new system of annexation, replacing the previous system, which had permitted annexation through legisla-

tive enactment. The new system permitted cities themselves to annex adjoining land, although if the land had been previously incorporated, it was to be annexed only with the consent of the annexees.³

While in the first decades of the century Milwaukee did not appear to be very interested in annexing the abundant incorporated lands in the county, given that the city was still expanding at a healthy rate, the change in the state laws provided the opportunity for ensuring that the expansion would continue. Although Milwaukee's first use of the two newest laws did not involve annexation,⁴ the stipulation included in the enabling law provided that when (not if) the areas in which extramural pipe was laid became part of the City of Milwaukee, the water pipes would become city property. In 1902 the common council approved water service for the Village of North Milwaukee, in 1903 for East Milwaukee, and in 1905 for West Allis and Greenfield. The formula used for all these service extensions clearly shows that the provision of water was meant as a carrot to lure each surrounding municipality into the waiting arms of Milwaukee.⁵ It did not occur to the members of the council that providing services prior to annexation might have the effect of postponing, or even negating, any proposed annexation, perhaps because the city was making such a tidy profit from these sales. The city did not require any agreement on annexation prior to the provision of service; if such agreements existed, they may have been verbal "gentlemen's agreements," and thus not binding on any successors of the original officials involved. (See maps 3 through 9 for location of Milwaukee suburbs.)

The first community on the North Shore to connect with Milwaukee water for retail service was East Milwaukee (now Shorewood) in 1905.⁶ The contract, signed May 8, 1905, was virtually identical with that signed by West Allis later in the same year.⁷ Water was supplied through a sixteen-inch main laid in North Downer Avenue and was paid for at the rate of six cents per hundred cubic feet, a figure 1.25 times that charged city residents. Milwaukee also undertook the job of supplying and installing the water mains for East Milwaukee at cost.⁸

By 1906 this servicing of surrounding communities was having repercussions. The aldermen of the three Polish south-side wards presented a resolution on November 26 to discontinue the provision of water to areas outside the city borders until such time as all residents of the city had adequate service.⁹ This resolution was approved by the

watering committee, but never came to a vote by the general council, as the aldermen were quietly dissuaded from attempting to interfere with a city revenue source. As shown above in chapter 2, the provision of water service to the wards in question accelerated after this point. Between 1907 and 1910 other resolutions to discontinue extramural service were submitted on the grounds that the service was depriving the city residents of high-pressure service needed in areas of higher elevation. These resolutions all were tabled or postponed.¹⁰ Despite their obligation to represent the interests of their citizens, the fact that the aldermen were, in effect, the board of trustees over a proprietary utility resulted in most of them responding to the bottom line rather than to customer satisfaction. This attitude would later prove to be a mistake, as the increasing regulatory power of the state would require more of the city in regard to service provision than it had ever intended to give.

In 1910 a new page in the service-annexation debate began. Article 8 of the Socialist platform read:

The City shall annex and incorporate reasonable territory in addition to its present area—Milwaukee having now the smallest area in the country for any city of the same class—the same to be surveyed and plotted by experts in such manner as to insure healthy and aesthetic conditions.¹¹

This plank was a sharp contrast to the city policy of selling water to suburbs in order to make a profit. Annexing suburban customers would eliminate the surcharge and, coupled with the Socialist argument that all parts of the city should have residential supply, would require capital expenditure that did not exist with the wholesale supply of water to certain suburbs. It reinforced, however, the idea of socialism that government existed to serve the people. With the victory of Emil Seidel and the corresponding majority of seats on the aldermanic council passing to the Socialists, the city could take immediate steps to achieve its annexation goals. Recognizing that the provision of service prior to 1910 had not resulted in the annexation of any land, despite the belief of the common council that it would do so, Seidel and his fellow Socialists took steps to halt the supply of water to extramural areas, despite the financial loss that would occur, unless those areas should apply for annexation. A resolution was passed to this effect on June 9,

1911, and modified in September to allow for the cutoff of water to the suburbs on January 1 of the following year if those suburbs had not applied for annexation. It passed on October 10 by a vote of thirty-one to one, indicating that in the area of annexing new land, the Socialists and the Nonpartisans shared a common goal.¹²

Arguments came at once from industries outside the borders that were subject to loss of their water supply should the council carry out its resolution. Faced with the prospect of job loss for Milwaukee workers employed at the suburban plants, the council postponed the shutoff for a year but urged industrial extramural users to counsel the officials of their particular town or village to apply for annexation or to apply for it themselves. No industrial land was annexed, however, and the six annexations that took place in 1912 were all residential in nature and unconnected with service provision.

The towns and villages in question took another route to ensure their continued water supply. They introduced a bill to the 1913 legislature requiring that when a city had been providing water to an adjoining town or village, the city could not cease to provide service, except for non-payment, without the consent of that town's council. Despite Milwaukee's protests, the bill was passed by the legislature and enacted as Chapter 389, Wisconsin Laws of 1913.

Chapter 389 put a crimp in the annexation goals of the Bading administration. The date to enact cutoff was indefinitely postponed, and provision of service outside the city continued, along with the money the city gained. Additional parts of Greenfield were watered in 1913, and the City of Wauwatosa was initially connected in 1915. No requirement for annexation was applied in either case, and the enacting legislation passed the council with only one dissenting vote.¹³ The only time annexation was linked with service was in 1915, when Whitefish Bay requested to receive city water through East Milwaukee. Milwaukee agreed to this only on the conditions that every person receiving water in this fashion would have to not only signify in writing to support any steps in an annexation process but also to waive their rights under Chapter 389.¹⁴ Milwaukee, however, would make no attempt to take action on this provision for another 12 years.

Bading was defeated in the 1916 election, and the return of a Socialist mayor re-energized the connection of service provision to annexation. In December of 1916, the Council enacted a provision that

stated: "After January 1, 1917, no persons, firms or corporations owning property outside the corporate limits of the City of Milwaukee shall be permitted to connect with said city's water supply."¹⁵ At the same time, Milwaukee moved in the state legislature to permit a city to annex adjoining property by a simple majority vote of the city's common council.¹⁶

While this bill was undergoing debate, the city considered testing Chapter 389 by cutting off water supply to the sponsors of the legislation, namely, the City of Wauwatosa, the Towns of Greenfield and Lake, and the Village of West Milwaukee.¹⁷ Discretion proved to be the better part of valor, and the council decided against cutting off service, even repealing their earlier ordinance requiring towns and villages to submit annexation papers to receive service. Although they eventually lost their battle to secure a liberal annexation bill in the legislature, the city did gain a victory of sorts in that the legislature repealed Chapter 389.¹⁸

The Socialists' concern with annexation became more intense when the results of the 1920 census were released. Showing Milwaukee to be the nation's second-most congested city, the results indicated that attracting new businesses would be unlikely unless the city could manage to expand its land base.¹⁹ Existing companies were uninterested in becoming annexed to the city; lower suburban tax rates coupled with, in many cases, water service provided by Milwaukee made them content with the status quo. The city's Board of Public Land Commissioners was instructed to circulate annexation petitions, and an engineer whose sole purpose was to expedite the engineering problems associated with annexation was appointed to the board. Despite these actions, only 152 acres were annexed in 1920 and none in 1921. The board's 1921 annual report stated that its efforts "were handicapped by the existence of perpetual water contracts held by property just adjacent to the city limits and to the hostility of industrial concerns located just outside those limits."²⁰

Hoan went to the common council and argued that Milwaukee's survival depended upon annexation of surrounding land, particularly the area just to the west of the city limits. The council obligingly returned a resolution on July 24, 1922, that permitted the city to use the full force of water service provision to force annexation. The resolution said:

All applicants to connect with the water system outside the corporate limits of the City of Milwaukee shall be

honored and water service granted by the Common Council provided such applications are accompanied by a lawful petition for annexation to the City of Milwaukee, approved by this Common Council, of the lands to which such service is proposed to be granted.²¹

Hoan was through with the city relying on future promises to annex or promises that homeowners and businesses would support any future annexation petitions. The July 24 resolution would be the foundation of the city's water extension policy for the next three decades.

Despite the resolution, the Board of Public Land Commissioners reported that they were unable to attract significant areas for annexation. In 1923 Hoan pushed through a resolution creating a supervisor of annexation, appointed by the mayor but responsible to the board, and assigned him a staff. The first commissioner was Daniel Werba, a long-time administrative supporter of the Socialist camp. Werba and his staff showed remarkable success, securing 1,463 acres for annexation by the end of 1923, including some industrial concerns that had previously rejected annexation.²² By concentrating on unincorporated land rather than that belonging to other cities, Werba was able to succeed in the city's goal of additional space. This also allowed the city to continue to make money on selling water to already developed extramural areas.

Throughout the decade of the 1920s, the population of Milwaukee County grew rapidly, and the city's coupling of water service with annexation allowed it to obtain an additional 16.5 square miles of land, through fifty separate annexations. This would lead to increasing conflict between the city and the surrounding suburbs, as they saw their size and importance diminish in comparison to the rapidly expanding Milwaukee. The *Pabst* case, mentioned in chapter 3, had clearly demonstrated the regulatory authority of the Railroad Commission (later Public Service Commission) over the Milwaukee Water Department, and the suburban towns and villages would soon utilize this agency as an ally in their fight against the city.

In 1926 the city engineer had reported to the common council that a severe problem with water supply existed. The *West Allis* lawsuit, which had been pursued by the city in an attempt to force the suburb to pay the additional fees that the city charged for extramural service, had delayed the accumulation of the money necessary to pay for a new

pumping station. Because the city was near to its debt limit, the station could not be financed through a bond issue but had to be paid for out of water department revenues. Since the tradition of transferring surpluses to the general fund had continued since the 1890s, using these departmental revenues meant that the city's main pocketbook, and the tax rate, would also be affected by any construction. In the meantime, the expansion of service through both annexation and continued extramural provision was causing a shortage of water, particularly in higher elevations on the west and south sides. To ensure that the city had sufficient water to supply its own needs at an adequate pressure, the engineer recommended that all suburban contracts be terminated within a three-year period. "Should this not be done," he stated, "a water shortage will be created with its menace to public health and its resulting fire hazard."²³

Also in 1926, an event occurred which would have long-term repercussions for Milwaukee's waterworks, although the short-term outcome was in the city's favor. The Town of Milwaukee and the Town of Lake petitioned the Railroad Commission to force the City of Milwaukee to supply water to both towns in their entirety.²⁴ Each withdrew its petitions after a month, in part because of each town's inability to finance the laying of water mains. In the midst of uncertainty over the city's annexation fever, however, it appears likely that the towns were also afraid that water supply might be linked to the loss of their independence. Although the petitions were withdrawn, the Railroad Commission ruled that the city could not be forced to extend or continue water service to any municipality to which it was not *already* supplying water.²⁵

The city responded with a resolution threatening to cut off water to West Allis, North Milwaukee, and Shorewood (formerly East Milwaukee) as of January 1, 1930, unless those cities negotiated new contracts at a significantly higher water rate.²⁶ The suburbs responded by proposing that a committee of city and suburban commissioners be formed, with some of the commissioners being appointed by Hoan, to discuss alternate ways in which the water department might be governed and also to negotiate a contract that would be acceptable to all parties. Hoan, seeing this proposal as an attempt to seize control of the city's profitable water department and make it subject to regional authority, refused to participate in any committee in which suburban of-

ficials would have jurisdiction over “his” water department. He counter-proposed that the city engineers of the respective municipalities involved meet to discuss the question of future water needs and suburban supply.²⁷ This clearly shows that Milwaukee, and Hoan in particular, were interested in providing service to the suburbs as long as the profit generated was sufficient to supply for the necessary costs of water provision within the city and as long as there was hope that the suburbs receiving the service might be convinced to annex themselves to the city. However, Hoan had no intention of letting any outsiders have a voice in the policy decisions of the Milwaukee Water Works unless those outsiders were desirous of becoming part of Milwaukee.

In Whitefish Bay the threat of water shutoff was felt most severely. The suburb had increased its population fivefold in the years since water had been first obtained in 1914; the availability of a piped water supply was an absolute necessity to the maintenance of that population. Unlike Shorewood and West Allis, Whitefish Bay did not receive its water directly from Milwaukee but rather purchased it secondhand from Shorewood, and only after it had passed through a lengthy Shorewood main. This resulted in perpetual low water pressure, which the city tried to alleviate by passing sprinkling restrictions during hours of high use and later (in 1927) banning lawn sprinkling altogether. Faced with the loss of its supply because of Milwaukee’s threatened cutoff of Shorewood, the village made attempts to negotiate directly with Milwaukee to secure a supply.²⁸

Due to the annexation frenzy of Hoan and his supporters, negotiations proceeded slowly, with the city pressuring the village for consolidation with the city. Whitefish Bay mayor Frank Klode was actually in favor of such a move if it would guarantee continued water service; the village councilors were less happy with such a move. They counter-proposed that Shorewood and Whitefish Bay form a separate North Shore water utility and construct their own water works.²⁹

Faced with such opposition, the city backed down and stated that it had every intention of providing water to the suburbs, if only the Railroad Commission could suggest a fair price that would allow the city to make a reasonable profit on the transaction.³⁰ However, it then announced that it was annexing a strip of land along the lake shore between Milwaukee and Whitefish Bay that would make the two municipalities contiguous. While ostensibly permitting Whitefish Bay to tap

the city's mains directly rather than through Shorewood (thus providing a higher-pressure supply), the real reason was less well-intentioned. In fact, under the conditions of the state annexation codes, this contiguity was necessary for annexation to occur.³¹

During the years from 1927 to 1929, the city anxiously watched the progress of two legislative proposals regarding the water department. One would have declared a metropolitan water district with boundaries identical to that of the sewerage commission and, further, establish that although the City of Milwaukee would not be a part of this district, it would be obligated to supply water to the entire district if it had in the past supplied water to any part of it.³² At the same time, the county introduced legislation that would give it jurisdiction over the water department and fund the costs through taxation rather than by the payment of rates. Milwaukee objected strenuously to this latter proposal, pointing out that its residents would be responsible for the payment of 85 percent of the taxes involved, although they would be excluded by the statute from the district to be served.³³ The first legislative effort was defeated in the assembly by a vote of forty-two to twenty-six; the county petition was dismissed when the city offered to provide water for the county institutional grounds at the same rates as for city institutions. The county renewed its effort in the following year, however, and forced the city to back down on its threatened 1930 water cutoff. The compromise provided that municipalities within the county would pay a water rate that allowed Milwaukee a "reasonable" profit and that Milwaukee would make no further efforts to cut off existing service. In turn the county dropped its attempts for a regional water district, at least for the time being.

In 1929 the Depression hit Wisconsin along with the rest of the nation. Faced with a continued high level of indebtedness and the necessity of new construction, with its attendant costs, to the newly annexed areas, on January 1, 1930, Milwaukee terminated its water contracts with West Allis, North Milwaukee, and Shorewood, just as it had earlier threatened. The suburbs sued, and although they won an initial reversal of Milwaukee's action in the county district court,³⁴ the Wisconsin Supreme Court upheld the termination—with a stipulation. The city, the court stated, had every right to terminate the contract. However, until a new contract was negotiated, the city was obligated by Wisconsin law to continue to provide service under the terms of

the previous contract.³⁵ At that time, service would continue under the new contract.

Shorewood dealt with the cutoff by refusing to make a new contract while the court action was pending and also by refusing to pay the new rate of twelve cents per hundred cubic feet. Although the court would eventually rule that the new rates were also invalid because they had not been resubmitted to the Public Service (formerly Railroad) Commission (PSC)³⁶ after the termination of the contracts,³⁷ Milwaukee was unable to resubmit the rate proposals to the commission with any likelihood of passage because of the economic effects of the Depression. Finally, in 1932 the city offered a rate of nine cents per hundred cubic feet, up 50 percent from the previous rate, and Shorewood signed. To clear up the outstanding charges from the time when no contract was in effect, Shorewood agreed to make a one-time payment of \$75,000 to partially compensate the city for its lost revenue; the city, desperate, agreed.³⁸

Whitefish Bay followed suit with a new contract later the same year, and Fox Point, a village to the north of Whitefish Bay, became a customer in 1933.³⁹ West Allis signed a new retail contract in 1935 but would continue to engage in litigation with Milwaukee for an additional five years over what was owed for service in the period between the contracts. Water was supplied wholesale to the Towns of Milwaukee and Lake, with the manner of distribution left up to the governments of those towns. These two towns, which had originally petitioned for service in 1926, were becoming desperate in their attempts to remain independent of the city, while at the same time supplying necessary services to their residents.

The city's reason for not extending retail service to these latter communities was, for once, not based on annexation. Economic downturns, largely stemming from the partial shutdown of the breweries and related industries due to Prohibition, and the subsequent loss of income from these very large water consumers had so impoverished Milwaukee that it had abolished the office of annexation supervisor in 1932 and in fact made only six small annexations in the years from 1931 to 1940. Rather, each of the two towns in question were situated on high bluff land, and service extension would have required the construction of booster pump stations, capital expenditures for which even the suburban surcharge was insufficient to reimburse the city. The Town

of Lake took advantage of the expanded role of the PSC's powers over that of the Railroad Commission and petitioned that the Milwaukee Water Works be forced to extend retail service under the provisions of *City of Milwaukee v. West Allis*. The town argued that the provision of wholesale water did, in fact, constitute service, therefore the extension of such service to retail supply was required under the stipulations of the court decision.⁴⁰ Further, pointing out that Lake was the only municipality bordering the city that did not receive water from it, the denial of such service amounted to unjust discrimination.

The commission agreed. Pointing out that if Lake had constructed water pipes, the city would have been required to extend a main to its borders, allowing the town to connect its own mains to that of the city, the commission decided that Milwaukee's past actions of selling water to Shorewood, Wauwatosa, and Greenfield were to blame for the need to provide service to Lake. "Because," the commission's decision read, "the City of Milwaukee has definitely held itself out to sell at wholesale to various cities and villages in the metropolitan area, hence it cannot repudiate its public utility obligation as to this sole municipality therein now served."⁴¹

The city, not surprisingly, appealed. Claiming that it was not aware that the water it provided wholesale was being distributed to the citizens of Lake, it argued that such distribution was done without its consent. Further, it argued that extension of service beyond the city limits should be in the sole power of the city, as only the city had the knowledge to judge the effects such service might have on the rest of the system.⁴²

Citing the *Pabst* case, the commission stated that it did, in fact, have authority over such extension of water supply. It then proceeded to state:

For many years the City of Milwaukee has furnished water service to the public living outside of its city limits and adjacent to its boundaries. The city recognized that the practical method of meeting the requirements of the Milwaukee area was by a large water system adequate therefore rather than by a series of small systems each designed to limit its services to any small systems each of which might be formed adjacent to the city limits.

The contracts indicate that the city has voluntarily

taken upon itself a public utility obligation of supplying water to various municipalities. Once undertaken the public utility may not arbitrarily discontinue it, *nor may the public utility arbitrarily continue it, or select its customers*. The City of Milwaukee holds itself out as a public utility in a metropolitan area to render service by sundry methods to all contiguous municipalities or to individuals; the position of the city that it is under no obligation to serve another potential customer outside its limits creates an intolerably discriminatory situation.

Nor may we dwell too heavily upon the exigencies of the moment or the convenience of a particular time to a general plan which ignores the general development in the normal growth and development of the system. We must consider the matter of feasibility of the service in this new area from the viewpoint of the whole metropolitan area.⁴³

The city was now truly trapped. Originally, it had approved the selling of "excess water" (ignoring the needs of its own new immigrant residents on the south side) in order to finance popular, and vote-getting, improvements. The adoption of a proprietary mode of operation had encouraged the city council to think of the waterworks not only as a cash cow, whose resources could be milked not only to provide extramural service but also as a hook to encourage residential and industrial areas to annex themselves to the city. The council had never intended that providing such service would obligate the city to go on providing it when economic or sufficiency conditions made it inexpedient to do so. The perceived antagonistic manner in which the city made its services available angered the surrounding suburbs and spurred them into increasing reliance on state authority to define and regulate the service of the waterworks. With the review of the Town of Lake decision, the city not only had to submit to the authority of the PSC and provide service to surrounding municipalities without the reward of annexation but had to do so even when the costs involved adversely affected the ability of the waterworks to provide service to city residents. Unless the city could obtain a reversal of the decision, it might find itself compelled to provide water service to the entire metropolitan area, with capital costs borne primarily by city residents. Given the existing economic conditions, the city was most reluctant to do so. Although Hoan's

use of water supply as leverage for annexation because it was almost the only tool he had available was not surprising, given the historical background of city-suburban annexation battles, his failure to have a contingency plan in place in case such leverage failed placed the city in financial jeopardy when the PSC made its ruling in *Town of Lake*.

As mentioned above, the city was also supplying water wholesale to the Town of Milwaukee. When that town, in 1937, put out bids for the construction of water mains that were in excess of the amount to which they were entitled by the contract to lay, the city moved to terminate its contract with the town, effective in 1939.⁴⁴ The town, when served notice that the contract was to be ended, then petitioned for additional water. The council indefinitely postponed action on this proposal. The town promptly applied to the Public Service Commission for an order requiring that their application be granted, based on the decision in the Town of Lake case.

The commission heard arguments on December 31, 1940. The city argued that, in operating a water utility, it was functioning not in its proprietary mode but in a governmental fashion, and that its primary responsibility was to provide water at reasonable cost to its own citizens. Any supply to extramural customers was to occur only if such supply was available and if the costs of providing such supply were not unnecessarily burdensome to the city residents. Because of this possibility of jeopardy to its own citizens, the city needed to have sole authority to determine if and when extramural provision might so jeopardize said supply. To support its argument, the city cited cases in South Carolina, Minnesota, and Oregon, as well as the U.S. Supreme Court decision in *Brush v. Commissioner of Internal Revenue*.⁴⁵ In that case, the court had for the first time ruled on the legal status of a municipally owned waterworks. It determined that “the acquisition and distribution of a supply of water for the needs of the modern city involve the exercise of essential governmental functions” and, further, “While these cases do not decide, they clearly suggest that municipal water works created and operated in order to supply the needs of a city and its inhabitants are public works and their operation essentially governmental in nature.”⁴⁶

The commission did not accept the city’s argument. It reasserted its authority over the Milwaukee Water Works and held that by serving the Town of Milwaukee in a wholesale fashion, it had already become

a public water utility operating in the town and hence could not cease its operations, under the provisions of *West Allis v. Milwaukee*.⁴⁷ Striking an additional blow against the city, the commission stated that even if the city were not serving the town as a wholesale customer, it could be required to serve the town because it was already serving the area around it, as in the case of *Lake v. Milwaukee*.⁴⁸

Faced with such an appalling decision, the city appealed the ruling to the Dane County Circuit Court, which upheld the commission. The city then appealed to the state supreme court. In 1942 the court finally ruled on the issue, which had been plaguing the city since 1935. On October 13, 1942, the court held that the commission had interpreted its powers too broadly. The question at issue was “whether a municipal utility which, by contract with an adjoining town has assumed to serve small, isolated, and precisely limited portions of a town, has become a utility throughout that entire town, and bound to extend its service in response to the orders of the Public Service Commission.”⁴⁹ While the city would have to agree to continue providing wholesale water to the Town of Milwaukee, even if it canceled the contract,

this is a far cry from the conclusion that the City of Milwaukee has become a public utility in the Town of Milwaukee as a whole. Such a ruling would mean that it is within the power of the Public Service Commission to compel Milwaukee to construct mains in the Town of Milwaukee, and to cover the entire territory in accordance with the needs of its population. This is so out of line with every limitation put by the City on its holding out that we think it cannot be sustained.⁵⁰

The court further concluded that the waterworks had done precisely what was necessary to avoid being considered a public utility in the Town of Milwaukee as a whole and that it was not compelled to serve the rest of the town. The jurisdiction of the commission as an agent that could be utilized to order service by demand in the metropolitan area was severely restricted. When the commission argued that the city had itself, on numerous occasions, provided extensions of service, the court replied that in unincorporated areas the city had the right to decide to what extent it would provide service.⁵¹

The city, of course, was delighted with this ruling. It regained the authority to determine which areas would receive water, at least areas

that were not already receiving service, and it could continue to hold out water service as a carrot with which to entice annexation. Although the city had made only six annexations in the decade from 1931 to 1941, and the advent of World War II would restrict the ability of the city to make major adjustments in the municipal lineup of the metropolitan area, the ability to continue its planned expansion would prove to be very useful after the end of the war.

With the onset of World War II, water consumption picked up. In part this was because of a large increase in industrial use but also was because the city agreed to supply water to a previously nonserved site in the Town of Milwaukee that was designated the Milwaukee Ordinance Area.⁵² This agreement, made with the Federal War Assets Administration, not with the town, was specifically intended to provide a service for the duration of the national emergency and did not, on the part of the city, constitute an indication that it wished to serve the entire Town of Milwaukee when the emergency was ended.⁵³ Such legal hedging failed to protect the city when it attempted to shut off water to the area in 1950, at a time when the existing armament factories had been purchased by private companies and converted to other uses. The plaintiffs, Wisconsin Can Company, Joseph Schlitz Brewing, the Industrial Research Laboratories, Inc., and E. R. Godfrey and Sons, appealed the cancellation of water supply to the Public Service Commission. Reiterating its decision in the *Town of Milwaukee* case, the commission ruled that as the city was supplying the area around the former ordinance area, it was obligated to supply that area as well.⁵⁴

This example illustrates the problems that Milwaukee faced after the war. Although the city's annexations had provided additional land and there was less congestion than there had been in the years between the world wars, the city desired still more land in an effort to prevent industries from leaving the city for the suburbs and their lower property tax rates. The ability to refuse to provide water service to these industrial customers was a necessary part of the city's plan to retain its large industrial base, and the requirement, as per the order of the PSC, that these areas be served was a severe blow to the attempts of the city to meet its goals.

The city had, in fact, attempted to define these goals in a rephrasing of its water expansion policy in 1946, in part as a response to a blistering editorial appearing on June 26, 1946, in the *Milwaukee Journal*. The

editorial complained that the policy of extending water service to unincorporated areas as a lure for annexation was a negation of the tradition of using extramural sales to generate revenue, because once these areas were annexed the profit would decrease; also, it pointed out the fallacy of providing services before annexation was completed. If outside areas could receive water without previously agreeing to become part of Milwaukee, why should they join the city? The system, insisted the editorial, was wasting the best “carrot” available in the annexation battles.

The policy statement that the city prepared in response insisted that there would be no outside service provision in the future and that annexation would be insisted upon in areas where service had already been provided.⁵⁵

Adherence to this policy brought the inevitable lawsuits before the Public Service Commission. The commission repeatedly ruled that the threat to cut off service in order to force annexation was a violation of the role of the city acting as a public utility. The city’s operation of the waterworks was a proprietary function of the government rather than a strictly governmental function, and the city was therefore bound by the same restrictions that would be upon it if the waterworks were privately owned.⁵⁶ Attempts by the city to provide service for a strictly limited time period were also denied by the commission when it concluded that the limitation of obligation to serve could not be validated.⁵⁷

In response to these rulings, Milwaukee again pursued a vigorous plan of annexation, and often found itself attempting to annex land that was being annexed by another municipality. In these cases, Milwaukee was in a precarious situation. Although it wished to provide service to the new residents of the city, in order to both gain revenue and reward the loyalty and support of those residents after an annexation fight, it was reluctant to provide water when the battle had not yet been won. The recent rulings of the commission showed that provision to part of a municipality meant that the city was operating as a public utility in the entire municipality and would therefore be required to provide service to the city as a whole should annexation fail. Faced with this no-win situation, Milwaukee’s response was to delay provision to any disputed areas until title should be finally resolved; this resulted in lawsuits by residents and developers of the disputed areas charging that water service was necessary for the development process to occur. Not

until 1958 would the PSC provide a ruling on this dispute, stating that the city should provide temporary water service to the disputed area, with the conditions that the service should be without prejudice to the rights of the city and might be ceased in the case of failed annexation.⁵⁸

The period immediately following World War II saw an influx of veterans eager to acquire land for the construction of housing. This search for undeveloped land caused a renewal of the city-suburb conflict that had characterized relations in the period after World War I. In one case the federally funded Wingfoot development in Wauwatosa was held up when Wauwatosa refused to allow the project to proceed unless a guarantee were made that the area not be subject to annexation by Milwaukee. The veterans who purchased lots, however, were largely from the city and were more than willing to support annexation if it would guarantee them access to city water.⁵⁹ This was strongly opposed by the political hierarchy of Wauwatosa, composed of long-time residents who found their political motivations to be greatly at odds with that of the new residents, leading to yet more conflict with the City of Milwaukee. This pattern of entrenched resistance to change among long-time suburban dwellers contrasted with the desire of new residents to receive services which the suburbs were not capable of providing, would characterize much of the metropolitan conflict in water policy in the decades of the 1940s and 1950s.

Relations with the Town of Lake were even more complicated. In 1936 the Public Service Commission had ordered the city to supply Lake with water because it had supplied two areas of the town with water already and was thus operating as a public utility there. This order was rescinded in 1942 with the state supreme court ruling in the *Town of Milwaukee* case, and Lake decided to install additional equipment with which to service its own residents. The well system that they installed was constantly breaking down; in 1944 the town found it necessary to request permanent wholesale water service from the city again. This was refused, but the city did provide emergency service on a more or less permanent basis. In 1946 the common council announced that it was tired of providing this service and that future service would depend upon annexation petitions being signed by town residents within sixty days.⁶⁰ Although the threat was futile, the town decided that its future needs could best be met by constructing its own waterworks.

Unfortunately, this only complicated matters further. Shortly after

the town laid out its system, the city annexed a portion of Lake and proceeded to install Milwaukee pipes in that area. The town then appealed to the Public Service Commission and argued that its utility area was being invaded. The commission agreed and stated that Milwaukee could only extend its distribution system into the town with the permission of the commission.⁶¹ Although this decision supported the state's policy of overlooking political boundaries when dealing with utility questions, it resulted in the city being unable to provide its own citizens with its own water. This access to city water had been a major impetus for the residents of the annexed area to agree to annexation. In an ironic twist, the city's refusal to grant city water to the residents of the unannexed portion of the town had led to annexed city residents, who had supported annexation in order to get water, being forced to obtain their water from the town.

In 1952 the Town of Lake disappeared. Of the part remaining after Milwaukee had annexed a section, the rest was divided between the existing Town of Cudahy and the newly formed Village of St. Francis. The town's water system was then dismantled and replaced with city water.⁶²

Shortly after the end of World War II, the suburbs had begun to agitate for some form of metropolitan water district, as they had done previously in 1927 and 1935. The city remained opposed to any system design that would be funded primarily by tax dollars but would confer most of the benefit upon the suburbs and also objected to a metropolitan governing board in which the suburban representatives would outnumber those of the city. No action was taken on the idea until 1948, when county supervisor Eugene Warnimont proposed in the legislature that a metropolitan district on the order of the sewerage district be created.⁶³

The common council appointed a committee to look into the possible repercussions of such legislation, and this committee prepared a statement reflecting the city's position on the creation of a metropolitan water district.⁶⁴ This stated that the city was in dire need of funds and that ownership and operation of the waterworks was the chief factor in helping to alleviate this financial crisis. The creation of a metropolitan water district, and the removal of water revenue from the city's coffers, would thus "imperil the ability of the city to conduct a clean, sound and efficient government." They further contended that they would only

“consider turning over the water works to such a newly created government having central authority and home rule.”⁶⁵

The bill, as it was finally introduced in the legislature in January 1949, proposed to give the operations of the waterworks over to the sewerage commission, which would have the power to purchase the existing water plants in the county. The city objected most strongly to this particular provision and managed to have the bill amended to exclude Milwaukee’s water plant from purchase. Without this very necessary provision, the bill died in committee, and the suburbs left off threatening a metropolitan water district until 1957.⁶⁶

The suburbs did not, however, entirely give up. Still trying to obtain water supply without having to resort to Milwaukee for it, several of the suburban communities banded together in 1954 and commissioned an engineering study examining the possibility of forming a separate suburban water district. The communities involved were Glendale (which constituted most of the former Town of Milwaukee), Wauwatosa, West Allis, St. Francis, Shorewood, Whitefish Bay, Fox Point, Bayside, River Hills, Hales Corners, Greendale, the Town of Milwaukee (of which only a tiny remnant near Shorewood still existed), the Town of Wauwatosa, and Greenfield. Glendale in particular had been trying to get water from Milwaukee since the days when it was part of the Town of Milwaukee. The incorporation of Glendale in 1950 came as a blow to city officials, who had hoped to add that territory to Milwaukee. The Milwaukee common council steadfastly refused to supply Glendale, stating that the water was simply not available at the present time. The study, completed by the firm of Alvord, Burdick, and Howson, concluded that a system that would provide water for all these communities could be constructed for slightly over \$12 million and could be completed by 1970. The pumping station and filtration plant would be located in Whitefish Bay, to the north of the Milwaukee facility, because the contractors felt that the water conditions on the south side of the county were less than desirable. It was to be financed with forty-year revenue bonds, with all participating municipalities paying equal rates.⁶⁷ Although another study was done in 1956 by the same firm for just those communities north of Oklahoma Avenue (thus excluding Greenfield, Greendale, and Hales Corners), the suburbs took no immediate action on implementing either study.

Attempts to reach a negotiated settlement between the city and the

suburbs regarding water supply failed in their initial attempt. Milwaukee County introduced state legislation to support the creation of a joint city-county-suburban board, with seven representatives from each governmental jurisdiction, to discuss issues of joint concern. This commission, designated the Committee of 21, met but twice, and its meetings were characterized more by strife than by reconciliation and an honest attempt to reach a middle ground. When the legislature refused to consider enacting a law to make the committee an official body, it dissolved.⁶⁸ The next attempt was somewhat more successful.

In September 1956 Governor Kohler appointed a metropolitan study commission to examine issues affecting the city and the suburbs. The committee, which was responsible for the commissioning of Beveridge's work, among others, reported to the governor in December of the same year. Among its conclusions:

Recommendation: We recommend to the City of Milwaukee a re-evaluation of its stated basis water policy, namely, that to obtain city water, a suburb must become part of the city.

Comment: The city has now acquired virtually all land which could be obtained by annexation. Further expansion could only occur through consolidation or merger. As a consequence, this 50 year old policy needs reexamination in the light of present day realities.

The problem of sharing revenue derived from a return of state taxes is of vital importance both to the City of Milwaukee and the suburbs, and what hurts one helps the other and vice versa. We have recommended later in this report a reexamination of this specific problem by a Commission created by the legislature. In so doing, we recognize (a) that when a business moves from the city to the suburbs, the city loses tax revenue and (b) that the movement of such a business may be influenced by the adequacy of the water supply.

But since we also know that the movement of business and industry is influenced by many considerations, we do not believe that all of the city's problems in this area spring from a single source, namely, possible defects in one phase of the state's tax system. Nor do we believe

that the City's problems in this area can be solved—or that it is even appropriate to attempt to solve them—by using the city water as a lever, political or economic. The City Water Department is a public utility assured by law of an adequate return on its investment by the Public Service Commission. The Water Department should provide a continuing and supplemental source of revenue for the city. The sharing of revenue derived from a return of state taxes and the furnishing of an adequate supply of water to the City, the suburbs and the Milwaukee metropolitan area are related problems but little progress has been made in their solution. We believe that more progress might be made by considering them separately at this stage.

Recommendation: We recommend at the earliest date—on a cooperative basis between the City and the suburban communities under the aegis of the Commission hereafter referred recommended—an area-wide study of the water problem by a competent firm of engineers to establish a factual base for long-range policy.

Comment: The water needs of Milwaukee metropolitan area citizens must be supplied at a reasonable cost. At this stage, fact-finding is the first step.

Recommendation: As part of a reexamination of its basic water policy, we recommend the creation by the Common Council of a Citizens' advisory Waterworks Board, appointed by the Mayor, subject to confirmation by the Common Council.

Comment: Such a board as we visualize it should be composed of representative citizens of the community with business, financial, legal, accounting, engineering, medical and public relations backgrounds. Its purpose should be to a) recommend policy to the Common Council, b) review performance of the City Water Works, and c) to provide a forum for discussions of water problems by the City and its customers, including the suburbs. Since the Common Council is essentially a legislative body rather than an administrative group, the existence of such a Board should help free the Common Council from unneces-

sary detail and simplify the formulation of policy without the interfering with the Council's prerogative to determine the actual policies and to control expenditures.⁶⁹

The members of the committee, as mentioned above, were appointed by the governor. Only one was a city resident or employee, George Parkinson. The other three members, Ebner Luetzow, Robert Foote, and Clifford Randall, were all suburbanites, with business and political ties to Governor Kohler. Further, the governor was a long-time political enemy of Mayor Zeidler and an outspoken opponent of the continued power of Milwaukee in regional and state politics vis-à-vis the suburbs. Given such a committee, and its recommendations, it is not surprising that its resolutions were not adopted by the city.⁷⁰

The recommendations were noted and acted upon by the suburbs. In Wauwatosa and in the North Shore suburbs, village and city governments took steps to ensure that they would continue to receive Milwaukee's water on their own terms, rather than those of the Milwaukee common council.⁷¹ In Wauwatosa the problem went back to 1944. In that year, Wauwatosa had reconditioned its existing wells and dug one new one to provide for the existing needs of its population. By 1956 these wells were insufficient to meet the needs of a greatly expanded population, partially because of natural increase and partly because Wauwatosa had doubled its size and population through annexation in the postwar years. Wauwatosa demonstrated its desire to supply these new residents by laying eight miles of mains in the affected areas but, apart from drilling one additional well, made no other attempts to secure an outside source until the publication of the Metropolitan Study Commission report mentioned above. Receiving notice of the commission's findings, the mayor of Wauwatosa, John Knuese, urged the council to pass a resolution demanding that Milwaukee supply Wauwatosa's water needs within ninety days or a petition demanding such service would be sent to the Public Service Commission.⁷² Milwaukee quickly announced its refusal to provide service, citing a lack of available water to meet the needs of its own citizens, and Wauwatosa filed its petition with the Public Service Commission on November 14, 1956.⁷³ In the meeting where this petition was drafted, Mayor Knuese made it clear to the council that if the Public Service Commission failed to grant their request, he would again petition the legislature to form a

metropolitan water district that would be essentially under suburban control.⁷⁴

The basis for Wauwatosa's petition rested on the historic provision of water to the Milwaukee County Institutional Grounds located in Wauwatosa. When Milwaukee had agreed to supply the grounds, Wauwatosa had agreed to the laying of a main to the grounds, with the proviso that it be allowed to tap the main at all street intersections, with the understanding that "the City of Wauwatosa and the citizens thereof may and shall be eventually supplied with water through said main from the water supply of Milwaukee, Wisconsin."⁷⁵ Wauwatosa argued that because Milwaukee had never protested or disputed this clause, it was the clear intent of Milwaukee to provide Wauwatosa with Milwaukee water.

Milwaukee countered that such a stipulation was nonbinding, given its age and the fact that the clause restricted supply to those residents directly abutting the main, and therefore did not include service to Wauwatosa as a whole. Further, its current water shortage meant that providing service to Wauwatosa would deprive its existing customers, including those within the city, of an adequate supply.⁷⁶ Wauwatosa countered that Milwaukee had been recently discussing hiring engineers to prepare a report on possible system expansion; provision could and should be made in this study for the supply of water to Wauwatosa, at least on a nonpeak basis.

The commission's decision was for the suburbs the culmination of a fifty-year battle to receive a public service from Milwaukee without the capital and construction costs involved in providing such a service. After a summary that included a history of water services to the suburbs by the Milwaukee Water Works, the PSC concluded:

The city of Milwaukee, as a water public service utility, has and now is engaged in the provision of water for resale to various municipalities which own and operate water public utilities and which are contiguous or near by the city of Milwaukee and has held itself out to furnish such service to other municipalities which operate public water utilities and are contiguous or near to the city of Milwaukee.

Because of this, the furnishing of water for resale to the city of Wauwatosa, as a public water utility, by the

city of Milwaukee, as a water public utility, is necessary, reasonable, equitable, and the refusal of such service by the city of Milwaukee, as a water public utility, discriminates between the city of Wauwatosa, as a water public utility, and other municipal water utilities to which Milwaukee sells water for resale.⁷⁷

The commission further ordered that the city make plans to extend its facilities to provide such service as was demanded.

Milwaukee was truly facing a serious situation. If it accepted the ruling, it would lose the carrot of water supply in dealing with city-suburban disputes and be forced to spend a great deal of money expanding its water service operations in so doing. If, on the other hand, it opposed and appealed the ruling, it ran the risk of the legislature creating a water district dominated by the suburbs. Appealing the case to the Supreme Court was no longer a viable solution, because the 1942 ruling in *Town of Milwaukee* had specifically referred to the city's power to refuse service in unincorporated areas. The total annexation of all unincorporated land in Milwaukee County on May 4, 1957, meant that the conditions of the court's decision no longer applied. Two groups arose in the common council; one favored opposing the commission's ruling by all possible means, the other favored accepting the decision as the course of least resistance.

Each side issued resolutions stating their positions; the provision which favored appealing the commission's ruling won, eleven to eight.⁷⁸ Mayor Frank Zeidler thereupon vetoed the resolution and urged compliance with the ruling, "however unjust and contrary to our original defense it may seem." Given the existing political conditions in Madison, Zeidler went on, it was likely that any appeal would fail, and the city would then be liable for damages in addition to the costs of service provision. Only by compliance with the order could the city hope to retain control over its own water department. His veto ended with a *cri de coeur* that showed very clearly the conditions to which the city felt the state had subjected it.

This constant harassment of the central City of Milwaukee by its suburbs for services which they are unwilling to supply for themselves, while at the same time they obstruct both the internal and external growth of the city, is ultimately the responsibility of the state government. By a

series of acts against the unity of the metropolitan area, the state has created the confusion of governments and fragmentation in this area, and the great inequality of the burden of tax sharing.⁷⁹

The mayor's veto was sustained by the council by a vote of eleven to nine, fourteen votes being necessary to override.

At the same time this controversy was occurring, the North Shore suburbs were attempting some changes of their own. As mentioned above, the city had fought a long battle with the City of Glendale (in its previous incarnation as the Town of Milwaukee) and the other North Shore suburbs, in the hopes of being able to avoid providing water service to that municipality, while it continued to supply the communities of Shorewood, Whitefish Bay, and Fox Point. In 1956 Glendale held a referendum, which citizens approved by a vote of 3,013 to 658, to join with the two latter communities in the formation of a separate water utility. Given Milwaukee's stated inability to supply Wauwatosa, citing lack of supply, it is surprising that the city took the action against this proposed water district that it did. When the three North Shore municipalities petitioned the PSC to allow them to form this separate utility, Milwaukee countered by applying for an order to serve Glendale, something which it had strenuously objected to in the past. The city's argument hinged on the commission's ruling in the Wauwatosa case. If it were to have the responsibility of serving the surrounding suburbs, as the commission had ordered, it should be also granted the rights of a public utility as to noncompetition. Since Milwaukee was serving as a utility in Fox Point and Whitefish Bay, it should be permitted to continue doing so. The city's brief stated: "While it may be argued that Whitefish Bay and Fox Point, as customers of a utility, may in some instances have the privilege of terminating sales, they have no authority or right whatsoever to establish a competing utility district or utility water plant for the purpose of selling water to the same area now served by the city of Milwaukee."⁸⁰

The city contended that while a single community might be permitted to cease its wholesale buying of supply from a utility in favor of supplying its own water without constituting a separate utility, the combination of three communities in so doing did in fact constitute an unfair restriction of trade upon the monopoly provision of the public utility statutes. Glendale countered by arguing that Milwaukee was only oppos-

ing the petition because it did not wish to lose Whitefish Bay and Fox Point as customers, not because it really wished to serve Glendale. If such had been the case, they argued, Glendale's petitions for service would not have been constantly denied by the city. The commission decided for the suburbs, just as it had for so many years, and the North Shore suburbs formed their own water utility in 1963.

Another step taken by the city at this time was the authorization of an engineering study by the firm of Black and Veatch to expand the city system and provide additional water for its own citizens as well as the suburbs. In order to have available funds for the construction program expected to be recommended by the study, the city also appealed to the PSC for its first rate increase since 1939. Arguing that the increase was necessary not only because of increased costs of supplying water but also because of the low rate of return requested in the 1939 decision, Milwaukee obtained an increase in rates of at least 25 percent, allowing it a return of 5.1 percent on its investment. The PSC, noting that it had in 1939 stated its approval of such a return but that the city had never taken advantage of it, approved the request. The rate increase only affected customers within the city boundaries, as suburban customers were already paying a premium.⁸¹

The Black and Veatch study had been commissioned not only to deal with the inadequacies of the system to meet future needs but to meet existing needs. The years 1955 and 1956 had been excessively hot and dry, and areas at higher elevations had suffered low water pressures as a result. Sprinkling restrictions failed to compensate entirely for the lowered system pressure, and the decrease of lake and water levels in that year made it more difficult and expensive for the city to pump sufficient water to meet its customers' needs. Residents on the south side were also plagued by problems with odors emanating from the Menomonee and Kinnickinnic Rivers as the lowered water levels exposed layers of mud and debris that had not been uncovered since the days prior to when pollution standards had been imposed in the nineteenth century. The exposure of these old tannery and sewage wastes to the air resulted in an odor that was "offensive to the nose and eye, and hazardous to the health," according to a *Milwaukee Journal* editorial. South-side residents appealed to their state representatives for an investigation of possible health hazards related to the odor, and a study was performed by the Department of Natural Resources.

This report, which appeared in June 1958, concluded that serious problems affected the two river basins. In addition to the accumulation of wastes in both streambeds, the DNR noted that every spring in which there was a significant snowmelt with accompanying runoff, a high bacteria count resulted in those rivers and in the portion of the Milwaukee harbor where the two rivers emptied. Additionally, the report noted the presence of “unidentified organisms” which accompanied the bacteria, “with unknown effects on the health and well-being of the citizens exposed to them.” Copies of this report were sent to the Milwaukee water department, the health department, and the sewerage commission; the latter two organizations noted and discarded them. The water department’s copy was stamped received and placed on file, and was archived in 1960.⁸² More than thirty years later, the “unidentified organisms” would make their presence known in a more public fashion.

The publication of the Black and Veatch study in 1959 marked the acceptance of the change in the relationship between the city and the suburbs. The study recommended a construction program that would permit the city to supply Wauwatosa and Glendale, as well as providing details for a plan that would permit the city to serve the water needs of the entire county. Acknowledging the likelihood of the PSC ordering the city to serve, if not the entire county, at least Wauwatosa and Glendale, the common council voted to approve the study on September 3, 1959. Funds to begin the improvements outlined in the study were authorized at that time, and arrangements were made to finance new construction, including a new pumping station, a new filtration plant, and additional booster stations by the issuance of bonds.⁸³

The new pumping station and filtration plant were to be located on the south side of Milwaukee, below the harbor facilities. A new alderman, Robert Anderson, had led the fight to place the water plant on the south side and argued that to place all the city’s eggs in one basket, so to speak, regarding water supply was foolhardy. He discarded the arguments that the quality of the water available on the south side was less desirable than that on the north, arguing that with chemical treatment and filtration the water could be made safe to drink. The decision to locate the plant on the south side was made for three reasons: in order to minimize the chances of either plant being destroyed in case of nuclear attack (a common fear during the height of the Cold War in the

late 1950s and early 1960s); to lessen the need for booster stations on the south side by supplying water at a higher pressure to the residents of the southern half of the county; and because the city already owned an acceptable plot of land on the south side that was suitable for the site of the filtration plant. To further minimize civil defense risks, it was determined that a control center, which would monitor pumpage flow data and provide information regarding reservoir and storage tank fill levels, was to be placed in the downtown municipal building. From here, pump changes could be made remotely in the case of disasters overtaking the personnel at either filtration plant or at one of the pumping stations.⁸⁴

A major assumption of the Black and Veatch study was that demand for water would continue to rise in the metropolitan area. Average daily demand in 1959 was 148 million gallons per day, and this was expected to rise to 230 MGD in 1980 without the addition of Wauwatosa and Glendale to the service area. The addition of Wauwatosa and Glendale was expected to add 6 MGD in 1960 and 14 MGD by 1980. Maximum daily demand (the peak demand on the day of highest usage, usually occurring in the dry summer months⁸⁵ when lawn sprinkling occurs) was estimated to be 444 MGD by 1980, with the addition of the two suburbs. Since the listed capacity of the existing water filtration plant, Linnwood, was 290 MGD, additional pumpage and filtration capacity was needed to meet the projected needs.⁸⁶

The Black and Veatch report noted that the intake for the south-side plant would be situated within the plume of the sewerage plants outflow, but this was not considered to be a problem. While it was recognized that the water at this south side intake would be of poorer quality than that available at the Linnwood facility, it was felt that additional chemical treatment would take care of any problems.⁸⁷ Additional costs to the city for this treatment could be ameliorated by raising rates, and the higher costs in general from the operation of new facilities could be compensated for in the same fashion.

Accordingly, the city approached the PSC with a proposal to raise rates. Announcing for the first time its willingness to serve the entire metropolitan area (within Milwaukee County), the city proposed that rates be approved which established new categories of usage. Instead of charging by the hundred cubic foot, the rates were in steps of 10,000 cubic feet, with increased charges for the various categories of service

mains. Additionally, the fixed charges for having service at all were to be increased to pay for the additional metering and accounting services that would be necessary. The PSC, having won its battle with Milwaukee over jurisdiction and suburban service provision, consented to the increase and recommended an annual review of costs to allow for annual increases in water rates.⁸⁸

Construction began immediately, and the south side pumping facility (Texas Avenue Station) and the filtration plant (Howard Avenue) went on line on June 1, 1962. The filter plant had a capacity of 90 MGD and was designed so that it could be expanded to 300 MGD should water demand increase to the point where such expansion was necessary. With the construction of the new facility, waterworks officials, common council members, the suburbs, and the PSC were convinced that all necessary steps had been taken to ensure the smooth provision of clean water to the metropolitan area into the next millennium.

They were wrong.

Notes

1. Chapter 54, *Wisconsin Laws of 1857*.
2. Chapter 231, *Wisconsin Laws of 1897*.
3. Chapter 296, *Wisconsin Laws of 1897*.
4. The first outside service provision provided water to the St. Aemilianus Orphanage and the St. Francis Seminary in St. Francis in 1900. *Common Council Proceedings, 1900–1901*, p. 467.
5. The form was as follows: “Whereas, It is apparent that in the near future the village (or town) of —— will become a part of Milwaukee by annexation . . .” From Beveridge, *History of Water Supply*, p. 55.
6. The 1903 contract had provided bulk water transported in wagons to the East Milwaukee village hall, where it could be purchased by village residents. The 1905 contract allowed for pipes entering the village itself.
7. Beveridge, *History of Water Supply*, p. 94.
8. Since East Milwaukee lay directly to the north of the eighteenth ward, the city reasoned that it was expedient to pipe the few remaining areas of that ward as long as they were in the area. See table 4 in chapter 2.
9. *C.C. Proceedings, 1906–7*, p. 957.
10. *C.C. Proceedings, 1907–8*, p. 855.
11. *Platform of the Social-Democratic Party of Milwaukee, 1910*.
12. *C.C. Proceedings, 1911–12*, pp. 539, 591.

13. *C.C. Proceedings*, 1913–14, p. 29; *C.C. Proceedings*, 1915–16, p. 757.
14. *C.C. Proceedings*, 1915–16, p. 951.
15. *C.C. Proceedings*, 1916–17, p. 1054.
16. *Milwaukee Sentinel*, April 24, 1917.
17. *C.C. Proceedings*, 1917–18, p. 169.
18. Section 16, Chapter 551, *Wisconsin Laws of 1919*.
19. U.S. Bureau of the Census, *Fourteenth Census of the United States*, Population, vol. 1, p. 76 (Washington, D.C.: Government Printing Office). The population of Milwaukee in the 1920 census was 457,147. The size of the city, according to the city civil engineer, whose job it was to know these things, was 20.3 square miles. Although this produced a density of approximately 22,500 per square mile, this was in no way the most dense city population. However, Milwaukee did not have the tradition of apartment or tenement dwelling, as did many of the more densely populated East Coast cities. Since over half of the square miles (13.1) that were included in Milwaukee were occupied by industrial or commercial property and since Hoan did not want to introduce the idea of apartment dwellings to the city, his interpretation of “congestion” meant that there was almost no available land for additional single- or two-family dwellings to be built. See Hoan’s comments in his *Letter to the Common Council*, November 18, 1920, Hoan Papers.
20. *Annual Report of the Board of Public Land Commissioners to the Common Council, 1921*, issued 1922, p. 42.
21. *C.C. Proceedings*, 1921–22, p. 1042.
22. Beveridge, *History of Water Supply*, p. 61. Werba used not only the power of the July 24 resolution, but also took advantage of the fact that Chapter 389 had been repealed. In 1922 it was reported that the water mains that the city had laid in Wauwatosa in 1915, just west of the Milwaukee city limits, were being illegally tapped by the city of Wauwatosa to provide water for residents in areas that had not petitioned to receive water service from Milwaukee. Although Wauwatosa was paying for the increased water use, Werba contended that this was an illegal extension of the original grant of service and threatened to cut off all service to Wauwatosa if the situation were not remedied. The area, now known as the Washington Heights, consisted of large elegant homes and was heavily dependent on city water. The 150-acre area applied for annexation and became part of Milwaukee on January 14, 1924.
23. *C.C. Proceedings*, 1926–27, p. 813.
24. *40 Wis. RC 813*.
25. *C.C. Proceedings*, 1926–27, p. 813. This should not have been an unexpected development. In battles over city-suburban annexation that had

been fought in East Coast cities, as well as elsewhere in the Midwest, the state traditionally sided with the suburbs. What is interesting is that Hoan and his council supporters seemed to find this decision unusual and had no contingency plan in place to deal with such a decision.

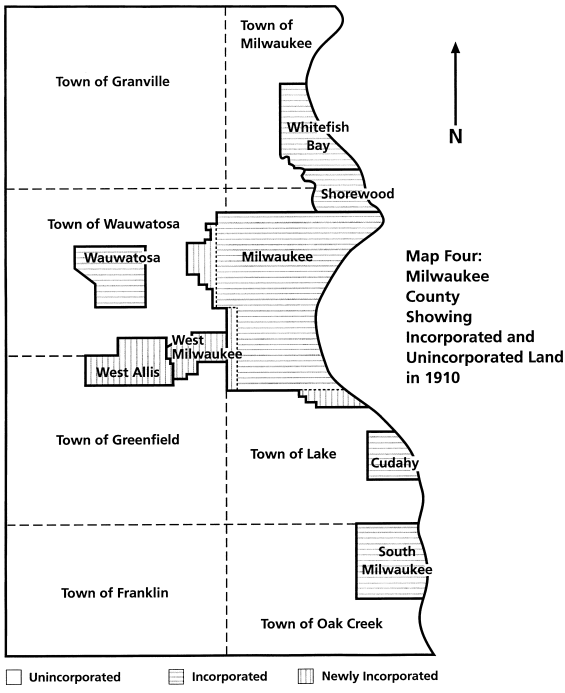
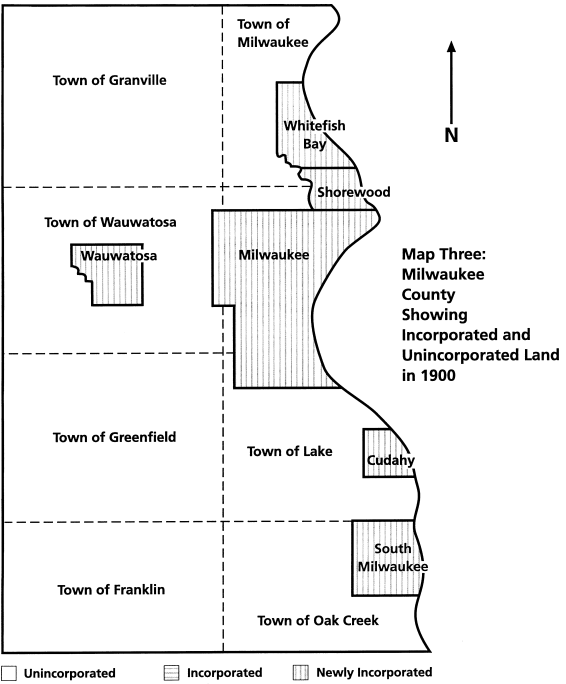
26. *Ibid.*, p. 815.
27. Daniel Hoan to George Gabel, February 7, 1927, Hoan Papers.
28. *Milwaukee Journal*, July 6, 1927.
29. Charles D. Goff, "The Politics of Governmental Integration in Metropolitan Milwaukee" (Ph.D. diss., Northwestern University, 1952), p. 259.
30. *C.C. Proceedings*, 1926–27, p. 1407.
31. Beveridge, *History of Water Supply*, p. 97.
32. *Wisconsin House Bill 549*, A, 1927.
33. Beveridge, *History of Water Supply*, p. 67.
34. *City of Milwaukee v. West Allis*, Milwaukee County District Court, 1930. The district court ruled that because the original contract had provided for contract termination only in the case of West Allis being annexed, no termination could be granted for any other reason.
35. *City of Milwaukee v. West Allis*, 217 Wi. 614, 1935. The summary of this case meant that once the city had contracted to provide a service, it had to continue doing so, regardless of the specific contract terms and arrangements.
36. Chapter 183, laws of 1931 abolished the Railroad Commission and created the Public Service Commission in its place. The PSC had the power to regulate service of public utilities, and to require extensions of service at its direction. *Section 196.58, Chapter 183, Laws of Wisconsin, 1931*, p. 5.
37. *Ibid.*
38. Breimeister, *Chronological Summary*, p. 9. The actual bill was slightly over \$88,000.
39. The city initially tried to make Fox Point contiguous, to smooth annexation, just as it had with Whitefish Bay. When the threat of a separate North Shore utility was again raised, the city backed down and agreed to supply Fox Point indirectly through Whitefish Bay. The lessons of indirect service had been well learned, however, and the contract clearly stipulated that there were to be no assurances that Milwaukee's supply to Whitefish Bay would be adequate to service Fox Point and that the city was to suffer no legal ramifications if the supply or pressure was such that water was effectively unavailable there.
40. *PSC Docket # 2-U-941*, brief for Town of Lake, 1935.
41. *13 PSC Wisconsin*, 174.
42. Brief for Appellant City of Milwaukee, *PSC Wisconsin Docket # 2-U-941*. Cited in Breimeister, *Chronological Summary*.

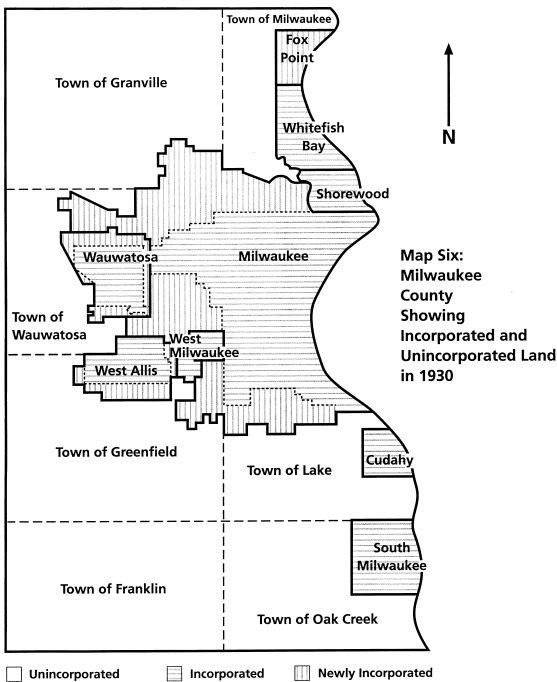
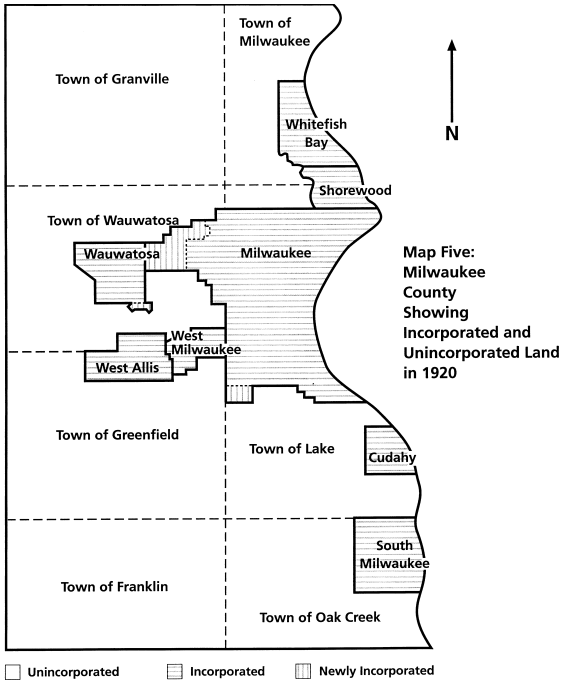
43. *15 PSC Wisconsin 263*, 1937.
44. *C.C. Proceedings*, 1936–37, p. 1476. The fact that the city attorney of the Town of Milwaukee had led the legislative fight to abolish the 25 percent suburban surcharge in 1935 also affected the city's decision to terminate the contract.
45. *PSC Wisconsin Docket # 2-U-1570*, Brief for City of Milwaukee. *Brush v. Commissioner of Internal Revenue*, 300 US S. Ct. 352, 1937.
46. *Brush v. Commissioner*, p. 352.
47. *27 PSC 337*, 1940.
48. *Ibid.*
49. *City of Milwaukee v. Public Service Commission*, 241 Wisconsin 397, 1939.
50. *Ibid.*
51. *Ibid.*
52. This was established for by federal ordinance for the manufacture of bombs, ammunition, and other items of explosive ordnance to be used in the war effort.
53. *35 PSC Wisconsin 328*, 1950. The wording of the contract reflects this opinion, stating, "The City of Milwaukee reserves the right to discontinue service should the property served be sold or leased to a private enterprise for a private purpose, or upon the termination of the existing war emergency if the property has not been annexed to the City of Milwaukee."
54. *Ibid.*
55. *C.C. Proceedings*, 1946–47, p. 743.
56. *31 PSC Wisconsin 797*, 1947.
57. *32 PSC Wisconsin 296*, 1947.
58. *PSC Docket # 2-U-4987*, May 1, 1958. This proved to be a moot point, as all unincorporated land in the county had been annexed the previous year.
59. Statement of Arthur Marcus, member of American Legion National Housing Committee, cited in *Milwaukee Journal*, May 27, 1947. Wauwatosa relented, and the Wingfoot subdivision was annexed to Milwaukee in January of 1948. It composes the area from 60th to 76th Streets, between Center and Burleigh Streets.
60. *Milwaukee Journal*, July 30, 1946.
61. *36 PSC Wisconsin 180*, and *36 PSC Wisconsin 365*, 1951.
62. Beveridge, *History of Water Supply*, p. 119.
63. At this time there was also discussion of having the county take over operation of other city functions, such as the museum (which it did). The general feeling expressed by Warnimont was that if the county should have to accept responsibility for operating nonprofit institutions, it should

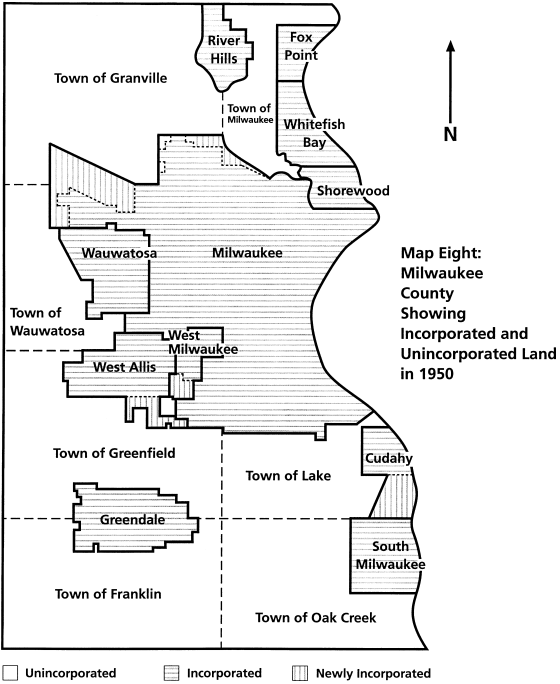
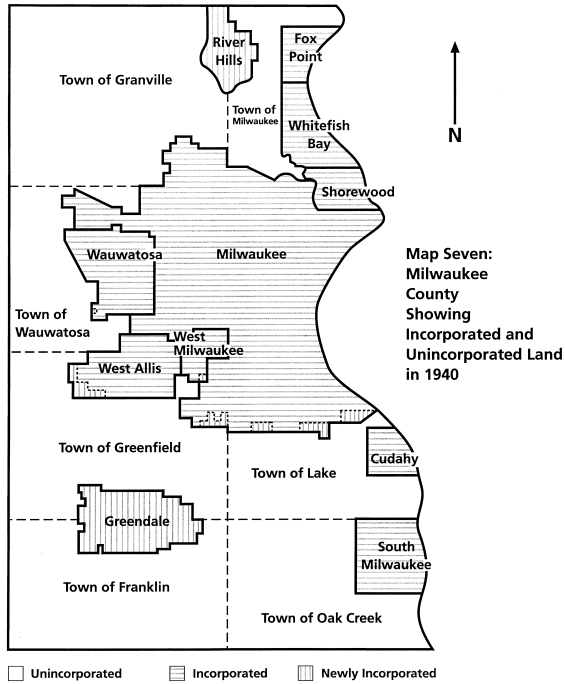
be compensated by receiving the revenues and governance of money-making operations such as the waterworks.

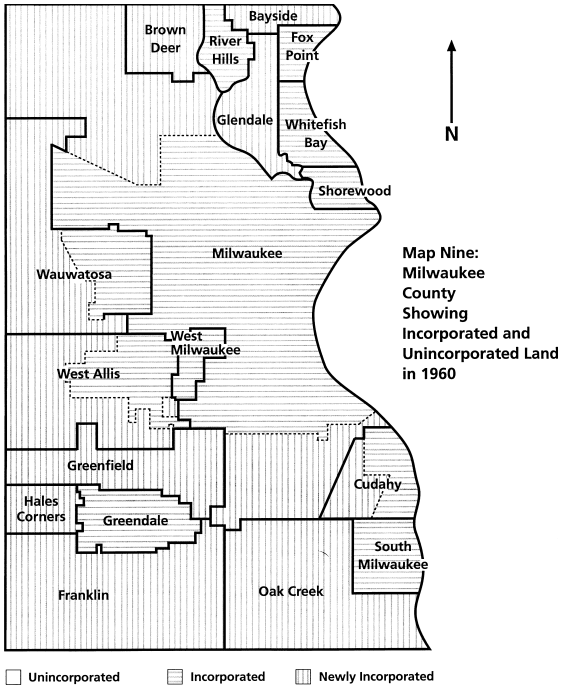
64. The committee consisted of Milwaukee city attorney Leo Hanley; waterworks superintendent Edward Tanghe, deputy commissioner of public works John Tanghe, alderman Koepke, and former alderman Matt Mueller. *Milwaukee Journal*, December 21, 1948.
65. *C.C. Proceedings*, 1948–49, p. 2369.
66. *Milwaukee Journal*, May 25, 1949; Beveridge, *History of Water Supply*, p. 121.
67. This was a major point of contention. Several communities felt that those suburbs with higher levels of industrial use, and thus higher peak demand, or those at a higher elevation requiring booster pumps to raise pressure should pay higher rates. Report of Alvord, Burdick and Howson, *Report on Water Supply and Distribution for Communities in Milwaukee County, Wisconsin*, 1954.
68. *Milwaukee Journal*, November 15, 1955; Beveridge, *History of Water Supply*, p. 123.
69. *Milwaukee Metropolitan Survey Committee Report*, December 1956, pp. 1–2.
70. Private Communication, Frank Zeidler to Kathleen Foss-Mollan, October 25, 1996.
71. Beveridge, *History of Water Supply*, p. 126.
72. *Resolution of the Wauwatosa Common Council*, October 14, 1956.
73. *Resolution of the Wauwatosa Common Council*, November 14, 1956.
74. *Message of Mayor Knuese to Common Council*, November 14, 1956. A conservative, anti-Milwaukee faction then held control of the legislative branch of Wisconsin government, making passage of such legislation much more likely than it had been in 1927 or 1935.
75. *Contract between City of Milwaukee and Milwaukee County*, July 8, 1908; *Resolution of Wauwatosa Common Council*, July 24, 1908.
76. Brief for Wauwatosa; Brief for Milwaukee, *PSC Docket # 2-U-4719*, April 2, 1958.
77. *PSC Docket #2-U-4719*, April 2, 1958.
78. *C.C. Proceedings*, 1957–58, p. 3091.
79. *C.C. Proceedings*, 1958–59, p. 291.
80. *PSC Docket # CA-3583*, brief of the City of Milwaukee, April 28, 1958, p. 31.
81. Beveridge, *History of Water Supply*, p. 146.
82. *Report on Bacteriological Conditions of Menomonee and Kinnickinnic River Basins in Milwaukee County, Wisconsin*, 1956–58, Madison, Wisconsin Department of Natural Resources, June 1958.

83. *C.C. Proceedings*, 1959–60, pp. 756–59.
84. *Report on Water Works System for Metropolitan Area, Milwaukee, Wisconsin*, Black and Veatch, Consulting Engineers, Kansas City, Missouri, 1959, pp. 65–70.
85. This contradicts the finding of the Alvord, Burdick, and Howson report that had been done for the suburbs, which recommended that a south-side plant not be constructed because of the danger of picking up sewage waste in the intake. Alvord had recommended that any suburban plant have an intake on the north side of Milwaukee. The company submitted a recommendation to the city of Milwaukee when the city began to investigate the possibility of constructing a second plant that it not be placed on the south side and submitted a bid to construct a north-side plant. When the city of Milwaukee decided on a south-side plant, Alvord withdrew its bid.
86. *Ibid.*, p. 67.
87. *Ibid.*, p. 103.
88. *PSC Wisconsin Docket # 2-U-5282*, December 8, 1960. Because chemical treatment costs were so much higher for the south-side plant and because electrical power was necessary for the greatly improved pumping and storage facilities, increases in costs of these components of the treatment and distribution system would lead to increased costs and lessened profits for the water department. The PSC determined that the annual review would ideally maintain the waterworks' rate of return at 5.5 percent, with increases permitted when the rate fell below 5.1 percent. This would permit the transfer to the general fund of no less than \$1 million per annum.









CHAPTER 5

NO FREE LUNCH

“The moral is to not let those who don’t understand the complex system influence how to operate it properly. The conditions for throwing the system out of control will always be present, so it must be controlled totally, not piecemeal, so as to placate one group that is supersensitive to something they have read, but don’t understand.”—Herbert O. Ranger, Water Treatment Chemist, *Milwaukee Journal*, September 11, 1993

With John Norquist’s election in 1988, the tradition of civil service in Milwaukee underwent a sharp change. Norquist, who would later summarize his opinion of city management in *The Wealth of Cities: Revitalizing the Centers of American Life*,¹ campaigned on the platform that he could lower property tax rates while improving services and that the way to this somewhat utopian future lay in the restructuring of city government. Earlier, positions such as department and bureau heads had been filled from the ranks of the civil service, subject to approval by the common council. The new mayor wanted a “cabinet” form of

city government and requested that the city regulations on high-rank employment be changed so that he could appoint those with whom he could work effectively. Although department heads were still expected to have at least moderate familiarity with the area they would be administering, they were no longer required to meet the civil service standards that maintained expertise in their fields. Examples of this are the appointment of Sandra Hoeh-Lyon, a former alderwoman, as superintendent of the public works department, an area in which she had no more knowledge than the average citizen, or the appointment of Paul Nannis, a layman, to be commissioner of the health department. Norquist also announced that his first budget, for 1988–89, would feature a lowered property tax rate for the first time in many years. This cut, however, would be offset by increases in tax rates for both the schools and the county, and thus taxpayers would still pay more, although, according to the mayor, not as much as they would have done had he not been elected. Norquist believed that American cities were flawed in that they thought of themselves as governing bodies rather than as businesses. Run the city like a business, he argued, and taxes will go down, productivity will rise, and everyone will be happy. Norquist argued that businesses prospered because they did not tolerate inefficiency, duplication of effort, and low productivity, as these all cost money. A lean business was the best business, he argued, urging that the city begin to rely more heavily on outside contractors, temporary agencies, and contract workers rather than hire city workers who had to be paid even in times of low productivity and who would also have to be paid benefits. Although the previous tradition relied on city employees for such things as forestry, street repairs, and quarterly and annual billing for water and taxes, those tasks could be done more cheaply if the city hired temporary firms or contractors to do the work.² The tradition had been established during Daniel Hoan's administration and was based on the assumption that using city workers to do the city's work would benefit the city in the long run because the employees were required to reside within municipal borders and would therefore pay property tax to the city, as well as spend much of their disposable income there.

The power belonging to the position of waterworks superintendent had long been ambiguous. Created in 1911 during Emil Seidel's tenure as mayor, the position was intended as a middle management buffer between the rank and file workers of the waterworks and the

superintendent and Board of Public Works. It had been argued as far back as 1925 that the superintendent should have final say over all aspects of operations, construction, and future planning concerning the department; at the time the position was subordinate not only to the superintendent of public works but also to the city engineer.³ The need for cooperation between the engineer and the head of the water department was fortunately enhanced by the personalities of the two individuals throughout most of the 1930s and 40s, but this situation did not continue for long after the war. The appointment of Edward Tanghe as waterworks superintendent in 1948 ushered in a new era in management in the department. Tanghe made up his mind that the city needed to upgrade its service and proceeded to make public statements advertising how he planned to proceed with this goal. In particular, Tanghe was bitterly opposed to the expansion of water service beyond the city borders and argued that the extra money gained by such provision would actually be against the city's best interests. In this opinion he was reiterating the original report of the Public Works Commission in 1890, which had argued that the best the waterworks could hope for was to meet its bills and to use any profits to keep rates low rather than acting in a proprietary fashion and using profits for general city revenues. Instead of transferring money to the general fund, Tanghe thought that the money should be reinvested in the department to pay for upgrades in pumping and storage facilities and for the replacement of aging water mains. Any additional funds could be returned to city residents in the form of lowered water bills rather than property tax relief.⁴ The fact that these improvements were officially in the realm of the city engineer to decide upon did not slow down Tanghe's enthusiasm for his perceived path, and he and the engineer, Schwada, had numerous disagreements over the respective spheres of influence of each of their offices.

Schwada retired in 1950, claiming that he had aged a decade in two years of having to work with Tanghe.⁵ He had met his goals of taking Milwaukee from a city with limited distribution and no filtration capacity to one that supplied filtered water not only to the city residents but to much of the surrounding metropolitan area. In his parting remarks, he suggested to Mayor Zeidler that the city "had too many eggs in one basket" by relying upon a single intake and filtration plant and that, given the trends in metropolitan development, the city would do well to build an additional intake and plant in order to increase its

revenues from the sale of water to the suburbs. Tanghe countered these remarks by stating that his job was to provide the best water available for the citizens of Milwaukee at the lowest cost, and to hell with the suburbs. "It is not," he said, "the proper role of the city to provide services to suburbs when the cost of building the infrastructure that permitted such services had been borne by the residents of the city."⁶

The appointment of Lloyd Knapp to the position of city engineer would mark the end of the collaborative effort. Knapp and Tanghe differed greatly on their respective roles, and Tanghe bitterly resented having to submit all plans for construction and expansion to the engineer's office for approval.⁷ Tanghe managed to gather a group of aldermen who felt as he did, and they instituted a resolution in 1951 that would make Tanghe solely responsible for the waterworks, and make the engineer defer to the superintendent's judgment in the area of water engineering. Perhaps recognizing that given the two personalities involved, such a resolution was unlikely to provide any relief from the bickering, a substitute resolution was submitted that subordinated both positions to the power of the superintendent of public works. This second resolution passed by a vote of fifteen to eleven; two weeks later the city charter was amended to reflect the resolution's change.⁸

Over the next forty years, other organizational changes occurred. The Bureau of Water Engineering was created as part of the Board of Public Works to carry out the construction and engineering requirements of the waterworks. The water engineer was subordinate in power to the water superintendent, in being a bureau head rather than a department head, and creation of the new bureau did much to smooth relations between the engineers and the waterworks. Tanghe's retirement in 1960 was also a major help.

From 1960 to 1988, the relationship between the water department, the city engineer's office and the Board of Public Works was smooth. Each division used the civil service evaluation procedures for hiring and promotion, ensuring that those in positions of authority had proper training and experience to complete their job assignments. In 1982, under the direction of the new superintendent, Henry Balconi, the water department instituted a new training program for its operations procedures, requiring additional training to be completed at each level of the operations hierarchy. State certification was required of chemists and operators in charge and recommended for those at other levels.⁹

In-house seminars on topics ranging from safer application of chemical treatment to improved chemical analysis methodology were offered, allowing workers to learn on the job. Finally, new hiring procedures were implemented, requiring an associate's degree in water treatment as a condition of hiring for non-chemist positions.¹⁰

Balconi's promotion to assistant supervisor of public works in 1987 led to the promotion of Fritz Wengler as superintendent, the last such appointment to be controlled by the civil service procedures. Wengler retired at the end of 1992, leading to the appointment of Jesse Cooks at the direction of the mayor. Cooks had held the position of chief operator (now assistant water treatment plant superintendent) at the Linnwood facility, after previous experience as an instrument technician. His subsequent rise through the management hierarchy did not include positions where he was called upon to make public statements regarding department operations; but in fact, water department officials were rarely called upon to make such statements. The pattern of high-quality water provision had persisted in Milwaukee since the opening of the Linnwood facility in 1939; although quantity discussions might invite the comment of a department superintendent, as in Tanghe's case, quality had never been an issue since the filtration plant's completion. The public role of the waterworks superintendent was supposed to be limited to signing the annual report, releasing the department surplus to the general fund, and representing the city at annual conferences of the American Water Works Association. The combination of Cooks's unfamiliarity with his new position and the fact that no superintendent had been called upon to defend the quality of the supply in over fifty years gave his public statements, when he was finally called upon to make them, an air of unease and mistrust. Cooks's experience had not prepared him for the events of April 1993.¹¹

Cooks was taking over a department that had changed during Mayor Norquist's tenure at the uppermost levels. In addition to being the first superintendent to not hold a graduate degree in water operations or engineering, Cooks headed a department that was more vital than ever to the city coffers. With the mayor's continual drive to reduce property taxes, a move made possible only by draining the \$586 million surplus built up during the Zeidler and Meier administrations, the transfers of funds from the water department to the general fund grew, in percentage as well as in dollar amount, each year. For 1993 the waterworks

was scheduled to transfer nine million dollars, or 1.9 percent of the total city budget.¹²

The winter of 1992–93 was noteworthy for its refusal to leave. Cold weather and snow persisted into late March, a time when the usual weather pattern would have brought cool days with high winds to sublimate the remaining snow and assist with the evaporation of runoff. Instead, spring in 1993 began with large snowbanks left over from late March storms and cold temperatures that did little to stimulate melting. On March 23 the temperature suddenly rose into the sixties, and the snowbanks that had been around for weeks began to melt rapidly, clogging sewers and filling gutters with their meltwater. Local rivers and streams quickly filled and overflowed their banks in some low-lying areas. The waste material that had accumulated in the layers of snow was washed into the sewers and the streets, ultimately finding its way to either the sewerage treatment plant or into the drainage basin of the three main rivers, where it was emptied into Milwaukee's harbor.¹³

The colder than average winter took its toll in the area of public health as well. The snow kept people congregated indoors later than usual, and the season of communicable diseases seemed to continue unabated. From February to early April, the health department recorded record levels of respiratory and diarrheal illness. They began to suspect the presence of a persistent rotovirus, a source of gastrointestinal disease, in the population. Such high percentages of metropolitan residents, especially school-age children, were taken ill with diarrhea that some schools closed.¹⁴ Health department officials appeared on television and in newspaper articles, urging residents to observe proper hygiene and to remember to wash their hands frequently. Sales of nonprescription antidiarrheals reached a new high. On April 8, 1993, residents of Milwaukee awoke to see banner headlines in the local morning paper. These announced that on the previous night, Mayor John Norquist had revealed the presence of *cryptosporidium parvum* in the fecal sample of a Milwaukee resident hospitalized for severe diarrhea and dehydration, and that the city's water supply was the suspected source.¹⁵

C. parvum, an oocyst that is capable of causing both severe diarrheal illness and bypassing the standard water treatment regime, had recently received some media attention in outbreaks near cattle corrals in the West. The mayor had, at the suggestion of a state epidemiologist and an internal medicine specialist, instituted a boil order

on all customers receiving water from the Milwaukee Water Works. Within hours, local supplies of bottled water were depleted, and the National Guard brought in supplies from outlying regions and eventually from surrounding states. By the time the crisis was declared to be over on April 15, the media reported that over 400,000 individuals had suffered illness as a result of the outbreak, and over 100 deaths had been attributed in part to *cryptosporidium* exposure.

The story was quickly picked up by the national media. It was the lead story on CNN's *Headline News* by noon and was featured on the three main network broadcasts. *Time*, *Newsweek*, and *U.S. News and World Report* all carried articles on the topic, and the *New England Journal of Medicine* cited the case in its June 1993 issue. Milwaukee's *cryptosporidium* outbreak was considered to be the worst case of water-borne illness to occur in an American city since water treatment became standardized in the early twentieth century. Jay Leno joked about the subject on the *Tonight Show*: "NAFTA is working in Milwaukee. The Canadians are sending them their weather, and the Mexicans are sending their water."¹⁶

Given Milwaukee's dedication to the provision of a clean water supply, how did such an event occur? At American Water Works Association conferences, Milwaukee consistently won high marks for the purity and taste of its water and had always exceeded the purity standards of both the EPA and the much stricter standards of the Wisconsin Department of Natural Resources. Milwaukee's water was so pure, in fact, that for several months during the year, even the untreated raw water from Lake Michigan met both the federal and state standards.¹⁷ If Milwaukee's supply was called into question, what did this mean for other municipal water systems with less pure supplies, and what impact would this episode have on the future of water purity standards in America? At the local level, panic continued, albeit on a more subdued level. Sales of bottled water continued to be very high, as many individuals chose not to believe the media reports that the water was now safe for drinking. Many households discarded large portions of food that had been processed or prepared locally, fearing that it might contain *cryptosporidium* oocysts, even when this food required long-term cooking. Beer customers nationwide rejected brands that were based in Milwaukee, even when the actual brewing took place in some other city. On the morning after Mayor Norquist's announcement, I even received a

call from a professional colleague, an academic Ph.D., who questioned whether eggs boiled the day before in the contaminated water were safe to eat. In short, the reputation of Milwaukee suffered great damage, and the search for a scapegoat began.¹⁸

In the weeks that followed, a hastily assembled commission consisting of officials from the health and water departments, along with representatives from the common council, began to investigate the source and extent of the outbreak. A class action lawsuit was filed by the victims of the outbreak, and the investigating commission sought to forestall criticism by instituting changes in both the structure of the water treatment plants and in the operations carried out there. The state decided to require the testing for *cryptosporidium* in all water systems, and the federal government was expected to follow suit. After including damages to city businesses, costs to insurance companies, city costs to update the filtration plants, and federal and state regulatory costs, the financial burden of the outbreak was estimated to be in the range of \$300 million.¹⁹

Conspicuous in their silence were representatives from the water department. Despite the blow to the reputation of the city's only money-making division, no representative from the water department made any kind of public comment on the situation for more than a week. While newspaper and television reporters investigated operating conditions in both filtration plants and pored over records of chemical treatments and water conditions, from the superintendent on down to the lowest laborer, no comment was made. Jesse Cooks, who had become superintendent on the retirement of his predecessor less than six months before, was not questioned by reporters and, more surprisingly, was not asked by the mayor, who had handpicked him for his cabinet, to make any sort of explanation or comment.²⁰

The actual beginning of the story goes back to the previous year. The Wisconsin Department of Natural Resources had recently issued new guidelines regarding lead levels in drinking water. While Milwaukee's water contained no measurable amounts of free lead, its high pH caused the leaching of lead solder from old service pipes in many areas of the city. These levels of lead could be easily purged from water pipes by allowing the water to run for a few minutes each morning before using it for drinking purposes. The DNR's previous guidelines had determined that in these cases the responsibility for lead removal rested with the individual householders whose plumbing included the old pipes, but it was

considering requiring local water utilities to alter the chemical composition of their water supply to prevent the lead leaching process. A consortium of local environmental organizations had taken the lead in the fight to change this regulation, arguing that requiring individuals to purge their systems by running water was unreasonably difficult. Through lobbying in Madison, the president of one of the organizations, attorney Susan Mudd, had convinced the city that they should proceed with the chemical alteration without awaiting a federal directive.²¹ Mudd cited the example of Minneapolis, which had recently completed a test program using a new polymer coagulant (poly-aluminum chloride, or PAC) that lowered the treated water's pH to a level where sediment was deposited in the tainted pipes, forming a protective barrier over the lead solder.²²

The waterworks purchased PAC in October 1992 from the General Chemical Company of New Jersey. Although the chemical cost more per pound than did alum, which the waterworks had used as a coagulant since the first filtration plant was put into operation in 1939, company officials assured the city that PAC's superior power would require that less be used, leading to a decreased cost in the long term. Company officials, according to the business and purchasing manager for the waterworks, estimated that savings of over \$500,000 a year could be gained from the use of PAC. The city could reduce the lead in the water, and make money by doing so. Since the water department was scheduled to increase the amount of monies transferred to the general fund, this would be beneficial to the city overall. Although General Chemical submitted the second-lowest bid for the chemical, rather than the lowest as required by city directive, the waterworks argued that they supplied a superior product, and the extra expense was justified.²³

Coagulants are used to clean large and small particles from water. After an initial dose of disinfectant (usually some form of chlorine), water is piped to a large underground area called a mixing basin, where a flocculating coagulant is added to the water. The chemical is distributed throughout the water by means of large paddles called baffles, which ensure that all portions of the water receive equal exposure to the coagulant. The water then passes into a settling basin, where the coagulant has an opportunity to surround particles in the water, joining them into increasing larger clumps known as floc. After a sufficient time in the settling basin, the water is pumped into the filtration chambers, where it passes through a

fifty-one-inch deep sand and gravel filter. The floc is accumulated in a gel-like mat on top of the filters and actually performs the most sensitive part of the filtration process by the removal of the smallest particles. The filtered water then passes to a clearwell, where additional chemicals are added to protect its treated condition, and it is then released into the distribution system.²⁴

Correct dosage of coagulant depends upon water conditions. Somewhat surprisingly, conditions when high turbidity, or cloudiness, of water exists can often be best treated by lowering a coagulant dosage, at least when alum is the coagulant in question. This is because the addition of too much coagulant can result in the formation of large floc particles that fail to capture all the microscopic biota in the water. Additionally, these large particles result in clogged filters, which must be washed more often, preventing the formation of a substantial mat on top of the filter, thus allowing smaller particles to pass through. Proper dosage is determined by a method called a jar test, in which water samples are placed into individual jars, and different levels of coagulant are added to each jar. A mixing machine mimics the agitation and filtration process, and the remaining water is examined for maximum clarity. Because of PAC's propensity for forming smaller particles, the performance of jar tests to examine for correct dosage with PAC is problematic. Higher doses produce more particles, hence more turbidity, which can lead an investigator to conclude that a lower dose would be more appropriate.²⁵

This coagulation process lowers the pH of the water in part because it removes organic molecules that contribute to the higher pH.²⁶ This acidification is reduced in part because alum bonds with some free ions in the water that contribute to acidification. In the case of alum, this lowering accounts for about a .5 lowering in the pH scale, from about 8.3 to 7.8, meaning that the acidity of the water is increased about 260 percent.²⁷ PAC, because it is a polymer, bonds with fewer free radicals in the water and thus lowers the pH by about 1.0 on the scale, to 7.3, for about a 1000 percent increase in acidity. Since lead is leached from solder when water has a pH higher than 7.6, the use of PAC should help, in theory, to prevent this occurring.

As mentioned above, Minneapolis had used PAC for its water treatment beginning in 1991. Special seminars were held for chemists there to help them determine proper dosing of the chemical, and a pilot program

was installed to make sure that the chemical met the needs of the system.²⁸ Milwaukee's use of PAC began in autumn, a time of year when water conditions in Lake Michigan tend to be excellent. The cold temperatures inhibit the growth of algae, bacteria, and other waterborne particles, which results in a lowered demand for all treatment chemicals. During these months, the use of PAC proved to be quite efficient, as dosages would remain constant for days at a time. Years of experience with alum had convinced chemists that jar tests were the correct method for determining coagulant dosage, and when water conditions began to decline in quality with the spring runoff in March, this was the method resorted to.

Treated water must meet federal, state, and local utility standards. At the time in question, the federal government, through the auspices of the EPA, regulated levels of seventy-four minerals and chemical residues in drinking water. It also determined appropriate standards on purity, clarity, taste, and odor and had the power to enforce these regulations through the use of fines and the authority to shut down systems that violated these standards consistently. As long as these standards were met, the method was not regulated. Hence New York City, receiving its water from the reservoirs of upstate New York, did not have to filter its water, and neither did Seattle. As long as these cities could meet federal standards, they were off the hook.

At the state level, the DNR maintained authority over water quality with standards over 117 minerals and chemicals, and its purity qualifications were stricter than those of the federal government. At the local level, the Milwaukee Water Works had internal standards that required notification of management when quality decreased below certain levels. These management officials were then to determine and, if possible, correct the situation causing the adverse conditions. Local standards were more stringent than those at either the state or national level, and Milwaukee took pride in the fact that these levels had very rarely been exceeded in the life of the waterworks filtration plants.

An example of these more stringent standards is in the area of turbidity. The EPA required that turbidity in treated water not exceed a daily average of five NTUs for more than two days, with a monthly average not to exceed one NTU.²⁹ The DNR required daily averages below three NTU, with individual test levels not to exceed five NTUs.³⁰ City standards required that management be notified when treated wa-

ter exceeded one NTU, and that the DNR be notified when levels over one NTU persisted for longer than a day. NTU readings were taken on an hourly basis³¹ from raw, chlorinated, settled, filtered, and finished water. Often potential problems with filtered and finished water clarity could be forestalled by high readings in settled water, leading the analyst to add more coagulant to decrease high turbidity levels. Water already passed through the settling process could be clarified by allowing a longer filtration time, and any finished water that exceeded hourly levels could be mixed with other finished water of lower turbidity to lower its cloudiness. Fifty years of treatment experience had led the water department to conclude that these methods were satisfactory for dealing with all possible conditions that Milwaukee's treatment plants might experience. If the federal and state governments maintained that their standards would ensure the safety of water consumers, then maintaining even stricter standards should fully protect both the water supply and the health of the water drinkers.

This plan worked because it was assumed that standard treatment eliminated all pathogens from water. Chlorine killed all organic particles, coagulation clumped the dead particles together, and filtration removed the clumps. The introduction of PAC to Milwaukee water changed the decades-old equation because its differential coagulation rate was not readily adaptable to spring runoff conditions in Lake Michigan.

The Milwaukee Water Works operates two filtration plants. The northern plant, the Linnwood Water Treatment Facility, is located about two miles north of the city harbor, and its intake extends outward into Lake Michigan to a distance of slightly over one mile at a depth of sixty-four feet. This depth prevents the water being taken into the plant from being greatly affected by surface turbulence conditions and also helps provide cooler water during the months when the surface waters are heated by the sunshine to unpalatable levels. This facility has a capacity of producing 290 MGD and supplies the northern and western half of the service area in Milwaukee county as well as the downtown business district. The southern plant, the Howard Filtration Facility, is located two-and-a-half miles in from the lake on the south side of the city. Water is provided from the Texas Avenue pumping station, located on the lakeshore directly to the east of the filtration facility. The Texas Avenue intake extends 7,600 feet into the lake but is only 30 feet below the surface of the water, due to the shallowness of Lake Michigan at that point. The

intake is also situated within the plume formed by the disposal flowage from the sewerage treatment plant located to the north of the Howard Filtration Facility. Because of the increased pathogenic levels and the increased turbidities from the shallowness of the water, Howard has, since its inception, had to deal with water of a lesser quality than the north-side facility. Although raw water facilities rarely exceed ten NTUs at Linnwood, even during the most severe runoff or storm conditions, Howard has reported NTUs in excess of one hundred on more than one occasion.³² Howard supplies Milwaukee's south side, as well as Greenfield, West Allis, and portions of other south-side suburbs.³³

This water quality problem has led to higher chemical dosages for all chemicals at Howard and the inclusion of some chemicals in the treatment process that are not used at the northern plant. Tables 5 and 6 show the chemical doses used per million gallons of treated water at each facility from 1987 to 1993.

Chemical	1988	1989	1990	1991	1992	1993
Fluoride	8.06	7.91	7.55	7.76	7.98	8.5
Alum	91.51	103.38	109.47	104.82	115.37	129.87
Ammonia	2.37	2.26	2.28	2.28	2.26	3.3
Carbon	4.09	8.36	12.98	15.41	16.19	20.81
Chlorine	16.12	16.55	16.9	17.39	17.29	20.63
PAC	—	—	—	—	40.72	41.65
KMnO30	0.43	0.66	0.98	0.81	1.57	0.41

Table 5: Chemical Dosages in Pounds per Million Gallons of Treated Water at the Howard Plant, 1988–93

Chemical	1988	1989	1990	1991	1992	1993
Fluoride	9.46	7.87	7.8	7.44	8.22	6.83
Alum	97.12	93.8	100.73	100.19	64.54	106.26
Ammonia	1.82	2.33	2.48	2.53	2.17	2.31
Carbon	1.06	3.3	3.57	2.45	3.12	5.53
Chlorine	14.4	16.02	16.62	15.44	16.14	15.65
PAC	—	—	—	—	10.26	8.64

Table 6: Chemical Dosages in Pounds per Million Gallons of Treated Water at the Linnwood Facility, 1988–93. Source: Milwaukee Water Department Annual Reports, 1988–93

During the late 1980s and until the *cryptosporidium* episode, potassium permanganate was added at the Howard facility to enhance the disinfecting properties of chlorine treatment and to assist in taste and odor control. At other times phosphoric acid was added to lower the pH of the raw water to improve disinfection. The addition of permanganate results in a slightly yellowish tinge to the water that is rarely noticeable unless one is looking for it.³⁴ Although Howard's water can be distinguished from Linnwood's during summer months by the experienced water taster, few persons prior to 1993 had any indication that the two plants experienced such different water quality conditions.

On March 23–24, 1993, temperatures rose rapidly, causing the lingering snowbanks in southeastern Wisconsin to melt. As water ran into the sewers, they filled, causing the sewage plant to overflow water into the lake without treatment. This water came from snow that had remained on the ground for as much as five weeks, accumulating in that time animal wastes and air pollution residue. Lake overflows were not uncommon at that time, for the sewerage commission resorted to them on average fifty to sixty times a year.³⁵ However, at the same time as this was occurring, the melting of river ice in the Milwaukee, Menominee, and Kinnickinnic river basins led to increased runoff from these sources. These river basins pass through many farming communities, where animal wastes had been accumulating over the winter months. Some of these wastes may have been swept into the rivers and carried into the harbor, although most were probably deposited in the river beds. On the afternoon of March 24, strong easterly winds arose, blowing the Lake Michigan waters back toward the shore and causing a roiling up of the lake surface waters. These three circumstances combined to raise turbidity levels sharply in a matter of a few hours.

As levels rose, chemists at the Howard facility, inexperienced with working with PAC under adverse water conditions, performed jar tests to figure proper coagulant dosage. As indicated above, when using alum, jar tests can indicate that dosages should be cut in order to deal with high turbidity levels rather than raised. When jar tests showed more cloudiness with higher levels of PAC (because of the smaller floc particles), the chemists cut the dosage accordingly. Because PAC is not alum, however, the dosage failed to provide sufficient coagulation to remove the particles, and the turbidity of the treated water on March 26 rose toward one NTU.³⁶ Although these levels did not exceed any

standards, the Howard Avenue plant superintendent, A. J. Henry, notified the waterworks superintendent about the problem. Cooks notified the DNR on March 27 when the turbidity exceeded one NTU. Cooks, along with Henry and assistant waterworks superintendent James Wegner, stepped in to rectify the problem by shutting off the potassium permanganate and using the emergency chlorine feeders to increase the dose of disinfectant. Between March 29 and April 1, several changes in PAC dosage were attempted, none of which significantly improved the turbidity of the finished water. On April 2 it was determined that the best course of action was to abandon the use of PAC and return to alum. Within eight hours after alum dosing began, turbidity in the finished water returned to levels of 0.1 NTU. During this time period, bacteriological testing indicated that complete disinfection had occurred and that no bacteria were present in the finished water.³⁷

However, people began to notice the problem. Beginning on March 25, calls to the Howard facility increased. Consumers had noticed the increased cloudiness in the water and for the first time had noticed the yellowish tint caused by potassium permanganate, which had been added to the water for several years. Many asked whether the water was safe to drink and were assured by water plant officials that the water met all cleanliness standards. The calls reached a peak of forty-five on March 29, when the finished water reached a level of 1.7 NTUs³⁸—noticeably cloudy, but not exceeding state or federal standards. Several customers accused the plant workers of lying or concealing water problems and demanded that something be done.³⁹

On April 6 both Milwaukee papers reported that diarrheal illness was present at high levels in Milwaukee's population. The reports stated that the health department had called on the resources of the state hygiene laboratory and the Centers for Disease Control to help identify the culprit. Health department officials suspected a rotavirus⁴⁰ rather than a bacterial source, as the diarrhea contained no blood, a common sign of bacterial infection.⁴¹ The article mentioned that several schools had been closed in the metropolitan area and that double the usual absentee rates were evident in suburban schools, including New Berlin, Muskego, Pewaukee, and Waukesha.⁴² The article in the *Sentinel* also quoted Kathy Fessler, the health department epidemiologist,⁴³ as saying that the epidemic could not in any way be traced to the water supply, as had been rumored for several days.

Given these reports, the mayor's revelation that *cryptosporidium* had been found in the fecal sample of an individual suffering gastrointestinal distress and that the water supply might be the source of the infection was a surprise. Paul Nannis, the city health commissioner, announced a free testing program for *cryptosporidium* available at the city's downtown clinic; over the next week 803 samples were collected and sent for analysis to the CDC, where they were analyzed for all known vectors causing gastroenteritis. The CDC reported that *cryptosporidium* was the only organism found in the samples that was capable of causing the exhibited symptoms, appearing in 39 percent, or 313, of the samples.⁴⁴

Cryptosporidium parvum is an organism about which more is unknown than known. First identified as a source of infection in humans in 1976, crypto, as it is commonly known, is an oocyst that is commonly present in the feces of cattle and sheep. It is a small organism, commonly one to two microns in length, and has a hard outer shell that is resistant to chlorine disinfection. Large doses of chlorine (using a 70 percent bleach solution), ammonia, ozone, and formaldehyde are known to definitively kill crypto, but the use of formaldehyde and ozone in large-scale water treatment plants is problematic. The 1976 researchers identified crypto as the culprit in an otherwise healthy three-year-old child in a rural farming community in Tennessee. A second case, this time in an adult college administrator, followed within two months, and other cases were soon identified as well. In these cases, severe gastrointestinal symptoms were in evidence, with no evidence of *E. coli* or other bacterial sources. Over the next six years, the world literature documented many cases, primarily among immune-deficient individuals. In non-Western countries, these cases were often found in rural communities among the malnourished; cases in Western nations with more adequate food stocks were found among those undergoing immune-suppressant radiochemical treatment or in AIDS patients. In 1982 the first multiple-victim outbreak among immunologically healthy people occurred on a Colorado cattle ranch, where twelve cowhands had succumbed. CDC's research indicated that the workers had become infected from handling calves with crypto-induced diarrhea.⁴⁵ Veterinary specialists subsequently developed tests to examine herds for crypto in the early 1980s; surveys of Wisconsin veterinarians servicing farms in the Milwaukee River basin indicate that standard

cleanliness and hygiene procedures have made occurrences of crypto almost nonexistent since 1990.⁴⁶

Cryptosporidia had been involved in several cases of waterborne illness. An outbreak in San Antonio, Texas, in 1984 was linked to contamination of a well by sewage outflow.⁴⁷ Drinking of untreated surface water was responsible for an outbreak in New Mexico in 1986, as well as in Sheffield, England, the same year.⁴⁸ In January 1987, an outbreak affected an estimated 13,000 individuals in a county of 64,900 residents in western Georgia—at that time the single largest waterborne disease outbreak in the United States attributable to an identified agent.⁴⁹

Not much is known about the effects of crypto on people either. Initial theories and research proceeded on the premise that only one oocyst was needed to produce gastroenteritis,⁵⁰ but later studies have indicated that the number is much higher.⁵¹ In most cases, crypto must be ingested to cause infection. Theories that infection could be spread by airborne means arose because some studies found the presence of oocysts in the respiratory tracts of those infected; further studies have indicated that this resulted from internal spread of the oocyst rather than as the source of primary infection.⁵² In healthy individuals, infection results in moderate to severe diarrhea, during which time *cryptosporidium* spores are shed through excretion. The course of infection lasts from five to ten days, leaving the victim moderately dehydrated, but not permanently impaired.⁵³ In healthy individuals, recovery is generally complete within two weeks, although oocysts may continue to be shed for an additional month. Once recovered, the individual is immune to a repeat infection. No test exists that can determine prior infection; individuals who fail to succumb after exposure to high levels of *C. parvum* are assumed to be immune due to prior infection.⁵⁴

In immunodeficient individuals, however, the story is quite different. In these cases, *C. parvum* can cause severe dehydration, contributing to death. It has also been found in these cases to cause hepatitis, gall bladder disease, pancreatitis, arthritis, and a variety of respiratory problems. Low levels of disease resistance can lead to chronic cryptosporidiosis, with diarrhea and the presence of oocysts continuing for several years. The lack of sufficient IgA in the individual's bloodstream prevents the formation of natural antibodies, and repeat infection can occur upon exposure.⁵⁵

Crypto testing was not widely available. An Illinois laboratory was hired to evaluate the water supply, and officials were somewhat disturbed to discover that there would be no quick answers. The test procedure required a special filter that would take twenty-four-hour water samples; the filter then had to be ground up, treated with chemicals, and examined under a microscope for oocysts. This took another twenty-four hours. Preliminary results would not be available for at least two days, and the water would have to be pronounced free of crypto for at least forty-eight hours before the boil order could be lifted. Public dissatisfaction with the water department and with the city in general was likely to remain high until the water was again pronounced safe to drink.

However confidence in the water supply and the city's administration might suffer, the city would not be likely to suffer any loss of customers. Water for drinking purposes uses less than 1 percent of all supplies, most water going for industrial use that does not involve contact with food or beverages. The main household use is for flushing toilets and bathing. Since the waterworks enjoyed a monopoly, businesses and residents would still have to get water for these nondrinking purposes from the city, even if they drank bottled water. The financial blow to the city would come in the form of new equipment to prevent a recurrence, and possible lawsuits over damages suffered.

On Saturday, April 10, the public was informed that crypto had been found in treated water at both plants.⁵⁶ Levels at the Howard Avenue plant were one organism in fifty liters of treated water and those at the Linnwood plant were one in seventy-eight liters. While these results were in one way alarming, because the organism should not have been present at all in the treated water, they were in another way reassuring. The levels indicated that the infestation was minimal and that significant amounts of water would have to be consumed to allow for the ingestion of even one oocyst. Because the number of oocysts necessary to cause symptoms was unknown, at the time the test results raised as many questions as they answered. They did not tell what the levels of *cryptosporidium* had been in the water on March 27 through 29, the time at which the high turbidity levels indicated that something was wrong at the Howard Avenue plant. The levels did not explain how so many people had become ill if the rate of infestation was indeed as low as the tests indicated; and finally, they did not identify the source of the infestation.

With the positive identification of crypto in the water, Mayor Norquist ordered the temporary closing of the Howard Avenue facility on April 9 until a complete examination of the plant could be performed. The consulting company CH2MHILL was hired to perform the examination and make recommendations as to the best method of removing any existing organisms and designing a system that would prevent future occurrences.

By Tuesday morning, officials were able to report that the crisis was almost over. If tests that day indicated that no organisms were present in the water, the health department indicated, the boil order would be lifted on Wednesday the fifteenth. Also on Tuesday, the mayor issued a statement that he had given the waterworks ten days to devise new standards to replace the previous ones; these would ensure that the situation would not again arise. These included new lower limits on turbidity; the introduction of regular tests for crypto; providing the city lobbyist with a list of legislative reforms, both federal and state; submitting monthly water quality reports to the mayor and the common council's Public Safety Committee; establishing a water quality improvement team within the department; and improving customer communication. Response to the orders was given by the superintendent of public works, James Kaminski. There was, as yet, no public comment from the water department or its superintendent.⁵⁷

The main point of the mayor's orders seemed to be that the high levels of public dissatisfaction had arisen because of the water department's unsatisfactory response to complaints about color, taste, and odor in the water after March 27. Requiring the department to report to the mayor and council was meant to reassure city residents that "their" officials would oversee the department workers and ensure that such a calamity would never again occur. However, the assumption of guilt on the part of water department workers because of the complaint calls is specious at best.

All but two of the ninety complaints⁵⁸ complained about the color, and three mentioned an odor in the water. No one mentioned becoming ill. Despite the fact that color and odor are not accurate indications of the presence of any organism, *cryptosporidium* in particular, in the water, the mayor's focus on this period indicates that he was more concerned with political fallout from the event than with finding the source of the outbreak.

In fact, complaints about the water have little, if anything, to do with water conditions. A statistical analysis of complaints at the Linnwood and Howard facilities from 1993 through 1995 shows that the relationship between media reports about water conditions anywhere in the world and complaint calls is a far greater explanation for those calls than are poor water conditions. Even when poor conditions exist, the fact that a report is delivered by the media regarding these conditions explains a large part of the complaints. Even when calls are separated into those complaining of illness versus more routine calls regarding dead-end mains or standing water that needs to be identified, a greater correlation exists with media reports than water conditions. Table 7 shows the R-squared values for these regression analyses for each plant. The variables Linnwood and Howard total calls and Linnwood and Howard sick calls refer to the total number of calls received in the three-year period cited. “Effluent days” refers to those days in which water distributed from the plant was of less than pristine aesthetic appearance but still met health quality standards.

	Linnwood	Linnwood	Howard	Howard
Independent Var.	Total Calls	Sick Calls	Total Calls	Sick Calls
Media reports	0.818	0.119	0.35	0.275
Effluent days	0.172	0	0.005	0

Table 7: R-Squared Values for Bi-Variate Analysis of Total Complaints and Sick Complaints for Linnwood and Howard Facilities, 1993–95. Source: Milwaukee Water Department Customer Complaint Logs, Howard Avenue and Linnwood Treatment Facilities, 1993–95, Milwaukee Journal, Milwaukee Sentinel, Milwaukee Journal Sentinel, 1993–95.⁵⁹

This indicates that calls to either plant are far more dependent on media reports of waterborne illness, whether locally or elsewhere, than they are upon actual water conditions. It is interesting to note that on days when the water quality of each plant’s effluent was less than pristine, there were no calls complaining of illness at either plant, although there were complaints about the appearance or taste of the water. Media reports, however, generated a much larger number of calls, both for sickness and for aesthetics, even when the reports were about water quality issues in such countries as India.

The above table does not explain the difference in R-squared values for complaints versus media reports for the Linnwood and Howard plants.

If the data are combined, however, it becomes evident that the patterns of complaint are very similar.

Variable	Co-eff.	Std. err	Std. co-eff.	T
Constant	45.88	2.983	0.001	15.381
Plant	-34.58	-0.3.461	-0.664	-9.991
Media	1.692	0.504	0.504	7.581

Table 8: Multiple Regression Results for Linnwood and Howard Facilities: Complaint Calls versus Media Reports (Where Plant Variable 0 = Howard and 1 = Linnwood)

Dependant Variable: Plant N = 1942
Adj. Multiple R-Sq: 0.686 Standard Error of Est: 14.68
Mean Monthly Calls Linnwood = 11 Mean Monthly Calls Howard = 46

Table 8 shows the record of complaints received at each plant for the years from 1993 to 1995; binomial regression on both plants reveals that Howard has a much higher base of complaints than does Linnwood. In any given month, the Linnwood plant can expect to receive eleven calls, while the Howard plant will receive forty-six. This is to be expected, as the Howard plant has a poorer quality water at the intake and requires more chemical treatment.

Multiple regression results reveal that every instance of a media report will increase the number of calls at each plant by 1.7 calls per month. In a month such as April 1993, there were over 100 media reports, generating many more calls to each plant. The multiple R-squared for this regression is .692, indicating that 70 percent of the variance is accounted for by the plant itself and media reports.⁶⁰ Since the Howard plant receives about four times as many calls on a monthly basis than the Linnwood plant, the effect of media reports on Howard total calls is less than at Linnwood.

Norquist had been voted into office in 1988 after a lackluster race against Martin Schreiber, a former governor. Norquist’s political experience included several terms as a state assemblyman for his south-side district, during which much of his focus was on reducing nonpoint source pollution in Wisconsin rivers. Once in office, his political agenda in this area continued, with much invective being addressed toward the governor and the DNR for their failure to adequately control this form of water pollution. One of the first suggestions his office made regarding the source of the *cryptosporidium* outbreak was runoff from upstream farms,

the same culprits he had indicated were responsible for much of the nonpoint pollution he had so decried.

The evening headline for Tuesday, April 14, also indicated that the crisis was nearly ended. Significant in this report is the first public comment from waterworks superintendent Jesse Cooks. Responding to a reporter's questions as to why the health department had not been notified about customer water complaints, the reporter indicated that Cooks responded, "We were trying to correct a problem, no question about it. I don't think there was any contact with the Health Department."

Cooks remembers the conversation somewhat differently. He recalls that when Neil Rosenberg, the *Journal* reporter, asked him why the health department had not been notified, he responded that it was not normal practice to involve other city departments with internal problems. He also recalls asking whether Rosenberg would expect the health department to notify the water department for a measles outbreak.⁶¹

The *Journal* then performed a survey of 400 households, asking whether any member of the household had been ill with diarrhea since the middle of February. The results of that survey, sorted into week-long time periods, revealed that 59 percent of the population surveyed reported at least one family member ill during the week of April 1–8. The *Journal* extrapolated this figure to the population of the metropolitan area, and estimated that between 165,000 and 211,000 of the population had become ill from *cryptosporidium*. In a companion article, the *Journal* reported that the immediate source of the outbreak was the improper cleaning of filters at the south-side filtration plant.

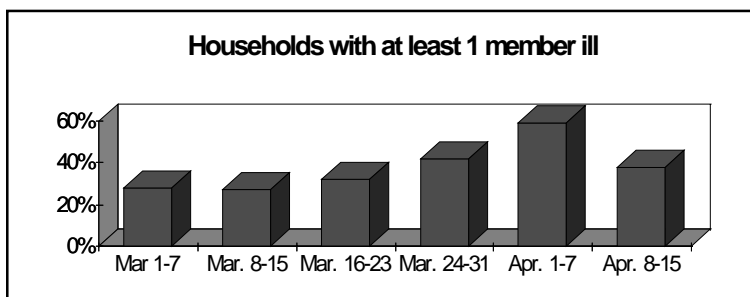


Figure 1. Diarrheal Illness, February–April 1993.

Chart Source: Milwaukee Journal, Thursday, April 15, 1993. Error = 5%

The *Journal*'s data, as displayed above, is somewhat problematic. First, there is no indication as to whether all those surveyed were within

the water service district of the waterworks. Although some who lived outside the district may have been thought to contract cryptosporidiosis from drinking water at their places of employment, presumably within the service district, there is no control for this. Secondly, and perhaps more importantly, what caused all the people to become ill before the fourth week of March? If, as the mayor suggested, the whole problem had begun on March 27, when turbid water entered the Howard Avenue plant, and that water was released the twenty-eighth, then, using the standard infection delay of seven to ten days,⁶² no one could have become ill prior to April 2, the date when both plants switched back to alum. The survey data, however, indicates that there was a 42 percent positive response in the last week in March, when crypto, according to the mayor's reasoning, could not have been the culprit. While the health department's samples as analyzed by the CDC showed no other source of infection, viral sources affecting the population in February or March would not show positive for virus when analyzed in April. The samples taken in April were from those sick in April. Something was making people ill in February and March—if it was crypto, then the turbidity problems were not an indication of oocyst presence, and correcting the treatment process for turbidity control would not stop further outbreaks. If the earlier disease was not crypto, then the actual maximum effect of crypto could only be the difference between the number of households affected after the outbreak occurred on March 27 (plus time for infection to occur) and the peak of the earlier rates. In other words, 59 percent minus 42 percent, or 17 percent of the households. This gives a much smaller figure for possible cryptosporidiosis, of between 40,000 and 60,000.

The question of improperly washed filters was also a problem. Filters are generally washed when the rate at which water flows through them reaches a certain limit. The filters are then removed from operation, with no further settled water from the sedimentation basins being introduced. The level of the water in the filters is then allowed to decrease until it is about one inch above the surface of the gelatinous mat on the filter's surface, at which point filtration is shut off. Treated water from the clearwell is then forced upward (backwashed) through the bed, removing the mat and any particles which might have passed through the mat into the top layer of the bed. The water that is used for the filter wash is diverted into gutters abutting the bed and sent to the

raw water intake, where it reenters the treatment stream. The wash process is ended when the water coming off the bed appears clear to the operator performing the wash. The bed is allowed to settle for two hours, water from the sedimentation basins is reintroduced, and filtering is restarted.⁶³ Because it is the mat that forms on top of the filter bed that performs the removal of the smallest particles, washing a bed too frequently will allow more small particles, rather than fewer, to pass through the filters into the clearwell. Therefore, gauging the proper time for bed washing is a balancing act between efficiency of filtration rate, or time, and treated water turbidity, or quality. Most large water utilities, including Milwaukee's, severely discipline employees who wash beds at inappropriate times, as this wastes water and degrades quality. Milwaukee in 1993 adhered to all recommended standards regarding the timing of bed washing;⁶⁴ the report of improper procedure came not from the DNR office of water operations, but from Jeff Davis, an epidemiologist. His argument to this effect would be presented during the hearings held by the common council's Water Crisis Fact Finding Committee.

On Wednesday, April 15, both papers and the local television stations announced that the crisis was over. The water, they announced, was safe to drink unboiled, and the steps that had been taken to examine the water for crypto would continue in order to prevent a second occurrence. It was further announced that the common council's hearings on the water crisis would commence on April 26.⁶⁵ This action was apparently insufficient for one alderman. Feisty Bob Anderson, a south-side council member who represented the area in which the highest percentage of confirmed crypto cases was reported, demanded that all employees of the water department be fired, with the loss of all pension and benefits.⁶⁶ Anderson's remarks, while widely reported, received little support, despite continued anger on the part of the infected. Anderson's outburst also led to his exclusion from the common council's committee, as the chair, John Kalwitz, strove for an unbiased attitude among the committee members.

In the eleven-day interval between the end of the crisis and the beginning of hearings, media attention began to focus on other communities' water systems. Reports from Door County, about ninety miles to the north of Milwaukee, revealed that several small town systems there had also found evidence of *cryptosporidium* in their systems, in

this case accompanied by elevated bacteria counts. Boil orders were imposed in Door County, seriously damaging the spring tourist influx. Bottled water had to be imported from Minnesota and Iowa, as sales in the Milwaukee area continued to overwhelm the available local supply, despite the lifting of the boil order there. By the last week of April, both local papers reported that more than 50 percent of individuals surveyed still distrusted the Milwaukee Water Works' supply.⁶⁷

The hearings of the Water Crisis Fact Finding Committee began with heavy media coverage. They were carried on the local government channel on cable, and all three major local television stations sent reporters and camera teams to record testimony and comment. A major item carried on all three channels was a woman from the south side holding up a jar of brown turbid water and announcing that it had come from her tap. The powerful image spurred more invective from Anderson as he renewed his call for punitive action against the water department.⁶⁸ The committee heard testimony from individual residents, from water department employees of the Howard Avenue plant, and from outside experts, including consultants and public health officials. One such official was Jeffrey Davis, epidemiologist from the Wisconsin Department of Public Health.⁶⁹

Davis speculated that returning the wash water to the treatment process was the source of the in-plant spread of crypto. Since the filtration process removed, by most estimates,⁷⁰ 91 percent to 94 percent of the oocysts, these organisms would thus be present in the wash water. Returning them to the treatment process would then introduce a concentrated source of oocysts, which would raise the number present. Thus the next round of filtration would remove 91 percent to 94 percent of this larger number, allowing more organisms to pass through the filters. Davis recommended that the wash water be discarded by being sent to the sewerage plant and recommended more frequent bed washing.⁷¹

Davis's theory neglected two important points about the water treatment process. Firstly, although the number of oocysts in the wash water would be higher, the presence of coagulant already in the water would mean that these organisms would be trapped in larger particles of flocculant, raising, rather than lowering, the amount removed by filtration. Secondly, more frequent bed washing would allow any organisms not so trapped to pass through the bed more easily because the

gelatinous mat would have less time to form and thus would perform less efficiently. Because *C. parvum* is a very small organism, it would be much more likely to pass through a nongelled bed than a larger particle. The lack of response on the part of the water department on these two points would lead to the adoption of a treatment policy that actually increased the possibility of another outbreak rather than reducing it.⁷² Davis also ignored the fact that without a source for the infection, adding wash water that, in his opinion, contained crypto to the sewers would mean that it would be added to the sewage plume from which the Howard plant obtained its supply.

Other testimony came from nationally known epidemiologist Joan Rose. Rose testified that *cryptosporidium* affected approximately 85 percent of all surface waters in the United States and was effectively reduced in filtered water supplies by about 91 percent to 94 percent. She cited examples of several large cities without filtered supplies, including New York City, Seattle, St. Louis, and Houston, to illustrate the potential for even larger-scale outbreaks. Rose also indicated that in these cities, as well as in cities where filtration plants existed, outbreaks of *cryptosporidium* had probably occurred and not been recognized as such. In fact, given the endemic existence of *cryptosporidium* in most water supplies, many individuals had been exposed to the oocyst, suffered through the requisite diarrheal infection, and recovered, which rendered them immune to further infection. Milwaukee's case was unique in that *cryptosporidium* was not endemic in its water supply, allowing a more marked example of infection. She further indicated that while the USEPA had been considering adding *cryptosporidium* to the list of infectious agents to be tested for, budget constraints under the Reagan and Bush administration had made this nonviable.⁷³

Additional testimony along the same lines came from EPA engineer Kim Fox. Fox made a revelation which considerably startled the committee, as well as many of those in attendance, when he revealed that no standards governing bottled water existed. He reported that the EPA had found that much bottled water was simply tap water poured into containers; the water that had been supplied by the city of Sheboygan, Wisconsin, during the crisis had, in fact, tested positive for *cryptosporidium*.⁷⁴

Another testifier was Ken Miller, vice president for municipal water management for the consulting firm CH2M Hill. Miller recommended

that the city install an ozone purification system in both treatment plants as the only effective means of preventing future outbreaks. Miller cited the recently built ozone facility in Lake County, Illinois, and a test project plant in Los Angeles as examples of plants where such a system had been introduced.⁷⁵ However, there had never been an instance where an existing plant had been retrofitted for ozone purification. Interestingly, no one was asked to provide testimony against Miller's recommendations, although he was speaking from the standpoint of a businessman representing a company that produced ozone purification products.

The final testimony came from water department officials and employees. While plant operations staff detailed the steps they had taken to counteract the adverse water conditions in the last week of March, they admitted that unfamiliarity with the quirks of operating with a new chemical may have adversely affected water quality. These operations employees emphasized that they had taken all established and necessary steps to deal with the crisis and had reported their difficulties to management officials. When Jesse Cooks testified, he emphasized that the department was aware of the crisis, but since his tenure in office had begun only in January, he was not completely familiar with the ramifications of his position. He also stated that the decision to use PAC had been made by the previous superintendent, Fritz Wengler, at the recommendation of the mayor's office, and that he was not responsible for any difficulties that arose as a result. The media chose Cooks's testimony to display on its newscasts, portraying a department whose superintendent was more interested in protecting himself than in accepting responsibility for and resolving the crisis.

An interesting area of testimony came from three officials from the state department of natural resources. These individuals—Ronald Kasmierczak, the assistant director of environmental protection; Sharon Schaver, the district hydrologist; and Elizabeth Spaeth-Werner, an environmental engineer—pointed out that given Milwaukee's usual dearth of crypto, a possible site of infection might be pinpointed, rather than nonpoint source pollution. Tests performed by the DNR in the weeks immediately after the crisis revealed that little or no crypto was found in the surface waters leading to the watershed which formed Milwaukee's harbor, a result which indicated that this was not a likely source of infection, contrary to what the mayor had suggested. Examination of

sewerage outflow, however, did indicate positive presence of the oocyst, indicating that the source was either spores still entering the system from infected individuals or from a site located within Milwaukee itself. Suspicion fell on the Peck Meat Packing Plant, a slaughtering and rendering facility located on the banks of the Menominee River. Peck had previously come under attack from both the city and the DNR for air pollution violations. The plant's operations produced a rancid, fetid odor that was most marked during the hot days of July and August, rendering breathing in the downtown area difficult. Peck countered that they had maintained all necessary pollution standards and were not the source of the infection.⁷⁶

Conspicuous in their absence from the hearings were the local AIDS support groups. The chair of one group, the Milwaukee AIDS Research Council, had announced on April 9 that AIDS patients in the Milwaukee area had been suffering from crypto for several months and had been shedding spores during the intervening time period. This information had been reported to the health department (a contention which the health department denied)⁷⁷; the AIDS groups contended that this was evidence that crypto had been present in the water supply prior to the last week of March. Additional information regarding this contention was never made available to the health department or the media, and it is not known whether the allegedly infected individuals were infected in Milwaukee or in some other city. Although the vast majority of the deaths attributable in part to the outbreak were AIDS patients, further information detailing the patient's cases and medical histories was not forthcoming to the health department.

The committee spent surprisingly little time discussing solutions to the problem and what could be done to prevent it. Davis had recommended that the wash water be sent to the sewers rather than recycled, and Miller had recommended ozonization. The city engineer recommended that the intake for the Howard plant be extended an additional three-quarters of a mile into Lake Michigan, where it would draw water from beyond the sewage plant's outflow and in an area where the water was deeper. The water department recommended that the filter beds be replaced with new filtering material and that improved sampling techniques be installed that would trigger alarms if particle counts in the one to two micron range reached levels considered potentially hazardous. The relative costs for the recommendations varied. The

ending of wash water recycling would cost about \$15,000 per year in additional sewage bills, replacing the filters would cost about \$3 million, extending the intake for Howard would cost about \$15 million, and an ozone plant would cost between \$50 and 70 million. The committee decided to adopt all of the recommendations, to be funded by bonds repaid through increases in the water bills, and ordered that all the improvements be installed simultaneously, without any provision to see whether the less costly solutions might eliminate the problem.

The committee's report was released in June 1993. It also recommended a number of changes in the operation of the water department, including the establishment of a total quality improvement division and a total quality management supervisor to facilitate communication and training within the department. It further recommended the implementation of ozone treatment at both facilities, as well as increased monitoring of turbidity conditions, improvements in chemical dosing equipment, and updated systems of plant operations monitoring. The estimated cost for these improvements was \$90 million.⁷⁸ On the question of fault, the committee determined that no employees of the water department were responsible for the outbreak.

The committee made two final recommendations. The first was that the city, along with the state and other interested parties, lobby the federal government to establish standards listing cryptosporidiosis as a nationally reportable disease under the auspices of the Centers for Disease Control and, further, that the USEPA establish new standards regarding the control of waterborne particles of one to two microns.⁷⁹ The final recommendation was that the city develop an official emergency plan that would define what constituted an emergency and, in the event of one occurring, direct appropriate media release of information. This emergency plan was to be placed under the auspices of the common council, rather than the mayor, and was officially to permit the dissemination of "timely and accurate" information to the council and the public.⁸⁰

The finding by the committee that no water department officials or employees were at fault was not accepted happily by many victims and their families. A Chicago law firm announced that it was instituting a class action lawsuit against the city for damages in the crypto crisis and advertised heavily for class action members.⁸¹ Other firms likely to profit from the episode were makers of water filters and water soften-

ers and purveyors of bottled water. Ads for filters purporting to remove crypto spores from water appeared as early as April 10, 1993; despite warnings by the state consumer protection agency that no filters were capable of performing such a task, sales were high. Many individuals purchased water softening units, despite the fact that water softeners do nothing to remove or reduce oocysts from water. Home bottled water systems received the greatest boost, as consumers wary of the tap water rushed to purchase “reliable supplies.”

The question of water quality and safety became a Midwestern issue in May 1993. The heavy rains that had brought on the conditions of turbidity in Milwaukee continued unabated across the upper Midwest and the Mississippi River basin, leading to flooding of the river. As the flood waters moved south, town after town lost its riverside water treatment facility, leading to the ironic situation of Milwaukee having to supply bottled water to the very communities that had earlier supplied it with water. In many cases the damage to riverside plants was so severe that residents in those communities were without water supply for over a month, as heavy silt and mud had to be removed from pumps and filter beds, and the filter beds had to be rebuilt with fresh sand and gravel.⁸² When the sewage treatment plant at St. Louis was overwhelmed by the flood, CDC officials feared outbreaks of typhoid and cholera from raw sewage entering floodwater and recommended that all persons located south of St. Louis and receiving water from the river undergo typhoid and cholera vaccination. Treatment plants in Arkansas, Mississippi, and Louisiana doubled their levels of disinfectant in the water treatment process to prevent the occurrence of these diseases.⁸³

Western Wisconsin was severely affected by the flooding, although it received little national media exposure. Given the spring episode in Milwaukee, the DNR moved quickly to institute testing and safety measures for treatment plants in the western half of the state and established a statewide testing program for *cryptosporidium* and *giardia* in November. The results of the two-year study, published in 1995, concluded that both organisms were present in all areas of the state, in all types of surface waters. This contradicted the statements of Joan Rose at the common council hearings that crypto was not normally present in Milwaukee surface water. Neither organism was found to be statistically associated with any particular type of land use, such as agriculture, but both appeared more frequently in conditions of spring runoff.⁸⁴ While

avoiding any conclusions regarding the source or cause of the Milwaukee outbreak, the report does state that even the highest levels of either organism found in Wisconsin are below the average for other states. It further states that there is no statistical relation between turbidity of water samples and the presence of *cryptosporidium* or *giardia*.⁸⁵

A major issue that neither the city nor the state report considered was what effect the opening of the Milwaukee River dam at North Avenue might have had on the episode. Since 1991 Citizens for a Better Environment, the group headed by Susan Mudd, had urged that the North Avenue dam on the Milwaukee River be opened to allow the lower reaches of the river to return to a more natural state. The dam was opened on November 1, 1992, and water levels above (north of) the dam promptly dropped, providing a wide bank that could be used by hikers and fishers.⁸⁶ Below the dam, the water flowed more quickly, and DNR reports indicated that the water quality had been improved because of the increased scouring action of the water on the river bed. Concerns over possible chemical and biological contamination of the water from the release of long-buried residues in the river bed were ignored by both city and local officials.

By 1995 the crypto episode had been largely forgotten. It was still possible to buy souvenir T-shirts at the downtown mall that recalled crypto, including "Milwaukee—Don't Drink the Water!" and "Beer Town—for good reason," but the vendors revealed that they were marked 70 percent off and sold only infrequently. Despite lowered confidence in city government, cited by media and official polls, support for the mayor continued high, and he easily won reelection in 1996. Renovations continued at both water plants, with new positions and facilities being established to increase monitoring of the water and to ensure early warning of any possible infestations. However, permanent damage had been done to the reputation of the water department.

The mayor and common council had no choice but to convene the hearings in order to investigate the outbreak. Failure to have done so would have caused even more harm to the reputation of the city, despite the fact that consumers literally had no choice of source for water for nondrinking purposes. If the city wished to continue its operation of the waterworks as a municipal monopoly, it had to appear to be doing something to discover the source of the problem and to prevent its recurrence.

Unlike other businesses, such as automobiles, computers, or even other utilities, alternatives to water supply are not available except for bottled supplies for drinking purposes. The cost of bottled water (about \$1.32 per gallon average in three local supermarkets in 1995) made its use for cooking, bathing, or other purposes prohibitive. However, the image of Milwaukee as a city with unclean water might seriously affect the decision of existing and potential manufacturers to locate in the Milwaukee area. It is perhaps interesting to note that sales of beer from companies headquartered in Milwaukee, even when the beer was brewed elsewhere, continued to decline after 1993, leading in 1998 to the closure of the Pabst brewery. Since the mayor and council wanted to improve the city's commercial and industrial base, any negative images had to be addressed as rapidly as possible.

Notes

1. John O. Norquist, *The Wealth of Cities: Revitalizing the Centers of Urban Life* (Reading, Mass., Addison-Wesley, 1998).
2. *Ibid.*, pp. 23–45.
3. Beveridge, *History of Water Supply*, p. 87.
4. *Ibid.*, p. 132.
5. *Ibid.*, p. 137.
6. *Common Council Proceedings*, 1950–51, p. 1457.
7. Knapp's authority came from the city charter, which grants the engineer the power to make all decisions regarding the construction of public works facilities. The engineer also had proprietary power over the superintendent of public works.
8. *C.C. Proceedings*, 1951–52, p. 2648.
9. Milwaukee Water Department Internal Memo, June 3, 1982.
10. Prior to this time, no degree had been required. The lowest level of plant operations staff was (and is) the laborer, who washes filter beds and assists other operations staff with heavy or cumbersome tasks. He or she is also responsible for a large number of janitorial duties. This position was previously filled with transfer personnel from the sanitation or street repair department. After one year in this position, the laborer was permitted to take a test for the position of chemical feed operator (now water treatment operator II). Each laborer was given a book and told to study the material therein and took the promotional exam when eligible. New chemical feed operators were hired off the list of those passing the exam until no further

names remained; this resulted in the hiring of several individuals who barely passed or who passed with the benefit of affirmative action or veteran's points. After a year, the chemical feed operator could take the test for pump operator (now water treatment operator III). The available training was the same—individual study. The fourth step was the position of operator in charge, which involved overseeing all plant operations and representing the plant on nights and weekends when management staff was not present. Balconi's directives ensured a higher standard of background education and improved the ability of operations staff to deal with unexpected job challenges. With Balconi's promotion to assistant superintendent of public works in 1987, the requirement for an associate's degree, and much of the training program, ceased. While seminars were still offered, they dealt more with diversity issues and worker safety issues, such as confined space training, rather than with plant operations.

11. See employment opportunity listings for management water positions from 1980 to 1993.
12. City of Milwaukee Budget, 1993.
13. I am indebted to the National Weather Service for the weather records mentioned.
14. *Milwaukee Journal*, April 6, 1993.
15. Norquist reports it somewhat differently. "At the city's request, the State of Wisconsin sent its chief epidemiologist, Dr. Jeff Davis, to help get to the bottom of things. At the emergency meeting with Dr. Davis that evening, Milwaukee Health Department epidemiologist Kathy Fessler argued that the illness was linked with Milwaukee's water. Water Works staff were adamant that the problem must lie elsewhere. 'Who's right?' I asked Davis. 'I'm not sure,' he said. 'We have only three samples so far. We do have some indication that there might be a problem with the water. But we won't know for sure until some time tomorrow.' 'Dr. Davis, I notice you're drinking a Diet Coke,' I observed. 'If I put a glass of our tap water (the ultimate outcome) in front of you, will you drink it?' He hesitated. 'No,' he finally said. At that moment I decided to issue a 'boil advisory' and warn the people of Milwaukee not to drink water straight from the tap until we could make sure it was safe." Norquist, *Wealth of Cities*, pp. 41–42.
16. *The Tonight Show with Jay Leno*, April 10, 1993.
17. See daily water test sheets for winter months for any year. A typical bacteriological report for many days in these months indicates that no pathogens or bacteriological organisms are present.
18. *Cryptosporidium* is destroyed by being heated to 115 degrees Fahrenheit for five minutes. Any cooking of food exceeding this time would

kill any existing oocysts. Beer is brewed in Milwaukee, but municipal water that is used in the actual beer production is pasteurized first. Unpasteurized water (but still treated by the city) is used for mechanical processes, such as power generation and cooling. The beer itself is pasteurized after brewing. Boiling eggs would destroy any oocysts present.

19. *Milwaukee Journal*, December 29, 1993.
20. *Ibid.*, April 8, 1993.
21. Marilyn Gorris of Citizens for a Better Environment indicates that her organization participated in several task forces with individuals from the health department's lead abatement program and from the mayor's office when making these recommendations. Fritz Wengler, the former waterworks superintendent, insists that the decision to use PAC was made solely by the water department. Personal communication, Marilyn Gorris to Kate Foss-Mollan, February 10, 1997; personal communication, Fritz Wengler to Kate Foss-Mollan, October 28, 1993.
22. *Standard Methods of Water Treatment*, joint publication of the American Public Health Association and the American Water Works Association, 19th edition (New York, 1995).
23. *Milwaukee Journal*, April 15, 1993.
24. *New York State Manual of Water Treatment*, 4th ed. (Albany: New York Department of Natural Resources, 1992), pp. 37–65.
25. *Standard Methods*, p. 775. This proviso for PAC was not added to *Standard Methods* until 1994, after Milwaukee's experience. At the time of the *cryptosporidium* outbreak, jar tests were still the method of choice for determining coagulant dosage.
26. The pH scale runs from 0 to 14. A reading of 0 indicates an extremely acidic substance; that of 14 indicates an extremely alkaline substance, also known as a base. A reading of 7 is chemically neutral.
27. pH scales are logarithmic. A one-point lowering of the scale accounts for an acidity ten times greater.
28. Minneapolis draws its water from the Mississippi River, which is subject to more rapid changes in water quality than are lake sources. Adverse water conditions arise more swiftly in river supplies but are also of shorter duration than in lake sources, where adverse conditions can persist for prolonged time periods. Runoff problems are less severe in river systems, as silt and sediment are carried away downstream or sink to the river bed rapidly; in lake systems there is the potential for the runoff to remain in the vicinity of the intake for days, depending on prevailing wind and current patterns. *New York Manual*, p. 27.
29. *Clean Water Act of 1974* (Washington D.C.: Government Printing Office, 1974), p. 31.

30. *State of Wisconsin Drinking Water Standards*, revised (Madison, 1988), p. 11.
31. Or more frequently when rapidly changing water conditions merit it.
32. Daily water test form, Howard Avenue Water Treatment Plant; and daily water test form, Linnwood Avenue Water Treatment Plant. Access to these records was granted by the Milwaukee Water Department.
33. Becker, *A Century of Milwaukee Water*, pp. 112–65.
34. *Standard Methods*, p. 1191.
35. Sewerage commission quoted in *Milwaukee Sentinel*, April 13, 1993. The completion of the deep tunnel sewerage system the following year reduced the number of overflows necessary to one or two per year.
36. Howard Avenue daily water test forms, March 27–31, 1993; *Milwaukee Sentinel*, April 13, 1993.
37. Bacteriological records indicate that the level of bacteria in the raw water reached a peak of 3,400 per 100 ml on March 26. This compares with record levels of 9,400 per 100 ml the previous June. *Cryptosporidium*, however, is not a bacterium and cannot be detected by standard bacteriological testing.
38. The finished water NTU of 1.7 had actually been reached the day before at the plant. It takes about twenty-four to forty-eight hours before this water reaches customers.
39. Such calls are not uncommon. In my four years as a water department chemist, I received hundreds of calls, often from the same customers. They would insist that their water was dirty and that it be investigated. These calls frequently were clustered after a blitz of media advertising by bottled water or water softener companies, or after reports in the media regarding water quality. In one three-day period in 1982, shortly after the *Journal* ran a report stating that there was a one in one million chance of contracting cancer from chlorinated water, I received 122 calls while working the 11 P.M. to 7 A.M. shift. Some of these callers demanded that I immediately stop chlorinating their water, as I was endangering their health. Many were obscene and would shout and refuse any explanation that was offered. To the more rational, I explained that death rates from untreated water far exceeded one in a million and that the report was investigating water supplies with a chlorine residual five times higher than that maintained in Milwaukee's water. My most memorable calls came from an individual who appeared to be in an advanced state of inebriation and called at 3 A.M. for three days in a row. He insisted that the waterworks was pumping chlorine gas into his home in an attempt to silence his political views. All these individuals were offered tests of their home water supplies at no charge. The acceptance rate for this test

was about 1 percent of total callers. At no time did any of the tests find any problems with the water. The two situations that caused complaints most commonly were a customer running hot water and finding sediment in it (resulting from the buildup in a hot water heater) or from having an aerator installed so that a portable dishwasher could be run. This results in an appearance of cloudiness from the minute air bubbles generated in the water.

40. The report that a Norwalk virus might be the culprit was not seriously considered by the health department, according to health department epidemiologist Kathy Fessler.
41. *Milwaukee Journal*, April 6, 1993; *Milwaukee Sentinel*, April 6, 1993.
42. Ibid. These four communities do not receive Milwaukee water.
43. Now Kathy Blair. This quote contradicts Norquist's statement that Fessler believed that the water was the source of infection.
44. *Centers for Disease Control, Report on Laboratory Samples from Milwaukee, Wisconsin*, April 29, 1993.
45. W. L. Current et al., "Human Cryptosporidiosis in Immunocompetent and Immunodeficient People: Studies of an Outbreak and Experimental Transmission," *New England Journal of Medicine* 308 (May 1983): p. 1252.
46. *Milwaukee Journal*, May 12, 1993.
47. R. G. D'Antonio et al., "A Waterborne Outbreak of Cryptosporidiosis in Normal Hosts," *Annals of Internal Medicine* 103 (April 1985): p. 886.
48. M. M. Gallegher et al., "Cryptosporidiosis and Surface Water," *American Journal of Public Health* 79 (January 1989): p. 39; B. A. Rush, P. A. Chapman, and R. W. Ineson, "Cryptosporidium and Drinking Water," *Lancet* 2 (January 1989): p. 632.
49. E. B. Hayes et al., "Large Community Outbreak of Cryptosporidiosis Due to Contamination of a Filtered Water Supply," *New England Journal of Medicine* 320 (June 1989): p. 1372.
50. These studies were performed on laboratory rats. See *Cryptosporidiosis of Man and Animals*, ed. J. P. Dubey, C. A. Speer, and R. Fayer (Boca Raton, Fla.: CRC Press, 1990).
51. Private communication, Kathy Fessler Blair to Kate Foss-Mollan, November 8, 1993. The research cited is found in H. L. Dupont et al., "The Infectivity of *C. parvum* in Healthy Volunteers," *New England Journal of Medicine* 332 (June 1995): pp. 855–59. Dupont's work indicates that the ID50 for *C. parvum* is 132, with a low limit of 30. The ID50 is the number at which 50 percent of the population becomes ill; there is no upper limit because some of the volunteers did not succumb to the infection for unknown reasons—most likely because of natural immunity or previous exposure.

52. Beth L. P. Ungar, "Cryptosporidiosis in Humans (*Homo sapiens*)," in *Cryptosporidiosis of Man and Animals*, ed. J. P. Dubey, C. A. Speer and R. Fayer (Boca Raton, Fla.: CRC Press, 1990), pp. 59–82.
53. *Ibid.*, p. 64.
54. *Ibid.*, p. 81.
55. *Ibid.*, p. 79.
56. News Conference, Mayor John Norquist, April 10, 1993; *Milwaukee Journal*, April 10, 1993; *Milwaukee Sentinel*, April 11, 1993.
57. *Milwaukee Sentinel*, April 14, 1993.
58. Seventy-six complaints were made to the Howard facility, fourteen to the Linnwood facility. Water department complaint log, cited in *Milwaukee Sentinel*, April 14, 1993.
59. Media reports were considered to be any article in the three listed newspapers that referred to water supply, whether local, national, or international. While all the local broadcast networks could not be monitored, the fact the local NBC affiliate is owned by the *Milwaukee Journal* (now *Journal-Sentinel*) is an indication that the items did receive broadcast coverage, as the stories played on that local station are usually identical to those appearing in the paper.
60. This is an example of the Hawthorne effect, whereby individuals, upon hearing of a specific reaction to a stimulus, believe they have developed that reaction, whether or not they have received the stimulus. A classic example is that of medical students reading about rare disease symptoms and subsequently fearing they have developed the disease in question. My favorite example occurred in 1992 in Stamford, Connecticut, when the municipal building was scheduled to undergo painting. Reports in the media about "sick building syndrome" were then common. On the day the painting was scheduled to begin, 87 percent of the building employees went home sick, complaining of reaction to paint fumes. However, the painter's union had gone on strike two days before, and no painting took place. Cited in *Chemical and Engineering News*, September 18, 1992.
61. Interview with Jesse Cooks, December 16, 1993.
62. Dupont et al., p. 589. Seventy-five percent of infections occurred in this range. Only 1 percent occurred prior to seven days; the longer infection times ranged up to twenty-eight days.
63. *New York Manual*, p. 161.
64. *DNR Monthly Report Sheet for Filter Operation*, Linnwood and Howard Facilities, January through December 1993.
65. *Milwaukee Sentinel*, April 15, 1993; *Milwaukee Journal*, April 15, 1996.
66. *Milwaukee Journal*, April 16, 1993; also the local television stations.

Ironically, it had been Anderson who led the fight to place the second water plant on the south side in his first term in office, despite the opinion of at least one contractor that the water conditions at that site contraindicated the placement of a water treatment facility there.

67. *Milwaukee Sentinel*, April 25, 1993; *Milwaukee Journal*, April 25, 1993.
68. Water department officials immediately investigated the woman's complaint. The water sample had not come from her tap but from the bottom of her water heater. Only the *Milwaukee Journal* reported this fact, and did so in a minor correction on the last page of the local section, May 1.
69. *Report of the Common Council Water Crisis Fact Finding Committee*, City of Milwaukee, June 1993, p. 7.
70. Charles R. Sterling, "Waterborne Cryptosporidiosis," in Dubey, Speer, and Fayer, *Cryptosporidiosis*, pp. 51–58.
71. *Report of the Common Council Water Crisis Fact Finding Committee*, City of Milwaukee, June 1993, p. 7.
72. *Ibid.*, p. 8. Davis's comments are summarized from videotapes of his testimony obtained by the author.
73. *C.C. Water Report*, p. 2; videotaped testimony.
74. *Ibid.*, p. 9. Fox's comments led to an examination of the Sheyboygan system, which had also been using PAC as a coagulant. A ten-day boil order was imposed on May 4 for that city. *Milwaukee Journal*, May 4, 1993.
75. Miller mentioned, but did not emphasize, that his firm had been the supervising consultant on both these facilities, and that his was the only firm then currently designing ozone plants. Both plants in question had been in operation for less than a year, and neither had experienced any adverse water conditions. Also, neither plant's capacity exceeded 5 million gallons a day, a far cry from the estimated 250 million gallons a day needed in Milwaukee. Finally, both plants were new constructions. Retrofitting existing plants for ozone treatment had never been attempted. *C.C. Report*, p. 9, videotaped testimony.
76. *Ibid.*, p. 10. Examination of meat packaged during the requisite period indicated no *cryptosporidium* present.
77. *Milwaukee Journal*, April 10, 1993.
78. *Ibid.*, p. 12.
79. *Ibid.*, p. 9. This size range includes crypto oocysts.
80. *Ibid.*, p. 8. This recommendation was a subtle jibe at the mayor, whom the council saw as damaging the reputation of the city and the city government with his management of the crisis. In a private conversation, alderman and council chairman Kalwitz commented that he imagined that previous mayors would have handled the situation differently.

81. *Milwaukee Sentinel*, May 15, 1993, June 1, 1993, June 15, 1993. *Milwaukee Journal*, May 16, 1993, June 1, 1993, June 15, 1993. The city contested the formation of a class action suit on the grounds that no class existed and urged in circuit court that any potential lawsuits be handled on an individual basis. Judgment on this matter had not been announced as of the end of 1995.
82. *Journal of the American Water Works Association*, June 1993, pp. 34–41.
83. *Time*, May 22, 1993, May 29, 1993.
84. J. R. Archer et al., *Cryptosporidium spp. Oocyst and Giardia spp. Cyst Occurrence, Concentrations and Distributions in Wisconsin Waters* (Madison: Wisconsin Department of Natural Resources, August 1995), iv.
85. *Ibid.*, vi. This is in contrast to an article in *Annals of Public Health*, which does find a correlation.
86. *Milwaukee Journal*, November 1, 1992.

CHAPTER 6

A CITY IS NOT A BUSINESS

“The policy analysis paradigm specifies work for a single client. That client may be an embodiment of the public interest, like a mayor taking a particularly heroic stand on an issue seen as vital to city residents. Or the client might hold a very personal agenda, like re-election, that could well work in opposition to the public interest.”—Carl V. Patton and David S. Sawicki, *Basic Methods of Policy Analysis and Planning*

The previous narrative shows that, throughout its operation, the operations of the Milwaukee Water Works have been greatly affected by politics. This meant that the department consistently suffered from a lack of a definitive policy of governmental service provision. At a time when East Coast cities had been providing water for half a century and Midwestern cities had begun to offer such service as a necessary component of urban life, Milwaukee was still struggling with balancing the desires of its citizens, the opinions of different political parties regarding the best method for service provision, and the best means of

providing those services. The fragmented political system led to a fragmented supply of public services.

The pattern of disunity that persisted in Milwaukee after the joining of the three original settlements was continued in the largely autonomous authority of the individual ward officials. Each ward was responsible for individual improvements, originally only at the request of the property holders who would benefit by those improvements, and ward councilors, supervisors, and aldermen considered the graft that could be gained from contracting out those improvements to be an unofficial perquisite of office holding. Despite the scandals that resulted from kickbacks and poorly done work, the pattern of autonomy was so entrenched in Milwaukee's governmental duties that it took almost a decade before substantial improvements were made in the provision of city services. Milwaukee residents reveled in the tradition of having politicians who could get things done (and with annual elections, those who did not get things done would soon be out of a job) and felt deprived of a voice in the political arena when the move toward citywide service provision came about. Residents who had previously been able to get streets paved, get sewers laid, or see parks developed in their neighborhoods now had to see their local desires prioritized on a citywide basis, and lack of funding could mean that one neighborhood's pet project was sidetracked while some less important (at least in the eyes of the first neighborhood) area received funding for its own improvement. As the change in financing of services from Einhorn's "subscription service" to the special assessment and later to the property tax developed, not only did the first neighborhood have to see its projects delayed in favor of another but it had to help pay for it as well.

Another major factor influencing water supply in Milwaukee was the strong tradition of democratic participation. One of the reasons why there was so much reluctance to change the system of individual ward autonomy was because of the belief that such a system gave more recognition to individuals and interest groups in all areas of city government. The power of groups such as the chamber of commerce, labor organizations, and citizen action committees to influence debate and media discussion, and the tradition of including these groups' opinions in the decision-making process, meant that it was always took more time and compromise in Milwaukee to get something done. Milwaukee's decision to use a municipally owned waterworks exacerbated many of

these disputes. Because participation in the process of democracy was so revered in Milwaukee and because political expediency required maintaining the favor of interest groups, city officials were constantly aware of the realm of perception in determining what course of action should be taken regarding the provision of, and funding for, services. The desires of groups with opposing viewpoints had to be examined in connection with those groups' voting power. Decisions expressed by a majority could be subordinated with the realization that a minority viewpoint might represent a more viable source of political support. These groups arose in part because of the need for extra-neighborhood action to regain the power that had before been in the hands of individual wards. These groups often supported specific candidates for office, and their squabbling was mirrored by the squabbling of "their" representatives. Further, groups which had power bases in more than one ward could threaten aldermen and councilmen that they might be removed in the next election if the groups' agendas were not met. Few groups agreed on anything; the "right answer" to the city engineer, such as the need for a water filtration plant, might be the wrong answer to the chamber of commerce, which would see elevated taxes and water rates not worth the "minor" problem of annual typhoid cases. However altruistic one's motives might be, there was likely to be a group that saw anyone else's proposals as anathema, making change a process of convincing not only the politicians but everyone else as well. Since a supermajority of votes was necessary in the common council for any expenditures, different interests had to be balanced and compromised upon, a process which took time.

It was largely as a result of this influence that initial implementation of the waterworks and, later, the construction of the water filtration plant were delayed. Although similar delays in service provision were noticed in Boston, Baltimore, Philadelphia, and Chicago, these cities experienced delay because of their inability to choose between private purveyors of water supply.¹ Once these cities accepted the idea that water supply should be a public municipal service rather than a private one, the cooperation between governments and citizens allowed for rapid implementation of water supply. New York's involved history in many ways replicates that of Milwaukee, as citizens and government argued over the need for water supply and the necessity of funding it. In New York's case, it would take cooperation between some

groups and some city administrations (which changed often) and, eventually, the state government to implement a water system.

These patterns did not disappear in Milwaukee with the Civil War. Despite the insistence of the state legislature that the Board of Water Commissioners be composed of private citizens, the idea remained that service provision should ultimately provide financial benefit if not to the officials, at least to the city. Even the board was not immune to using its position for financial gain, as witnessed by the favoritism in bid awarding or by Guido Pfister's magnanimous reward for acting as board secretary. Although the idea of getting something extra for one's work was not unknown in the latter part of the nineteenth century, and while graft and shoddy work had characterized Milwaukee's earlier history, the whole point of a nonpolitical board was to eliminate this.

The appointment of businessmen to the board, however, created another pattern. As noted in chapter 2, the pattern of distribution supply indicates that areas with heavy concentrations of industry, particularly the businesses of the board members, were watered first. Supplying large-scale customers first makes sense from a business standpoint; after all, the money generated from these large consumers would generate funds that would hasten the installation of mains in residential areas and retire the bonds floated for construction of the waterworks itself. The Milwaukee Water Works has always supplied a larger amount of its water to business customers than to residential ones; those large industrial customers received, and still do receive, a price subsidy for their usage. Meter reading was not a major expense in the years prior to the turn of the century, but quantity issues—such as the large-scale use by industry making a new intake a necessity by 1892—prevented the supply of water to residential customers prior to that time. However, by establishing this pattern from the beginning, the Board of Water Commissioners, perhaps unwittingly, set up the proprietary attitude that would later characterize the operations of the waterworks. Clearly the Board of Water Commissioners and its successor, the Board of Public Works, thought water supply was to be for business's benefit first, and that residential requirements could be subordinated to the profit motive. Since appointments to the Board of Public Works Commissioners that followed were in the control of the mayor, and only indirectly subject to the control of the electorate, pleasing the mayor and council by continuing to generate revenue would be firmly established even be-

fore the waterworks generated a profit in 1893. While the Board of Public Works' 1893 annual report would caution that these surpluses should be used to extend supply in unwatered areas and to maintain a reserve for maintenance and repair, the political benefits of extra revenue were too great for city officials to change the pattern of ignoring residential concerns, especially in an area that had little political clout.

In *Property Rules*, Robin Einhorn contends that the reason many Midwestern cities took so long to address issues like localized pollution and denial of services to certain city areas was because cities were not designed with the idea of transferring assets from one group for the benefit of another. Her discussion on the origins of special assessment, arising from "subscription," indicates that most cities underwent a period in which it was felt that improvements that would benefit a specific area or individuals should be paid for by those individuals and not be financed from general tax revenues by those who would receive little, if any, benefit from those improvements. It was not until the cities reached the stage of needing large-scale public works projects such as water and sewer provision² that this thinking would be influenced by concerns over public health and the need for services in poorer areas, justifying city-wide financing on the rationale that such improvements benefited the entire city, even if one area did receive a more direct benefit. This idea seems to have short-circuited in Milwaukee, as the democratic process made any one influence weaker.

Although the establishment of special assessments to fund water distribution indicated that there was a growing willingness to engage in some transfer of wealth as long as the overall benefit to the city was enhanced, the pattern of ward officials' enriching themselves from the provision of services would be reinforced in the example of the board using its position for financial gain and the establishment of the process of profit transfer. Despite the protest of the Board of Public Works Commissioners, the fact that the aldermen rather than the commissioners had the final say on how revenue surpluses were handled was to establish a tradition of proprietary service unlike that of other cities with municipally operated water works.

Milwaukee's political arena in the years from 1890 to 1910 was that of competition between four major parties. The traditional Republicans had experienced a split in their ranks with the formation of Robert LaFollette's Progressive wing (later the Progressive Party), which

helped to reduce the impact of growing conservatism among the German voters, now rising into the middle class, who had earlier supported the Democrats. Democrats seemed assured of the support of the south-side Polish voters because the perception of these largely Catholic voters toward Republicans (including Progressives) and Socialists was negative. Rose and his Democratic machine could use their power over water supply provision, as well as other services, against the Poles with little fear of retaliation because he clearly saw that for the Poles there was no alternative electoral choice. It took concerted efforts on the part of the Milwaukee Socialists to overcome the influence of German anti-Slavic prejudice and convince the Poles that socialism was a viable alternative and that supporting the Socialist Party would bring tangible rewards in the area of services and patronage.

Although the department spent its first two decades establishing its infrastructure and distribution service, the fact that surplus transfers began only fifteen years after the waterworks began its operations indicates that there was a deliberate intention to ensure that the department not only not be a drain on the resources of the city but actually generate funds for it. In contrast, Philadelphia went thirty-four years (until 1868) before making a modest profit, Baltimore for forty (1874), and New York fifty-two (1888).³ Midwestern cities that provided a public water supply chose to forego profit transfers, instead rolling any money back into the system. Chicago's municipal water system has never, in its nearly hundred and fifty years of operation, transferred any money to the general revenues of that city once initial expenditures had been recouped. Detroit, Cleveland, and Minneapolis, relying more heavily on bond issues for their construction, used their profits to retire the bonds early, and subsequent funds were earmarked for future construction, maintenance, and improvements. Despite these examples, Milwaukee chose profit.

With the transfer of authority for service and improvements from individual officials to the city Department of Public Works, there should have been a concomitant transfer of a philosophy of provision from a proprietary to a governmental utility. Instead of offering street paving, sewers, or water because residents of a particular area would benefit, the concept that water would benefit the entire city came into play, at least in other cities. In Milwaukee, however, it became the means by which the city could enrich its coffers, benefiting whichever political party was in the ascendant. The frequent turnover of office between the

parties prior to Rose's mayoralty and the reign of the Socialists did nothing to deter utilizing the waterworks as a money maker because each party recognized that upon gaining office, they too would benefit. With additional supply available, the earlier "business is king" rationale developed into a philosophy of "profit is all."

If this line of reasoning is considered, much of the subsequent history of the department becomes clear. The expansion of service to the south-side Polish neighborhoods was delayed because the profit in such an undertaking was less than the profit that could be gained from selling the same water to suburban customers at a premium. Further, the relative lack of political and commercial clout on the part of the Polish citizens meant that they lacked a powerful enough voice to demand such services as a right. The media outlets for this community were largely ignored outside that community, and the more traditional major newspapers were relatively uninterested in covering the news and opinions of the Poles. The relative isolation of the Polish communities and their lack of large cultural and commercial organizations, coupled with the power of the parish priests in recommending the Democratic Party as the only alternative, meant that the populations of the eleventh, twelfth, and fourteenth wards were not considered important enough to be heeded in their call for service. It took the efforts of the Socialists in the first decade of the twentieth century, through both political action and media coverage, to make the Poles aware of their power and demand the provision of service as a reward for political loyalty. While the Socialists did not stop the water revenue transfers, they clearly felt that decreased profits from supplying the Polish wards were a reasonable payoff for gaining the political power to achieve their goals.

By agreeing to see that the Poles received services, particularly water supply, in return for votes, the Socialists were not acting purely out of altruism but rather taking a necessary step in their plan to use water supply as a hook for annexation. Although aldermen under Rose had denied water to the south side, choosing instead to sell it to suburbs and suburban factories, in fact supplying the south side with water had little effect on the actual availability of water. Because many of the desired new customers were located just outside the city boundaries on the south side, mains would have to be laid in the general area even if service was to continue being denied to the Poles. Supplying water to the eleventh, twelfth, and fourteenth wards was also a good advertisement, as it let individuals residing

just outside the border know that such services would be available to them if they were only part of the city. Finally, using up some of the available water might create an eventual shortage, which would help lend support to Socialist calls for improvements to the intake and pumping stations and eventually for the construction of a filtration plant.

The Socialist attempt to tie water service to annexation was ultimately the cause of increased state regulation over the waterworks. Despite the provision of service to areas within the city that had previously been denied it, the continued practice of transfers of waterworks surpluses to the general fund and the increase in the value of these transfers that took place after the Socialists took office indicate that the Socialists continued to think of the waterworks as a proprietary service rather than a governmental one. The Socialists could have canceled the pattern of transfers and used the funds to lower water bills within the city and establish an account to build the desired new intake, yet they did not do so. Lower-cost water would have made using it as a hook for annexation even more valuable, as this would have meant a bigger difference in the price paid between the surcharged amount (which was fixed by contract) and the lower city rates.

Since the annexation lever failed, the perception of the railroad commission that Milwaukee was primarily interested in providing service to the suburbs because it made a profit doing so must also be considered in any examination of the commission's rulings. Although Milwaukee was the victim in these rulings, its failure to come up with any alternatives made it at least partly responsible for the commission's decision.

Seidel's and, later, Hoan's inability to force through their improvements in water service were also important factors influencing the commission. The political stalemate that Hoan, in particular, faced while trying to implement construction of the filtration plant meant that the state regarded the city as incapable of managing its existing water system. Since the only matter regarding water supply upon which both Nonpartisans and Socialists could agree was the attempt to use water for annexation, the state had a point. Had the department surpluses been used to generate a building fund for the filtration plant, much of the squabbling between the parties would have disappeared, and the decision of the state might have been different.

The operations of the waterworks from 1910 to 1940 show that many of the decisions that had to be made were simply too important to

be left on the local level, at least in Milwaukee, where things took more time. It had required state intervention in 1871 to form the Board of Water Commissioners in the first place, and a similar move by the legislature was necessary to establish the Sewerage Commission in 1913. Placing these boards under the control of local government meant that local political considerations took precedence over the provision of these services, leaving Milwaukee without an adequate supply of pure water for decades after the initial recommendations of health and engineering professionals. Examples of similar problems in other cities are common; perhaps the best-known is the frequent scandal emanating from the Chicago Sewer Commission, where commissioners were appointed as political favors and frequently pocketed money intended for service improvement. New York experienced a similar situation in service provision during the Tammany Hall era.⁴

Before 1910 the biggest problems tackled by the Board of Public Works Commissioners had been securing permission to establish reserve and backup facilities and replacing malfunctioning machinery. The addition of new facilities or equipment that ensured both higher-quality water and additional supply was much more easily approved than those that only affected purity. Thus, the replacement of the North Avenue intake in 1892, and even the Linnwood Avenue intake, were funded and completed much more swiftly than the filtration plant. The filtration plant affected only the purity of the water, and since it actually made less water available (the filtration capacity was 290 million gallons per day, while the combined pumping capacity of the Riverside and North Point stations was 310 million gallons per day), it received less support. It also required more money to operate and made less profit for each gallon produced. For a city that had been running the waterworks like a business, less profit was a difficult stand to take. Annexation would also be opposed in part by business interests in the 1940s and 1950s because it meant less water would be available to city industry. The Howard plant, which would supply additional quantity, was approved very quickly, despite arguments that the quality of water it provided would be less than what customers were used to.

Just as in the initial battles to secure a water supply in the 1860s, the placement of oversight authority for the department under the political control of the common council allowed various groups to block or delay construction of necessary facilities. Such power made it possible for one political faction to delay construction on a particular

facility which they opposed, as in the case of the Nonpartisans' delay of the Linnwood Avenue intake or in Hoan's blocking construction of the sewerage plant. Political vicissitudes impaired the construction and operation of facilities designed to improve the purity of the water and positively affect the general health of the population, despite the political attention gained by the use of such rhetoric as Bading's "typhoid highball."

Politics was the most important component of waterworks policy from 1910 to 1940, in the sense that the Socialists had always included the improvement of the city's water supply, in both quality and quantity, as a major plank in their platform. Although Seidel had only one term as mayor, and Hoan had to deal with the problems of a common council that never had a Socialist majority, the support of such figures as Henry Bohmann, who was waterworks superintendent from 1912 to 1940, and Joseph Schwada, the city engineer, helped to eventually convince the council that pure water was a necessity. The fact that the filtration plant would not benefit all the water customers equally (industrial consumers do not usually require filtered water for their processes) helped in the formation of groups that were opposed to the plant's construction. The strong presence of business interest on many of the groups involved in the fight, including the American Chemical Society,⁵ the Chamber of Commerce, and the Citizen's Government Research Bureau illustrates this point. Because politicians controlled the running of the waterworks, business interests, which had a large voice in the media and which, through campaign contributions, greatly influenced elections, enjoyed a strong voice in the decision-making process regarding water supply. Politicians who necessarily feared for their jobs were more sensitive to arguments that might affect the city's employment picture than were water department employees, who enjoyed civil service protection.

Milwaukee in 1940 was a very different place than it had been seventy years earlier. Greatly increased in size (43.7 square miles as opposed to 15.1), much higher in population (500,000 versus 71,440),⁶ with a diverse industrial and commercial base, Milwaukee was luckier in its engineers and planners than in its politicians. Unlike the forty-year lag in the provision of basic services, Milwaukee in 1940 had a water system that seemed well equipped to provide not only for the needs of its existing citizens but for future needs as well. With daily pumping capacities of 310 million gallons, filtration capacities of 290 million gallons, and storage capacity of 40 million gallons, measured against an all-time

peak use of 142 million gallons, the city appeared to have designed its waterworks to meet current as well as future needs.

The practice of using the water department as a source of revenue for the city through the transfer of money to the general funds had been beneficial to the city since it began in 1883. Despite the city's willingness to see a low rate of return on its investment in order to keep rates low in order to lure annexation, the practice still allowed for the transfer, by 1940, of almost three-quarters of a million dollars a year to the general fund for the reduction of the tax levy. While this transfer, particularly during the Depression years, was greatly to the benefit of the citizens, its continued use in the decades following World War II would have far less satisfactory results. The amounts of the transfers, the total waterworks revenue, the amount of the city budget, and the percentage of that budget accounted for by the funds transfer are shown in table 9.

Year	Transferred	Revenue	General Fund	% of Fund
1900	0.076	0.458	7	1.1
1910	0.092	0.605	6.9	1.3
1920	0.225	1.235	14.7	1.5
1930	0.3	2.399	16.8	1.7
1940	0.72	2.862	13.4	5.3
1950	0.5	4.279	30.3	1.6
1960	1.54	8.365	57.5	2.7
1970	5.22	14.05	116.8	4.7
1980	4.08	32.413	258.6	1.6
1990	5.78	45.722	407.7	1.4
1991	6.67	56.584	446.2	1.5
1992	6.76	53.163	461.5	1.5
1993	9	60.749	474.8	1.9
1994	6.52	61.098	478.7	1.4
1995	10.61	62.81	486.3	2.2

Table 9: Water Department Funds Transferred to City General Fund, Total Water Department Revenue, General Fund Budget, and Percentage of General Fund Accounted for by Transfer, for 1900–1995 (in millions of dollars). Sources: City of Milwaukee Budget, 1900–95; Water Department Annual Report, 1900–1995.

After the war, Milwaukee continued in its efforts to enlarge itself through the annexation of unincorporated land or at the expense of its

suburban neighbors. The pattern of provision to parts of suburbs in the previous two decades had indicated that the city was interested in providing utility service beyond its borders. The unavoidable fact that they had only done so because they did not expect those areas to remain outside the borders for long was not considered by the commission, which looked at results rather than intentions. It is certain that Milwaukee was acting in a governmental rather than a proprietary manner when it chose a far lower rate of return on its investments than permitted so that its citizens could receive water at the cheap rates, and the city used just this argument in its briefs regarding the 1934–39 rate case. But to the PSC, this was just another example of Milwaukee's acting in a proprietary fashion, because it believed that Milwaukee had chosen the lower rate of return as a sales ploy to convince the suburbs to do business with them. Once contracts had been signed, the city was free to return to the commission and request rates at the (considerably higher) permissible rate of return. Because the State Supreme Court had ruled in *West Allis* that a contract could not be voided just because a customer suburb objected to a rate change, provided of course that the commission had approved the change, the apparent reasoning of the commission was sound. It would have been impolitic in the extreme for the city to openly argue that it had made the choices that it did in order to secure annexation, despite the fact that everyone was quite aware of this fact. Despite Milwaukee's population, the suburbs, none of which had a Socialist government, had a closer relationship with the almost entirely Republican governors of the state, who had serious problems dealing with the Socialists.⁷ Since the Public Service Commission members were appointed by the governor, they would be naturally more sympathetic to the cause of the suburbs than to that of a Socialist city.

Milwaukee's struggle to retain control over its waterworks was rooted in the internal city politics that had been a tradition in the city since its founding. With frequent elections, it was difficult for any party to gain control over the office of mayor and the council, and if it managed to do so, it was unlikely that such control could long prevail. The resulting stalemates in arguments over new policy direction, such as beginning water supply, building a sewage plant, building a filtration plant, and extending service beyond the city borders meant that a regulatory body outside the purview of the city was necessary for getting things done. That this body eventually turned out to be a state regulatory commission dominated

by the political interests of the suburbs rather than by interests sharing the city's concerns was merely a result of the city's inability to resolve its own problems.

For 125 years, the people making decisions about Milwaukee's water supply have been the people who wanted to make money from it. In the initial implementation stages, the Board of Water Commissioners was heavily dependent upon the expertise of the engineer they hired, but they did not always heed his advice, especially when it prevented the quick accumulation of profit. The siting of the reservoir, the order in which the wards were watered, and the bidding process were areas in which the board decided the course of action to be followed, with occasional disagreements from the waterworks engineer and the health commissioner. Both of these individuals possessed knowledge and expertise far beyond that of the board, the engineer in the area of fluid mechanics and the operations of a water system, and the health commissioner in the effects that a water supply would have on the health of the city residents. During the tenure of the board and later, when the operations of the system were turned over to the Board of Public Works but placed under the supervisory authority of the common council, decisions were made on the basis of politics or economics. The decision to forego the watering of the south side was one such example. The selling of water to the suburbs on a wholesale basis meant that not only would the city receive 125 percent of the fees for the same water that they would receive from supplying to the Polish wards; the fact that the supply was wholesale rather than retail distribution in the city meant that they were spared the capital expense of having to lay distribution mains in those wards. The resulting extra profits could be used by the party in power (from 1890 to 1910 this was largely the Democrats) to provide political lagniappe in an effort to secure votes.

However faithful the Socialists were in their provision of city amenities such as water, sewers, and paved streets to the beleaguered Poles, their pattern of utilizing political control over the water department did not end. Although permission for water quality and quantity improvements and equal access to distribution did occur, the desire of the Socialists to use water supply to annex extramural territory was ultimately responsible for a massive increase in state regulatory authority. Additionally, the continuance of the policy of transferring funds from water department revenues to the general fund would eventually have a delaying

effect of its own in the fight for the filtration plant. When it was realized in 1925 that water pressure and quantity were insufficient, requiring the construction of a new pumping station, funds were not readily available due to the policy of transfer. The need to float bonds for this necessary construction would result in a depletion of waterworks revenue, which would delay construction of the filtration plant once it was finally approved. The need to apply for assistance through the Works Progress Authority and the debacle of the termination of that program were responsible for additional delays in construction, so that the plant was not brought on-line until 1939. Ironically, had the Socialists been willing to forego the transfers, the filtration plant might not only have been built earlier, but there might also have been less difficulty in using water supply for annexation. Water rates that were 10 percent to 15 percent lower (figures are from table 9) could have removed much of the Public Works Commission's objections.

The role the media would play in the *cryptosporidium* episode would be much greater than that it had enjoyed in earlier arguments about water supply. By the 1980s, the media of Milwaukee no longer automatically supported the role of city over suburb. With the migration of many members of the editorial board and staff to the suburbs, criticism of city government appeared in editorials and in slants given to city vs. suburban interest stories. The dislike both papers, the *Journal* and *Sentinel*, held for Mayor Henry Maier, particularly in his later terms, showed in frequent condemnation of Maier's attitudes of "pampering" city workers and criticism of his continued support for a strong city rather than unified city-suburban government. The newspapers' support of John Norquist for mayor in 1988 did not change this direction in editorial opinion, despite the better press image the new mayor enjoyed. The media reports during the *cryptosporidium* crisis greatly enhanced public fear over the reliability of the water supply and outrage over perceived attitudes of misconduct by city employees.⁸

The decision of the common council's Water Quality Committee to implement all the recommendations that were made meant that major renovations would have to be made at both of the existing filtration plants. The estimated cost for these renovations and installations was \$90 million, to be financed by water bonds that would be paid for by increases in the water bills over a twenty-year period. These improvements included the installation of a crib feed system whereby chlorine

could be fed at the intake, 7,000 feet out under the lake, in an effort to reduce zebra mussel infiltration; the construction of a new, longer intake for the south-side Texas Avenue pumping station, which would bypass the sewage output plume; the installation of a new stainless steel driver for the flocculation baffles, which would ensure greater mixing of flocculant in the settling basins; the installation of particle counters and a computerized monitoring system for them; the addition of two kinds of synthetic polymers to the filtration beds, one to enhance the cleansing properties of the wash water and one to enhance the filtering capacity of the beds; the substitution of hypochlorite for chlorine in an effort to improve safety; and an ozone treatment system, which would replace the chlorine disinfection system that had been used since the plants began their operation. All but the hypochlorite and ozone had been installed by the end of 1995; with the exception of the intake, all the systems failed to operate correctly. The new intake provided much-improved water to the south-side plant, with turbidity levels at about 90 percent less than they had been with the earlier intake, making Howard's water as good, on most days, as Linnwood's. Somewhat ironically, the contractor that constructed the new intake was the same one who had refused the commission to build the original intake and Howard plant in 1960, pointing out that the water brought in would be contaminated by sewage.

The city council's decision to adopt the consultants' recommendations was admittedly based on the evidence existing at the time. However, given the overall relative lack of evidence available and given that the outbreak spurred investigation into the prevalence of *cryptosporidium* in American and Wisconsin surface waters as well as research into the actual infection process of *cryptosporidium*, a better choice would have been to delay funding the entire recommendation until the results from the first completed improvements were made. The move to adopt such a wide-ranging plan, without any indication to see whether the proposed systems would indeed even function together, indicates that the improvements were undertaken to improve the political image of the mayor and council rather than through a genuine concern to fix the problem. In other areas where an ozone treatment system had been adopted, particularly in Los Angeles and Lake County, Illinois, pilot projects were established to determine the operational stability of the new components. Milwaukee's proposed new system

would be the first to incorporate all new forms of technology in a single plant, as well as the first to retrofit an existing plant for ozone. Using Norquist's business analogy again, it made more sense for the bottom line to see whether all the recommendations were necessary or whether a lower-cost solution might solve the problem. The city, after all, was not likely to lose customers, since it enjoyed a monopoly. However, the business/proprietary attitude still held in other ways.

The issuance of bonds to finance these improvements indicates that the city still thought of the waterworks in a proprietary fashion. Table 9 shows that from 1993 to 1995, \$26.3 million was transferred to the general fund. Using these figures, the city could have chosen to finance the improvements through foregoing the transfer of these revenues, allowing for a payoff in under eleven years—as opposed to twenty for the bond scheme—with no increase in rates. However, this would have meant raising the property tax to cover the missing transfer money. Norquist's theme for his entire incumbency in office had been keeping property taxes low, and he was not above using unusual methods to accomplish this. The city's decision to accompany the water rate increase with a corresponding switch in financing city electrical street lighting from the property tax to a part of the water service charge supports this argument.⁹ Since fees, unlike property taxes, are not deductible on the federal income tax, transferring this source of revenue meant that not only did residents get charged more, but the city did not have to wait so long to receive its money.

The council's decision to adopt all of the recommendations was made before additional scientific evidence on the nature of *C. parvum* could be obtained. This decision, made in the need to be seen as addressing the problem and taking decisive action to resolve it, meant that the possibility of an overkill response existed. Second, the rush to implement the changes did not allow for sufficient time for city engineers and contractors to fully determine the conditions under which the new equipment would be operating, as in the case of the particle counters and the floc driver. Further, with the installation of multiple systems at once, there was no time to determine the effectiveness of each improvement and to determine its maximum efficiency of operation. Although each of the proposed changes would improve water quality when considered individually, the combined effect could not be measured until they were installed. In the tradition of the law of dimin-

ishing returns, implementing all of the improvements together meant that the change in quality that each gave was marginal at best. If a longer time to adopt the new implementations had been allowed for, many of the problems could have been eliminated.

All of these examples are evidence that the city's improvement program was less concerned with real quality issues than with improving public perception of the water department, and by extension, the city itself. Since the crypto crisis had largely been caused by the introduction of a new variable into an existing treatment equation without a proper procedure for testing whether that variable was the best solution for a problem, it seems that introducing multiple new variables into the system would create even more problems. A more measured investigation, less dependent on time pressures, would have eliminated many of the problems involved, such as the fact that the floor of the settling basin was insufficient in strength to support the greater weight of the new baffle shaft or that the humidity in the pipe galleries was too high to permit proper operation of the new electronic monitors placed there. With more time available to fully examine the plants and their operations, the potential for these mistakes could have been eliminated and other existing hazards recognized.

While these improvements were taking place, other necessary improvements were not. One glaring example concerns the electrical transformer housing located outside the Linnwood plant. The base of this housing, through which high voltage is transmitted into the pump building, had cracked in 1991 and had the potential for sparking when water from rain or snow leaked into the housing. The transformer station was located directly next to the ammonia tanks, where the highly explosive gas would explode if it received such an electrical charge, causing damage and possible fatalities over a large portion of the eastern side and downtown regions of the city. Electricians at the Linnwood plant had tried unsuccessfully to get funding to fix the problem since it was discovered in 1991; it was finally fixed in 1994 at the direct intervention of common council president John Kalwitz.¹⁰ Despite the possibly deadly outcome of this problem, none of the three consultants who made recommendations regarding plant improvements in the wake of the *cryptosporidium* episode noticed it.

How much improvement was necessary? Nationwide studies performed by the American Water Works Association between 1990 and

1995 indicate that the average concentration of *cryptosporidium* oocysts in United States surface waters were 10.2 oocysts per hundred-liter sample and that the oocysts were found in 60 percent of untreated surface waters and 17 percent of treated waters on a regular basis.¹¹ Surprisingly, surface waters around Milwaukee, including Lake Michigan, were found to contain no oocysts during the testing. Additional testing by the Wisconsin Department of Natural Resources found that the only location where *cryptosporidia* were found near Milwaukee on a regular basis was in the output of the sewage treatment plant. Other than that location, the highest level ever found in Lake Michigan water was 2.8 per 100 liters, far below the national average.¹²

Of course, there is no way of knowing what the levels of *cryptosporidium* were in Milwaukee water during the 1993 outbreak. It is significant, however, that reports of diarrheal illness began to climb rapidly after the topic was discussed in the local media. Since testing did not begin until the onset of diarrhea, about a week after the high-turbidity incident, any measure of the levels a week earlier were unobtainable.¹³ However, given that Dupont's research indicates that the ID50 rate for infection in healthy individuals is 132 and given that most adults, who were the hardest-hit segment of the population, on average consume no more than a quart of water per day (four glasses), this would necessitate levels of *cryptosporidium* of over 10,000 per 100 liters in filtered water. None of the testing performed, including that on the ice, indicated levels even a thousandth as large. The results of the analysis on the relationship between media reports and complaint calls indicates that much of the episode can be attributed to Hawthorne effect.

Why, then, was the city so eager to expend \$90 million on a problem that might not even exist? As mentioned above, public perception of the Milwaukee water supply remains low. The expenditure of money to improve or, at least, change the treatment process provides the perception to the public that something is being done. Since the mayor had declared that the water crisis constituted an emergency, it was necessary for his public image to be seen as doing something to abate the problem.¹⁴ The reinforcement by the media that these changes were necessary—despite the facts that only 338 cases of *cryptosporidium* were confirmed, with 70 percent of them occurring in immune-suppressed individuals, and that healthy individuals, once infected, could not become ill again—was not discussed.

Future changes outlined for both plants include the installation of SCATA, a computer-driven monitoring system, and the subsequent reduction by 20 percent of operation crew size from five to four. In contrast, the Chicago Jardine Filtration Facility, which is about three times as large as Milwaukee's Linnwood plant and ten times larger than Howard, has crews of thirty.¹⁵ While SCATA purports to provide greater protection for water quality, in that it includes the ability to summon additional personnel in the event of problems, the fact that operations crews will be cut might well cause problems to develop that might be forestalled by the retention of a larger crew.

The 1993 *cryptosporidium* episode is just the latest example of how politics and the idea of proprietary service have shaped water policy in Milwaukee. From the beginnings of the system, when fraud and corruption shaped public perception to believe that only a board composed of private citizens could effectively establish a water system, to the denial of service to a large segment of the city population because of their lack of political influence, through the delays in the construction of a filtration plant, the imposition of state regulation, and the 1993 crisis, the provision of water in Milwaukee has always depended on what the city officials believed would make money rather than what might be actually needed at the time. At every stage, there were individuals who tried to convince the appropriate officials that they were following an improper course, yet they were consistently ignored. The decision-making process broke down because of political pressure that "something be done." The decision to solve the problem by throwing money at the water department made it appear that something indeed had been done. It wasn't, however, necessarily the right thing.

Over two thousand years ago, the Roman philosopher Marcus Tullius Cicero said, "The welfare of the people is the highest law." In a business, the highest law is to make money for the stockholders who own the company. In a city, there are no stockholders, although residents can be assumed to meet this function. In this case, using the profits (tax revenues and income generated through fees) to pay out-of-town or out-of-state vendors defeats the purpose of reducing costs. Income is ultimately lost from the city (business) when funds previously spent internally, generating a return through property taxes and fees, go elsewhere. In addition, the sense of community, which often

has more to do with the choice of potential residents and businesses to move to a certain city, is lost. The ability for redress over poorly performed services, or even services not performed, is lost when workers are low-paid temps or private contractors. With no investment in the city other than their paychecks, these workers have no larger ties to the community to inspire them.

Even as many large corporations downsize in the 1990s, others are learning that educating their workers to perform work previously outsourced reduces expenditures, increases productivity, and leads to a greater sense of worker loyalty. Every year, companies that do this are listed as the best places to work in America. If Milwaukee wants to be a city where people want to live and work, it would be well for it to follow the trends of these companies rather than the profit chasers of Wall Street. If not, it might find that competition has made it unprofitable for residents to remain.

Notes

1. Blake, *Water for the Cities*, pp. 212–37.
2. This stage varied in date and in time of city development, but generally seemed to have appeared when a city reached a population of around 80,000 to 100,000 people, depending on density. At that point, population will overwhelm an ecosystem's ability to purify a water table and dispose of wastes through natural means. Cities in areas with less rainfall, denser population, or high temperatures in winter might reach such a point earlier in their growth.
3. Blake, *Water for the Cities*, pp. 212–37.
4. Monkkonen, *America Becomes Urban*, p. 213. One of the few boards that was effective was New York State's Public Health Council, which was staffed with private citizens. It had oversight over the social welfare programs existing in the state and had the power to supersede local and state political control, something that Milwaukee's boards and city departments never had. The Public Health Council was also staffed by professionals in the area of public health, unlike most of Milwaukee's boards. Walter Trattner, *From Poor Law to Welfare State: The History of Social Welfare in America*, 4th ed. (New York: Free Press), p. 142.
5. The ACS did not recommend filtration until the 1930s. Most industrial processes did not require filtered water, and chemists were not rou-

tinely employed at filtration plants. The presence of a scientific organization in the opposition to the filtration plant gave the false impression that the scientific community had not reached a consensus on the subject of filtration.

6. The 1940 population was slightly over 500,000 and the city occupied 43.7 square miles. This compares to a population of 71,440 and a size of 15.068 square miles in 1870. U.S. Census Bureau, *16th Census, Population*, 1940, vol. 1, Population, p. 70. *Milwaukee Record of Annexation*, Milwaukee City Engineer, 1988.
7. From 1895 to 1959, there was only one Democratic governor of Wisconsin, Albert Schmedeman, who served from 1933 to 1935. Philip LaFollette, who succeeded Schmedeman in office, was a Progressive and strongly disliked the Socialists and distrusted their motives. All other serving governors were Republicans. (Orland Loomis, a progressive elected in 1942, died before inauguration. He was succeeded by the elected lieutenant governor, Walter Goodland, a Republican.) *State of Wisconsin Blue Book*, 1991–92 (Madison: Wisconsin Legislative Reference Bureau), p. 655.
8. This became even more marked after the newspaper bought the local NBC affiliate.
9. *City of Milwaukee Budget*, 1993, p. 232.
10. The author brought the problem to Kalwitz's attention, and later received letters from both Kalwitz and the chief electrician thanking her for helping to solve the problem. Personal communication, John Kalwitz to Kate Foss-Mollan, January 16, 1994; Personal communication, Linnwood Water Plant Chief Electrician to Kate Foss-Mollan, February 1, 1994.
11. *Waterweek*, July 6, 1996, p. 6.
12. *Cryptosporidium* monitoring data for both plants indicates that even this level is rarely reached. Results for 1995 and 1996 indicate that the highest count found in the raw water in those years was 0.39 oocysts per hundred liters of water. No cysts have been found in treated water. Milwaukee Water Works 1994 and 1995 *Cryptosporidium* Monitoring Results, Howard and Linnwood Treatment Facilities.
13. Attempts to measure the presence of oocysts in ice made from water on the days of high turbidity were inconclusive. While oocysts were found, they were in damaged condition from the freezing process, and it was not possible to determine how many oocysts the fragments that were found actually added up to, although the estimates of the microbiologists ranged from 1 to 3 per 100 liters. *New England Journal of Medicine*, 1993.
14. Apparently the common council was also concerned with the mayor's

handling of the situation, as indicated by their enacting the new plan for handling emergency situations, which placed control of government comment and response in the hands of the council.

15. Chicago Water Department, *Operations of the John Jardine Water Filtration and Treatment Facility*, January 27, 1997.

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