

Report on the Early History of the Alexandria, Virginia Sewerage System

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In 1952, the Alexandria City Council created the first sanitation authority in Virginia. Four years later, the City of Alexandria Sewer Authority opened a water-treatment facility near the mouth of Hooff's Run. Since 1956, the water treatment facility has treated the city's sewerage discharge, purifying the sanitary water of the city and discharging clean water back into the environment. In response to more stringent environmental standards and renewed efforts to restore the health of the Chesapeake Bay, the Alexandria Sewer Authority upgraded the facility during the late 1990s and through the 2000s. Now known as Alexandria Renew Enterprises after a 2012 rebrand, the sewerage facility remains a crucial component of the city of Alexandria's efforts to maintain the health and prosperity of its citizens and environment.

This brief overview of the city of Alexandria's twentieth and twenty-first century efforts to manage and treat its sewerage is well documented in city records, newspapers, and the annual reports of the Alexandria Sewer Authority.¹ However, as much as these recent efforts to manage waste- and stormwater are known, the city's earlier struggles to accomplish these goals have largely remained a mystery. The obscurity of Alexandria's early sewerage control efforts might mistakenly suggest a dearth of water management efforts in the nineteenth century. As this report demonstrates, since the city's founding Alexandrians exerted immense efforts to manage the excess stormwater and to dispose of the human and animal wastes by incorporating new technologies and practices to respond to evolving knowledge of human health and the environment of a growing regional entrepôt.

In addition to exploring how and why Alexandrians in the long nineteenth century² strove to manage excess stormwater and the disposal of wastes – the two primary functions of a

¹ For example, the 2014 Annual Report for Alexandria Renew Enterprises enumerates the achievements of Alexandria's sewerage treatment and state and federal environmental laws since the 1940s.

² The "long nineteenth century" refers to the period of this study that encompasses the era between 1780 and 1920.

sewerage system – this report reminds its readers of the importance of a properly functioning sewerage system for the medical and economic health of a city. Problems that plagued nineteenth-century Alexandrians, such as chronic standing water, poor drainage, or release of untreated effluent, could still imperil the city but have largely disappeared due to intelligent management of facilities like Alexandria Renew. The work done to protect modern society from such hazards is usually out of people’s minds as long as the sewerage system functions properly. By drawing attention to the ways that early Alexandrians succeeded and failed to respond to problems with sewerage reinforces the importance of proactive management of resources to safeguard the environmental resources and well-being of the city of Alexandria.

The following pages offer a full analysis of the nineteenth century Alexandria sewerage system including its several components and their significance for the city. The first section defines what is considered part of a sewerage system and expands the definition to include all features related to the removal of surface water and wastes from the city. The second section examines the historical significance of studying sewerage systems and why historic sewerage systems are important to understand from the perspective of a professional historian. Next, the report analyzes the Alexandria sewerage system as it existed before 1870. This early version of a sewerage system did not include public subsurface sewers but consisted primarily of open gutters and street grading. The fourth section details the development of the subsurface conveyance system that was constructed beginning in the final third of the nineteenth-century and incorporated into the modern sewerage system when the system became reoriented to the Hooff’s Run treatment facility in the early 1950s.

Section1: Public Sewerage Systems, A Definition

Before continuing with an analysis of the history of Alexandria's public sewerage system, it is prudent to clarify what I consider a "public sewerage system." For the purposes of this report, I define a sewerage system as the interconnected elements of an infrastructure that collectively or separately work to fulfill two fundamental functions: to facilitate the drainage of excess stormwater from the city and to expedite the removal of wastes. Further qualifying the sewerage system as "public" indicates the expenses made to construct, improve, and maintain the services of the system came from the community. In this case, the Alexandria municipal government was the entity responsible for improvements and maintenance to the system. Although some private Alexandrians financed improvements to properties to accomplish the essential objectives of a sewerage system, this report specifically examines those improvements that were funded and controlled publicly by the city. However, even private sewers required government regulation and, as the report will demonstrate, government officials surveyed private as well as public structures to maintain the effectiveness of the overall sewerage system.

Often what comes to mind when considering a public sewerage system are the subsurface pipes and culverts that discreetly convey stormwater and effluent from the city. There are, however, a number of other, more visible components that comprise a public sewerage system. Streets, for instance, are often improved by grading and pavement to function as a vehicle for the drainage of storm water. When it rains, the street's grade directs excess water toward a predetermined direction based on the degree and orientation of surface slope. However, ungraded or improperly graded streets allow stormwater to collect in pools that makes travel difficult and could endanger the health of city inhabitants. Unpaved streets similarly cause health and travel

concerns since they absorb more water and may become viscous pools of mud with the accumulation of superfluous water. Pavement makes streets more impermeable and, if properly graded, helps direct water away from low areas and further avert the problem of pooling. Paved gutters along the side of streets supplement the grading of streets by channeling accumulated water in a quickened and concentrated flow that can wash away the dirt, grime, rubbish, and other materials that happened to be deposited on streets and gutters. Therefore, surface drainage via streets and gutters satisfied both the removal of wastes and the draining of excess water from the city.

The city's streets and gutters were collection points for waste materials as it was common practice throughout the long nineteenth century for people to dispose of rubbish, ashes, and other wastes on the streets. Additionally, the large number of livestock living in cities generated an excess of animal excrement that was often deposited indiscriminately over the streets. Animal and solid wastes discarded in public spaces created hazards to health and urban transit. Intermittent stormwater could carry away some of wastes from the city streets but the city relied on public employees, known as scavengers, hired by the city to regularly collect and dispose of the waste products. Furthermore, cities hired street cleaners to scrub the city streets to supplement the city's cleanliness. Thus, scavengers and street cleaners formed a vital part of a public sewerage system.

The component of a public sewerage system most likely thought of are the subsurface conduits that convey stormwater and effluent hidden from sight beneath the city streets. Cities constructed underground pipes using pointed bricks and prefabricated iron and vitrified pipes. The earliest forms of these conduits were narrow metal pipes buried beneath intersecting streets connecting congruent gutters that permitted a level street surface at intersections. (see Figure 1)

The larger, pointed brick construction of subsurface pipes were built with open ditch construction techniques, in which workers dug a large ditch and masons built the structure of the pipe brick by brick. (see Figure 2) The subsurface system included drains, catch basins, and manholes necessary to conduct stormwater and effluent into the system and to grant access for system maintenance. Originally, sewer pipes led to a water body, such as a nearby creek or river, where the excess stormwater and effluent met and combined with flowing water without additional treatment. Wash from the city streets through the subsurface conduits contaminated the water body and led to considerable pollution that was not addressed until well into the twentieth-century.



Figure 1 - Mansion House, Alexandria, Va. during the Civil War. Note the gutter at the bottom-right of the image that passes under the side street. (Library of Congress Prints and Photographs Division)



Figure 2 - Laying Sewer Main in Portsmouth, Virginia. Alexandria's sewer mains were constructed using open ditch techniques as is seen here in Portsmouth, Virginia. (Library of Virginia)

Before the construction of subsurface conduits, urbanites used privies and cisterns to dispose of human wastes. These structures were essentially large holes in the ground that were usually located at the far corner of residential backlots. The walls of the privies and cisterns were brick or stone masonry that dually reinforced the structure and confined the effluent from seeping into the adjacent earth. Residents deposited human wastes, as well as household garbage and rubbish, into the caverns which filled gradually over time. Once filled, the hole was covered and a new hole was dug. The privy-cistern system worked well as long as the wastes were contained, but as happens over time, cracks formed in the superstructure and allowed for the contamination of local ground water. Also, the crowding of thousands of people within the limits of a city led to an overabundance of wastes in a highly concentrated area. Additionally, the introduction of running water into homes by means of a fresh water supplier enabled the creation

of indoor plumbing and toilets flushed with water that overtaxed the privy-cistern system. Without anywhere else to go, the waste water poured into the cisterns and privies causing them to fill up and fail at a much more rapid pace.

Altogether, these improvements, whether existing concurrently or in succession, encompass a sewerage system. However, there may be some confusion between the terms “sewer” and “sewerage.” As mentioned above, sewerage refers to the entire system used to manage and dispose of storm and sanitary water. Sewer, on the other hand, refers to the underground conduits used to conduct these materials. These terms will be key to keep in mind in section four of this report when I illustrate the construction of underground conduits in Alexandria between 1870-1920.

Section 2: Significance of the History of Sewerage Improvements

American public sewerage systems have received scant attention by historians. When they are addressed, sewerage systems are usually reduced to a side topic relating to humans’ impact on the environment or conditions related to public health. Joel Tarr, possibly the most prolific historian on the topic, has written on sewerage systems in the context of a technology that addresses the human impact on the environment. Tarr examines the advantages and disadvantages of sewerage improvements and served as the lead editor of several collections of articles written about sanitary improvements in cities. Martin Melosi also examined sewerage systems in depth in *Sanitary City*, as he traced urban sewerage infrastructure from the colonial era to the present. Melosi, Tarr and other historians primarily focus on the largest cities, namely

Boston, Chicago, London, New York, Paris, and Philadelphia.³ While addressing these larger metropolises, historians have largely overlooked smaller cities. The history of the sewerage systems of these cities are largely left to local studies similar to this report.

There are a number of academic and empirical reasons to understand the history of Alexandria's public sewerage system. Often, academic studies are meant to answer research questions so as to better understand the historical processes of the past and how we can engage in a better future. Yet in the end, academic historical research tends to ask one basic question: How did people in the past understand and live in their world? By studying the efforts made in Alexandria to address public sewerage problems during the nineteenth century, this report elucidates a clearer understanding of what life was like in the historic Potomac city. Nineteenth century Alexandrians daily dealt with an excess of stormwater and the removal and disposal of wastes. Stagnant water and irritating nuisances, as human and animal wastes were often called, posed particular dangers to public health and property. Although they did not specifically write about their experiences, nineteenth century Alexandrians endured the problems of lacking a modern sewerage system. Therefore, by understanding how Alexandrians responded to the problems of their time, we can better understand how historic peoples understood and lived in their world.

Mirroring other historians' work on public sewerage systems, the study of Alexandria's public sewerage system can offer compelling information to advance our understanding of the effects of technological innovation on the environment and on public health. In regards to

³ See: Joel A. Tarr and Gabriel Dupuy, eds., *Technology and the Rise of the Networked City in Europe and America* (Philadelphia: Temple University Press, 1988); Joel A. Tarr, *The Search for the Ultimate Sink: Urban Pollution in Historical Perspective* (Akron, OH: The University of Akron Press, 1996); Martin V. Melosi, *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present* (Baltimore: The Johns Hopkins University Press, 2000); Barbara Gutmann Rosenkrantz, ed., *Sewering the Cities* (New York: Arno Press, 1977).

environmental history, the Alexandria sewerage system can tell the story of human impact on the local environment and how man made innovations to control and dispose of storm water and wastes impacts the environment. Additionally, the Alexandria sewerage system's history engages in a discussion of public health. In this regard the system is examined by how nineteenth- and early-twentieth century Alexandrians worked to solve problems with public health caused by stagnant water and the accumulation of human and animal wastes. Further, the sewerage system can be studied as a component of the search and acquisition of potable water and the potential dangers to sources of potable water. Analyzing technological improvements in the sewerage of Alexandria in this way complicates the typical ascension model of technology – that technological improvements correspond with positive advancements in society – and instead we see both the positive and negative effects of technological achievements in sewerage systems.

In addition to a study of technology as related to public health and environmental history, the Alexandria sewerage systems offers evidence to how sewerage systems affect the local economy. Improperly drained stormwater could lead to stagnant pools that impede traffic along the streets, flood basements and cause other property damage, and decrease the real estate values in the city. Dried manure and other filth could be similarly destructive since the wind could carry the dust to coat commodities in stores and further damage salable goods in the city. Chronic problems could also repel potential business investments from the city to more favorable conditions elsewhere. The study of the Alexandria public sewerage system can therefore be a study regarding efforts to secure the local economy.

Lastly, a study of the public sewerage system is informative of the historic social conditions in Alexandria. Infrastructural improvements to streets, gutters, and subsurface conduits occurred in a particular order and can be spatially analyzed to investigate the

relationship between civic mobilization and contemporary socio-economic and racial characteristics in the city. For example, were improvements made to the sewerage system based on the commercial value of neighborhood real estate or by the degree of risk posed by sewerage problems for the city? Did the areas that were most in need of improvements receive them first or did class and race affect the order of improvements? Did the wealthy, controlling factions of the city prioritize improvements for their streets over others? These questions address major, complicated issues of civil government tackled by nineteenth and early-twentieth century Alexandrians and reflect how contemporaries understood social order, government, and the environment.

Studying the history of a public sewerage system produces empirical value for public education about civic and environmental resources. The history of local sewerage improvements reminds the lay population of the importance of the system to limit environmental pollution and health nuisances within the city. The historical sewerage problems that faced Alexandrians could still be present in modern society but for the accomplishments of the sewerage system. Additionally, understanding the trials of creating and maintaining a sewerage system reinforces the importance of adequately funding the system to meet its goals of preserving the health and environment of the city. Learning from the mistakes made during the initial construction of the system encourages greater forethought in spending taxpayers' money on infrastructure so that improvements can be made responsibly and in a way that limits the potential reoccurrence of problems that Alexandrians experienced in the past. The analysis of the history of a public sewerage system suggests that adequate funding and intelligent engineering will, in the end, save money and better preserve the environmental resources and ensure success in addressing sanitary issues in the future.

Section 3: Alexandria's Public Sewerage System to 1870

Having presented a working definition of what entails a public sewerage system and why studying the history of public sewerage systems is fruitful, it has now come to the point where the report can examine in-depth the historical evolution of the Alexandria public sewerage system. Because contemporary Alexandrians paid little attention to the components of a sewerage system in their typical correspondence, I primarily rely on official city records, such as official reports, correspondence with and between city officials, annual budget statements, and early photographs of city landscapes to construct an illustration of the city improvements and make conclusions about the system's impact on the inhabitants of the city.

The Natural Environment at the Settlement of Alexandria

The land on which Alexandria lies has been occupied for centuries. Native Americans lived in the area long before the first English settlers first cast eyes on the ridges overlooking the Potomac, making use of the numerous streams cascading toward the river for fishing and transportation. The first English settlers at the mouth of Hunting Creek established a seasonal warehouse where bundles of tobacco could be stockpiled before shipment to the mouth of the Chesapeake Bay and on to England. In 1749, the House of Burgesses approved a petition to establish a permanent town at the warehouse and founded the town of Alexandria.⁴

The site chosen for the town of Alexandria possessed a number of geographic advantages for commercial development. Located approximately 120 miles up the Potomac River, the town

⁴ Alexandria was then known as Belhaven.

was only a few miles below the point where maritime ships could no longer ascend yet far enough inland to provide access to northern Virginia's piedmont region. The Potomac River at Alexandria was deep enough to cater to ocean-going vessels allowing for direct overseas shipment from the port. Further, a protective cove occurred naturally along the west bank of the river near the settlement that provided shelter for ships from the strong Potomac current. This cove, which has since been filled in, allowed ships easy access to the shore and a tranquil anchorage.

Alexandria's colonial inhabitants were also blessed with an abundant supply of clean, flowing water that was a boon to a growing commercial village. The settlement was flanked to the north by Four Mile Run and to the south by Hunting Creek and Cameron Run. Into these waterways ran a number of smaller streams that drained the rising elevation west of the Potomac. The cascading water of these rivulets offered potential locations for water-powered grist mills that could centralize a grain market in Alexandria. Yet there were also low-lying points in the town that entrapped water and formed swampy marshland. These areas, however, would not become a major issue until urban expansion in the nineteenth century required their drainage for new land use. Early Alexandrians also tapped into the subsurface springs for potable well water that fostered a healthy population. With these natural geographic advantages, Alexandria blossomed during the eighteenth century to become one of the leading ports along the British North American coast. Yet, as we will see, these natural advantages required maintenance to support a growing population. Even in the last quarter of the century, Alexandrians were already noticing fractures in the natural infrastructure and considered internal improvements to remedy emerging crises.

Improving the Early City

Some of the first improvements made by early settlers to Alexandria, after securing shelter, was constructing receptacles for the disposal of wastes and to procure fresh water for household consumption. This later task often meant daily trips to the river or public wells located at several street intersections, although occasionally a private well was located in the basement of a residence.⁵ Although wells could be dug wherever uncontaminated water could be procured from the water table, which included inside basements, the strategic decisions to locate places to dispose of waste was of more consequence to avoid concentrations of miasmatic smells thought, at the time, to be the cause of disease. As a result, privy vaults were usually located far in the rear of buildings.⁶

Surprisingly, there is a lot of information available detailing the structures – wells, privies, and cisterns – constructed in early Alexandria to procure fresh water and dispose of wastes. This is due to the archaeological work of Steven J. Shephard. Shephard excavated 78 ground structures between the 1960s and 1980s and reported his findings in an article presented at the First Joint Archaeological Conference in January 1989. Shephard found that the structure of the shaft indicated its intended use, based on depth and construction of the brick lining. Alexandrians deposited household trash into the wells and privies after they fell out of use. From an analysis of artifacts and rubbish, Shephard determined the date in which the shaft fell into disuse. Nearly half of the structures surveyed by Shephard fell into disuse during the late-

⁵ Steven J. Shephard, *Obtaining Water and Discarding Waste: An Overview of Attitudes and Practices in Nineteenth-Century Alexandria, Virginia* (Alexandria, VA: Alexandria Archaeology Publications, 1988), 3-4. A medicinal spring was located on the north end of the town. Known as the Chalybeate Spring, the city passed ordinances in 1818 to protect the water source.

⁶ Shephard, *Obtaining Water and Discarding Waste*, 4; Joel A. Tarr, "Sewerage and the Development of the Networked City in the United States, 1850-1930," in *Technology and the Rise of the Networked City in Europe and America*, ed. Joel A. Tarr and Gabriel Dupuy (Philadelphia: Temple University Press, 1988), 160.

nineteenth and early-twentieth century, the era in which the greatest initial expansion of the underground sewer pipes took place.⁷

Access to privies was an obvious necessity for early Alexandrians. However, according to Shephard's archaeological evidence, individual household privies may have only been available to affluent families. An excavation of an early nineteenth-century free black neighborhood showed that a lot was used as a community privy area where several outhouses on platforms existed. The row of outhouses in this neighborhood were regularly moved around the lot so that Shephard's excavation uncovered a layer of waste that was produced at the same excavated elevation. Shephard found that shaft-type privies did not exist on the site until houses were constructed there sometime after 1870.⁸

Privy vaults were designed to contain all of the materials that were deposited in them by lining the sides and bottom of the shaft with stone or brick masonry. Over time, cracks in the masonry or the overflow of the shafts allowed for seepage from shafts and polluted the local aquifer. Recognizing the danger of the effluent pollution, even though they did not fully understand why it was dangerous, the city passed a number of laws to limit the potential health hazards of pollution. In 1807, the city passed a law that required privies to be kept clean and issued a fine of \$2.00 each day that the privy was considered a nuisance. To put this in perspective, the daily wages of a non-farm worker was \$1.00 per day.⁹ In 1810, Alexandria passed an ordinance that prohibited wells from being dug for privies and for limiting wells that were currently used as privies after ten years. A year later, the city regulated scavengers, who

⁷ Shephard, *Obtaining Water and Discarding Waste*, 11-12.

⁸ Shephard, *Obtaining Water and Discarding Waste*, 5.

⁹ This data is based on calculations of Stanley Lebergott. Stanley Lebergott, "Wage Trends, 1800-1900," in *Trends in the American Economy in the Nineteenth Century*, ed. The Conference on Research in Income and Wealth (Princeton, NJ: Princeton University Press, 1960), 449-499.

went around the town every Friday to remove “all filth and dirt which shall incommode the inhabitants” and take it outside of the town to a designated area for dumping. The regulations also required that scavengers could only clean privies and privy-wells at night between 11:00 pm and 4:00 am. In 1874, the city further regulated the scavenger so that he could empty privies by appointment only and set a per-foot cleaning fee that was annually regulated by the Alexandria Common Council.¹⁰

Street improvements were the largest component of the sewerage system in this early era.¹¹ At first, streets were little more than paths reserved for traffic that structures, like buildings and sheds, were prohibited from encroaching upon. The natural grasses were gradually removed from the streets with repeated use and they became essentially dirt paths. When it rained, however, streets turned to mud with large standing puddles where grading proved insufficient to remove the excess water until it either soaked into the ground or evaporated. Until then, passage along these morasses was difficult. In the other extreme – when conditions were dry – the wind carried the dust to coat exposed salable goods with the grime from the streets damaging the products and leading to diminished retail prices and loss of property value.

It is unclear when and how Alexandrians began to improve the city’s streets, but we do know that significant improvements to the city’s infrastructure occurred by the end of the eighteenth century. According to Shepherd, Alexandrians moved tons of dirt from the bluffs that overlooked the original cove to cut an easier passage for the streets to descend to the waterfront. Today, these cuts are most evident along King Street between Union and Fairfax Streets. The earth from the bluffs was moved downhill to fill in the cove between 1750 and 1790. This

¹⁰ Shephard, *Obtaining Water and Discarding Waste*, 7-8.

¹¹ In this section I draw extensively from my article, “Cobblestones: Street Pavement in Early Alexandria,” *Arlington Historical Magazine* 15 (2014): 49-60.

removal of earth also helped to grade King Street and create Union Street along the waterfront to facilitate drainage and make travel easier in the city.¹² By the end of the War for American Independence the city of Alexandria was ready to further improve streets by paving primary streets with cobblestones. This may have been prompted by the renewal of maritime trade brought on by peace in the postwar era, by the perspective of the decision to relocate the seat of the government to the Potomac by the Residence Act of 1790, or a combination of both. Regardless, the Alexandria town council, on February 21, 1794, directed its Commissioner of Streets to pave several blocks of King Street, Fairfax Street, and Prince Street. As part of their instructions, they decreed that the “said Streets to be leveled as to carry of [sic.] the water in the most convenient manner.”¹³ The council followed up this directive with additional orders to improve sections of Fairfax, King, Prince, Royal, and Union streets as well as alleys leading into these streets.¹⁴

Of particular concern in these early street improvement initiatives was the capacity for streets to aid in the drainage of the city. The instructions for improving the streets stipulated that water should be allowed to flow freely and easily off the streets and not pool in any location. This pooling of water was particularly problematic in certain areas of the town where streets remained unimproved. Of note was the intersection of Washington and Prince Streets and nearby Royal Street, each of which the pavement improvements had not yet reached. In these locations in August of 1795, a health officer reported “there are large ponds of water...[and] deep muddy

¹² Steven J. Shephard, “Reaching for the Channel: Some Documentary and Archaeological Evidence of Extending Alexandria’s Waterfront,” *The Alexandria Chronicle* (Spring 2006): 4-5.

¹³ Wesley E. Pippenger, ed., “Minute Book for the Town of Alexandria commencing February 7th 1794,” in *Records of Alexandria (Arlington) County, Virginia* (Richmond, VA: The Library of Virginia, Archives and Records Division, 1995), 210.

¹⁴ *Ibid.*, 212-215.

stagnated waters” present. The problem in this case was solved by using dirt to fill in the holes that contained the ponding.¹⁵

The free flow of water remained a concern for the municipal government in the nineteenth-century. A survey of the 1817 Alexandria council minutes demonstrates this unease in ordinances to continue paving initiatives. By then, the improvements had reached further inland to pave sections of Washington and Columbus Streets and included Wolfe Street between Prince and St. Asaph streets. Additional improvements to footways and gutters occurred on Union, Water, and Wilkes streets. There must have been problems with drainage along Union Street in 1817 since the council ordered the street repaved to allow for the “freer movement of water in gutters.”¹⁶

Streets, of course, were not the only locations where water could collect within the city. The alleys between and behind the buildings could also be sites where stagnant water pooled. Because of this hazard, the council – as early as 1795 – ordered alleys paved, like the streets, with cobblestones to allow the free runoff of water. The alleys were graded and often incorporated a central gutter that permitted water to drain by gravity to the street gutters and then directed toward the most convenient path to the river.¹⁷

Responsible for overseeing the construction and maintenance of street improvements was an official hired by the city. This position was first identified as the Commissioner of Streets but later became the prevue of the Superintendent of Police. The Superintendent of Police reported to the Mayor and the Alexandria council and had a number of responsibilities related to the

¹⁵ Ibid., 215.

¹⁶ Alexandria, Va., *Alexandria Common Council Minutes, 1817-1830 Vol. 1* (Alexandria, VA: Alexandria Archaeology Publications, 1988), 7-11, quote on p. 11.

¹⁷ Pippenger, ed., “Minute Book for the Town of Alexandria commencing February 7th 1794,” 215; William Francis Smith and T. Michael Miller, *A Seaport Saga: Portrait of Old Alexandria, Virginia* (Norfolk, Va.: The Donning Company, 1989), 39.

execution of the laws of the city. These tasks included issuing fines to property owners for violations of city codes, collecting fees for the repair of streets and gutters adjoining the property, and directing scavengers for the proper removal and disposal of nuisances in the town. The Superintendent of Police also investigated and responded to petitions to the municipality for a number of reasons, such as the presence of nuisances, malfunctioning water pumps, and damaged streets, gutters, and footways.

From the extent of the correspondence between the Superintendent of Police, the residents of Alexandria, and the municipal government, it is possible to piece together a sketch of some of the problems that Alexandria's officials addressed to keep the city functioning properly. We are particularly fortunate that so much of the correspondence of William M. Mills, the Superintendent of Police during 1850, survives in the archival record. Coupled with petitions written to the council and opinions of city surveyors and other official, the correspondence gives us a deeper understanding of how the construction and maintenance of city infrastructure worked. From these records, we can assemble a rather thorough account of the various tasks addressed by the Superintendent of Police and identify reoccurring patterns in the maintenance of the Alexandria infrastructure.

A typical petition sent to the common council requested street maintenance or improvements. For example, on February 15, 1848, Tomas & Dyer submitted a request to grade Gibbon Street from their property to Union Street. This, as Tomas and Dyer claim, would make the streets passable for their carts carrying lime and aid in their commercial venture.¹⁸ Other petitions requested some special assistance from the municipality. In the case of Carles Neale's August 1849 petition, this request was to erect an awning to adorn a new store front. In another

¹⁸ *City of Alexandria, Va., Correspondence of the City Council and City Officials, 1805-1920 [MICROFILM], Local History/Special Collections, Alexandria Library. Hereafter referred to as "Official Correspondence."*

case, that of Mrs. Kinsey Griffith, the request was to release her from the obligation to pay for laying pavement on a vacant lot adjacent to her property on the south side of Prince Street. She requested that she be released from this obligation because of her limited financial means and that the paving expense would be too much of a burden.¹⁹ In each of these cases, the petition was forwarded to the Superintendent of Police for his opinion and, if need be, a report to the city council after a supplemental inspection.

An example of this referral and recommendation process is apparent in a letter from William Mills to Robert Jamieson, the president of the Common Council. Mills responds to a petition from Lewis McKenzie and several other residents that had been referred to him. In the remonstrance, the petitioners requested the installment of flagstone footways at the intersection of Washington and King Streets, noting that the walkway was badly worn and unsafe for public use. In the course of explaining why he recommended that the petition be granted, Mills reasoned that not only is the structural integrity of the walkway damaged, but that it also lies “as the great midway Central point of the whole Town, and where our fellow citizens have to pass and repass in large numbers to their respective places of Worship.”²⁰ This demonstrates that the geographical positioning of infrastructure in town, as related to the social routines of the community, affected the decisions made by the Superintendent of Police in his recommendation of infrastructural improvements.

The duties of the Superintendent of Police also stretched to managing the water resources of the city. For example, in response to a petition first signed by Henry Bortz requesting a new pump to be erected at the corner of Prince and West Streets, Mills once again responded with a detailed explanation of his considerations. Mills established that the location was within the

¹⁹ *Official Correspondence* [MICROFILM].

²⁰ Letter from Wm. M. Mills to Robert Jamieson, October 8, 1850, *Official Correspondence* [MICROFILM].

corporate boundaries of Alexandria and near a number of recently occupied buildings. Since there was no water pump within a reasonable distance of these buildings, Mills considered it prudent to recommend the erection of a pump since, without a pump the structures would be at an increased susceptibility to fire. Mills recommended that the city dig a well at the location that was 22 feet deep by 4 ½ feet in diameter. This depth would reach what Mills called the land springs and increased, according to Mills, the likelihood of sustained potable water for the foreseeable future.²¹ The concern that Mills had in this case that led to his recommendation for improvements centered on the availability of drinking water and the prevention of fires.

Mills was busy during the first half of 1851 addressing problems with the city's drainage. In January, Mills responded to a petition for paving a gutter on the east side of Pitt Street between King and Cameron. Due to erosion of the existing stone gutter and shallow grade, pockets of water draining from King Street and running northward down the east side of Pitt Street collected in puddles and produced foul stench from the decomposing debris carried by runoff from King Street. Although Mills recommended improvements to the gutter, he was also concerned about the low ground further north on Pitt Street and the effects of the runoff from a rather large drainage area on the adjacent properties.²² Several months later, Mills reported to the council that a large ditch that drained much of the southern neighborhoods and led directly into Hunting Creek was filling with debris. He recommended that the city work to keep the ditch open to ensure that the ditch continued to moderate a marshy area on the south side of the town. This action, like that on repairing the Pitt Street gutter, was based on the preservation of the health of the city. Even though some of the project occurred outside of the corporate limits, Mills still recommended action because "in my opinion it did not become less important on that

²¹ Letter from Wm. M. Mills to Robert Jamieson, February 8, 1851, *Official Correspondence* [MICROFILM].

²² Letter from Mills to Jamieson, January 14, 1851, *Official Correspondence* [MICROFILM].

account, as a safe guard against sickness during the fall season of the year.”²³ From these letters, we get a clear indication that drainage of the city streets and availability of potable water was of primary concern to the public health and safety of the city. We also get a sense of the thought of city officials of the time about the concern for the corporate boundaries, since once the drainage was removed from the city it was no longer thought of as a substantial concern to the city’s inhabitants.

This idea of corporate limits and connectivity to the areas beyond the city – particularly as it related to the impact across the artificial boundaries established by the civic government – plays a significant role in a remonstrance from M. J. Hooff. In October 1865, Hooff petitioned the city council as a legal representative of his mother, Martha J. Hooff. Martha owned land outside, but adjacent, to the corporate limits commonly referred to as “Hooff’s Meadows.” She claimed that sometime in 1861, the city constructed a trunk line in the vicinity of King Street that directed water from the northwestern portions of the city into Hooffs Run. In constructing this conduit, the embankment that protects Hooff’s Meadow was damaged and, since then, erosion of the bank as caused by the increased flow of water into Hooffs Run led to further damage of the meadow. The petition concluded with a request “to examine into the case; that a just and reasonable compensation be allowed her, for the damages she has sustained, and that the said embankment, may be restored to its pristine condition, so as to protect her property from any farther injury.”²⁴ This matter was investigated by a committee, which must have disappointed Hooff when it decided that there was no just claim for damages that could be charged to the corporation of the city of Alexandria.²⁵

²³ Letter from Mills to Jamieson, May 13, 1851, *Official Correspondence* [MICROFILM].

²⁴ Petition from M. J. Hooff to the City Council of Alexandria, October 24, 1865, *Official Correspondence* [MICROFILM].

²⁵ Letter from the Committee to Council, April 24, 1866, *Official Correspondence* [MICROFILM].

It is clear from the above examples that the city infrastructure required routine investment and maintenance in order to maintain proper functionality. This included repairing streets and gutters, installing and fixing water pumps, constructing new footways and grading streets. There were also the less common tasks of repairing damages caused by flooding and cleaning out conduits for drainage. The continuous stress of maintaining the infrastructure, in particular the troublesome cobblestone pavement, eventually led to decisions in the final third of the nineteenth century to abandon some innovations (such as the cobblestone pavement) and to introduce new technologies to the city, such as vitrified brick and macadam pavements and subsurface combined sewers.

Alexandria in the 1840s and 1850s

During the 1840s and 1850s, Alexandria experienced a number of changes that would have a lasting effect on the city as well as its sewerage system. First, a canal was constructed that linked Alexandria's waterfront to the Chesapeake and Ohio Canal at Georgetown. Next, the city and the adjacent county returned to the jurisdiction of Virginia after being a part of the District of Columbia since 1800. Lastly, the Alexandria Water Company began operation to supply fresh water to subscribers in Alexandria.

The Alexandria Canal, the first of these mid-century improvements affecting Alexandria, indirectly affected the city's sewerage system. The canal was designed to connect Alexandria with the Chesapeake and Ohio Canal at Georgetown and enable canal traffic to avoid the swift currents of the Potomac River around Mason Island.²⁶ Construction began on the canal and

²⁶ Mason Island is now known as Theodore Roosevelt Island. In the early nineteenth century, a causeway was constructed between the southern shore and the island to direct the flow of water against the Georgetown waterfront to help prevent the sedimentation of the Georgetown. This closed the calm, backwater channel between the island and the southern shore that river men used to reach Alexandria, leading to a dramatic decrease in upriver commerce

aqueduct bridge in 1833 and opened to traffic in 1843. However, the city did not fully benefit from this project until the Chesapeake and Ohio Canal reached the coal fields in western Maryland. The Alexandria Canal had little initial impact on the city's public sewerage system. The city considered extending the canal through the city during the late 1840s and 1850s. The proposed urban canal had the potential to create an open conduit for drainage but concerns over an open sewer in the midst of the city and the impediment to pedestrian and cart traffic caused the proposal to be scrapped.²⁷

Even though the Alexandria Canal ended on the north side of town, the canal should not be overlooked as a component of the public sewerage system, particularly in its capacity as an open ditch to carry water and wastes to the river. This was one function of the Washington Canal, albeit an unintentional one, that led that canal to become so rancid as to be suffocating to passers-by. A number of Washington's now forgotten creeks that ran into the Washington Canal carried debris and sewerage unimpeded into the waterbody. The canal became so polluted from the sludge that it was unusable. Without a profitable solution to clean the canal, the city transformed the entire canal into a trunk sewer pipe and constructed a street over it. Constitution Street now runs most of the east-west portion of the canal.

Of more significance to the sewerage system and town was Alexandria's retrocession to Virginia. The town and county of Alexandria were contained within the District of Columbia since 1800 when the federal government moved its seat from Philadelphia to the Potomac. At the time, the District of Columbia was a ten-mile square with corners at each of the cardinal

to Alexandria. Constance McLaughlin Green, *Washington: Village and Capital, 1800-1878* (Princeton, NJ: Princeton University Press, 1962), 34-35; John Hammond Moore, "The Retrocession Act of 1846," *Virginia Cavalcade* 25 (Winter 1976): 129.

²⁷ John D. Macoll, *Alexandria: A Towne in Transition* (Alexandria, Va.: Alexandria Historical Society, 1977), 3-4.

directions. While a part of the District, Alexandria's economy stagnated. The city tried to galvanize trade through investments in turnpikes and the Alexandria Canal, but these proved to be long-term solutions that did not help Alexandria in the short time. Mirroring its economy, Alexandria's population also stagnated, its population increased by only 241 people between 1820 and 1840, an increase of only 2.9%. In comparison over the same time, Washington grew by 129% and Baltimore grew by 39,575 people, or 63% on top of its 1820 population.

Once again a part of Virginia, Alexandria benefitted from Virginia's liberal investments for internal improvements, which included paying off Alexandria's debt for the Alexandria Canal and investing in the Chesapeake and Ohio Canal to finally complete and open the canal to the coal fields further west. Investors returned to Alexandria since the clear regulations of Virginia made investments in Alexandria more secure than they were in the District of Columbia's confusing mess of legal codes. Alexandria's population grew along with its economy during the decade after retrocession and the city witnessed a population growth from 8,734 in 1850 to 12,652 in 1860, a 44% increase over a decade, witnessing its largest decennial growth since the beginning of the nineteenth-century.

The final antebellum innovation affecting Alexandria's sewerage system was the creation of the Alexandria Water Company. The Alexandria Water Company, whose descendent corporation merged with two other companies to form the Virginia-American Water Company, continues to provide clean water to the city. The water provided by the company addressed the need for Alexandrians to have access to clean, potable water for daily uses, access to water for manufacturing purposes, and a reliable supply to extinguish fires. Yet the boon to the community also came with negative effects of stressing the existing sewerage system of privies and drainage in the city.

The availability of fresh water for Alexandrians was a major concern for the prevention of disease and fires, each of which was a recurrent problem for the city inhabitants. Fires were common in the nineteenth century and on occasion grew into raging conflagrations. For instance, a fire that began in a cooper's shop near the Union Street wharves consumed much of the waterfront between Prince and Duke Streets on September 24, 1810. Another fire that occurred in January 1827 originated at a cabinet workshop on Royal Street and expanded to burn down a large section of the city. In total, fifty-three houses and a number of businesses burned, destroying \$150,000 worth of property.²⁸ The potential for fires in Alexandria endangered the lives and property of Alexandria's inhabitants and undermined the city's potential to attract commercial investors.

Freshwater supplied by a water company reduced the threat of disease that typically plagued a seaport town. Alexandria was no stranger to epidemics and passed legislation to quarantine incoming vessels at Jones Point to make sure newly arrived sailors did not pass contagious diseases into the town. Yet the largest potential killer came from the water supply. In the eighteenth century, Alexandrians collected water from a number of private and public wells scattered throughout the city. Due to seepage from innumerable privies, these rather shallow wells became tainted with bacteria that contributed to outbreaks of disease. To combat disease, the town authorities prohibited the digging and use of private wells and instead dug deep, public wells at several street corners. Drawing water from a deeper water table lessened the risk of disease but led to fewer water pumps available around the city from which to draw water. Limited access to fresh water elevated the number of water carts to serve the city. For approximately one cent per bucket, Alexandrians could fill their buckets with fresh water filled

²⁸ Smith and Miller, *A Seaport Saga*, 51-54.

from the city's deep wells from the brass spigot attached to a hogshead on a cart. This business saved Alexandrians living at a distance from the water pumps the struggle of hauling water in buckets by hand from the pumps.²⁹

Leading the struggle to establish a water company in Alexandria was Benjamin Hollowell, a Quaker school teacher who may be best known as the elementary school teacher of Robert E. Lee. Hollowell was not a native of Alexandria, having been born in 1799 in Montgomery County, Pennsylvania, but moved to Alexandria in October 1824 to establish a private school. Although his school got off to a slow start, Hollowell became entrenched in the social aspects of the town and regularly thought about improving his adopted city. In addition to founding a school, he was one of the founders of the town's Lyceum in 1831. He also envisioned how best to supply fresh water to the town for the purposes of household consumption and extinguishing fires. It is unclear what motivations drove Hollowell besides altruism, but it is possible that the premature deaths of three of his children to typhoid and cholera – diseases often caused by contaminated water – may have prompted his motivations for making fresh water available. Or, having lived through a number of conflagrations, Hollowell may have been inspired to bring water to the city to prevent the frequent destructive fires.³⁰

Hollowell and his compatriots considered a number of potential sources of water for the city. Their first idea was to tap the Alexandria Canal, but it was quickly rejected after it was realized how much rubbish was thrown into the canal by boatmen and others. Their next idea was to build a reservoir near the Potomac River and force water from the Potomac into the reservoir, but the Potomac water was deemed equally unpotable as the canal water. A third idea

²⁹ Smith and Miller, *A Seaport Saga*, 74-75.

³⁰ Benjamin Hollowell, *Autobiography of Benjamin Hollowell* (Philadelphia: Friends' Book Association, 1883), 1, 43-44, 95-109; Alexandria Water Company, *The History of the Alexandria Water Company* ([Alexandria, Va.], 1988), 2.

was to redirect the flow of a number of streams northwest of town into a single channel from which to supply the town, but this idea was deemed too impracticable for the amount of labor for such limited results.³¹

The fourth and final proposition was to pump the waters from Cameron Run to the top of Suter's Hill where it could be stored in a reservoir and gravity-fed through pipes into the homes of Alexandrians. Hollowell was inspired by a visit to his sister in Moorestown, New Jersey when a tour of the Mount Holly pumping station demonstrated that water could be pumped by a mill to an elevation to supply Mount Holly with water. Returning to Alexandria with this model, Hollowell proposed to pump water into a reservoir on top of Suters Hill by utilizing Cameron Mill as a pumping station. This would be the basic premise of the plan when the Alexandria Water Company received its charter on March 22, 1850. The biggest substantial change to this plan occurred when the project engineer, Frederick Erdman, recommended that the reservoirs be built on a knoll behind Suters Hill on land owned by Peter Tressler. According to Erdman, Suters Hill was more than twice the height needed and "would be a double strain upon [the] service pipes, and cause a continued perplexity and expense from their breaking."³² As such, Tressler's knoll provided ample gravitational force to feed water through pipes to the upper stories of the houses in the city.

Under the guidance of Frederick Erdman, construction of the reservoirs, pumping station, conduit, and pipe occurred smoothly. From Cameron Mills, water from Cameron Run was pumped into conduits up to the knoll where the site was excavated for a nearly 200 square foot hole that was deep enough to contain sixteen feet of water. The initial reservoir was lined with bricks and expected to hold 2.5 million gallons of water, enough water to supply the town of

³¹ Hollowell, *Autobiography of Benjamin Hollowell*, 196.

³² Hollowell, *Autobiography of Benjamin Hollowell*, 195-200, quote on page 199.

Alexandria for 10 days. After the reservoir was filled and the initial seven miles of cast iron pipes were in place, water began to flow from the reservoir into Alexandria on June 15, 1852. Hallowell professed that, due to the expert engineering of Frederick Erdman, only two leaks occurred in the entire system, which were quickly rectified.³³

Initial observations confirmed that the Alexandria Water Company was a success. At the January 9, 1855 annual meeting of the President and directors of the board, Hallowell, serving as the company's president, declared that the company issued dividends of 3% for shareholders. This was quite a rarity for internal improvement projects during the mid-nineteenth century as many companies failed to issue dividends to stockholders until long afterwards. An inspection of the dam, mill, and reservoir all proved to be in perfect working order although an embankment on the reservoir required some repair due to erosion. According to Daniel W. Lewis, the Superintendent of the Works, water from the reservoir was used to extinguish eleven fires during 1854, any of which could have expanded into a dreadful conflagration. Hallowell accentuated the use of water from the reservoir as a fire retardant: "Since its first introduction into our town, a fire has rarely, if at all, extended beyond the building in which it first originated. The Board are confidently of opinion, that the amount of property saved thereby to our citizens, since the introduction of the Cameron water, is already more than the whole cost of the work." In 1854, the water company supplied 506 families and stores with potable water and extended subsurface water pipes over 1200 feet.³⁴

³³ In the 1870s, a second reservoir was constructed that was estimated to hold 14 million gallons. This reservoir was placed into service in 1875. Alexandria Water Company, *The History of the Alexandria Water Company*, 10-12.

³⁴ *Annual Report of the President and Directors of the Alexandria Water Company to the Shareholders, At Their Annual Meeting, Held on the 9th Day of January, 1855* (Alexandria: E. F. Tatsapaugh, 1855), 4-11, quote on p. 9.

The excess of water supplied by the Alexandria Water Company had to go somewhere after being used in the city. Once used, the water drained through the existing stormwater sewerage system of gutters, using the force of gravity, until it reached the lowest point – often the Potomac River. Water used for flushing of water closets was discharged into privies and cisterns. The exponential increase of water caused the vaults and cisterns to fill faster than they were intended to with more liquefied contents and led to increased failure in the masonic structure and the contamination of ground water or the appearance of nuisances. These problems took time to develop as household access to water was limited to those who purchased licenses. These negative effects of running water in Alexandria were felt by Alexandrians who could afford the technological innovations while the advantages of greater access to potable water and fire protection were distributed more ecumenically.

Alexandria's rapid growth in the 1850s was cut short by the American Civil War. Beginning in May 1861 and lasting throughout the remainder of the conflict, Alexandria was occupied by Union soldiers. Many of Alexandria's residents fled during the conflict and, quite expectedly, the records for the city are less complete during the extended occupation. The available evidence suggests that the privy-cistern system of waste disposal as well as access to water from the reservoir continued during the war. The Alexandria Canal, however, ceased operation during the conflict as the aqueduct at Georgetown was drained and used instead as a bridge. Additionally, the outskirts and vacant lots of the city were occupied by refugees from the war and filled with shanties and contraband houses. The neighborhoods that sprang up, with names like Petersburg, Contraband Valley, and Pump Town, were breeding grounds of disease as there was overcrowding and little drainage. Union soldiers occupying Alexandria changed other aspects of the city by building encampments, forts and warehouses, including a temporary

stockade to protect the forces from Confederate raiders. (see Figure 3) However, the Union soldiers did not seem to have made any permanent effect on the city's drainage and ability to perform its sewerage activities.



Figure 3 - Building Stockade in Union Occupied Alexandria (Library of Congress Prints and Photographs Division)

On the eve of the 1870s, Alexandria was in the process of recovering from the trauma of the Civil War. Most of the city's streets remained unimproved dirt tracks. The streets that were paved with cobblestones required substantial annual attention to maintain. The gutter system was plagued with stoppages and privy vault and cistern failures grew increasingly troubling as failures and generations of deposits necessitated new improvements to be made. New solutions to these continued complications would present themselves in the final third of the nineteenth century. With these innovations, Alexandria took the next step toward a modern infrastructure that begins to closely resemble that which is understood today.

Section 4: Alexandria's Public Sewerage System since 1870

As Alexandria progressed into the final third of the nineteenth century, the public sewerage system began to resemble a familiar form with characteristically modern pavements and a system of subsurface conduits. The city phased out cobblestone pavements to modernize the grid of streets and gutters, replacing the archaic materials with brick or macadamized pavement that was less expensive to construct and maintain. Dirt streets within the corporation became rarer in the early twentieth century with renewed efforts to address the entire corporate area. The Alexandria Water Company increased the available water supply to coincide with the rising population. And, as a new system of underground pipes and accessory components were installed to carry sanitary and storm water, the use of outhouses and the privy vault system declined and was eventually phased out.

A number of new sources become available to study the late-nineteenth and early-twentieth century public sewerage system. Photography, which was invented in the antebellum era, became increasingly widespread in the postbellum years. By the final decades of the century, photography was so common that hundreds of photographs survive of Alexandria. Analyses of photographs reveal a number of things about the Alexandria public sewerage system. Streetscapes meant to capture notable buildings in the city inadvertently include the composition of streets, gutters, and surface components of the subsurface sewers, like manhole covers and drains. Conversely, photographs depict the absence of these improvements, as some photographs portray the deep cobblestoned gutters that lined wheel-rutted cobblestone streets and unimproved dirt paths. Knowing the date and location of these photographs permits a fuller understanding of the order of improvements to the city infrastructure.

Information from the official financial reports of the city, which become increasingly accessible and detailed as the century came to a close, is also informative about the public sewerage system. The annual auditor's reports detail the expenses of the city and include fascinating information about the location and dates that streets, gutters, and other construction projects occurred, the costs of maintaining the cleanliness of the city, and any other related changes to the city ordinances regarding any component of the public sewerage system. These reports also provide a quantifiable valuation of the efforts of the city to address concerns in drainage and street cleaning through an annual comparison of the budgetary allotments for city departments.

Beginning in 1896, at the end of the fiscal year during which the city first hired a civil engineer, a report by the city engineer accompanied the annual reports of the city of Alexandria. The city engineer assumed many of the roles that were previously designated to the Superintendent of Police. The major difference between positions was that the city engineer accomplished increasingly complicated construction projects that required a professionally trained engineer. The annual "Report of the City Engineer," appended to the published annual report of the city auditor, detailed the amounts spent and received for engineering projects, a survey of the conditions of streets, an accounting of sewer conduits existing in the city, a listing of the projects accomplished during the preceding year, and recommendations to the city council for the following year.

Postbellum Improvements to the Alexandria Public Sewerage System

The Alexandria Water Company continued throughout the late-nineteenth century to supply fresh water to the city. The technology and process of water delivery changed very little

since the company began operations in the 1850s. However, the company actively expanded to meet the demands of a growing population. Construction began on a second, much larger reservoir adjacent to the original reservoir in 1874. This reservoir, spanning approximately 150,000 square feet and reaching a depth of 17 ½ feet, had an estimated capacity of 14 million gallons of water. Along with the original reservoir, the Alexandria Water Company could have 16 ½ million gallons of water available at any single time for the use of the city. Later, in the early-twentieth century, the company decided it was prudent to further expand and acquired water rights on Holmes Run. The company constructed a dam which, when completed in 1915, contained the reserved waters of Lake Barcroft. Water from the lake could be released down Holmes Run to a pumping station where the water was pumped through a treatment plant and supplied to the growing city.³⁵

Although the availability of water in Alexandria decreased the likelihood that small fires in the city could grow into destructive conflagrations, it did not entirely remove that possibility. This was the case in May 1871 when the town tragically lost the old Market House in a conflagration that began in a grocery and liquor store. Among the losses in the blaze was the Alexandria Museum housed on the third story of the building and the offices of the City Sergeant, Clerk of the Corporation Court, Superintendent of Gas, and the law offices of A. & C.E. Stuart. The fire destroyed property estimated to be valued between \$75,000 to \$100,000, but it could have been much worse without the supply of water that the Alexandria Water Company provided to the city, as the firemen extinguished the flames before it could further spread

³⁵ Alexandria Water Company, *The History of the Alexandria Water Company*, 6, 10-12. The company was acquired in 1929 by the American Water Works and Electric Company, which was later renamed the American Water Works Company. With a greater population to serve, the company decided in the 1940s to develop a water supply from Occoquan Creek. In 1958, the Occoquan Reservoir was completed, containing approximately 10 billion gallons of fresh water. The company merged with Old Dominion Water Corporation and Prince William Water Company to form the Virginia-American Water Company in 1972.

throughout the heart of the city. However, the city was less lucky in 1897 when a June conflagration destroyed the old Pioneer Mill located on the waterfront at Duke Street as well as the entire waterfront east of Union Street between Duke and Prince Streets.³⁶ With these notable disasters aside, it is unknown how many fires that the dependable supply of water prevented from growing out of control.

The deterioration of the city streets continued to plague Alexandrians in the postbellum years. To city officials, it was becoming clear that cobblestones required too much effort and cost to maintain and clean. However, the expense to completely remove the cobblestone pavement and replace it with another form of surfacing, such as vitrified bricks, was also prohibitive, especially when most of the city streets were still unimproved with proper grading or pavement. One solution was to spread crushed oyster shells over the roadway. Oyster shells were attainable and inexpensive as castoffs from the oyster industry that raked the Chesapeake Bay and its tributaries for the food source. Once crushed and applied to the road surface, the shells formed a solid layer over which urban traffic traversed. In a petition dated December 13, 1875, C. F. Lee, Jr. and others requested that the Alexandria council purchase “enough Oyster shells to cover the Street from the W&O R.R. depot to Union Street as to be serviceable to the very great needs of our business which is done on the rail street.”³⁷ This section of Princess Street between Fairfax and Union Street was heavily traveled for commerce, passing by the gas works and a fertilizer plant as Princess Street descended to the wharves on Union Street. To the petitioners, it

³⁶ Smith and Miller, *A Seaport Sage*, 104; *Alexandria Gazette*, May 19, 1871.

³⁷ Petition of C. F. Lee, Jr. and others to the City Council, December 13, 1875, City of Alexandria, Va., *Petitions to the City Council, 1829-1872* [MICROFILM], Local History/Special Collections, Alexandria Library. Hereafter referred to as “*Petitions to the City Council*.”

was prudent for the flow of business to cover these several blocks with crushed oyster shells which warranted the decision to petition the council.³⁸

Street pavement remained an issue for the city during the 1880s. In a number of instances, the Superintendent of Police, the city council, or the Committee on Streets issued orders to address the pavement and structure of streets. A January 18, 1883 resolution permitted the Superintendent of Police to appropriate \$700 to purchase oyster shells to coat unpaved streets that were in regular use.³⁹ In that same year, the city addressed concerns with the pavement of Cameron Street (between Henry and Patrick), Duke Street (between Fairfax and Pitt as well as between “Black Dog” Alley and Lee Street), Prince Street (between Fayette and Payne as well as between Fairfax and Lee), Queen Street, Washington Street, and various alleys within the city. In addition, the Superintendent of Police responded to complaints about sidewalks and gutters at several locations scattered about the city.⁴⁰

While responding to postbellum concerns about the pavement of streets, city officials were also in the process of modernizing the city’s capacities of removing wastes and draining excess water through the construction of subsurface pipes. Using underground conduits to remove storm- and sanitary water was already in place in a number of large cities by mid-century. London’s sewers, after all, discharged so much effluent into the Thames River to cause the “Great Stink” in 1858 when an enormous miasma stemmed from the river due to the unusually warm weather and the high concentration of human excrement discharged into the river.⁴¹ Additionally, New York constructed a number of antebellum sewers but did not

³⁸ Ibid.

³⁹ City of Alexandria, Va., *City of Alexandria Council Minutes, Vol. 21, 1883-1894* [MICROFILM], Local History/Special Collections, Alexandria Library. Hereafter referred to as “*Alexandria Council Minutes*.”

⁴⁰ *Alexandria Council Minutes* [MICROFILM].

⁴¹ For more information on London’s sewer system and the Great Stink, see: Halliday Stephen, *The Great Stink of London: Sir Joseph Bazalgette and the Cleansing of the Victorian Capital* (Stroud: Sutton, 1999).

constitute a fully networked sewerage system until after the Civil War. Brooklyn, Chicago, and Jersey City were also among the American cities that constructed antebellum public sewers.⁴²

Even after extensive analysis of historical records, it remains rather ambiguous when and where the first underground public sewer pipes were constructed in Alexandria. The historical records suggest a number of possibilities for Alexandria's first sewer. As will be recalled, the petition written for Martha J. Hooff by M. J. Hooff in October of 1865 referenced the construction of a trunk sewer by the city in 1861. This petition, as previously mentioned, refers to a conduit near the upper end of King Street. The Hooffs claimed that,

sometime in the year 1861, the Superintendent of Police, of the said City of Alexandria, proceeded, as your Petitioner is informed, by the order & direction of your Honorable Body, to lay down a trunk beneath and across, the upper end of King street, between the line of the Corporation and 'Hooff's Run,'... for the purpose of carrying off the water, which flowed from the drains & gutters, of the upper end of the City; that subsequently, it became necessary to repair or rebuild the said trunk, and in doing so, the said Superintendent of Police, or his successor in office, removed a portion of the embankments, binding the said meadows on the North, and made use of the earth thus removed as a covering for the said trunk.⁴³

However, due to the incomplete records of the era – due to their destruction or misplacement during the Civil War or the breakdown of the city's bureaucracy during Union occupation – it is difficult to substantiate this possibility especially since the petition for recompense was rejected by the Alexandria council.⁴⁴

Evidence for another contender for Alexandria's first public sewer appears in the municipal government reports recorded in the *Alexandria Gazette* between April and June of 1860. The situation began when James Green requested approval to construct a sewer from the

⁴² Tarr, "Sewerage and the Development of the Networked City in the United States, 1850-1930," 163-169.

⁴³ Letter from M. J. Hooff to City Council of Alexandria, October 24, 1865, *Petitions to the City Council* [MICROFILM].

⁴⁴ See the letter from the committee investigating Martha Hooff's case to the Alexandria Common Council, April 24, 1866, *Petitions to the City Council* [MICROFILM].

Mansion House, located near the corner of Fairfax and Cameron Street, to the river. The sewer would include a drain that connected to the water closets at the Mansion House hotel and sewer pipes that would run through Cameron Street and into the river. This sewer was stipulated to be accomplished under the supervision of the Superintendent of Police but at the expense of Green. In June, the *Alexandria Gazette* reported that the Alexandria Council granted Green permission to construct his sewer, which was constructed using “earthenware” instead of iron pipe.⁴⁵ Because this sewer was funded by Green and not the corporation of Alexandria, it may be supposed that it is considered a private sewer and therefore out of contention for the first public sewer in the city. However, it is likely that this sewer was adopted under the city’s care, in which the city inspected and maintained it. This sewer could be the same one that is accounted for in the “Statement of Length and Sizes of Public Sewers” of the preliminary 1896 Report of the City Engineer. Similarities abound between Green’s sewer and a sewer designated as the Market Alley Sewer. Both run approximately from Fairfax Street to the river and are made of terra cotta – or earthenware – pipe.⁴⁶ Market Alley, to confirm this relationship, is located across the street from Green’s hotel. Since it was constructed in 1860 and later assumed under public control, Green’s sewer is likely the first sewer constructed in Alexandria, but without full and complete documentary evidence it is difficult to absolutely confirm it.

Although we may never know definitively the very first sewer constructed in Alexandria, we can examine the extent documents to understand how Alexandrians thought about them. In a series of newspaper editorials, Alexandrians offered opinions concerning the city’s construction – or lack of construction – of suitable drainage. On February 8, 1867, “Query” asked the readers

⁴⁵ *Alexandria Gazette*, April 25 and 28 and June 13 and 27, 1860. “Earthenware” is also referred to as vitrified clay pipe or terra cotta pipe.

⁴⁶ Report of the City Engineer, July 1, 1896, *Annual Reports & City Directories* [MICROFILM], Local History/Special Collections, Alexandria Library, 59. Hereafter referred to as “*Annual Reports*.”

of the *Alexandria Gazette* if the municipal government will do something to address the poor drainage in the northwestern part of the city. Query reported that several intersections in the vicinity of Prince and Pitt Street were inundated with flood water. Query referred to street crossings as “ferries” and reinforced the obstruction of undrained water to urban travel.⁴⁷

Another editorial propagated a rumor about a sewer being constructed along King Street. The author professed that “such a sewer would be an incalculable benefit to our city drainage, [since] the sewers at the Marshall house corner....choke up at every hard rain.”⁴⁸ This editorial indicated the desire of Alexandrians for sewers to address drainage concerns in the city, but also revealed that rudimentary or inefficient drains or sewers existed before. Unfortunately, very little information is available about the preliminary drains mentioned in this editorial.

In order to intelligently expand the sewer network, the municipal government needed to collect information about the existing sewerage system. The council made a move to be more comprehensive in 1873, when it directed the city surveyor to “make a map of the city giving the grades and the sewerage of all streets and alleys.”⁴⁹ The Alexandria council also dispatched the Superintendent of Police to investigate infrastructure around the city, such as to the corner of Henry and Duke Streets to investigate the condition of a culvert. Having the knowledge of what sewers existed and what improvements were needed was vital to the responsible expansion of the city’s sewerage infrastructure.

The faulty construction of some early sewers compounded, rather than alleviated, the drainage problems. In the spring of 1875, repairs were required on Cameron Street between

⁴⁷ *Alexandria Gazette*, February 8, 1867.

⁴⁸ *Alexandria Gazette*, August 22, 1867.

⁴⁹ *Alexandria Gazette*, March 11, 1868 and April 23, 1873. Included in the 1873 report are details about paying for the costs of constructing sewers: “The cost of grading the carriage way on any street shall be paid by the corporation; the cost of grading the side-walk shall be assessed to the property owner. Wherever a sewer is ordered to be built two-thirds of the cost shall be assessed to the property owners on the streets on which said sewer is laid, providing that one outlet shall be left for every lot.”

Royal and Fairfax where the haphazard construction of a sewer failed to refinish the cobblestone street and led to “deep and long holes, reaching to the river” to appear in the street.⁵⁰ Later that year, a similar inundation occurred on Patrick Street near its intersection with Queen Street. The city’s grading of Patrick Street caused an overabundance of water from a previously established drain to overflow and spill into a lake, inundating private property and “completely surrounding the nice little dwelling house of a thrifty colored woman, so that she needed a boat for entrance or exit, besides making the neighboring streets impassable.”⁵¹ In these instances, inadequate construction of sewers increased inconveniences to several neighborhoods.

The city implemented a number of other projects to sewer sections of the city during the 1870s and 1880s. These improvements included the construction of sewer trunks on Princess Street (1877), the repair of a water conduit at the west end of Cameron and Duke Streets (1883), and the replacement of the old sewers at the foot of King Street with “newer sewers of a larger size and drainage.”⁵² Furthermore, between 1885 and 1888, the city constructed sewer trunks on King, Pitt, and Princess streets as well as the sewer at the corner of Duke and Henry Streets.⁵³ This wave of sewerage construction was impressive when compared to the previous few decades of inactivity. However, it was overshadowed by construction after 1889.

Mayor Downham’s Internal Improvement Program

The year 1889 was a watershed moment in the history of Alexandria’s sewerage system. Although the city had been constructing sewers for thirty years and improving streets for over

⁵⁰ *Alexandria Gazette*, April 2, 1875.

⁵¹ *Alexandria Gazette*, November 12, 1875.

⁵² Municipal Reports of the Corporation of the City of Alexandria, For the Fiscal Year Ending May 31, 1877 with the Revenue Bill for the Year Ending May 31, 1878, *Annual Reports* [MICROFILM]; *Alexandria Council Minutes* [MICROFILM].

⁵³ Annual Report and Official Directory for the fiscal years ending in 1886, 1887, and 1888, *Annual Reports* [MICROFILM].

one hundred years, this particular year established the threshold between archaic and what we may consider modern improvements. These improvements were kicked off by an address from Mayor E. E. Downham in which he itemized an aggressive plan for improving the city. In the decades that followed the speech, Alexandria witnessed unprecedented development of the sewerage system with particular concentration given to developing the network of streets and sewers.

Although he only served a limited time as Alexandria's mayor, Emanuel Ethebert Downham was instrumental in the extraordinary growth of the city's sewerage system in the last decade of the nineteenth-century. In 1889, Downham, who preferred to be called E. E., was in the midst of his first term as mayor of Alexandria, Virginia.⁵⁴ He had not been elected but was appointed the interim mayor after his predecessor, John B. Smoot, suddenly died of a heart attack. Downham's experience and perspective of Alexandria as the city's mayor was bolstered by his previous experience as a liquor merchant and his marriage to Sarah Miranda Price, the daughter of the Alexandria merchant George Price. This background gave Downham a perspective that was, like many others in the commercial-driven city, aligned with increasing Alexandria's mercantile potential. It is unsurprising that, with this context, Downham strove to improve the city's commercial viability. What was remarkable was that two of Downham's three recommendations for improving the city dealt with components of the sewerage system.

In his address, Downham prioritized streets as the most crucial element of the city's infrastructure in need of improvement. According to Downham, "the principal drawback that we have is the fact that our streets are, in certain sections of the city, at times almost impassable." The strategic locations of particular trouble spots were particularly concerning to Downham,

⁵⁴ Jack Sullivan, "E.E. Downham and Frank Hume: Whiskey Men of Alexandria," *The Alexandria Chronicle* (Spring 2013): 1-8.

who attributed the city's loss of investors to infrastructural shortcomings. "These streets," explained Downham, "are adjacent to the depots where persons who are traveling (perhaps seeking investments) will see them." Downham indicated that individuals with capital were plentiful in the country and only needed assurance that their investments were secure and could produce interest. Alexandria, according to Downham, was losing out on these opportunities for individuals to invest in the city since the first thing potential investors see are the dilapidated condition of the city's streets, which scared away potential investors. If the city council legislated street improvements, Downham predicted that the city would benefit exponentially by the revenue that could be attained from investors. Downham encouraged the council to "open out and extend every street in the corporation to the corporate limits, and grade and pave them with some improved pavement of which there is plenty in use." This plan, as Downham viewed it, would "give work to our mechanics and laborers, and it will only be a few years before, with the enhanced value of real estate, the revenues will be enough to pay the interest and provide a sinking fund for the principal." In short, by investing in their city, Downham predicted that external investors will be induced to invest in Alexandria.⁵⁵

Downham's message to the council disclosed the poor condition of the city's streets in 1889. It was apparent from the message that the street conditions near the railroad depots, presumably the places where potential investors will pass through on their way to consider potential investments in Alexandria, were appalling. The Alexandria station for the Southern Railroad Company was located at the corner of Fairfax and Princess Streets. As will be recalled, this area was of concern during the previous decade when C. F. Lee, Jr. and others asked the city

⁵⁵ "Message from the Mayor," in *The One Hundred and Ninth Annual Statement of the Finances of the City of Alexandria, Virginia, with Department Reports for the Fiscal Year Ending May 31, 1889, the Revenue and License Laws, and the Official Directory for 1889-90. Annual Reports* [MICROFILM]; The speech was also published in the *Alexandria Gazette* on April 10, 1889.

to purchase crushed oyster shells to make Princess Street more serviceable.⁵⁶ Additional street improvements were required in the vicinity of the depot to improve the streets since Downham made particular reference to the conditions near the depot.

Downham's message to the council implied that many of the city streets were still, in 1889, unopened and ungraded. Downham urged the council to "open and grade the streets from Franklin street to the northern limits, and extend and grade to our western line."⁵⁷ Downham implies that there were a number of planned roads within the corporation that were yet to be opened to traffic. Plans of the city, like the one in Figure 4 published in 1845, depict a lattice of streets that cover the entirety of corporate district. However, maps such as these belie the true condition of the corporate streets, which according to Downham were mostly unpaved near the outer extents. By 1889, the corporation extended west about ½ to 1 block beyond West Street and north to about a half block north of First Street. Opening up the streets did not necessarily mean paving the streets with the highest quality pavement, but rather grading the roads and covering with moderately inexpensive crushed stones as to allow for easier transportation to and from these properties. The opened streets provided access to these areas that was previously unavailable and as a result, Downham anticipated that "more transactions in real estate [would occur] in the next two years than there had been in the past twenty."⁵⁸

In addition to street improvements, Downham encouraged the expansion of the sewer network. Downham predicted that a barrel sewer on King Street would be all that was necessary to carry the sanitary- and stormwater for the city, with proportional terra cotta pipes that intersected with the main barrel sewer on King Street with the tributary drains in a lattice-work

⁵⁶ Petition of C. F. Lee, Jr. and others to the City Council, December 13, 1875, *Petitions to the City Council* [MICROFILM].

⁵⁷ "Message from the Mayor," *Annual Reports* [MICROFILM].

⁵⁸ *Ibid.*

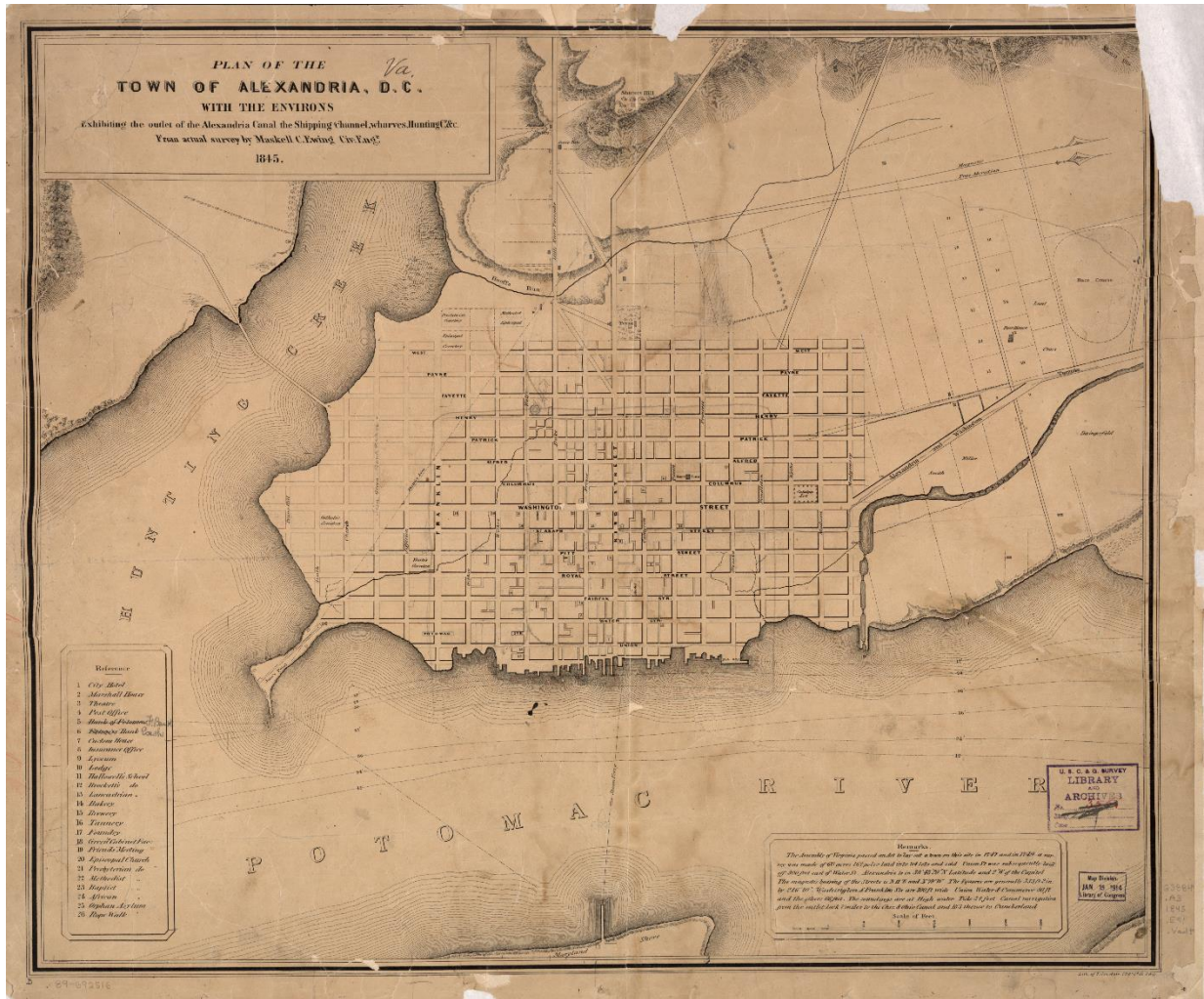


Figure 4 - Plan of the town of Alexandria, D.C. with the Environs, 1845 (Library of Congress)

spanning the city. The sewers were intended to augment rather than replace surface drainage and to allow enough water to flow through the underground conduits to continually flush and clean the pipes to prevent the buildup of sediment and materials that could clog the system. Downham proposed that the sewers could be partially funded by the tenants where the lines will be run, so that those who benefitted the most from the drainage will contribute to the improvements and limit the increased taxes required from the rest of the city. Additionally, Downham recommended that a scaled fee be used for the privilege to tap the sewer based on the capacity of the pipes and size of buildings linked to the sewer. To complete a comprehensive sewer system,

Downham suggested that the council “enact ordinances requiring persons to use them and abandon the system now in use, that of wells and boxes.”⁵⁹

Downham’s proposals, although implemented, were not immediately welcomed by all Alexandrians. Most of the objections were less about the conveniences or necessity of these improvements, but to the potential increase in taxes that would accompany them. Expressing a concern in the April 11, 1889 edition of the *Alexandria Gazette*, an unnamed Alexandrian warned that the improvements “necessarily increases taxes, and high taxes tend to keep away and drive off capital.” The unnamed protestor verified that improvements themselves were much desired in the city, but should be obtained “without increasing the present high tax rates” for the individuals who had been paying taxes for years “for the chief benefit of those who have just become, or who may be induced by the proposed improvements to become, property owners.”⁶⁰ This objector brought up an important consideration for the city officials: how to enhance the city without producing too much of a tax burden on its citizens.

Undeterred by minor opposition, Alexandria embarked on the construction of a comprehensive sewer system. The first step was to hire a city engineer, E. C. Dunn, who began work on August 1, 1895. The city engineer took over many of the duties of the Superintendent of Police relating to the city’s internal improvements, including administering streets, sewers, gutters, curbs, surveying and various other engineering posts.⁶¹ The decision to hire a City Engineer may have been due to the increasingly complicated internal improvement projects that became more frequent at the end of the nineteenth century that would require the attention of a professionally-trained specialist. For example, the construction of barrel sewers, although

⁵⁹ Ibid.

⁶⁰ *Alexandria Gazette*, April 11, 1889.

⁶¹ Report of the City Engineer Submitted on July 1, 1896, *Annual Reports* [MICROFILM].

physically accomplished by day laborers, required the supervision of a trained engineer to ensure the accurate alignment and angular grade to ensure an adequate flow of water.

Dunn, who had only held the position of city engineer for a scant ten months, provided the earliest complete illustration of the internal improvements of the city in his first report to the city council. In addition to cleaning the gutters and side ditches, Dunn surveyed the city's infrastructure to ascertain a full status of the public sewerage system in 1896. Dunn found that, of the 153,835 feet of streets within the corporate limits, 34,774 feet, or approximately 22.6%, were paved with cobblestones. Another 7,210 feet, approximately 4.7%, were paved with granite rubble, oyster shells, or macadam. The vast majority of Alexandria's streets remained either dirt (80,231 feet, or 52.2%) or unopened (31,620 feet or 20.5%).⁶² As these figures demonstrate, less than 28% of Alexandria's city streets were improved beyond rudimentary dirt grading. Over the next twenty years, the city expanded its paved streets to cover most of the city and transformed its paved streets from cobblestone to bituminous macadam or vitrified brick pavement. These pavements were less costly to maintain than the archaic cobblestone. By 1916, the attention of the city engineer turned from the historic city to the condition of the roads in the newly annexed area of the corporation that linked the city with the countryside to the west.

Just as impressive as Alexandria's expansion of improved streets was the growth of its sewer system. A comparison of a series of snapshots of the locations and reports on the extension of the sewers revealed its notable growth. Dunn's initial report in 1896 determined that there were four individual networks of sewers. (see Figure 5) The aforementioned Market Alley, or Green's, sewer ran from Fairfax Street to the Potomac River. To the north, running along Pendleton, Royal and Princess streets, was another sewer that ran a combined 2,884 feet and

⁶² Ibid.

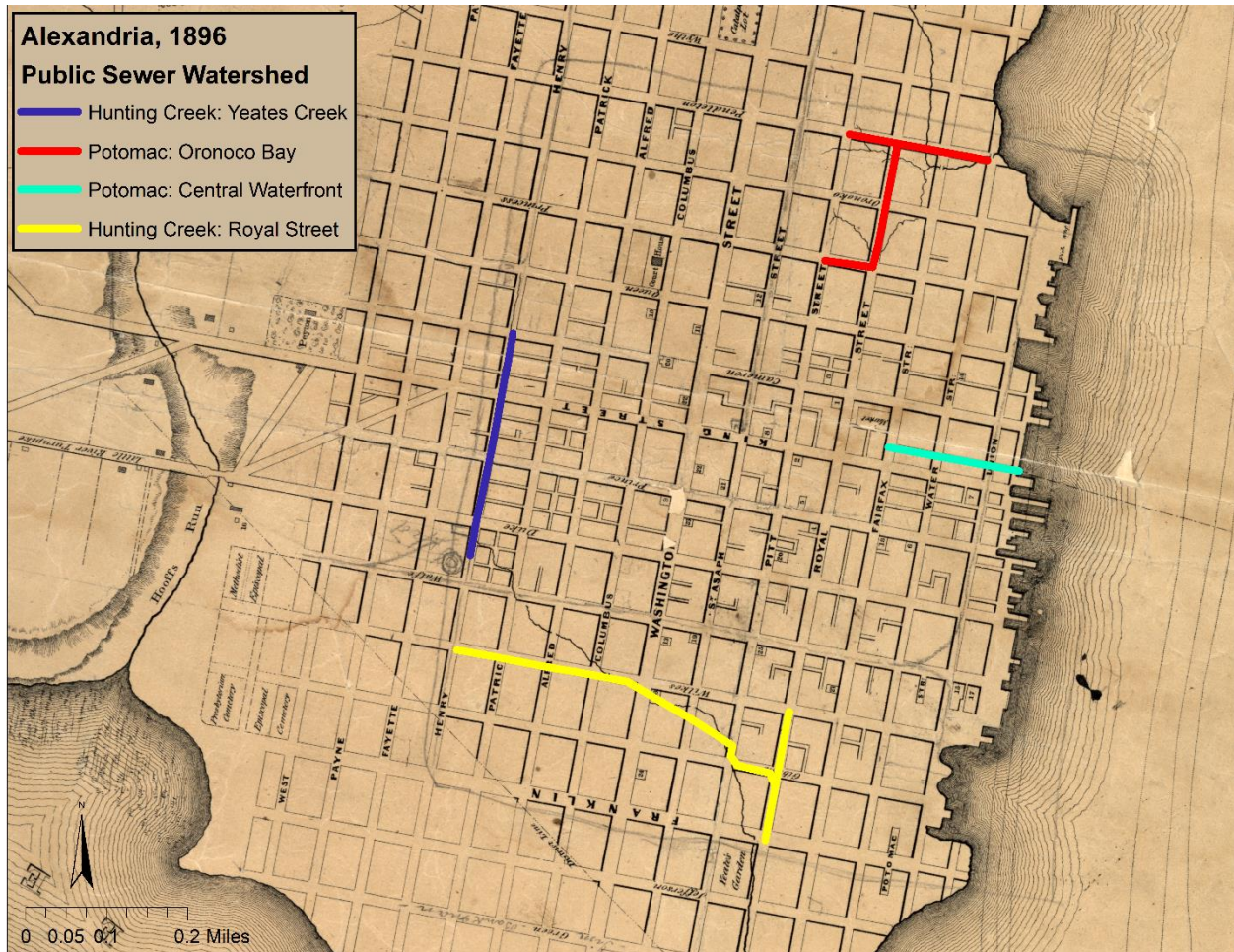


Figure 5 - Alexandria's Public Sewers in 1896.

emptied into the bay near the foot of Oronoco Street. A third sewer ran along Henry Street between Cameron and Duke Street where it supposedly drained into an open ditch culvert. Lastly, a fourth sewer, the second longest in Alexandria at 2,565 feet, ran along Wilkes Street, past the tannery between Washington and St. Asaph streets, and south along Royal Street before emptying into the lowland that drained into Hunting Creek west of Jones Point. Most of these sewers were large brick, barrel sewers between 3 and 5 $\frac{3}{4}$ feet in diameter (5,253 feet or 62% of the total sewer length). The Market Alley (Green's) sewer was the only sewer made entirely of terra cotta pipes. The upper ends of the branches of the Pendleton Street and Henry Street sewers were also constructed of prefabricated terra cotta. The Wilkes Street sewer, in 1896, was the only

sewer without any terra cotta pipe used in its construction.⁶³ The construction of large pipes represents forethought in ensuring trunk sewers had the capacity to convey large quantities of water from the city.

Under the direction of Dunn, the preliminary system of sewers reported in 1896 expanded over the next two decades. In 1902, Alexandria contained over 3 ½ miles of sewer, of which 57.75% were made of terra cotta pipes while another 37.86% were the larger, brick barrel sewers. (see Figure 6) The Henry Street sewer was extended slightly to the north and east with installations of terra cotta pipe. Two new trunk sewers were constructed along Prince and King

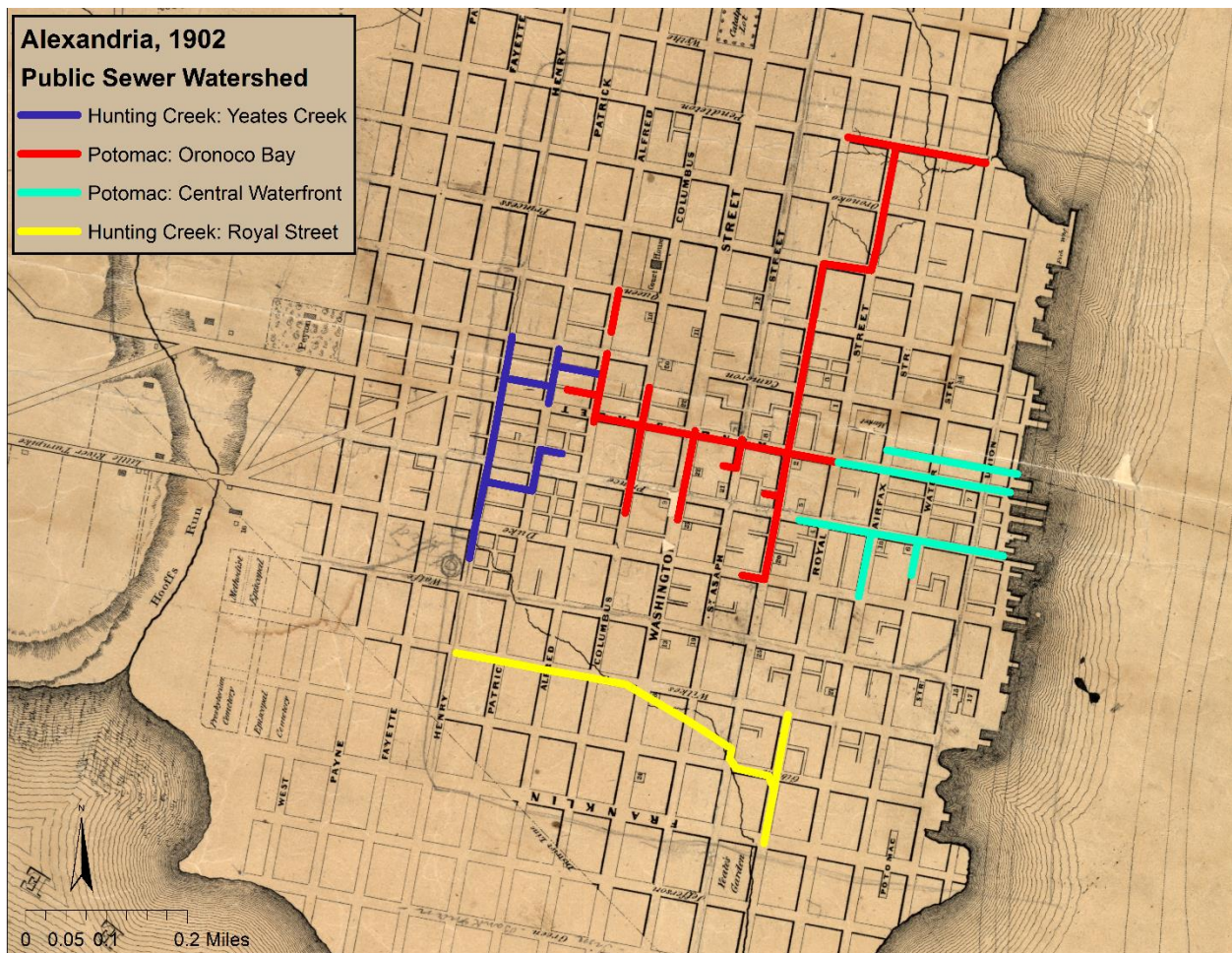


Figure 6 - Alexandria's Public Sewers in 1902

⁶³ Ibid.

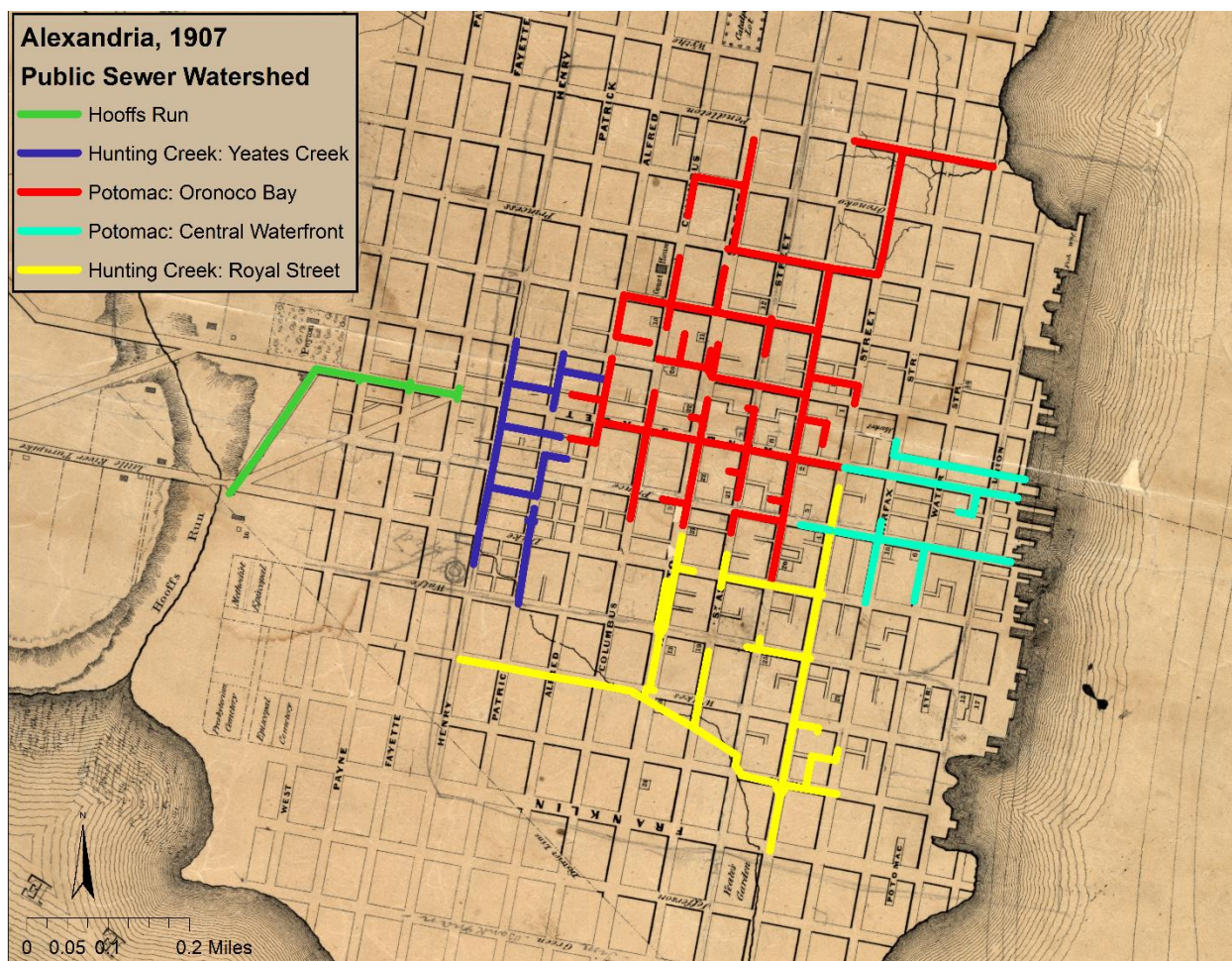


Figure 7 - Alexandria's Public Sewers in 1907

Street to drain these two streets to the river between Royal and Union streets. The largest expansion of the sewer system between 1896 and 1902 was the sewer emptying into Oronoco Bay. This sewer was extended south along Pitt Street to King Street, where it extended westward on King Street to Alfred Street. This sewer drained the central King Street corridor, diverting water to the north by an elongated route instead of taking the most direct route down King Street to the river.⁶⁴

By 1907, E. C. Dunn had further supervised the expansion of the sewer system to over 7.1 miles. (see Figure 7) By then, terra cotta pipes made up 73.14% of the system with just under

⁶⁴ Report of the City Engineer Submitted on July 1, 1902, *Annual Reports* [MICROFILM].

20% constructed of brick barrel sewers. The increased proportion of smaller, terra cotta pipes indicated that the sewer system expanded to fill in the spaces between the trunk lines that were constructed earlier. The Wilkes Street sewer expanded northward along Royal Street and Washington Street, while the Oronoco basin sewer covered the spaces north of King Street. One major addition to the sewer system was the commencement of a new sewer that ran northwestward from Hooff's Run up Peyton Street to King and West Streets. This sewer would consequently be continued after 1907 along Cameron to Henry and further to the north. The purpose of this sewer was to drain the western and northwestern portions of the city which had been contemplated since E. C. Dunn was hired by the city. The sewer, however, was intended to be unique in the system and restricted for the carriage of only stormwater. By 1912, construction was completed on the Hooff's Run sewer to the northeast to Oronoco Street between Patrick and Alfred.⁶⁵

In 1914, the final year that the city engineer's report is available, the sewer network was over 10.3 miles long. (see Table 1) Terra cotta pipes remained the highest percentage of type of pipe in the system at over 74%. Due to the construction of a mile of concrete oval sewers, the percentage of brick sewers decreased to 13.7% of the total of the system. By then, much of the inhabited neighborhoods in the city was drained by the system of sewers which carried water to the most convenient point and discharged directly into Hooff's Run, Hunting Creek, or the Potomac River.⁶⁶ (see Figure 8)

The prevalence of the sewer pipes extending throughout Alexandria decreased the need for privies in the latter decades of the nineteenth century and all but extinguished their need in the early twentieth century. This was substantiated by the coinciding expansion of the sewers and

⁶⁵ Report of the City Engineer Submitted on June 1, 1907, *Annual Reports* [MICROFILM].

⁶⁶ Report of the City Engineer Submitted on June 1, 1914, *Annual Reports* [MICROFILM].

Table 1 - Length of Main Sewers by Material

Year	Terra Cotta (feet)	Brick, Stone or Concrete Masonry (feet)	Total (feet)	Total (miles)
1896	1,910 (23.9%)	6,077 (76.1%)	7,987	1.51
1902	10,877.5 (57.9%)	7,922.5 (42.1%)	18,800	3.56
1907	27,571 (73.15%)	10,127 (26.85%)	37,698	7.14
1914	40,833.5 (74.4%)	14,020.5 (25.6%)	54,854	10.39

* Parenthesis indicates percentage of whole system.

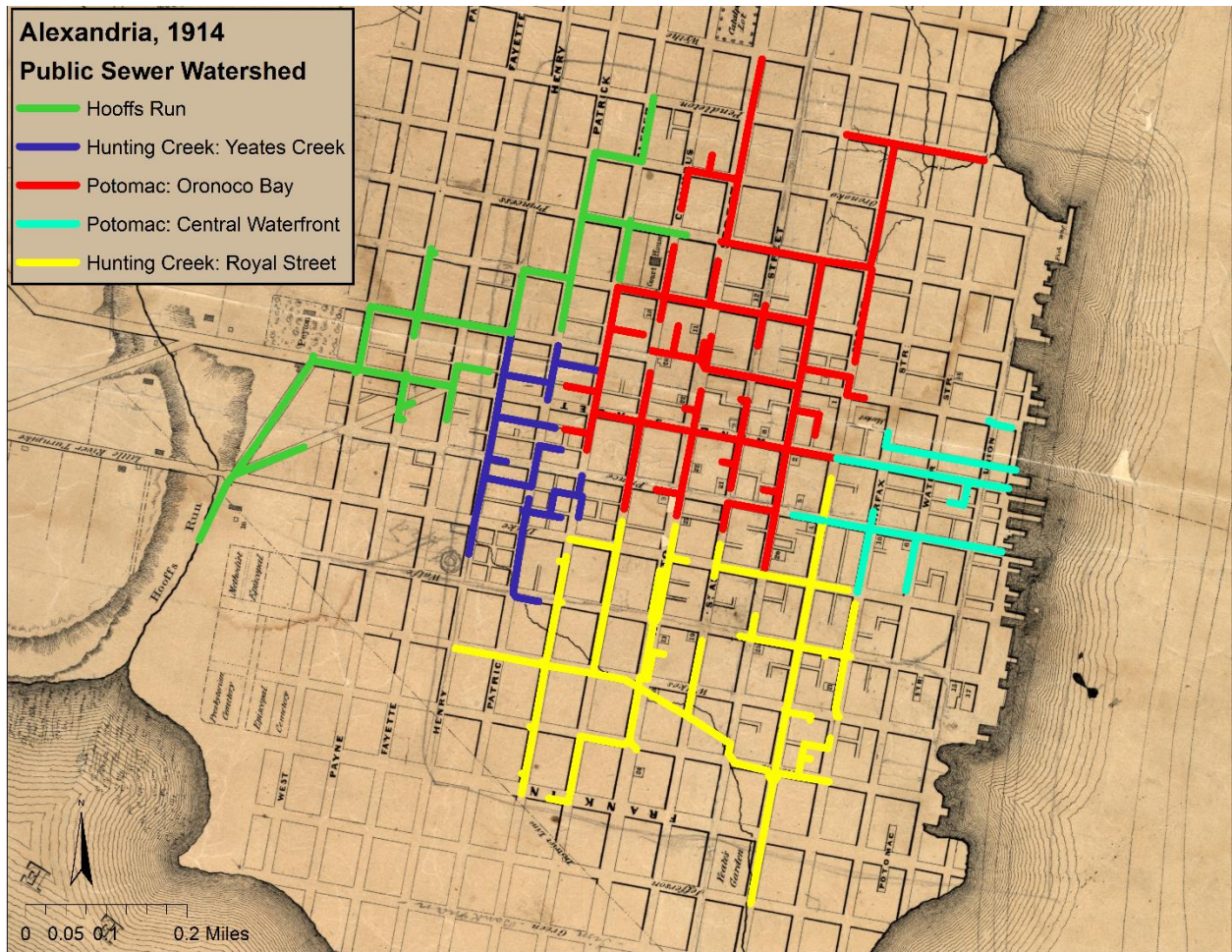


Figure 8 - Alexandria's Public Sewers in 1914

the rise in disused privies according to archaeologist Steven Shepherd's study. Shepherd found that 46% of the privies he studied fell into disuse in the late-nineteenth and early-twentieth centuries based on the artifacts found during the excavation of the shafts. There was, however, no specific moment when the change occurred, as the use of outhouses extended for some residents into the twentieth century before sewer pipes offered a better alternative.⁶⁷

Conclusions

Alexandria's public sewerage system transformed between the 1780s and the 1910s. Many of the tools used to manage the disposal of human wastes and the removal of stormwater were modified but not entirely replaced by new innovations. Surface drainage, for example, remained an integral component of sewerage control. However, techniques of grading, surface structure, drains and sewers increased the effectiveness of surface drainage to prevent the pooling of and subsequent stagnation of water.

After the 1910s, Alexandria's civic officials continued to invest in the sewerage system. In the 1920s, Alexandria purchased a sewer cleaning machine that was used to ensure the sewers remained passable for effluent and stormwater.⁶⁸ Just as before, city officials invested in the maintenance of the system and addressed repairs as required by regular system investigations.

With increased concern for the health of local and regional waterways, the municipal sewerage authority constructed a sewage treatment plant in the early 1950s. In order to effectively and inexpensively transform the system, the new configuration utilized the old sewer pipes. However, three intercepting sewers were installed, as well as two pumping stations, to

⁶⁷ Shepherd, *Obtaining Water and Discarding Waste*, 11-13.

⁶⁸ June 5 and 19, 1924, City of Alexandria Council Minutes, *Alexandria Council Minutes* [MICROFILM].

carry the sewage to the new plant near the mouth of Hoofs Run instead of directly into the already polluted waterways. Since the sewage treatment facility began operation in July 1956, it has worked to improve the waterbodies adjacent to the city by cleaning the water before it is discharged back into the environment.

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