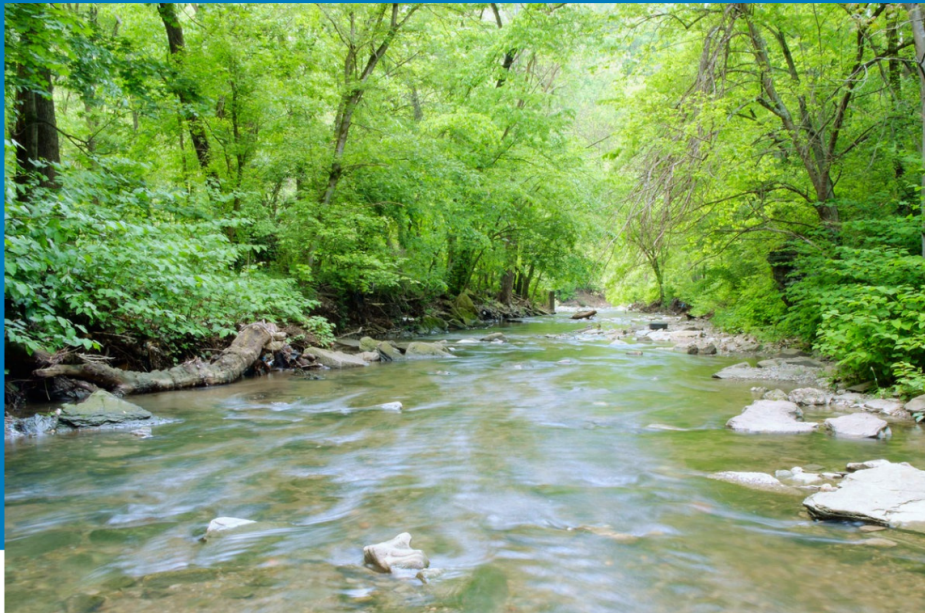




September 2021



An Analysis of Current Water Infrastructure Financing in Pennsylvania

SNAPSHOTS FROM THE LOWER LEHIGH RIVER, UPPER CONESTOGA RIVER AND SAW MILL RUN WATERSHEDS

Special recognition to funding partners:



THE HEINZ ENDOWMENTS



An Analysis of Current Water Infrastructure Financing in Pennsylvania:

Snapshots from the Lower Lehigh River, Upper Conestoga River and Saw Mill Run Watersheds

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Introduction

The University of Maryland Environmental Finance Center (EFC) partnered with the Water Center at the University of Pennsylvania (the Water Center) to analyze public water sector entities (drinking water, wastewater, and stormwater) in three study areas in Pennsylvania—the lower Lehigh River watershed in the Delaware River basin, the upper Conestoga River watershed in the Chesapeake Bay basin and the Saw Mill Run watershed in the Monongahela River basin. We looked at their infrastructure investment needs and their capacity to take advantage of state revolving fund resources managed by PENNVEST and other financing programs in Pennsylvania to meet those infrastructure needs. The goal of the analysis was to provide some insight into how the state financing programs are meeting the needs of water managers and how to facilitate extending the reach of the available financing programs to more communities throughout Pennsylvania to address their drinking water, wastewater, and stormwater management needs.

The 2018 American Society of Civil Engineers report on infrastructure in Pennsylvania gives the state a C-grade.² The picture is even worse for the water sector—drinking water infrastructure gets a D, stormwater infrastructure gets a D, and wastewater infrastructure gets a D-. Through our work, both EFC and the Water Center interact with managers of municipal water entities and hear about the significant backlog of maintenance challenges they face and new challenges related to the increased number of large storm events resulting in flooding and water quality impacts. The public is consistently told that resolving these water resource challenges will require huge investments. At the same time, there is available financing for water infrastructure at low-interest rates through PENNVEST, but most water sector entities do not access these resources. Resources are also available through the US Department of Agriculture’s Rural Development programs and through the US Department of Housing and Urban Development community block grants. The goal of this project is to gain clarity about whether and how available resources can be better utilized to address the water sector infrastructure challenges in communities outside the major urban areas in Pennsylvania.

The analysis focuses on one watershed in each of the three major water basins and the municipal water sector entities (utilities, authorities and MS4 permit holders) to understand whether there are existing policy hurdles to leveraging state revolving fund and other resources for financing needed infrastructure. This

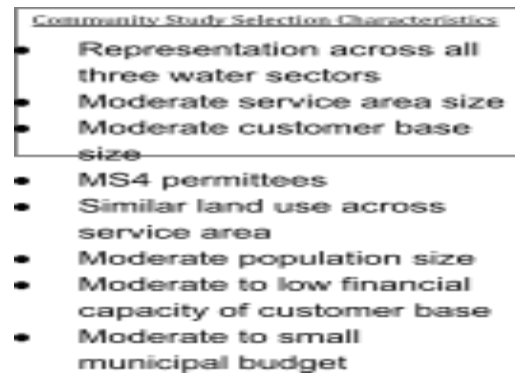
¹ The authors would like to acknowledge the contribution of information from Dr. Lauren Patterson and Dr. Martin Doyle at the Nicholas Institute for Environmental Policy Solutions at Duke University.

² https://www.infrastructurereportcard.org/wp-content/uploads/2016/10/ASCE-PA-report_2018.pdf

analysis also addresses potential impacts of any increase in federal resources available to PENNVEST and other programs through stimulus funding related to the COVID economic recession and any increases in federal infrastructure funding. For this reason, the research will consider whether and how these municipal entities were able to take advantage of stimulus funding from the 2009 American Recovery and Reinvestment Act. In addition, PENNVEST has recently developed three new funding programs: the small project program, the programmatic financing program, and the sub-level revolving fund program. The analysis will look at whether and how these programs are being used in the three focus areas and how they could be used to support the financing of water infrastructure needs. Finally, the analysis will consider other existing funding and financing resources such as rural development programs and community block grants that can support water sector infrastructure project planning and implementation. All parts of the analysis will consider the role that cooperation at a regional or watershed level can play in maximizing the impact of available funding and financing resources.

Community Selection

Because of limited resources and time, the research team focused on a set of communities for analysis in each of the three river basins. We looked for adjacent communities that had municipal water and/or wastewater services as well as municipal stormwater permit obligations regarding a shared waterway. Finally, we were interested in communities of varying sizes in terms of population and service area to see if there were any differences in terms of financing.

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- Community Study Selection Characteristics**
- Representation across all three water sectors
 - Moderate service area size
 - Moderate customer base size
 - MS4 permittees
 - Similar land use across service area
 - Moderate population size
 - Moderate to low financial capacity of customer base
 - Moderate to small municipal budget

The Lehigh River was selected as the location for analysis in the Delaware River basin. The watershed is completely within Pennsylvania and its water resources do not serve any of the residents of Philadelphia, the largest urban area in the state. Nonetheless, the lower part of the Lehigh River watershed is home to several moderately sized communities and the smaller urban areas of Allentown and Bethlehem.

Reducing pollutants from Lancaster County is a high priority for Pennsylvania in terms of meeting the state's Chesapeake Bay Total Maximum Daily Load (TMDL) obligations, so we looked for communities in this county. Communities in the upper Conestoga River watershed in Lancaster County were selected because they met the overall criteria and were upstream of the City of Lancaster, which was included for comparison purposes.

Saw Mill Run flows into the confluence of the three rivers of Pittsburgh, the second-largest urban area in the state. The municipalities in the Saw Mill Run watershed have participated in an ongoing effort to create an integrated watershed management plan, which is of specific interest to this analysis. There is a wide range of population sizes and financial standing in the watershed.

The following municipalities were selected for analysis in each study area:

Lower Lehigh River Watershed
(Lehigh and Northampton Counties)

- Allen Township
- South Whitehall Township
- Whitehall Township
- Catasauqua Borough
- North Catasauqua Borough
- Northampton Borough
- Coplay Borough
- City of Allentown

Upper Conestoga River Watershed
(Lancaster County)

- City of Lancaster
- Clay Township
- Denver Borough
- East Cocalico Township
- Ephrata Borough
- Ephrata Township
- Warwick Township
- West Cocalico Township

Saw Mill Run Watershed
(Allegheny County)

- Baldwin Township
- Bethel Park Borough
- Brentwood Borough
- Castle Shannon Borough
- Crafton Borough
- Dormont Borough
- Green Tree Borough
- Mount Lebanon Borough
- Mount Oliver Borough
- City of Pittsburgh
- Scott Township
- Whitehall Borough

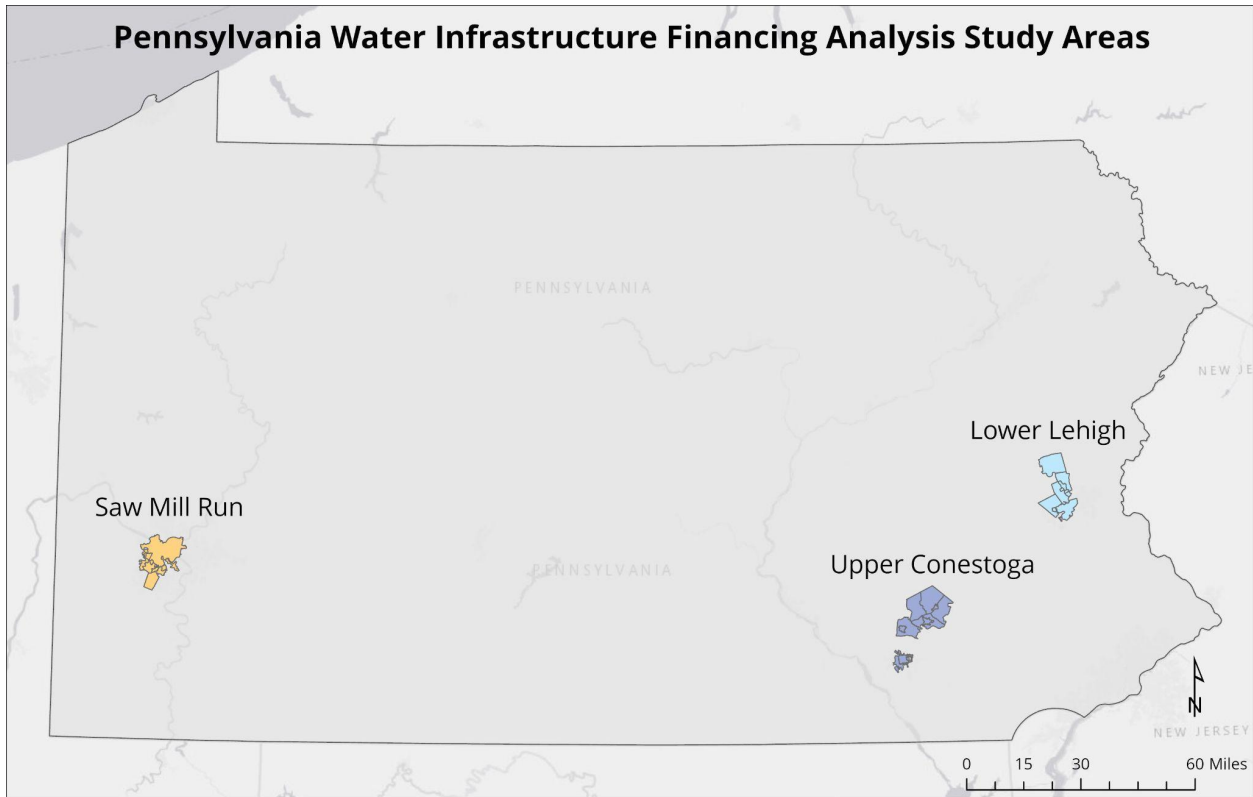


FIGURE 1: THE THREE SELECTED WATERSHEDS.

Analysis Methodology

The research team reviewed borough, township, and municipal authority information available online, including service area maps, budgets, and plans. The information available for review was not consistent—some boroughs and townships had a copy of their pollution reduction plan (PRP) for their municipal separate storm sewer system (MS4) permit available on their websites and some did not. We looked at capital improvement plans and municipal budgets to see what capital investments entities were planning in the near future and how they were budgeting for operations and maintenance needs. At the regional level, we reviewed regional and county plans. Finally, the research team had access to data compiled and analyzed about water infrastructure from Dr. Lauren Patterson and Dr. Martin Doyle Duke University's Nicholas Institute for Environmental Policy Solutions. This dashboard considers the applicable prevalence of poverty and household burden on single-family households within water utility districts to determine the financial burden for water service within that provider's boundaries.

To collect additional information and to provide context, a short survey was developed (a copy is provided in the appendix). The survey was sent out to all borough, township and municipal entities managing water resources in the three study areas, a total of 59 recipients. The research team used these surveys as the foundation for follow-up interviews. The data collected from the surveys and interviews is included with the analysis for each study area.

Water Infrastructure Financing Programs in Pennsylvania

Pennsylvania communities can seek financing assistance from several sources to support water infrastructure projects. This analysis will focus on two funding sources—PENNVEST and the Commonwealth Financing Authority. The analysis considers projects financed between 2009 and 2020 to allow for consideration of federal stimulus funding through the American Recovery and Reinvestment Act of 2009 (ARRA) as well as other resources and result in a holistic analysis of funding and financing gaps and recommendations for filling those gaps.

The research team intended to include information about funding from the USDA Rural Development Water and Environmental Programs. According to the program description, many of the municipalities and water sector entities in this study area are eligible for these programs. However, information about projects funded through this program was not readily available. In addition, the eligibility mapping provided by USDA appears to exclude most of the municipalities in the three study areas.³

Municipalities in all three study areas use general fund revenues and individual municipal bonds to finance water infrastructure projects in addition to accessing capital from these financing programs. Given the limited resources available to conduct this snapshot analysis, we were not able to outline every revenue stream for each municipality for funding infrastructure across all three water sectors. Nonetheless, the municipal finance reviews in each study area provide some perspective on the scale of the water infrastructure needs and the current sources of revenues for townships, cities, and boroughs in Pennsylvania.

PENNVEST

Founded in March 1988, PENNVEST is an independent state entity that provides grants and loans to support drinking water, wastewater, and stormwater projects. Most resources are provided through low interest loans (under 2%) though some funding is provided in the form of grants if communities meet certain criteria. While most of the financing goes to municipalities or municipal authorities, some programs are open to private landowners and businesses.

In general, about 50% of PENNVEST financing supports wastewater projects, about 30% supports drinking water projects, and about 5% supports stormwater projects. Since inception, the share of funding going to the fourth

³ USDA Rural Development mapping is available here: <https://eligibility.sc.egov.usda.gov/eligibility/welcomeAction.do>

category - non-point source projects - has increased to 17% during the last fiscal year. Below is a graphic from the annual report outlining specific financing information since inception and for the last fiscal year.⁴

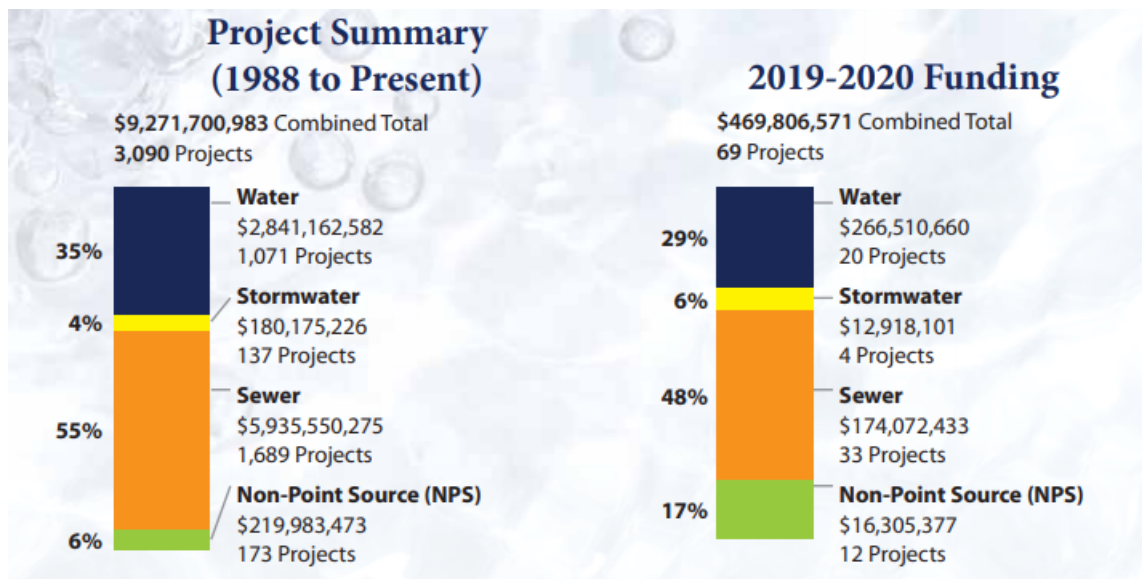


FIGURE 2: PENNVEST FUNDING BREAKDOWN.

The annual report also outlines the source of funding for PENNVEST since 1988. The most significant source has been the annual federal capitalization grants, providing 44% of financing resources. Four separate state general obligation bonds have provided almost \$1.3 billion, about 24% of the financing resources. The 2009 ARRA funding is specifically called out at \$220.9 million, approximately 4% of PENNVEST sources since inception. Over the 32-year history of the program, average annual funding is \$290 million. The federal funding through the ARRA represented almost an entire year of water infrastructure financing for the state.⁵

Commonwealth Financing Authority (CFA)

The authority was established in 2004 as part of the Pennsylvania Department of Economic and Community Development to help manage state and federal economic stimulus funding. CFA has several programs that provide financing for water infrastructure projects. This analysis reviewed three of those programs: the H2O PA program, the PA Small Water and Sewer program, and the Act 13 program (specifically the watershed restoration and protection element and the flood mitigation element of the program). Each program varies slightly in terms of eligibility, timeline, focus, and grant amounts. Available data about these programs is aggregated since each program's inception.

- The H2O PA programs date to 2008 and are funded through state gaming and tourism revenues. The water and sewer part of the program provides grant funding for stormwater, drinking water and sanitary sewer projects to municipalities or municipal authorities, with a minimum grant amount of \$500,000 and a maximum of \$20 million for any one project. The timeline for a project cannot exceed 6 years. The flood control part of the program is available to the state, independent agencies, municipalities, and municipal authorities for grant projects ranging from \$500,000 to \$20 million for construction or rehabilitation of a flood control system.
- The PA Small Water and Sewer program is funded through the state's fiscal code and provides grants to municipalities and municipal authorities for a minimum of \$30,000 and a maximum of \$500,000. The

⁴ https://www.pennvest.pa.gov/SiteCollectionDocuments/Executive_Docs/PENNVEST_2019-2020_Annual_Report.pdf at 6.

⁵ Id. at 14.

funding can be used to build, expand, or rehabilitate drinking water, stormwater, flood control or sewer systems.

- Funding for the Act 13 program, initiated in 2012, comes from Marcellus Shale gas impact fees. There are several uses for the revenue that reverts to the state. This analysis focused on two elements of the Act 13 program:
 - The goal of the Watershed Restoration and Protection Program is to restore and maintain streams impaired by uncontrolled non-point source pollution and remove these streams from the state's impaired waters list. A broad set of entities are eligible to apply for these funds, including watershed organizations and land trusts.
 - The goal of the Flood Mitigation Program is to support projects identified by a flood protection authority, the Pennsylvania Department of Environmental Protection, the US Army Corps of Engineers (USACE) or the Natural Resources Conservation Service. A variety of public and private entities are eligible to apply. Funding will not exceed \$500,000 and the applicant must provide 15% match.

The level of funding varies across these programs and the amount granted each year varies as well. Since inception, the sewer and water funding through the H2O program has totaled more than \$680 million; the flood control funding has totaled approximately \$87 million. The total expenditures for the PA Small water and sewer program totals more than \$136 million and 656 projects. The Act 13 flood mitigation funding has totaled more than \$20 million and the watershed restoration and protection support has totaled \$18 million.

Information about approved projects is available on the PENNVEST and CFA websites, though specifics about individual projects vary for each source.

Lower Lehigh River Watershed Study Area

Lower Lehigh River Watershed Characterization

On its 103-mile journey from its headwaters in glacial bogs and marshes near Gouldsboro in Wayne County to its confluence with the Delaware in Easton, the Lehigh River informs the geography, natural systems, history, economy, and culture of communities along its length. These historic lands of the Lenni-Lenape people have borne witness to several hundred years of developments that trace the history of Europeans in North America—from frontier subsistence agriculture to the rise of coal, steel, and cement during the industrial revolution on to the rapid technological and social changes of the past fifty years.

Much of the current channel and character of the Lehigh River and its key tributaries in the study area is the result of over 100 years of operation of the 72-mile Lehigh Navigation Canal System. From the 1820's to the 1930's, the canal operated within or alongside the original river channel. The canal supported all the industry along the Lehigh River, carrying coal, timber, and other commodities from the upper reaches of the watershed to the industries of the Lehigh Valley, and on to Philadelphia, and New York. The canal was an engineering marvel of its time which brought enormous prosperity to the region, but it required equally enormous alterations to the river itself. The system overcame a greater elevation change than any other North American canal of its day—along its full length the canal used 28 dams and 81 locks to manage a drop of over 850 feet. In its peak years of its operation, the canal carried nearly 1,000,000 tons of anthracite coal per year from Carbon County to Easton, and to this day portions of the riverbanks and river bottom are covered by many tons of coal silt.

Compounding the historic impacts of upstream resource extraction, the river also served as a recipient of industrial and human waste in more developed downstream areas. Since the demise of the canal system and the implementation of the Clean Water Act, water quality in the river has seen steady improvement. Though far from pristine, the river now supports a thriving sport fishery, and riparian areas through the study area act as important wildlife corridors. The prevalence of limestone karst geology in this region of the watershed, coupled with historic agricultural/rural land use, means that small tributaries in this section of the watershed have

historically supported high value cold-water fisheries. However, threats to water quality are changing, and are increasingly associated with the significant changes in land use affecting this section of the watershed.

As the regional economy has undergone a post-industrial renaissance, vast areas of former farmland in Lehigh and Northampton Counties have been developed for residential, industrial, and logistics. The availability of large parcels close to transportation corridors and the large markets of the urban northeast has led to a building boom, with the region consistently among the fastest growing areas in the state. This increase in impervious areas has led to a burgeoning stormwater management challenge.

Municipalities in the region are struggling to manage the changes in water quality and quantity associated with this development. Older, largely developed, industrial towns with current and former industrial properties struggle with aging infrastructure, combined sewer outfalls, sanitary sewer overflows, and storm drain systems not designed to mitigate impacts to receiving waters. Rapidly developing exurban townships face a rapid increase in peak flows and sedimentation due to impervious surface, failing sedimentation basins and poorly designed infrastructure by developers, thermal pollution due to runoff from hardstand, conductivity challenges due to road salt, failing septic systems and residential wells, among others.

The complex network of municipal boundaries, urbanized area, and drinking water and wastewater service areas are illustrated in figures 3 and 4.

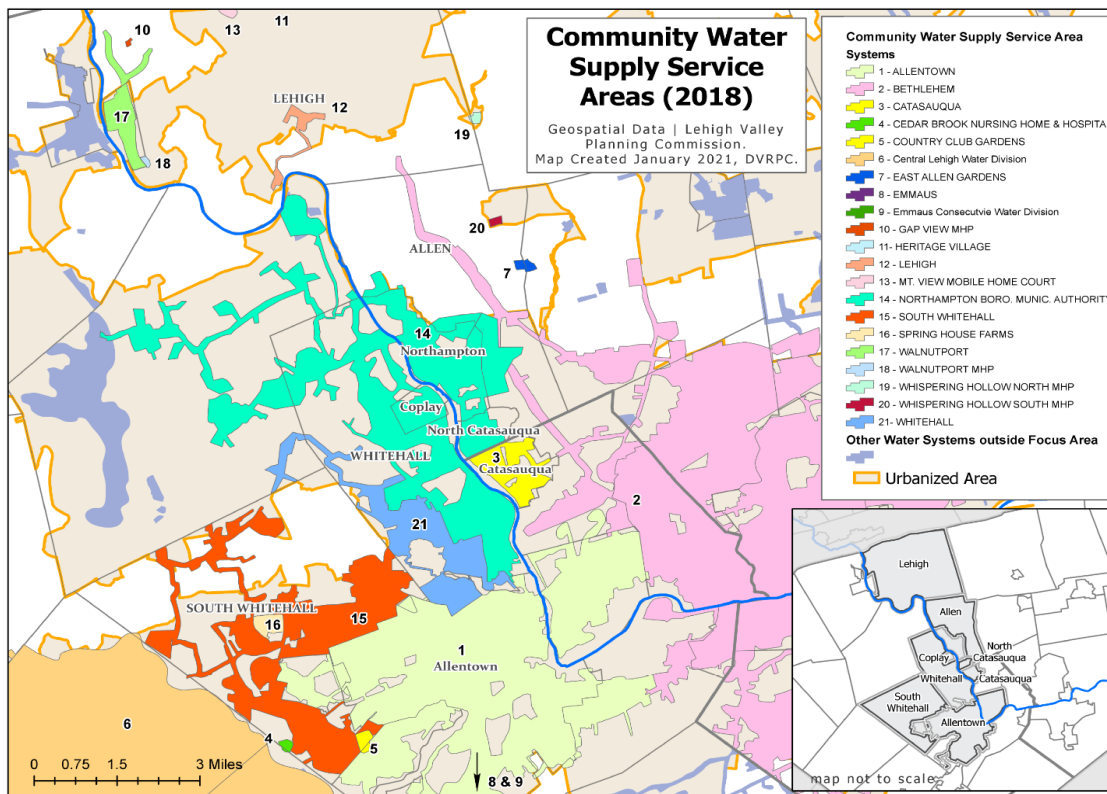


FIGURE 3: LOWER LEHIGH DRINKING WATER SUPPLY SERVICE AREAS

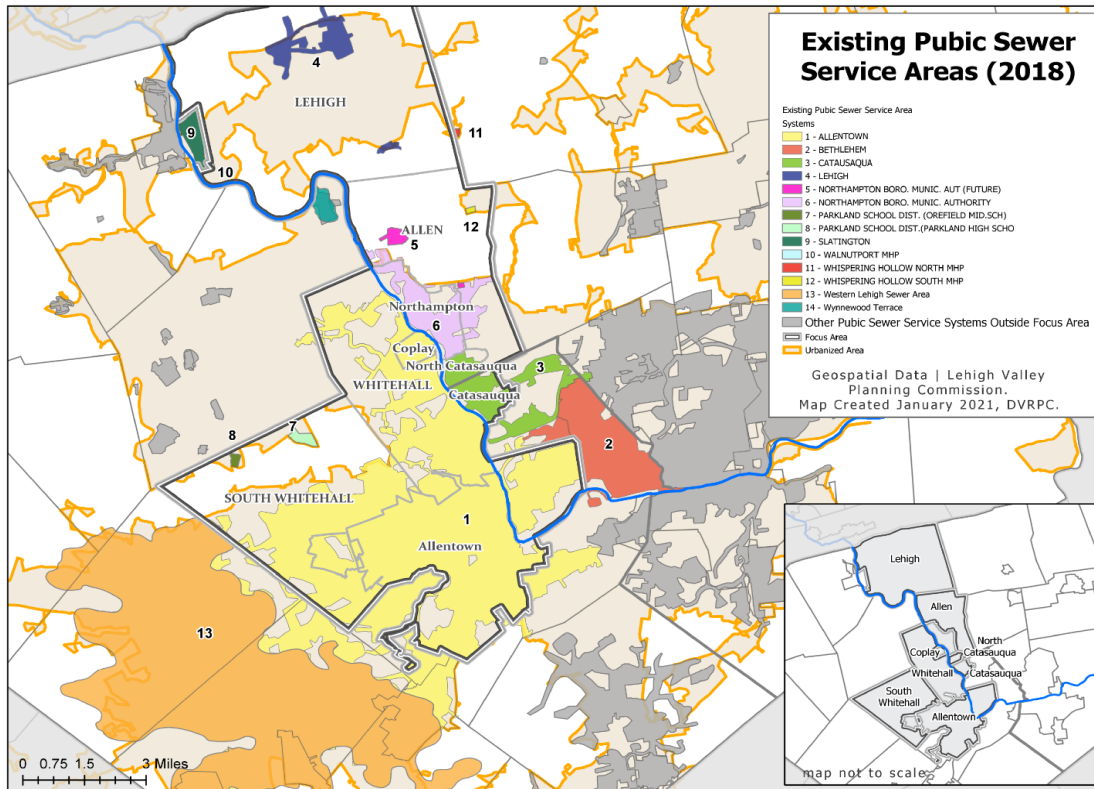


FIGURE 4: LOWER LEHIGH SEWER SERVICE AREAS

Community Profiles

Our research focused on eight municipalities located along the upper Lehigh River: Allen Township, Allentown City, Catasauqua Borough, North Catasauqua Borough, Coplay Borough, Northampton Borough, Whitehall Township, and South Whitehall Township. The total population of the area covered by these municipalities is 206,406 and 76,247 households.⁶ The amount of reserve funds, available cash, and planned expenses for water and sewer projects varies as a result of different revenue sources and infrastructure needs in each municipality. One common need evidenced across municipal budgets however is the upgrade of existing infrastructure.

Demographics

Selected community data was collected from the American Community Survey 2015-2019 five-year estimate tables provided by the U.S. Census Bureau. The selected categories were chosen to help frame the socio-economic context of the study area. Population, age, and housing data were also collected to provide further context for the socio-economic information, as well to provide background on the potential size of the customer base for water and sewer services and related benefits. Below is a table [Table 1] detailing the data for each municipality.

TABLE 1: LOWER LEHIGH RIVER VALLEY COMMUNITY PROFILES

Municipality	Pop.	Median Age	Age 65+ (%)	Households	Housing Units	Unemployment Rate (%)	Poverty Rate (%)	College Graduate or Higher [B.A., 25YR+] (%)	MHI
Allen Twp.	4,928	46.2	21.5	2,039	2,131	3.2	4.1	36.5	\$80,942
Allentown City	120,915	31.6	11.9	42,245	45,824	10	25.7	15.3	\$41,167
Catasauqua Boro.	6,568	36.5	14.4	2,705	2,817	3.8	12.1	25.8	\$59,460
Coplay Boro.	3,201	44.6	19.9	1,363	1,416	3.9	8.6	16.1	\$54,625
Northampton Boro.	9,847	39.8	18.9	3,946	4,208	3.9	9.3	18.2	\$60,285
South Whitehall Twp.	19,778	46.1	24.5	7,709	7,991	3.6	3.8	42.5	\$82,258

⁶ U.S. Census Bureau ACS. 2015-2019 Five-year Estimates. U.S. Census Bureau American Community Survey. 2020.

Whitehall Twp.	27,567	39.9	17.8	11,091	11,464	4.7	6.1	25.8	\$63,707
N. Catasauqua Boro.	2,831	40	17.6	1,068	1,139	8.1	10.3	19.1	\$69,244
Total Avg. for Group	24,454	41	18	9,021	9,624	5	10	25	\$63,961

Due to its much larger size than the other municipalities studied here, Allentown’s data may not easily compare with that of the other jurisdictions; nevertheless, it contrasts greatly beyond the population total. The unemployment rate (10%) and poverty rate (25.7%) are greater than the next closest rates. When accounting for the level of educational attainment, Allentown also has the lowest rate of college graduates aged 25 or higher. As reflected by the city’s demographic data, the city’s age range skews young with a median age of 31.6 and only 11.6 percent of the 120,915 estimated residents being age 65 or older. These are the lowest numbers for each category in Table 1 and when viewed in comparison with the Median Household Income (MHI) for Allentown, a challenge for Allentown may be a young workforce that is under-skilled or that employment opportunities may not be plentiful or available.

Whereas Allentown City is lagging behind its neighbors in most socio-economic metrics examined, South Whitehall and Allen Townships lead the study area in measurements of economic strength. Each has a higher MHI, over \$80,000, approximately double that of Allentown. Both also rank high in college degree attainment and have the lowest rates of unemployment and poverty in the study area. The educational attainment totals are both significantly higher than the average of 25% for all municipalities studied. South Whitehall and Allen Townships also have the highest proportions of residents aged 65 or higher. This may mean that a high percentage of their residents are retired, and the townships may not be attracting younger residents.

Generally, the association between having a higher number of residents with a college degree and a higher MHI is clear in the data from Table 1, although there appear to be other factors influencing the rate of income increase. For example, Allentown City’s college-educated population 25 years or older is less than one percent below that of Coplay, however, Coplay’s MHI is \$13,000 greater and its unemployment rate is 6.1% less and poverty rate is over 16% less than in Allentown.

Over seven percent less of Northampton Borough residents 25 years old or greater have a college degree compared to those in Catasauqua Borough, yet the MHI in Northampton is only about \$800 higher than that in Catasauqua Borough. Similarly, Whitehall Township’s 25.8% of applicable residents with a college degree is over six percent higher than those in North Catasauqua Borough, but the latter’s MHI is approximately \$5,500 higher. Whitehall is larger than North Catasauqua by almost 25,000 residents, but the age demographics are similar. North Catasauqua’s unemployment rate is much higher than Northampton or Whitehall’s though.

Examining the lower Lehigh River using the Duke University affordability dashboard shows that there is a range of low to moderate financial burden on households within most of the included boroughs and townships, including the comparatively affluent township of South Whitehall where the burden is rated low. The only exception is Allentown City where the burden range is moderate to high. This corresponds with Allentown's high unemployment and poverty rate reflected in Table 1 above.

Water System Profiles

The public water systems that serve the selected municipalities are Catasauqua Municipal Water Authority, Lehigh County Authority (LCA) – Allentown Division, Northampton Borough Municipal Authority, South Whitehall Township Authority and Whitehall Township Authority. Tables summarizing the public drinking water and wastewater authorities and the municipalities they serve within the lower Lehigh River study area are included below. Generally, each municipality is responsible for the drinking water distribution and wastewater collection systems (i.e., pipes and pumps) within their jurisdictional boundaries unless otherwise noted. The costs for this part of the system are covered with general fund revenues or through an authority structure but not through drinking water and wastewater treatment utility rates.

The table below focuses on the entities providing drinking and wastewater treatment services as opposed to distribution and collection.

TABLE 2: PUBLIC DRINKING WATER SYSTEMS—LOWER LEHIGH RIVER WATERSHED STUDY AREA

Public Drinking Water System	Municipalities Served within Study Area
Catasauqua Borough Water Department	Allen Township Catasauqua Borough North Catasauqua Borough
Coplay Whitehall Sewer Authority	Coplay Borough Whitehall Township
Lehigh County Authority—Allentown Division	Allentown City
Lehigh County Authority—Central Lehigh Division	South Whitehall Township
Northampton Borough Municipal Authority	Allen Township Coplay Borough North Catasauqua Borough Northampton Borough Whitehall Township
South Whitehall Township Authority	South Whitehall Township
Whitehall Township Authority	Whitehall Township

TABLE 3: PUBLIC WASTEWATER SYSTEMS—LOWER LEHIGH RIVER WATERSHED STUDY AREA

Public Wastewater System	Municipalities Served within Study Area
Catasauqua Borough Sewer Department	Allen Township Catasauqua Borough North Catasauqua Borough
Coplay Whitehall Sewer Authority	Coplay Borough Whitehall Township
Lehigh County Authority—Allentown Division	Allentown City Coplay Borough South Whitehall Whitehall
Northampton Borough Municipal Authority	Northampton Borough
South Whitehall Township Authority	South Whitehall Township

Catasauqua Borough manages a complete water system that provides drinking water to Catasauqua Borough. Drinking water is supplied by three wells that are authorized by PADEP to withdraw approximately 1 million gallons of water collectively per day. The Catasauqua Water Department currently withdraws around 720,000 per day, which is treated and stored in two large storage tanks. The Catasauqua Sewer Department operates a 2.25MGD wastewater treatment facility that processes sanitary sewage and industrial wastewater from Catasauqua, North Catasauqua, and some of Allen Township’s industrial areas. Treated wastewater is conveyed to the Lehigh River.

Coplay Whitehall Sewer Authority (CWSA) owns and operates the collection and conveyance sewage system that serves the entire areas of Coplay Borough and Whitehall Township. CWSA currently services over 13,500

customers with approximately 120 miles of pipe. Wastewater is conveyed to the LCA Allentown treatment facility and is shown as part of the LCA service area in the public sewer map included in this report.

LCA is the largest public water entity within this study area. Several municipalities within the study area, as well as several other municipalities, are served by the Allentown and Central Lehigh Divisions of the LCA for drinking water. The LCA's five primary sources of drinking water are Schantz Spring, Crystal Spring, the Little Lehigh Creek, groundwater wells and the Lehigh River (emergency supply only). The approximate 21 million gallons per day of water drawn from all LCA sources is treated at a full-scale water treatment and filtration plant located in Allentown. The Allentown Division provides drinking water to all developed areas within the boundaries of the City of Allentown, totaling over 33,000 residential and commercial properties. The Central Lehigh Division supplies drinking water from wells and an interconnection with the Allentown Division to numerous municipalities within Lehigh County including South Whitehall Township. LCA also serves as a central hub for wastewater service in Lehigh County, providing direct sewer service to residents of Allentown and interceptor connections to Coplay, South Whitehall, and Whitehall as well as other communities outside the study area. Sewer flows for these municipalities are treated at the Kline's Island Wastewater Treatment Plant in Allentown. South Whitehall Township Authority is currently in the dissolution process and LCA Central Lehigh Division will provide both drinking water and wastewater services to the township going forward.

The Northampton Borough Municipal Authority (NBMA) drinking water service area crosses the most municipal boundaries of the systems in this study area. NBMA has approximately 16,000 service connections, 200 miles of pipeline, over 1,000 fire hydrants and serves an average of 3.5 million gallons of water per day to a population of approximately 50,000. Further, NBMA has the largest footprint along the main stem of the Lehigh River and relies upon the Lehigh River as its primary water source. NBMA draws water from the Lehigh River and the Spring Mill Reservoir and conveys it to an 8.0 million GPD treatment plant. NBMA provides drinking water services to Allen Township, Coplay Borough, North Catasauqua Borough, Northampton Borough, and Whitehall Township.

Whitehall Township Authority provides water service for 2,885 connections (serving a population of 13,600) in Whitehall Township and North Whitehall Township from a groundwater source⁷.

A summary of statistics on the public water systems in this study is provided below. Affordability metrics and census data for the public water systems in this study were also provided by Dr. Lauren Patterson and Dr. Martin Doyle at the Nicholas Institute for Environmental Policy Solutions at Duke University when available.

TABLE 4: LEHIGH RIVER VALLEY PUBLIC WATER ENTITY AFFORDABILITY PROFILE

Water Authority	Customers Served	Population Served	AWWA Burden Score	Percentage of Low-Income Households Income spent on Water Services	Family Income below \$24K	Family Income above \$150K
Catasauqua Borough Sewer and Water Department	-	6,598	-	-	-	-
Coplay Whitehall Sewer Authority	13,500	-	-	-	-	-
Lehigh County Authority—Allentown	33,390	118,000	Moderate-High	4.33	27.48%	6.04%
Lehigh County Authority—Central Lehigh Division	17,831	47,508	Low	-	-	-

⁷Sources: <https://www.lehighcountyauthority.org/drinking-water/about-your-water/#section-map>; <https://www.lehighcountyauthority.org/wastewater/about-your-wastewater/>; <https://www.catasauqua.org/departments/public-works/>; <https://www.nbma.org/>; <http://www.whitehalltownship.org/generalinfo.html>; https://www.epa.gov/enviro/sdwis-search#water_id

Northampton Borough Municipal Authority	16,000	40,000	Low-Moderate	4.48	14.99%	8.97%
South Whitehall Township Authority	-	14,500	Low	1.81	11.64%	15.03%
Whitehall Township Authority	2,885	13,063	Low-Moderate	2.92	20.07%	6.53%

Municipal Separate Storm Sewer Systems (MS4s)

Each of the eight municipalities in the study area has an MS4 permit. Both maps of the study area include the urbanized area that defines the reach of the MS4 program in each jurisdiction. PA DEP's 2017 MS4 permit included pollution load reduction requirements for sediments and nutrients for streams impaired by these pollutants, including the Lehigh River. The impaired streams in the study area are identified in the table below. For most of these municipalities, the pollution load reductions are a new element of their MS4 permits. The City of Allentown is a Phase I community, and it formed a stormwater utility in 2017. The other municipalities are small MS4s and none of them have a stormwater fee in place to fund the implementation of stormwater best management practices. In general, these municipalities have been paying for their MS4 obligations through general fund resources and they use external engineers to support their permit applications. These communities have stormwater systems that are composed of inlets and pipes with outfalls to various creeks as well as stormwater management facilities that are specific to a certain development.

TABLE 5: AREA IMPAIRED STREAMS BY MUNICIPALITY

Municipality	Impaired Streams Requiring Load Reductions in Current PA DEP MS4 Permit
City of Allentown	Lehigh River Cedar Creek Jordan Creek Little Cedar Creek Little Lehigh Creek Trout Creek Trout Creek West
Catasauqua Borough	Lehigh River Catasauqua Creek
Coplay Borough	Lehigh River
South Whitehall Township	Lehigh River Jordan Creek Little Cedar Creek Little Lehigh River Coplay Creek
Whitehall Township	Lehigh River Jordan Creek Coplay Creek Little Lehigh Creek
Allen Township	Lehigh River Catasauqua Creek Dry Run Hokendauqua Creek Coplay Creek

North Catasauqua Borough	Lehigh River Catasauqua Creek
Northampton Borough	Lehigh River Catasauqua Creek Dry Run Hokendauqua Creek

During our research, we found two Pollution Reduction Plans (PRP) for Allen and Whitehall Townships and a Stormwater Management Program Plan (SWMPP) for Allentown City. Although different, both types of documents offer insight and details about the current and expected pollution loads for its associated impaired waters, as well as the BMPs being implemented to meet permit requirements and improve water conditions. The following is a short summary of takeaways for these three municipalities.

Allen Township

The principal pollutants of concern along the Township's section of the Lehigh River are organic enrichment/low dissolved oxygen, siltation, and suspended solids.⁸ As of July 2018, no existing BMPs qualified as a pollution reduction credit. Accordingly, as shown in the table below, Allen Township is required by the permit to "reduce the amount of sediment discharge by 10% and phosphorus by 5% for the Lehigh River watershed" at minimum.

TABLE 6: ALLEN TOWNSHIP POLLUTION REDUCTION REQUIREMENTS

Pollutant(s)	ALLEN TOWNSHIP		
	Existing Load (lb./yr.)	Minimum Reduction	Required Reduction (lb./yr.)
Total Sediment	51,547.21	10%	5,154.72
Total Phosphorus	74.42	5%	3.72

Both BMP installations proposed in the PRP to address these pollutants are rain gardens. The plan explains that this option was chosen because proper plantings and the area spacing of a garden would "encourage infiltration and filtering of sediment and nutrients from the stormwater runoff." Worth noting is that both of the suggested sites for rain gardens are outside of the "urbanized area" of the Township's MS4 boundary, but stormwater from within the boundary area would reach the sites for treatment.

Allentown City

Allentown has a large and complex stormwater management infrastructure that incorporates a variety of BMPs to address pollutants in its runoff. Its assets include: "pipe (343 miles), swales, curb/gutter, best management practices (BMPs) such as rain gardens, detention basins, and other collection and conveyance components"⁹. As reflected in Table 7 below, Allentown's pollutant reduction requirements are not detailed in its SWMPP, but the plan does list the existing pollutant loads impacting the various water bodies within its MS4 boundary. The amounts below reflect the existing pollutant loads (as of May 2020) in the Lehigh River in the area of Allentown.

TABLE 7: ALLENTOWN CITY POLLUTION LOAD IN THE LEHIGH RIVER

Pollutant(s)	ALLENTOWN CITY		
	Existing Load (lb./yr.)	Minimum Reduction	Required Reduction (lb./yr.)
Ammonia	1,335.20	-	-
Cadmium	24.60	-	-

⁸ Allen Township Pollution Reduction Plan, July 10, 2018, <http://www.allentownship.org/forms/20180710MS4PRP.pdf>

⁹ Allentown City Stormwater Management Program Plan at 86, May 2020, <https://www.allentownpa.gov/Portals/0/files/Water/2019-2020%20Annual%20MS4%20Progress%20Report.pdf?ver=2020-06-05-092333-600>

Copper	124.13	-	-
Lead	211.16	-	-
Zinc	768.57	-	-
TSS	635,214	-	-
TDS	488,789	-	-
BODS	65,125	-	-
COD	391,857	-	-
TKN	9,685	-	-
Total Phosphorus	1,231.89	-	-
Diss. Phosphorus	2,362.80	-	-

As described in its SWMPP, Allentown has undertaken a variety of BMPs to address these pollutant loads, but it is not clear from the report what specific projects apply specifically to the Lehigh River.

Whitehall Township

The copy obtained of Whitehall Township's PRP does not include a breakdown of the pollution load requirements by each impaired water body within its MS4 boundaries.¹⁰ It does, however, present the total sediment pollution load amounts for the entire planning area. The amount in Table 8 under "Existing Load" has been reduced by 23,582 lbs. per year due to pollution reduction credits resulting from existing BMPs, including an infiltration project, detention basins with wetland pockets and a water quality basin installation. The latter water basin was done at a Walmart and managed to reduce the sediment pollutant load there by 78.4%.¹¹

TABLE 8: WHITEHALL TOWNSHIP POLLUTION REDUCTION TARGET

Pollutant(s)	WHITEHALL TOWNSHIP		
	Existing Load (lb./yr.)	Minimum Reduction	Required Reduction (lb./yr.)
Total Sediment	4,703,092	10%	470,309

Future BMPs proposed in Whitehall include mostly water quality basins and swales and infiltration basins, in addition to wet ponds, a wetland, sand filters, stream restorations, and more.¹² If these BMPs are all implemented and function as forecast, the PRP states that they are expected to reduce the pollution load by 481,517 lbs. per year, 11,208 lbs. per year more than the 10% reduction target.

Municipal Water and Sewer Financial Resources

Budget data for the different municipalities studied varies in online availability and in presentation making straightforward comparisons challenging. Coplay and North Catasauqua did not have budget data available for remote access. The only document available online for Northampton is the projected budget for 2019, which is what was used. This analysis will focus largely on the closing budget balances in order to show the level of potential funding available for projects. More information needs to be gathered to determine the degree to which municipalities are open to using reserve funds for existing projects in the pipeline.

Catasauqua Borough

Catasauqua appears to have the greatest challenge to covering its sewer budget in 2021¹³ The closing balance for the 2021 proposed sewer budget is -\$421,946, and it was the only municipality of those examined here with a negative closing balance. This budget denotes two large expenses significantly impacting the total, including

¹⁰ Whitehall Township Pollution Reduction Plan, August 2017, http://www.whitehalltownship.org/forms/pollution_plan.pdf

¹¹ Ibid.

¹² Ibid.

¹³ Catasauqua Borough 2021 Proposed Budget,

<https://www.catasauqua.org/wp-content/uploads/2020/12/2021-Catasauqua-Proposed-Budget.pdf>

\$450,000 listed under maintenance and marked for capital construction and a \$600,000 charge for a water treatment plant.

Allentown City

Five-year projected budgets for Allentown expect a significantly diminishing series of closing balances and annual deficits, including in 2021.¹⁴ No financing sources are indicated for stormwater in the General Fund Budget; however, the city does have a stormwater fee, billed at \$20 per 500 sq. feet of impervious surface per year, implemented in 2018. At the time, the city said it had "\$60 million in backlogged storm sewer projects."¹⁵ The corresponding proposed Stormwater Fund budget has a closing balance in 2021 of \$6,351,558, compared to a closing balance for the Water & Sewer budget of \$1,037,524 and \$11,359,060 for the general fund budget.

Allen Township

The proposed general fund and wastewater fund budgets were available for inspection on the Allen Township website.¹⁶ It reflects an expected deficit at the end of FY21 after having had a diminishing closing balance in 2018 and 2019. Main rising expenses appear to be repair and maintenance related, as well as usage charges paid to other municipalities. The surplus balance of \$1,146,950 for the proposed 2021 wastewater fund budget is because of the positive carryover balance. The proposed 2021 general fund budget has a closing balance of \$2,979,088.

Northampton Borough

Northampton's 2019 balances include a sewer budget closing balance of \$3,355,541 and a general fund closing balance of \$11,359,000. Sewer related expenses were listed at \$1,465,624 and expected revenue at \$1,641,700. The document notes "The largest Capital Projects include ... \$75,000 for the MS4 stream remediation ... Capital projects include a new lawn tractor, a six (6") inch trash pump and a continuation of the upgrade for the treatment facility. In light of the results of the study done by the Borough's environmental engineers, Gilmore and Associates, it has become apparent that Council may wish to consider a sewer rate adjustment within the not-too-distant future."¹⁷

Whitehall

Whitehall's proposed 2021 general fund balance is \$4,001,602.¹⁸ Regarding expected costs, the budget for the Public Works dept. lists \$474,500 worth of storm sewer expenses. This is potentially \$247,000 more than what the proposed expenses were for the storm sewer system in the 2020 budget (\$227,500 total related to the storm sewer, \$192,500 of which were likely associated with federal and state projects). In 2021, the federal and state projects were both water-related projects.

South Whitehall

There is a \$4,911,729 closing balance for South Whitehall in its 2020 water and sewer budget.¹⁹ In 2021, capital expenses for the sewer system total \$1,042,500 and \$1,234,400 for water service projects.

External Financing for Water Infrastructure

PENNVEST

Since 2009, five water infrastructure projects in the study area have received PENNVEST financing support. Information about the projects is outlined in the table below and can be found on the PENNVEST website.²⁰ Other water infrastructure projects have been financed in the study area before 2009. In Lehigh County, a total of 34 projects have been financed; in Northampton County, a total of 42 projects have been financed. A review of these

¹⁴ Allentown City Proposed 2021 Budget, <https://www.allentownpa.gov/Government/City-Budget>

¹⁵ Opilo, Emily. "Stormwater credits OK'd by Allentown Council benefit big property owners." *The Morning Call*. June 20, 2018. <https://www.mcall.com/news/local/allentown/mc-nws-allentown-stormwater-credits-20180620-story.html>.

¹⁶ Allen Township Draft 2021 Budget, <http://www.allentownship.org/forms/2021draftbudget.pdf>

¹⁷ Northampton Borough 2019 Budget Summary Pages, https://129bcf8f-da71-cadc-b74c-0a1092e3ece3.filesusr.com/ugd/b22cae_660016afb968408a9a0793cda68ea43a.pdf

¹⁸ Whitehall Township 2021 Proposed Budget, <http://www.whitehalltownship.org/forms/2021pb.pdf>

¹⁹ South Whitehall Township 2021 Budget Summary, <https://southwhitehall.com/wp-content/uploads/2020/11/2020.11.19-SWT-2021-Public-Inspection-Copy.pdf>

²⁰ <https://www.pennvest.pa.gov/Information/Pages/Approved-Projects.aspx>

past projects indicates that PENNVEST has been an important source of funding for major drinking water and wastewater infrastructure projects in the study area.

TABLE 9: PENNVEST PROJECTS 2009-2020

PENVEST Water Sector Entity	Date	Amount Financed	Area Served	Purpose
North Catasauqua Borough, Northampton County	7/2020	\$618,229	1113 households	Stormwater Installed 5010 ft of new storm sewers and 69 new inlets alleviating current flooding and providing capacity for larger storm events; repayment with general funds from borough
Lehigh County Authority, City of Allentown	11/2010	\$8,612,681	34,000 households	Drinking water Replaced existing meters and installed mobile reader technology
Lehigh County Authority, City of Allentown	11/2010	\$672,000	34,000 households	Drinking water Repaired leaking joints on transmission main
Coplay-Whitehall Sewer Authority	1/2012	\$9,973,000	10,209 households	Wastewater Replaced 24,300 ft of interceptor sewer pipe; rates expected to increase by 12%
Total:		\$19,875,910		

Commonwealth Financing Authority (CFA)

CFA has three programs that provide financing for water infrastructure projects - the H2O PA program, the PA Small Water and Sewer program, and the Act 13 program. Each program varies slightly in terms of eligibility, timeline, focus, and grant amounts. A total of eleven projects have been funded in the study area through CFA programs.

TABLE 10: CFA PROJECTS 2009-2020

CFA Applicant	Grant Program	Grant Amount	Purpose
City of Allentown, Lehigh County	H2O PA Sewer and Water	\$877,806	Wastewater Sewer System infiltration and inflow removal
Coplay-Whitehall Sewer Authority, Lehigh County	H2O PA Sewer and Water	\$293,020	Wastewater Jordan Creek interceptor replacement
Lehigh County Authority, Lehigh County	H2O PA Sewer and Water	\$298,300	Drinking Water Water meter replacement
Coplay-Whitehall Sewer Authority, Lehigh County	PA Small Water and Sewer	\$100,000	Wastewater Prospect Street Sanitary Sewer
Whitehall Township Authority, Lehigh County	PA Small Water and Sewer	\$155,000	Drinking Water Water main replacement
Northampton Borough, Northampton County	PA Small Water and Sewer	\$100,000	Wastewater Sewer manhole improvement

Catasauqua Borough, Northampton County	PA Small Water and Sewer	\$425,000	Wastewater Lehigh Canal interceptor rehabilitation project
Northampton Borough, Northampton County	PA Small Water and Sewer	\$200,000	Stormwater/ Flood Control Dry Run Stream Restoration
North Catasauqua Borough, Northampton County	PA Small Water and Sewer	\$200,000	Stormwater Main Street Storm Sewer
South Whitehall Township, Lehigh County	Act 13 Flood Mitigation	\$30,000	Stormwater/Flood Control HEC-RAS Army Corps Study along Jordan Creek
Wildlands Conservancy, Lehigh County	Act 13 Watershed Restoration and Protection	\$28,249	Stormwater/Flood Control Jordan Creek Restoration Project, Phase II
Total:		\$2,707,375	

Water Infrastructure Survey and Interview Results

The water infrastructure survey was shared with all eight MS4 managers, five drinking water managers and four wastewater managers in the study area. Responses were received from seven of the 17 entities, including three drinking water managers, two wastewater managers and two stormwater managers. These responses provided the following information:

- The water systems serve communities ranging from 2300 households to 55,000 households.
- One water manager has an asset management system in place. Small systems in the region generally do not have an asset management system.
- Funding has come from a variety of sources, including general fund, fees and rates. All managers have used external funding, though only one indicated knowledge of how to access PENNVEST programs.
- Three managers indicated that their water infrastructure needs benefitted from ARRA funding.
- All seven water managers have project funding needs in the next five years. Their priority needs are split between operations and maintenance, aging infrastructure, upgrading systems, and addressing challenges related to the COVID pandemic.
- Lead service lines, flooding and sewer overflows are challenges in the region.
- These entities have either recently increased rates or may be considering increases in the near term.

We interviewed water managers representing all of the respondents to the surveys. In addition to the information collected from the survey responses as outlined above, we learned that:

Drinking Water and Wastewater

- It is much easier and more economical for municipalities to manage drinking water systems than wastewater systems.
- There appears to be a lack of capacity for wastewater management in the region. The Act 537 Sewage Facilities Plans in the study area are between 5 and 40 years old, with the largest area having a plan at least 20 years old.
- Wet weather creates challenges for wastewater systems, particularly separate storm sewer overflows.

- Water systems throughout the region are suffering from aging infrastructure and lack of regular maintenance likely linked to lack of political will to raise rates.
- The regional water system has significant experience with PENNVEST funding and is aware of the programmatic financing program. WIFIA funding is not helpful to them.
- The regional water system is challenged in realizing the efficiencies of scale as a result of the lack of consistency in management agreements with municipalities.
- Recent experience with PENNVEST on a small project was challenging because a community had to rent a generator for many months while a loan was being approved, creating significant financial stress.
- One community applied for and was denied a CFA grant. They went to the municipal bond market to fund their capital needs.
- One community had experience with USDA but found similar challenges to getting loan financing in place though indicated that USDA funding can be stretched out over a longer period of time.
- The COVID pandemic did result in significant reductions in bill payment for some systems, but it is not clear how significant the impact will be in the long term.
- Recent capital projects and/or needs for the small drinking water and wastewater systems include backup generators, security systems, water meter replacement.

Stormwater

- Flooding is a challenge for some communities in the region.
- While municipalities in the region have had stormwater permits for more than a decade, the 2017 permit was the first to require pollution load reductions and resulting need for larger investments in stormwater management.
- The county conservation district has been an important partner on stormwater management.
- Most communities are dependent on contract engineers for stormwater management work, including identification of grant funding in some cases.
- Communities in the region are looking to general funds and grants to fund needed stormwater pollution reductions. Municipalities are generally not willing to use debt-financing for stormwater management.
- Stormwater fees are not seen as politically feasible currently in the region even though Allentown has had one in place for several years.
- The increased use and potential expansion of the airport and surrounding land uses to accommodate the new distribution centers is creating a stormwater management challenge in the region.

The eight communities in the lower Lehigh River watershed are most challenged in addressing their wastewater treatment and stormwater management needs. Specifically, they face ongoing operation and maintenance issues from aging infrastructure coupled with separate stormwater system overflows from wet weather events. The pollution reductions requirements in the current MS4 permit have introduced new challenges to communities that lack significant financial capacity. The size of the municipal budgets is modest in this study area. These communities would benefit from technical assistance and funding around adoption of asset management systems and stormwater management planning. While CFA resources have been clearly helpful, these communities would benefit from a better understanding of how PENNVEST programmatic funding could be accessed for stormwater management within the limits of the municipalities' financial capacities.

Upper Conestoga River Watershed Study Area

Upper Conestoga River Watershed Characterization

The municipalities selected in this study area are located in the north central part of Lancaster County including the Cocalico Creeks and the Lititz Run parts of the upper Conestoga River watershed. The City of Lancaster was also included because of the city's shared interest in the Conestoga River watershed. It also provides an example of the water infrastructure needs for a larger municipality in the region and a mid-sized city in the state.

Lancaster County is located in the Piedmont portion of Pennsylvania, characterized by sloping and hilly topography. The central portion of the county, including the Conestoga River Valley, is underlain by limestone and a region of limestone and schist. Indigenous peoples occupied the areas along the waterways for thousands of years and established varying cultures. Historic Native American tribes included the Shawnee, Susquehannock, Gawanese, Lenape, and Nanticoke peoples, who were from different language families and had distinct cultures. The area that became Lancaster County was part of William Penn's 1681 charter; the county was organized in 1729. Native Americans lived in the area through the mid- 1700s, when European settlers forced out or killed the remaining tribal members.

With some of the most fertile non-irrigated soil in the country, the county has a strong farming industry and is known for its Plain Sect communities. Lancaster County's more than 5000 farms are responsible for nearly a fifth of the state's agricultural output. Livestock-raising is responsible for the vast majority of that output, including dairy, poultry, eggs, cattle, and swine. Agriculture is likely to remain an important part of Lancaster County—half of Lancaster County's land is zoned for agriculture. The county also has been one of the fastest growing in Pennsylvania during the last several decades. From 1980 to 2010 the population grew over forty percent. The Lancaster County Planning Commission projects that the county's population will increase to over 600,000 by 2030.

The county's water resources face several challenges. Floodplains have been altered dramatically as a result of several causes, including mill dams. While many have disappeared, the sediment that built up behind the dams still remains. In some areas these "legacy sediments" are as much as twenty feet deep causing a disconnection of the stream from the floodplain, minimizing the natural functions of the floodplain. While agriculture is the predominant land use in the county and the greatest source of impairment of local streams, developed areas also contribute to the degradation of water resources. The stormwater runoff generated from developed areas often carry sediments, fertilizers and oils which pollute the streams. Large impervious surfaces that prevent groundwater recharge can also impact the base flow of streams during dry weather periods.²¹

Cocalico Creek is a 27.2-mile-long tributary of the Conestoga River and covers 140 square miles. The name of the creek comes from the Lenape, meaning "snake dens". Cocalico Creek flows south and southwest before it meets the Conestoga River which then flows into the Susquehanna River. The Lititz Run watershed is immediately adjacent and south of the Cocalico Creek watershed. It is 7 miles long and 12 square miles in area. As in most of the county, agriculture dominates the land uses; tree canopy cover ranges between 20 to 37 percent in the study area.

Many of the municipalities in this region have long histories. Denver Borough has grown and prospered over the last 118 years. Industries in the borough include manufacturers of hats, ladies knitwear, battery cables and extension cords, graphite products, woven materials, and meats. Ephrata Borough is the outgrowth of the famed religious community, the Cloisters, founded in the early 1700s by the German mystic Conrad Beissel. When the Cloister community declined in the early 1800s, the village grew as a regional center of commerce. During this time of growth, two resort hotels were built, the Mountain Springs and the Mount Vernon House. The village also became known as a key stop for the Reading and Columbia Railroads. An influx of German pioneers and Swiss Mennonites settled in Clay Township in the mid-1700s. The main occupations were farming and running grist mills or sawmills. Limestone was quarried at the southern end of the township; some of the best sandstone in the

²¹ Blueprints: An Integrated Water Resources Plan For Lancaster County, April 2013 at 7 - 11;
https://lancastercountypanning.org/DocumentCenter/View/16/blueprints_final_20130528_with_dep_letter?bidId=

state was found in the hills. Tobacco crops were manufactured into cigars. The City of Lancaster was founded in 1742. It was an important munitions center during the Revolutionary War and the state capital in the early 1800s. Its historic buildings date from colonial to Victorian times when it became an industrial center and its population tripled in size as a result of the steam mills and related industries. Today, its economy revolves around its status as the county seat, a regional healthcare center, an evolving shopping and arts destination and home of institutions like Franklin and Marshall College.

The complex network of municipal boundaries, urbanized area, and drinking water and wastewater service areas are illustrated in figures 5 and 6.

Community Water Service Supply Areas

Selected Municipalities in Lancaster County

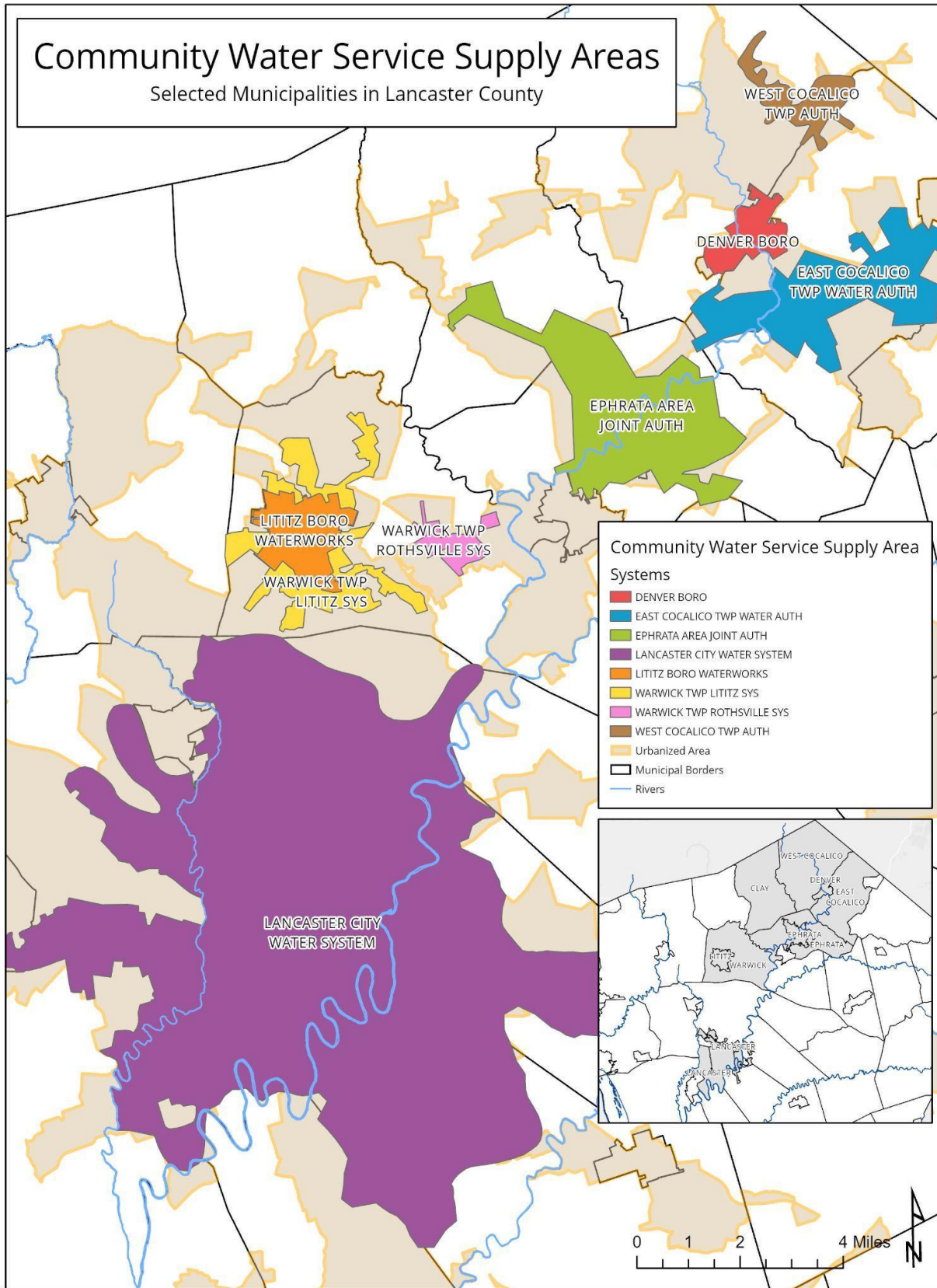


FIGURE 5: UPPER CONESTOGA DRINKING WATER SERVICE AREAS

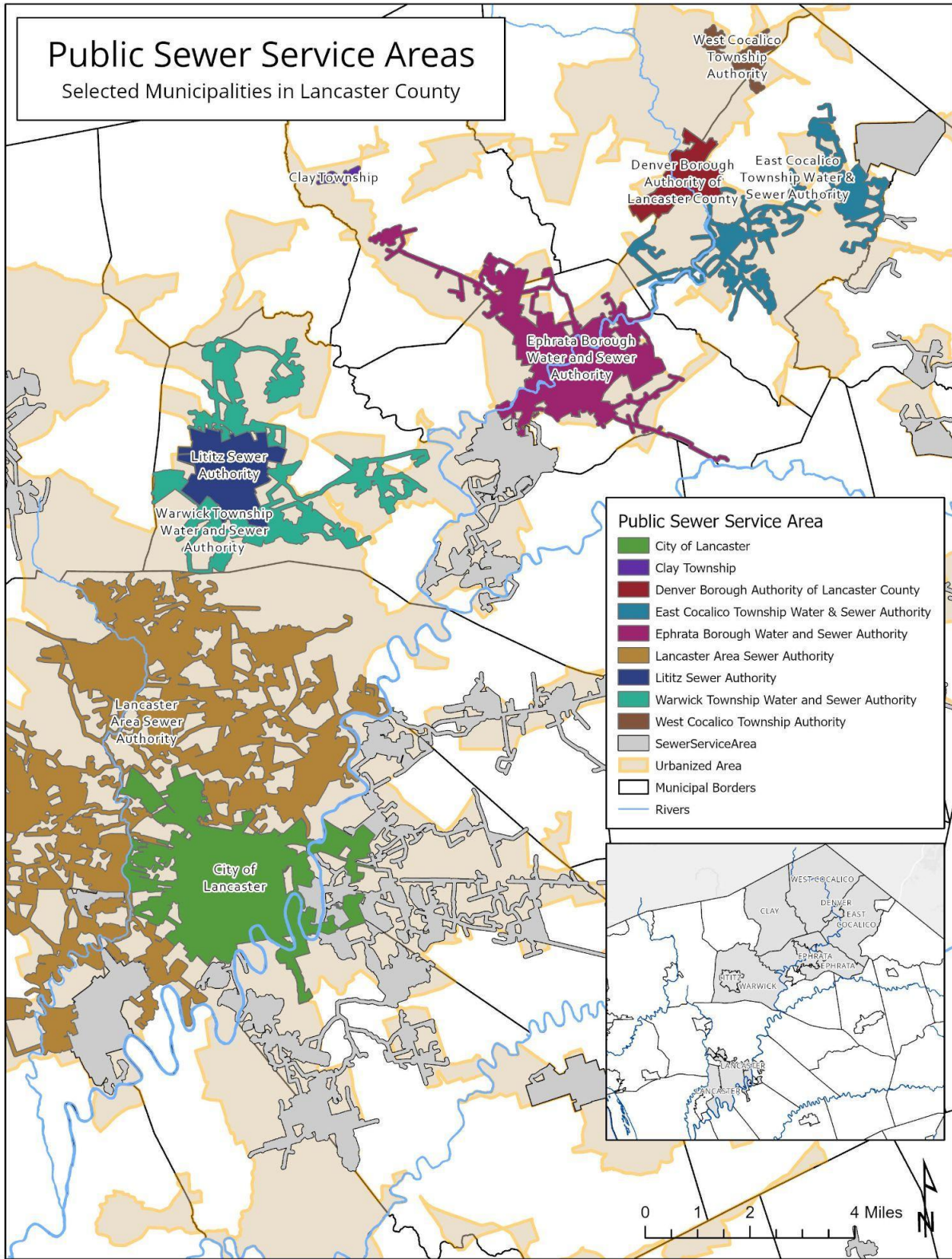


FIGURE 6: UPPER CONESTOGA SEWER SERVICE AREAS

Community Profiles

The demographics and economic indicators of the eight municipalities - East Cocalico Township, West Cocalico Township, Denver Borough, Clay Borough, Ephrata Borough, Ephrata Township, Lititz Borough, and Warwick Township, as well as the City of Lancaster - provide context for consideration of the region's water, sewer, and stormwater infrastructure needs. This data also demonstrates a municipality or region's ability to finance and plan for infrastructure improvements, or the feasibility of long-range comprehensive growth plans.

Methodology

Data for the community profiles was taken from the 2019 five-year American Community Survey (ACS) results. Each category helps the challenges and opportunities each municipality faces when deciding if or how to implement updates to aging water infrastructure. For example, the unemployment and poverty rates, levels of higher education attained, share of the population over 65, and household incomes are all relevant statistics in an equity analysis. Population and median age totals serve to compare the scale of each municipality in this analysis and the likelihood that an area is growing economically, therefore potentially expanding its tax base for the long-term.

TABLE 11: COMMUNITY PROFILES OF SELECT UPPER CONESTOGA RIVER MUNICIPALITIES

Municipality	Population Total	Median Age	Population Age 65+ (%)	Households	Housing Units	Unemployment Rate (%)	Poverty Rate (%)	College Graduate or Higher [B.A., 25YR+] (%)	Median Household Income
East Cocalico Twp	10,554	40.1	16.5	3,781	4,059	3.6	7.4	19.5	\$76,607
West Cocalico Twp	7,448	36.1	11.9	2,416	2,409	2.3	6.1	15.3	\$78,611
Denver Borough	3,861	38.1	17.4	1,492	1,501	7.1	11.4	21.9	\$62,931
Clay Borough	6,839	37.5	17.3	2,429	2,440	3.2	6.8	22.2	\$70,637
Ephrata Borough	13,810	37.6	15.6	5,719	5,894	4.3	11.7	22.8	\$51,954
Ephrata Township	10,334	37.7	18.8	3,681	3,873	2.9	8.4	22.1	\$64,848
Lititz Borough	9,335	45.1	24.3	3,922	4,096	3.4	4.9	32.4	\$64,343
Warwick Township	19,022	42.3	18.9	7,275	7,704	3.7	5.6	35.2	\$75,514
SUB-TOTAL AVG.	10,150	39.3	17.6	3,839	3,997	3.8	7.8	23.9	\$68,181
City of Lancaster	59,433	32	9.8	22,092	23,734	7.2	23.9	22.9	\$45,514
TOTAL AVG.	18,418	38.8	17.5	6,994	7,391	4.1	9.9	25.9	\$62,999

The City of Lancaster is the largest city in Lancaster County, as well as the county seat, however it is the poorest municipality of the nine examined in this region. Although its share of population that has attained a college degree (22.9%) is higher than six of the other areas, it is over four percent lower than the county average and over eight percent lower than the state average. The poverty rate is far higher than anywhere else studied here (23.9%). The average poverty rate of the eight other municipalities studied is 7.8%. Similarly, the unemployment rate is over three percent higher in the City of Lancaster than in most of the other municipalities. This underperforming economic data aligns with the significantly lower median household income (MHI) in the City of Lancaster compared to the average MHI of \$68,181 for the other municipalities.

The primary industries for almost all municipalities analyzed here are manufacturing, retail, and "educational services, and health care and social assistance." The lone exception is West Cocalico where construction is the largest employing sector. and it is also important in East Cocalico, Both West Cocalico and East Cocalico Townships have the two highest MHIs, notwithstanding the lowest and second lowest college degree attainment rates. Each also has comparatively low poverty rates and younger than or close to average median ages. These

numbers depict towns with seemingly stable economic futures. Clay Township and Ephrata Township have numbers that stick closely to the group average outside of the City of Lancaster.

Somewhat in contrast, Lititz Borough and Warwick Township have the oldest median ages of the group, largest proportion of population over the age of 65, and the two highest rates of college degree. However, the MHI in each is lower than that in East and West Cocalico. Lititz and Warwick may have a greater share of residents that may be retired and live on fixed incomes. This would make those residents more financially vulnerable to changes in water, sewer, and/or stormwater fee assessments.

Denver and Ephrata Boroughs have below average incomes compared to neighboring municipalities and the highest poverty rates in the study area besides the City of Lancaster. These metrics reflect towns where residents may have difficulty paying bills and where less opportunities exist for funding for infrastructure projects.

Water System Profiles

In general, there are more entities managing water in the Upper Conestoga River watershed than in the lower Lehigh River watershed. Across nine municipalities, there are seven drinking water entities and nine entities managing wastewater infrastructure, though only four have treatment facilities. Each of the nine municipalities has its own stormwater MS4 program. Tables summarizing the public drinking water and wastewater authorities and the municipalities they serve are included below.

TABLE 12: PUBLIC DRINKING WATER SYSTEMS—UPPER CONESTOGA RIVER WATERSHED STUDY AREA

Public Drinking Water System	Municipalities Served within Study Area
City of Lancaster, Bureau of Water	City of Lancaster
Denver Borough Public Works - water system	Denver Borough
East Cocalico Township Water & Sewer Authority	East Cocalico Township
Ephrata Area Joint Authority	Ephrata Borough Clay Township Ephrata Township
Lititz Borough Authority	Lititz Borough
Warwick Township Municipal Authority	Warwick Township
West Cocalico Township Authority	West Cocalico

TABLE 13: PUBLIC WASTEWATER SYSTEMS—UPPER CONESTOGA RIVER WATERSHED STUDY AREA

Public Wastewater System	Municipalities Served within Study Area
City of Lancaster, Bureau of Wastewater Operations	City of Lancaster
Clay Township Public Works (Sewer collection)	Part of Clay Township
Denver Borough Public Works (Sewer collection)	Denver Borough
East Cocalico Township Water & Sewer Authority (Sewer collection)	East Cocalico Township
Ephrata Borough Authority	Ephrata Borough Ephrata Township Part of Clay Township Denver Borough East Cocalico Township
Ephrata Township Sewer Authority	Ephrata Township

(Sewer collection)	
Lititz Borough Sewer Authority	Lititz Borough
Warwick Township Municipal Authority	Warwick Township
West Cocalico Township Authority	West Cocalico Township

The City of Lancaster manages a public drinking water and wastewater system; both systems serve surrounding municipalities in addition to city residents. The drinking water system serves 110,000 people through 43,000 service connections. Approximately 60% of the drinking water comes from the Susquehanna River and 40% comes from the Conestoga River. The city's water system serves ten municipalities through direct billing though none of them are other municipalities in the study area. The city also provides bulk water to four customers but none of the other municipalities in the study area.

The City of Lancaster's Advanced Wastewater Treatment Plant (AWWTP) is owned and operated by the city. It treats wastewater from a combination of residential, commercial, and industrial used water discharges. The service area includes the city and portions of Manheim Township, Lancaster Township, East and West Lampeter Townships, Strasburg Borough, Strasburg Township, Upper Leacock Township, West Earl Township, Manor Township, Pequea Township, and East Hempfield Township. The AWWTP's capacity is 32.08 million gallons per day (MGD) and includes nine pumping stations.²² The system includes both sanitary and combined sewer systems and discharges to the Conestoga River.

Denver Borough manages a drinking water system that serves the borough's 3900 residents from four groundwater wells and Cocalico Creek. The system includes a distribution system and a treatment facility for surface water coming from Cocalico Creek. The average use is about 260,000 gallons per day.²³ The borough manages the sewer collection system that delivers wastewater to Ephrata Borough Authority for treatment.

The East Cocalico Township Authority was established in 1956 and incorporated on February 21, 1957, to provide a safe water supply to an estimated 900 customers in East Cocalico Township. The Authority has 14 permitted wells. The Authority also operates four water storage tanks with a total capacity of 4,700,000 gallons. The Authority is permitted by the Susquehanna River Basin Commission to withdraw up to 1,395,000 gallons of water per day from its series of wells. Currently, the Authority withdrawals on average about 600,000 gallons of water per day to meet the needs of its 2,500 residential, commercial, and industrial customers. In July 2015, the Authority began operating a new water treatment plant located in the Stevens area. Sanitary sewer conveyance and treatment began in 1964. The system now includes nearly 2,500 customers and over 50 miles of sanitary sewer mains and laterals. The Authority operates five sanitary sewer pumping stations throughout the Township that collect and transmit wastewater to either Ephrata Borough's Treatment Plant #2 or Adamstown Borough's Treatment Plant.²⁴

Ephrata Borough manages a drinking water system as well as a wastewater collection and treatment system through the Ephrata Area Joint Authority (EAJA). The authority serves three municipalities: Ephrata Borough, Ephrata Township, and Clay Township. The borough is the contract manager for the water system. The authority produces over 700 million gallons of water annually to serve more than 8,000 customers in the three-municipality area. Of the almost two million gallons of water used daily approximately one third comes from the Cocalico Creek and the remaining comes from groundwater wells. The water from the Cocalico Creek is treated at the filtration plant located on Church Street, which was built in 1932 and upgraded in 1985. EAJA has three wells and four storage tanks that can store a two-day supply of water.²⁵ The wastewater system includes eight pumping stations and two treatment plants. The first treatment plant was built in 1938 and after several upgrades and expansions,

²² <https://cityoflanasterpa.com/wastewater/>

²³ <https://www.denverboro.net/2180/Water-System>

²⁴ <https://www.eastcocalicotownship.com/water-sewer-authority/pages/authority-history>

²⁵ <http://www.ephrataboro.org/2146/Ephrata-Area-Joint-Authority>; <https://www.ephrataboro.org/2177/Description-of-System>.

now treats 3.8 million gallons of sewage per day from residents in four municipalities. The second treatment plant was built in 1998, treats 2.3 million gallons of sewage per day and serves residents from four municipalities.²⁶

Warwick Township Municipal Authority ("WTMA") was established in 1969 to provide municipal water and sewer service to residents of Warwick Township. It is an "operating" authority which means that it operates solely on the receipts of the systems.²⁷ WTMA's "Lititz" water system began in May 1975 and today, there are approximately 4,000 connections to the WTMA distribution system supplied by water purchased from Lititz Borough through an Intermunicipal Agreement. In 1989, a separate water system was established by WTMA to serve the Rothsville area. Sewer service was initiated in 1977 with the execution of an agreement with Lititz Borough for sewage treatment. Today, the sewage collection system has 18 pumping stations which pump sanitary sewerage to the Lititz Borough Sewage Treatment Plant. WTMA and Lititz Borough executed an agreement which guarantees WTMA residents 42.33% of the treatment capacity of the Lititz Plant. In addition, WTMA currently provides sanitary sewer service to over 4,800 properties in Warwick Township. The water sources for Lititz Borough's treatment plant are seven groundwater wells located within the Borough and Warwick Township that have been determined to be under the direct influence of surface water. Lititz Borough and the Warwick Township Municipal Authority (WTMA) continue their efforts to protect your drinking water through its Wellhead Protection Program. The program was approved by the PADEP in 2002.

Currently there are 972 homes served by public water from three wells and 650 served by public sewer by the West Cocalico Township Authority. The most recent well, Well #3, went into service in 2004 due to nitrate levels rising in Well #2. In 1987, the West Cocalico Township Authority began providing residential sewer service with the wastewater treatment plant permitted by Pennsylvania DEP for 150,000 gallons per day of wastewater. Currently there is a moratorium on the sewer connections as there is an infiltration problem when it rains, which causes the daily flow of sewage through the wastewater treatment plant to rise well above the DEP permitted level of 150,000 gallons per day.

As in the lower Lehigh River study area, many of the municipalities retain responsibility for maintaining the collection system for public wastewater and the distribution system for public drinking water, which translates to miles of piping and any needed pump stations. While some municipalities have formed authorities and/or enterprise fund structures and collect fees to address this function, others address it through their public works department with resources from the municipality's general funds.

Affordability metrics and census data for the public water systems in this study were also provided by Dr. Lauren Patterson and Dr. Martin Doyle at the Nicholas Institute for Environmental Policy Solutions at Duke University when available.

TABLE 14: UPPER CONESTOGA RIVER WATERSHED WATER SERVICE AFFORDABILITY

Water Authority	Customers Served (approx.)	Population Served (approx.)	AWWA Burden Score	Percentage of Low-Income Households Income spent on Water Services	Family Income below \$24K	Family Income above \$150K
City of Lancaster, Bureau of Water	43,000	110,000	Low-Moderate	3.62%	18.89%	11.19%
Denver Borough Public Works - water system	-	3,900	Low-Moderate	3.75%	15.51%	8.03%
East Cocalico Township Water & Sewer Authority	2,500		Low-Moderate	6.62%	15.33%	9.42%

²⁶ <https://www.ephrataboro.org/2172/Wastewater>.

²⁷ <https://www.warwicktownship.org/wtma>.

Ephrata Area Joint Authority	8,222		Moderate-High	2.69%	15.53%	5.93%
Lititz Borough Authority	-		Low-Moderate	2.37%	12.08%	11.38%
Warwick Township Municipal Authority - Lititz System	4,000		Low	1.29%	11.07%	12.14%
Warwick Township Municipal Authority - Rothsville System	761		Low	2.05%	16.34%	11.52%
West Cocalico Township Authority	972	-	-	-	-	-

Municipal Separate Storm Sewer Systems (MS4s)

The most common stormwater problems cited in the County's 2013 integrated water plan, *Blueprints*, included uncontrolled runoff from upstream municipalities, undersized drainage systems, flooding and a large increase in uncontrolled runoff. These problems are all related to increased stormwater runoff. All of the municipalities in the study area are MS4 permittees. Both maps of the study area include the urbanized area that defines the reach of the MS4 program in each jurisdiction. Pennsylvania Department of Environmental Protection's 2017 MS4 permit included pollution load reduction requirements for sediments and nutrients for streams impaired by these pollutants, including Cocalico Creek and the Conestoga River as set out in the table below. Many of the communities in this region have had MS4 permits for more than a decade and have programs to implement the six minimum control measures. The 2017 MS4 permit's requirement to address the Chesapeake Bay Total Maximum Daily Load (TMDL) by reducing sediment and nutrients, however, created a new need for implementation of best management practices. The table below outlines the impaired streams that the municipalities in the study area are required to address through the MS4 program. Some of these municipalities have been paying for their MS4 obligations through general fund resources and they use external engineers to support their permit applications. The City of Lancaster and a few other municipalities have adopted a stormwater fee.

TABLE 15: PA DEP IMPAIRED STREAMS IN UPPER CONESTOGA WATERSHED

Municipality	Impaired Streams Requiring Load Reductions in Current PA DEP MS4 Permit
City of Lancaster	Conestoga River Little Conestoga River Chesapeake Bay
East Cocalico Twp	Conestoga River Little Muddy Creek Cocalico Creek Stony Run Chesapeake Bay
West Cocalico Twp	Cocalico Creek Chesapeake Bay
Denver Borough	Cocalico Creek Chesapeake Bay
Clay Borough	Cocalico Creek Chesapeake Bay

Ephrata Borough	Cocalico Creek Chesapeake Bay
Ephrata Township	Cocalico Creek Meadow Run Coover Run Conestoga River Chesapeake Bay
Lititz Borough	Lititz Run Conestoga River Chesapeake Bay
Warwick Township	Lititz Run Little Conestoga Creek New Haven Run Hammer Creek Bachman Run Cocalico Creek Conestoga River Chesapeake Bay

The Lancaster Countywide Action Plan (CAP) includes a summary of activities from the MS4 permittees' pollution reduction plans across the county to meet the Chesapeake Bay TMDL. The plan states:

Municipalities with issued MS4 permits are required to implement BMPs with the intent to reduce nutrients and sediment in their jurisdictions. These efforts are captured by the Lancaster CAP to help ensure total reductions are tracked and reduce the potential of duplicative efforts. The Stormwater Priority Initiative will be managed by the Stormwater Action Team, which empowers municipalities to address stormwater through cost-effective and locally relevant practices, including management and considerations related to watershed management (Watersheds Action Team), land use, and stream restoration.²⁸

The CAP envisions implementation of the following practices to meet the MS4 sector reductions of the Chesapeake Bay TMDL for MS4 permittees in the county:

- 200 acres new forest buffers
- 50 acres new tree canopy cover
- 500 acres of land retired from agricultural land use to open space
- 29,000 linear feet of stream restoration in urban areas
- 64,000 linear feet of stream restoration outside of urban areas
- 50 acres of wetland restoration
- 50 acres of impervious reduction
- 155 acres of street sweeping
- 290 acres treated with wet ponds or constructed wetlands
- 1000 acres of stormwater management from performance standards
- 200 acres treated with rain gardens
- 2000 acres treated with bioswales
- 400 acres treated with open vegetated channels
- 600 acres treated with filtering practices
- 10 acres treated with filter strip runoff reduction
- 300 acres treated with dry ponds
- 70 acres treated with infiltration practices
- 300 acres treated with dry extended detention basins
- 20 acres treated with infiltration basins
- 70 acres treated with hydrodynamic structures
- 1 acre treated with permeable pavers

²⁸ Lancaster Countywide Action Plan at 11.

- 30,000 pounds of sediment removed from storm drain cleanouts²⁹

The municipalities in the study area make up only part of the urbanized area within the county's Chesapeake Bay watershed. Several pollution reduction plans provide insight into how municipalities in the study area plan to address local water quality challenges and the Chesapeake Bay TMDL.

Warwick Township and Lititz Borough developed a shared plan to address the required pollutant load reductions across their municipalities. The plan is designed to address more than 500,000 lbs. of sediment reductions needed across several small watersheds.

TABLE 16: TMDL REQUIREMENTS FOR WARWICK TOWNSHIP AND LITITZ BOROUGH.

WARWICK TOWNSHIP AND LITITZ BOROUGH			
Pollutant(s)	Existing Sediment Load (lb./yr.)	Minimum Reduction	Required Sediment Reduction (lb./yr.)
Hammer Run Cocalico Creek Little Conestoga (Simplified method)	214,660 381,775	10%	118,597 210,925
Lititz Run (MapShed)	1,867,659	10%	186,766
TOTAL			516,288

The plan proposes to implement five stream restoration projects, two constructed wetland projects, a rain garden, a bioswale and one riparian buffer project to meet the needed reductions.³⁰

TABLE 17: TMDL REQUIREMENTS FOR THE CITY OF LANCASTER.

CITY OF LANCASTER			
Pollutant(s)	Existing Sediment Load (lb./yr.)	Required Reduction (considering proposed BMPs)	Percent Reduction from Proposed Projects
Lower Conestoga River	1,585,572	1,295,000	21%
Little Conestoga Creek	1,369,000	1,255,000	5%
TOTAL	2,955,572	2,541,747	14%

The City of Lancaster's proposed projects include street sweeping, a green roadway with permeable pavers and bioretention, and a green park retrofit. The city also plans green infrastructure into its capital improvement projects as standard practice. These practices result in more than a 10% reduction in the sediment loading thus meeting the MS4 permit requirements.³¹

Municipal Water and Sewer Financial Resources

The financial resources information for the Upper Conestoga watershed area municipalities was gathered mostly from township/borough or water/sewer authority budget documents. In some cases, those documents were not available online and the research team was unable to secure them through outreach to local officials. The focus in this section is on examining the balances of municipal and authority water and sewer fund budgets, as well as the balances and line items of interest related to stormwater management or other water related infrastructure. These balances provide context about each jurisdiction's financial capability to pay for infrastructure projects and take on debt.

²⁹ Ibid.

³⁰ https://www.warwicktownship.org/sites/g/files/vyhli5151/f/u86/draft_tmdl_prp_lititz-warwick-manheimtwp_7-20-2017.pdf

³¹ <https://www.cityoflanasterpa.com/wp-content/uploads/2017/08/CBPRP.pdf>

East Cocalico

The Township balanced its budget for 2021 and had a small surplus. Its budget included \$361,909 of expenses allocated for stormwater management, including drainage maintenance, MS4 related costs, Land Studies coordination, engineering, etc. The only revenue tied directly to stormwater was \$2,000 earned from a project fee. There is nothing else in the budget document reflecting municipal water/sewer revenue or expenses, other than line items categorized under other umbrella expenses (ex. Police dept.'s water/sewer costs). This is likely due to the existence of the East Cocalico Township Authority (ETCA), which would have its own budget.

The Authority's audited data between 2018 and 2019 show that the ETCA improved its financial stability and increased its net position with a 3.65% increase in assets worth \$965,975. The 2020 projected budget for the sewer division estimated \$246,973 in net income without requiring a rate increase. Similarly, the water division also did not raise its rates in 2020 and was projected to have a net income of \$110,725 for that year. In 2019, operating revenues increased, and overall expenses decreased, with an increase in water and sewer utility rents driving revenue growth. Capital improvements were funded through tapping fees, cash, developer contributions, and utility rents. No PENNVEST funds appear to have been used and the sewer division, as of 2019, did not have debt service.

West Cocalico

West Cocalico's 2021 budget includes a "carryover from 2020- Earmark stormwater \$163,970.00" that functions as revenue and balances the general budget as well as \$147,000 of expenses listed for storm drains/sewers. Stormwater and sewage management is divided over several budget categories and line items, including: \$24,000 for stormwater management in the Planning and Zoning Dept., sewage enforcement and labor items, and a separate category for street and gutter cleaning totaling \$34,100. Sewage permits brought in \$35,000 in revenue and sewage admin fees an extra \$5,000.

According to the West Cocalico Township Authority's budget, almost all of the revenue, approximately \$451,000, comes from metered sales to residential customers. The two highest expenses besides depreciation cost are repair/maintenance and operator wages. The Water Fund has a \$50,515 net income for 2021 and mentions that it reflects a 5% increase. The 2021 Sewer Fund budget includes a 10% increase and \$520,000 of revenue received from residential customers; however, \$6,000,000 is listed under revenue from "total construction." and \$2,000,000 is included in sewer expenses for capital construction. Also, a line item for a \$4,000,000 "carryover of bond money" reduces the net income for the Sewer Fund to \$210,375.

Denver Borough

The Borough's 2021 General Fund budget has a positive \$114,055 balance. The Water and Sewer budgets are also balanced or positive. Specifically, the Water budget is balanced, as are the Water/Sewer Capital Funds. The Sewer budget has a positive balance of \$76,560. Expenses for the capital funds include a truck replacement, autocon system replacement, and a filter plant intake structure. Regarding stormwater, the Stormwater Management Inspection Fund is balanced at \$500 of revenue and expenses, which includes \$500 in engineer fees. However, stormwater expenses fall under the general budget and \$3,500 are listed for 2021, \$2,000 of which is for "highway maintenance - storm sewers." Only \$1,000 of general revenue is projected from a stormwater fee.

Clay Borough

Although Clay Borough has a narrow general budget surplus, with \$2,181,170 of revenue and \$2,169,542 of municipal expenses, sewer operations will run a deficit of less than \$15,000.³²

Ephrata Borough

Ephrata Borough has a Capital Improvements Program for 2020-2024 that includes MS4 related stormwater projects. These projects total \$2.04 million over five years, all of the funding for which comes out of the capital reserve fund, with partial grant funding available for some. Other included projects include infrastructure replacement and new construction of BMPs.

³²

https://lancasteronline.com/news/regional/clay-township-preliminary-budget-has-no-tax-increase/article_591cbc60-34d8-11eb-8d43-139f6ccad844.html

The Borough's 2021 water funds appear to be balanced at approximately \$1.6 million and sewer related funds reflect a surplus with \$2.48 million of revenue against \$2.21 million of appropriations.³³ The Sewer Fund budget also had a positive balance in 2019 of \$26,008 even with \$608,600 of capital projects being funded.

Lititz Borough

The 2021 Lititz budget meeting notes reflect that the town has a stormwater utility fee, as well as other stormwater-related revenue from a drawdown loan. Water and sewer projects are funded by tapping fees and fund transfers. Expenses include several street specific projects, MS4 compliance costs, inlets and televising, and debt service.

Warwick Township

The township's budget fact sheet reflects a 1.75% revenue reduction in 2021, which it attributes to drops in reductions in interest, earned income and realty transfer, but it foresees further reductions in revenue as a result of lower cable franchise and state reimbursements.³⁴ In 2020, storm sewers and drains made up \$2,500 of town expenses. Also in 2020, there was a \$45,000 Interfund Operating Transfer line item in the general budget for Stormwater Sewer Replacement. Beginning in July 2021, a stormwater fee (Capital Storm Water Replacement fee) will be introduced to raise more revenue.

Lancaster City

Within the City of Lancaster's Department of Public Works is the Sustainability and Environment Division. This Division consists of the Bureau of Stormwater Management and the Utilities Division, the latter itself consisting of the Bureau of Water and the Bureau of Wastewater Operations. The city's general fund balance for 2021 is \$8,053,383, but the water and sewer (wastewater) fund balances are both negative at -\$3,827,414 and -\$969,284. The Bureau of Stormwater Management is responsible for the city's green infrastructure program. In the 2021 budget, the Stormwater Management fund is balanced at \$4,729,050. Most of the revenue marked for stormwater comes from stormwater fees charged to property owners. Regarding expenses, \$10,000 is projected for landscaping costs associated with rain gardens in 2020 (down from the \$35,000 initially proposed). For 2021, \$100,000 is proposed.

External Financing for Water Infrastructure

PENNVEST

A total of 79 projects have been funded in Lancaster County since the inception of PENNVEST, including 21 wastewater projects, 16 drinking water projects, and two stormwater projects. The remaining 40 projects are classified as non-point source (NPS) projects; most of them manage manure either on farm or before it was land applied, they are described as grant funded and they are under \$1 million. These projects are unique to this watershed and are directly related to the state's commitment to meet its pollution reduction commitments to improve water quality in the Chesapeake Bay.

Since 2009, nine water infrastructure projects in the upper Conestoga River study area have received PENNVEST financing support. Information about the projects is outlined in the table below and can be found on the PENNVEST website.³⁵

TABLE 18: PENNVEST PROJECTS 2009-2020, UPPER CONESTOGA RIVER STUDY AREA

PENNVEST Water Sector Entity	Date	Amount Financed	Area Served	Purpose
City of Lancaster	7/2011	\$7,000,000	18,003 households	Non-Point Source Installing 35 green stormwater infrastructure projects throughout the city; capture runoff from 951,000 sq ft
City of Lancaster	2020	\$8,579,468	43,502	Drinking Water

³³ Ibid.

³⁴ <https://www.warwicktownship.org/BudgetFactSheet> at 3.

³⁵ <https://www.pennvest.pa.gov/Information/Pages/Approved-Projects.aspx>

			households	3 emergency power generators; 7500 feet of 16-inch main
City of Lancaster	2019	\$11,200,000	18,050 households	Wastewater Rehab and replace 7200 ft of conveyance pipe, 4500 ft of interceptor; upgrade a pump station
City of Lancaster	2009	\$2,000,000	18,003 households	Wastewater Engleside & Stevens Ave screen replacement
City of Lancaster	2014	\$5,500,000	18,003 households	Wastewater North PS Preliminary Treatment facility upgrade & diversion chamber construction
Clay Township	2021	\$579,775	0 household	Non-Point source Grant to Earl Ray Zimmerman for boiler with chicken manure as fuel
Ephrata Township	2010	\$237,794	0 household	Non-Point Source Grant to Brian Zeiset for waste storage
Ephrata Township	2011	\$522,841	0 household	Non-Point Source Grant to Meadow Spring Farm for manure storage and covered heavy use area
Warwick Township	2020	\$556,730	0 household	Non-Point Source Grant to Jeff Balmer for manure and waste storage structure; covered manure stacking structure
Total:		\$36,176,608		

Commonwealth Financing Authority

TABLE 19: CFA PROJECTS 2009-2020, UPPER CONESTOGA RIVER STUDY AREA

CFA Applicant	Grant Program	Grant Amount	Purpose
City of Lancaster	H2O PA Water and Sewer	\$3,000,000	Wastewater Capital Improvement Project
City of Lancaster	H2O PA Water and Sewer	\$1,000,000	Combined Sewer Overflow Project
City of Lancaster	H2O PA Water and Sewer	\$768,333	Green infrastructure
Ephrata Borough Authority	H2O PA Water and Sewer	\$591,026	Wastewater treatment plant biological nutrient removal upgrade
Lititz Sewer Authority	H2O PA Water and Sewer	\$1,627,233	Wastewater treatment plant upgrade
City of Lancaster	PA Small Water and Sewer	\$181,000	South Lime Street Sewer Line
Denver Borough	PA Small Water and Sewer	\$142,428	Washington Street water main interconnection
Lititz Borough	Act 13	\$300,000	Lititz Borough Watershed Restoration and Protection Program

	Watershed Restoration and Protection		
Total:		\$7,610,020	

Water Infrastructure Survey and Interview Results

The survey about water infrastructure was shared with the MS4 permit holders as well as the drinking water and wastewater managers in this area of Lancaster County. Survey responses were received from 14 out of the 18 entities, including five stormwater managers, four drinking water managers and five wastewater managers. Follow up interviews were conducted with representatives of 8 out of the 18 entities representing two stormwater managers, three drinking water managers, and three wastewater managers. The survey responses and interviews provided the following specific information about water infrastructure challenges in the upper Conestoga River watershed:

- These systems serve communities ranging from 1500 households to 22,000 households.
- Most of the water entities have asset management systems in place.
- Funding has come from a variety of sources, including general fund, fees, PENNVEST and CFA programs. Nonetheless, municipal staff don't necessarily know how to access PENNVEST funding, and several entities have not used any kind of external funding.
- Only one entity indicated that their water infrastructure needs benefitted from ARRA funding in 2009. Several respondents were unsure.
- While all entities had capital project needs, the need for planning assistance was uneven. Aging infrastructure and operations and maintenance were identified as the biggest funding challenges in the next five years.
- Lead service lines are not an issue for most of the responding entities.
- The study area has been challenged by flooding and sanitary sewer overflows. The City of Lancaster is challenged by combined sewer overflows and is under a federal consent decree.
- All but one of these entities have either recently increased rates or may be considering increases in the near term.

We interviewed water managers representing 8 of the 14 respondents to the surveys. In addition to the information collected from the survey responses as outlined above, we learned that many of the concerns mirror what we heard in the lower Lehigh River study area though there are notable differences, particularly with respect to stormwater management. In addition, commitment to community utilities seems to be even stronger in this study area.

Drinking water and Wastewater

- There is a long history of community-managed utilities in this region dating back almost 100 years.
- As in the lower Lehigh River watershed, it is much easier and more economical for municipalities to manage drinking water systems than wastewater systems in terms of treatment costs.
- Water systems throughout the region are suffering from aging infrastructure and lack of regular maintenance. Some respondents acknowledged a lack of political will to raise rates.
- Based on information collected for this project, systems in this region are more likely to have asset management systems in place, have completed cost of service reports and access available technical assistance than the systems in the lower Lehigh River watershed.

- Only the City of Lancaster has significant experience with PENNVEST funding and has accessed its resources across all three water sectors.
- The impression of other municipalities in the region is that the process of accessing PENNVEST funding and USDA Rural Development funding is too cumbersome to make it worth the effort. It was noted that better communications and outreach could address this issue.
- CFA resources can be helpful; respondents noted that these resources are limited, and the likelihood of a successful grant application is uncertain.
- These municipal entities are comfortable using debt-financing for their drinking water and wastewater systems. Several have accessed the municipal bond market and worked with local banks.
- The focus on “shovel-ready” projects for some of the financing programs is a significant challenge for many communities - few have the resources to support these upfront costs. More flexibility on funding for design would be beneficial.
- The COVID pandemic did not result in significant reductions in revenues in this region. One respondent noted that the ability to use funding from the American Rescue Plan for stormwater management was appreciated.
- Recent capital projects and/or needs for the small drinking water and wastewater systems include lining pipes, ensuring emergency interconnections, and finding additional capacity/drinking water sources.

Stormwater

- Repetitive flooding is a challenge for several communities in the region, impacting residential neighborhoods in some areas.
- While municipalities in the region have had stormwater permits for more than a decade, the 2017 permit was the first to require pollution load reductions and resulting need for larger investments in stormwater management.
- Communities in this region are further along in planning and implementing stormwater BMPs for water quality improvements, likely a result of the Chesapeake Bay TMDL implementation process. Several have planned, designed, or implemented projects, including rain gardens, riparian buffers, wetland restoration and stream restoration projects.
- Most communities are dependent on external engineers for stormwater management work, including identification of grant funding in some cases.
- Communities in the region continue to rely on general funds and grants to fund needed stormwater pollution reductions. Municipalities are generally not willing to use debt-financing for stormwater management.
- More communities in this region have either adopted or are considering adopting stormwater fees.
- There was a collaborative effort among several municipalities in the Cocalico Creek watershed but unresolved administrative issues and unclear guidance from PA DEP on collaboration proved insurmountable challenges.
- One respondent noted that stormwater managers would benefit from the establishment of a technical assistance structure similar to that available for drinking water managers.
- The state’s strategy for achieving the pollution reductions needed to meet the Chesapeake Bay TMDL has resulted in a countywide plan that outlines the needed stormwater management activities. It also recognizes that the largest source of pollutants comes from agricultural land uses, the historical economic base of the region.

As in the lower Lehigh River study area, the nine communities in the upper Conestoga River watershed are most challenged in addressing their wastewater treatment and stormwater management needs. Specifically, they face ongoing operation and maintenance issues from aging infrastructure coupled with stormwater system overflows from wet weather events. However, these communities have more management capacity as a result of their strong utility history and evidenced by the adoption of asset management systems. In addition, these communities are more financially capable even though the population sizes and median household incomes are not remarkably dissimilar from the lower Lehigh River region (with the exception of Allentown being twice the size of Lancaster). They have made more progress in terms of stormwater management in terms of planning and financing, with the City of Lancaster demonstrating the role PENNVEST can play in supporting green stormwater infrastructure projects. These communities indicated an interest in support for infrastructure planning, particularly for stormwater, and would benefit from a better understanding of how PENNVEST programmatic funding could be accessed. Given the county-wide structure in place to implement water quality projects to meet the Chesapeake Bay TMDL, this region might be a good candidate for PENNVEST's sublevel revolving fund.

Saw Mill Run Watershed Study Area

Saw Mill Run Watershed Characterization

The Saw Mill Run (“SMR”) watershed in southern Allegheny County, Pennsylvania drains approximately 12,400 acres (approximately 19 square miles) of heavily urbanized land in the South Hills area of Pittsburgh and its near suburbs. SMR itself runs approximately 9 miles to its confluence with the Ohio River just downstream of the confluence of the Allegheny and Monongahela Rivers.

In many respects, the water quantity and quality challenges confronting the watershed represent a microcosm of challenges faced by many such urbanized streams in Southwest Pennsylvania. Much of the watershed is densely developed, with steeply sloped hillsides. Over the past 100 years, most of the stream has been channelized and lined with stone or concrete to make way for railroads, highways, and other infrastructure. Thus, little natural floodplain remains. Among the many identified impacts to SMR and its small tributaries are:

- Over 100 discharges from Municipal Separate Storm Sewers (MS4s);
- Seven structures prone Sanitary Sewer Overflows (SSOs), with three SSO events in a modeled “typical year”;
- 72 Combined Sewer Overflow (CSO) structures, with over 1250 wet weather CSO events and ~434,000,000 gallons of combined sewer discharge in a “typical year”; and
- Several stretches of stream heavily impacted by Acid Mine Drainage (AMD).³⁶

The Pennsylvania Department of Environmental Protection (PA DEP) lists each individual stream segment within the watershed as impaired, with various individual segments listed as impaired for various combinations of:

Low Dissolved Oxygen (DO)/Biochemical Oxygen Demand (BOD)

- Nutrients
- Organic Enrichment/Low DO impairments
- Siltation
- Water/Flow variability
- Habitat Modification
- AMD (causing metals and pH impairments)

In addition, the combination of topographical constraints, historic floodplain and stream channel modifications, and high percentage of impervious surface combine to produce an extremely “flashy” hydrologic regime, with regular flooding in constrained points throughout the watershed.

All these compounding factors within a largely built-out area would present a challenge for any municipality. However, no fewer than twelve municipalities have jurisdiction over parts of this small watershed. This results in layers of complexity to efforts to manage water quantity and quality within the watershed, as each municipality (each with its own level of resources and sophistication) brings a different approach to land use, engineering, and institutional approaches regarding water management, governance, and finance. This results in duplication of effort, geographically limited solutions, and an inability to address challenges in a systematic watershed-wide manner which might allow for greater return on infrastructure investment.

³⁶ Pittsburgh Water and Sewer Authority, Municipal Separate Storm Sewer Permit Application: Sawmill Run TMDL Strategy, 12/2015

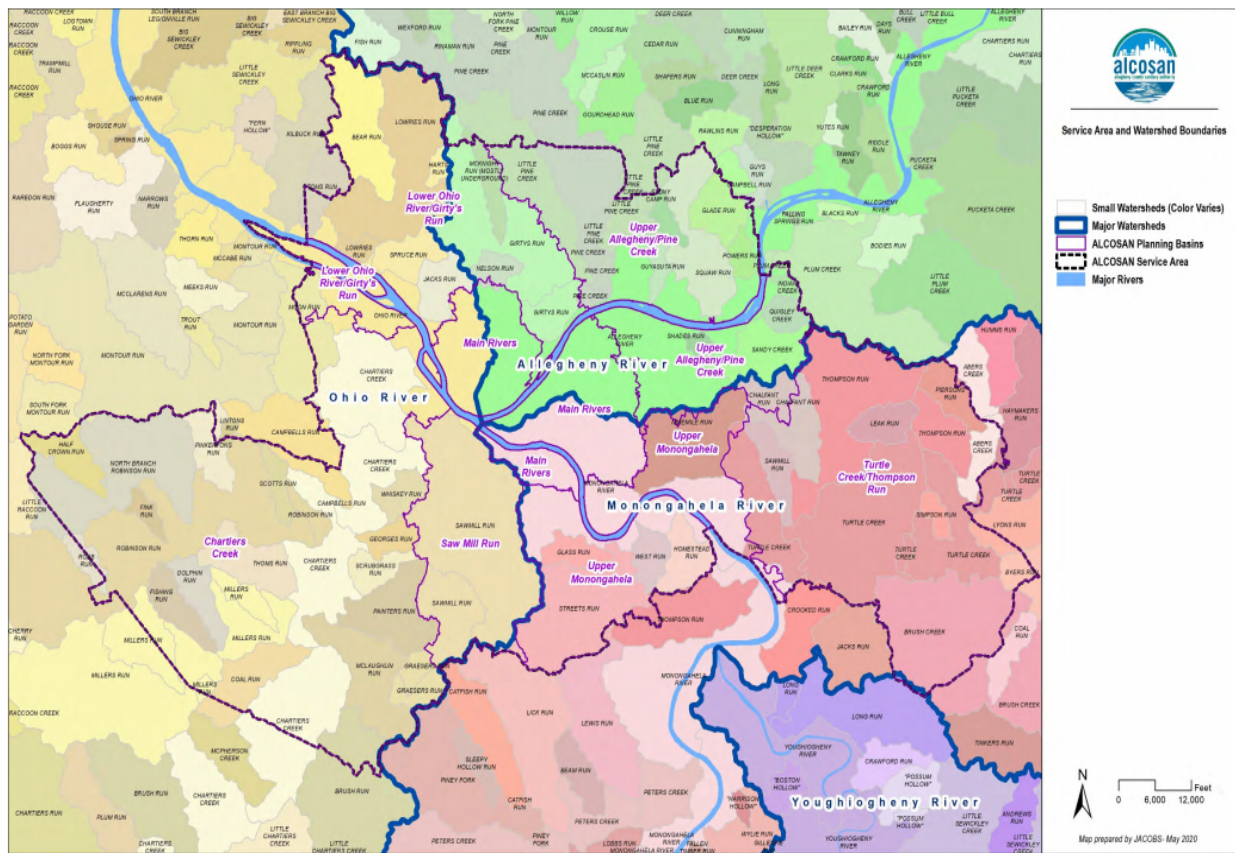


FIGURE 7: SAW MILL RUN WATERSHED IN THE CONTEXT OF THE LARGER PITTSBURGH REGION (ALCOSAN, 2019)

A concerted effort to align these efforts has been underway for several years, as reflected in the Saw Mill Run Integrated Watershed Management Plan (IWMP) published by the Pittsburgh Water and Sewer Authority (“PWSA”) in 2019. This effort has attracted various levels of interest from most of the 12 municipalities within the watershed. However, absent a regional entity to organize and execute the plan, and clear, compelling incentives to motivate each municipality to participate fully in such an integrated approach, the IWMP has struggled to gain traction.

This study is an attempt to identify structural impediments to a more integrated approach as well as put forward specific policy recommendations to the regulatory and infrastructure finance organizations at the regional and state level to encourage and incentivize more efficient, integrated approaches to managing similar water quality and quantity challenges at the regional and state level.



FIGURE 8: WATERSHED ZONES OVERLAID WITH MUNICIPAL BOUNDARIES (PWSA 2015)

Community Profiles

All 12 municipalities in the Saw Mill Run watershed were chosen for this analysis: Baldwin Township, Bethel Park Borough, Brentwood Borough, Castle Shannon Borough, Crafton Borough, Dormont Borough, Green Tree Borough, Mt. Lebanon Borough, Mt. Oliver Borough, Scott Township, Whitehall Borough, and the City of Pittsburgh. These municipalities have participated in the ongoing Saw Mill Run Integrated Water Management plan. Selected community data was collected from the American Community Survey 2015-2019 five-year estimate tables provided by the U.S. Census Bureau. The selected categories were chosen to reflect the socio-economic conditions in each municipality, including employment and poverty status, available income, and educational attainment. Population, age, and housing data was collected to provide background on the potential size of the customer base for water and sewer services and related benefits. Below is a table [Table 20] detailing the data collected for each municipality, followed by observations.

TABLE 20: CENSUS PROFILES OF SELECTED MUNICIPALITIES IN THE SAW MILL RUN WATERSHED³⁷

Municipality	Pop.	Median Age	Age 65+ (%)	Households	Housing Units	Unemployment Rate (%)	Poverty Rate (%)	College Graduate or Higher [B.A., 25YR+] (%)	MHI
Pittsburgh	306,199	34	27.81	140,028	157,311	5.57	18.88	26.26	\$46,393
Baldwin Township	2,050	45	31.46	869	917	3.5	8.98	24.2	\$62,917
Bethel Park Borough	32,177	46	36.27	13,663	14,199	4.6	4.61	30.17	\$82,054
Brentwood Borough	9,386	36	25.39	3,949	4,329	2.71	8.85	21.79	\$59,000
Castle Shannon Borough	8,213	43	30.8	3,880	4,187	3.62	6.72	25.59	\$64,042
Crafton Borough	5,838	37	28.01	2,745	3,018	4.64	9.52	24.76	\$52,066
Dormont Borough	8,373	37	22.84	4,076	4,513	3.64	5.31	35.85	\$68,810
Green Tree Borough	4,885	43	32.65	2,130	2,290	2.02	11.48	32.29	\$86,735
Mt. Lebanon Borough	32,303	45	32.8	13,539	14,089	2.58	4.78	37.4	\$102,899
Mt. Oliver Borough	3,324	33	19.16	1,379	1,773	13.67	32.13	7.56	\$38,568
Scott Township	13,650	44	36.89	6,475	8,163	2.85	5.82	23.61	\$63,105
Whitehall Borough	13,517	48	37.27	5,900	6,264	2.82	12.79	23.38	\$68,843
Total Avg. for Group	12,156	42	30	5,328	5,794	4.24	10	26	\$68,094

Pittsburgh has been separated from the other 11 municipalities as it is a large city with substantially different socio-political dynamics. The total population of the 11 municipalities excluding Pittsburgh, is 133,7716 residents, while Pittsburgh alone has a population of 306,199 residents. More than half of the smaller municipalities have populations under 10,000 and, for the most part, are geographically small and have little remaining undeveloped area.

The average median household income for the group is \$68,094, which is right around the 2019 national average of \$68,703, yet as in most regions there are disparities. Mt. Oliver Borough is the most economically distressed municipality in the region and is also the second smallest. Mt. Oliver has the highest unemployment rate and poverty rate, and lowest median household income (MHI) and college attainment. These indicators suggest that utilities, taxes, and infrastructure fees are a substantially higher burden for residents in Mt. Oliver compared to their neighboring municipalities. Mt. Lebanon and Bethel Park are the larger two municipalities excluding Pittsburgh and show some of the strongest economic indicators. Along with Green Tree Borough, Mt. Lebanon and Bethel Park are the three municipalities with an average MHI over \$80,000. The median ages for both Mt. Lebanon and Bethel Park are mid-forties, and their poverty rates are the lowest in the study area. As such, both municipalities have a citizenry that is more likely to be capable of supporting the municipal budgets. The remaining smaller municipalities are more aligned with the national average MHI for 2019. Additionally, the poverty rates in these municipalities are below the 10.5% 2019 national average aside from Green Tree Borough and Whitehall Borough. The affordability dashboard created by Dr. Patterson and Dr. Doyle at Duke University confirms this data, as the majority of census tracts in the selected municipalities have Low or Low-Moderate financial burden levels of water services. The notable exceptions are the City of Pittsburgh and certain census tracts within municipalities that immediately border Pittsburgh including Mt. Oliver, Crafton, Green Tree, and Brentwood. For example, the entirety of Mt. Oliver is facing Very High or High burden levels while Crafton ranges from Very High to Low. The communities at the top of the watershed are generally more financially secure than those at the bottom of the watershed.

³⁷ U.S. Census Bureau ACS. 2015-2019 Five-year Estimates. U.S. Census Bureau American Community Survey. 2021.

Water System Profiles

Drinking Water Systems

Pennsylvania American Water (PAAW) supplies drinking water to the twelve municipalities in the Saw Mill Run study area, including the southernmost portions of the City of Pittsburgh. Pittsburgh Water and Sewer Authority (PWSA) has two water treatment facilities that have a combined daily treatment capacity of 100 MGD and provide drinking water to the majority of Pittsburgh, including a portion of the city south of the three rivers junction. PAAW is planning to invest approximately \$94 million in water main replacements throughout the state; a summary of planned projects in the Saw Mill Run study area is presented below.

TABLE 21: PAAW PLANNED WATER MAIN REPLACEMENTS FOR 2021 WITHIN THE SMR STUDY AREA³⁸

Municipality	Number of Projects	Length of Pipe (ft)	Estimated Project Cost
Bethel Park Borough	3	3,397	\$891,303
Brentwood Borough	8	5,238	\$1,626,952
Castle Shannon Borough	1	117	\$36,579
Mt. Oliver Borough	6	5,676	\$1,830,835
Pittsburgh	8	9,191	\$3,223,728
Whitehall Borough	1	1,431	\$449,216

Wastewater Systems

All of the small municipalities in the Saw Mill Run study area convey their wastewater for treatment by ALCOSAN, which maintains approximately 90 miles of interceptor sewers that convey wastewater from municipal sewer systems to a 59-acre treatment plant on Pittsburgh's North Side. The municipalities are currently responsible for maintaining their conveyance systems, which connect to ALCOSAN's interceptor network (which in the study area, roughly parallels the channel of Sawmill Run). Bethel Park is the only municipality in the study area that is still served partially by an independent authority. Bethel Park Municipal Authority manages a separate sewer system comprising over 200 miles of sewer lines, primarily 8-inch vitrified clay pipe, and over 6,000 sanitary manholes. The southeastern two-thirds of the sanitary system drains to the Bethel Park Wastewater Treatment Facility, located in South Park. Pittsburgh Water and Sewer Authority has 1,233 total miles of sewer lines which convey wastewater to ALCOSAN for treatment.³⁹

Municipal Separate Storm Sewer Systems (MS4s)

The PA DEP finalized a plan for the Saw Mill Run Watershed in 2007, titled "AMD and Sediment Total Maximum Daily Loads for the Sawmill Run Watershed, Pennsylvania". Saw Mill Run is impacted by discharges from MS4s, CSOs and SSOs, all of which contribute to the total pollutant loads. The Saw Mill Run hydrological simulation water quality model developed for the SMR IMWP was used to parse the contributing sources of the pollutant loads. The pollutant load analysis results show that MS4s and direct drainage areas contribute the majority of the total pollutant load, and that CSO controls alone will not solve the watershed impairments⁴⁰. A map of the contributing sources is included below. These findings highlight the necessity of the required TMDL strategic plans for the municipalities in this study area.

³⁸ Pennsylvania American Water Infrastructure Upgrades <https://www.amwater.com/paaw/water-quality/system-updates/>

³⁹ Allegheny County Sanitary Authority, Controlling the Source: A Roadmap for working Together on Impactful Source Control, 7/2020

⁴⁰ Saw Mill Run Integrated Watershed Management Plan - 2019

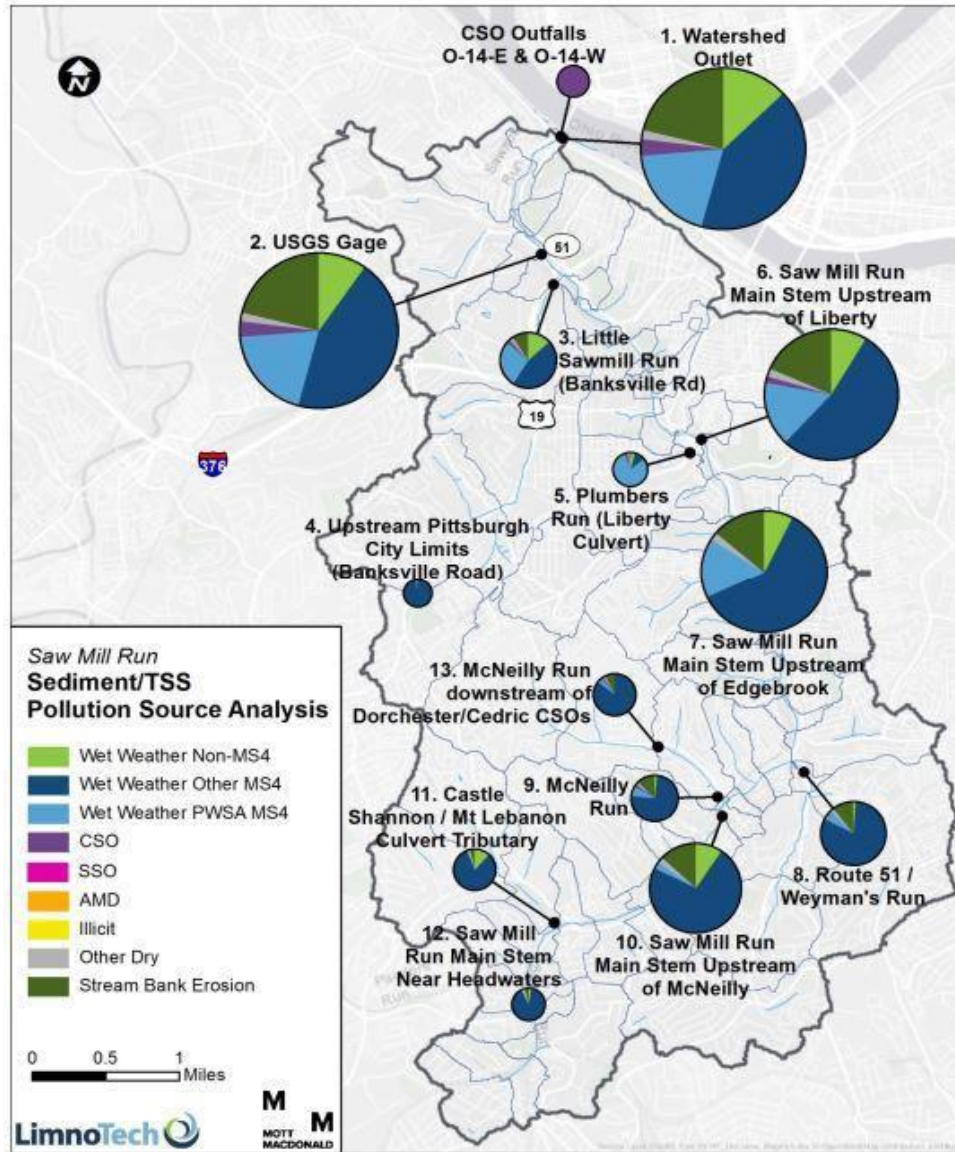


FIGURE 9: SEDIMENT/TSS POLLUTION SOURCE ANALYSIS (PWSA 2015)

Each of the 12 municipalities in this study area are identified in the PA DEP 2017 MS4 requirements table and all 12 hold either a general or individual permit, though Crafton Borough obtained a permit waiver. Generally, the urbanized area of each municipality defines the reach of the MS4 program in each jurisdiction. PA DEP's 2017 MS4 requirements for each municipality are summarized in Table 22.

TABLE 22: PA DEP MUNICIPAL MS4 REQUIREMENTS FOR THE SAW MILL RUN WATERSHED⁴¹

Municipality	Individual Permit Required?	Reason for Permit	Requirements
Baldwin Township	Yes PAG136115	TMDL Plan	TMDL Plan - Siltation, DO/BOD, Nutrients, Organic Enrichment Appendix A-Metals, pH
Bethel Park Borough	Yes PAG136147	TMDL Plan	TMDL Plan - Siltation, DO/BOD, Nutrients, Organic Enrichment Appendix A-Metals, pH

⁴¹ PA DEP Municipal MS4 Requirements Table (Revised 11/18/2019)

Brentwood Borough	Yes PAG136271	TMDL Plan	TMDL Plan - Siltation, DO/BOD, Nutrients, Organic Enrichment Appendix A-Metals, pH
Castle Shannon Borough	Yes PAG136117	TMDL Plan	TMDL Plan - Siltation, DO/BOD, Nutrients, Organic Enrichment Appendix A-Metals, pH
Crafton Borough	No PAG136220 Waived	N/A	TMDL Plan - Siltation Appendix A-Metals, pH
Dormont Borough	Yes PAG136284	TMDL Plan	TMDL Plan - Siltation, DO/BOD, Nutrients, Organic Enrichment Appendix A-Metals, pH
Green Tree Borough	No PAG136268	N/A	Appendix E-Organic Enrichment/Low D.O., Siltation, Nutrients, DO/BOD
Mt. Lebanon Borough	Yes PAG136275	TMDL Plan	TMDL Plan - Siltation, DO/BOD, Nutrients, Organic Enrichment Appendix A-Metals, pH
Mt. Oliver Borough	No PAG136242	N/A	N/A
Pittsburgh City	Yes PAI136133	TMDL Plan	TMDL Plan - Siltation, DO/BOD, Nutrients, Organic Enrichment Appendix A-Metals, pH
Scott Township	No PAG136138	N/A	N/A
Whitehall Borough	Yes PAG136222	TMDL Plan	TMDL Plan - Siltation, DO/BOD, Nutrients, Organic Enrichment Appendix A-Metals, pH

Baldwin, Bethel Park, Brentwood, Castle Shannon, Dormont, Mt. Lebanon, and Whitehall held general permits ahead of the 2017 MS4 requirements review but were identified as needing to apply for individual MS4 permits and to develop TMDL plans for the next phase of NPDES permitting. Not all of the municipalities in the study area have publicly available stormwater or TMDL management plans. Bethel Park, Brentwood, and Dormont published TMDL strategic plans in 2015, some of which have been updated since, and are available for public review. The City of Pittsburgh and PWSA are co-permittees on an individual MS4 permit. PWSA prepared a Pollution Reduction Plan (PRP) that was submitted to PA DEP in September 2017, but it did not address Saw Mill Run. A separate Saw Mill Run TMDL Plan was prepared by PWSA and submitted to PADEP in September 2017, which is summarized below. The TMDL plans for the MS4 permits that were available for review are summarized below.

Bethel Park Borough

Bethel Park is located at the headwaters of the Saw Mill Run watershed and occupies approximately 600 acres, or close to 10%, of land in the watershed. The TMDL plan for Bethel Park, most recently revised in March 2019, includes existing baseloads for the pollutants of concern, siltation, and phosphorus, as well as reduction targets, Best Management Practices (BMPs) to achieve the minimum reductions, and a discussion of their long-term pollution control strategy.

TABLE 23: BETHEL PARK BOROUGH POLLUTION REDUCTION REQUIREMENTS

Pollutant(s)	Bethel Park Borough		
	Existing Load (lb./yr.)	Short-term Reduction Targets	Required Reduction (lb./yr.)
Total Sediment	115,188	10%	83,590
Total Phosphorus	76.3	5%	72.5

Bethel Park’s goal is to achieve a 10% reduction of sediment within the first five-year permit term, which will also serve as a means to reduce total phosphorus. The proposed intervention is a 100 linear-foot stream restoration project, estimated at a total cost of \$27,500. The project will be funded out of the municipal capital budget with additional funding from PA DEP, PA Department of Conservation and Natural Resources, and other governmental and private sources. Additionally, Bethel Park has been awarded a Growing Greener Grant of \$18,000 for the project. Bethel Park’s TMDL plan discusses their participation in efforts to create an Integrated Watershed Management Plan for Saw Mill Run, which they state will allow the watershed to meet Clean Water Act compliance and “plan projects that maximize water quality benefits”.⁴²

Brentwood Borough

Brentwood Borough’s TMDL strategy was prepared by Gateway Engineers in 2015. Brentwood occupies 6.59% of the total Saw Mill Run MS4 watershed area. The report notes that the EPA recommends a total reduction of 72.2% of sediment and 95% nutrients for the Borough of Brentwood. The immediate action plan recommended for Brentwood to undertake during the first five years of their TMDL plan focuses on known pollution area projects, detailed watershed characterization, and inventory and evaluation of existing BMP programs. The longer-term strategy includes identifying funding opportunities and developing cost effective watershed management strategies to reduce the TMDL pollutants, as well as developing a monitoring program for completed projects.⁴³

Dormont Borough

Dormont Borough submitted a TMDL Strategic Plan to PA DEP at the end of 2015. Dormont is a highly urbanized area dominated by residential land uses. It lacks an industrial area but has a small commercial district. The report notes that the extent of urbanization hinders the potential for constructed BMPs—the Borough has 63% impervious coverage. Dormont occupies approximately 10% of the Saw Mill Run MS4 watershed. The pollution loads at the time the report was generated are summarized in the following table.

TABLE 24: DORMONT BOROUGH POLLUTION REDUCTION REQUIREMENTS

Pollutant(s)	Dormont Borough	
	Existing Load (lb./yr.)	Required Reduction (lb./yr.)
Total Sediment	187,200	133,700
Total Phosphorus	170.9	162.7

The report notes that Dormont is a unique case in the watershed, as it is almost completely built out and has no farms, new developments, or stream banks that are the usual sources of sediment and phosphorus. The likely sources of sediment and phosphorus identified for Dormont include falling leaves and grass clippings, roof shingles, and deteriorating concrete. To achieve the required reductions, Dormont and its stormwater authority planned to develop a robust public education campaign focused on residents and target groups whose activities contribute to both sediment and phosphorus pollution loads. Additionally, the borough planned to continue organized leaf collection, to consider increasing street sweeping frequency, and to develop a concrete curb and sidewalk evaluation and maintenance program. Dormont’s TMDL plan proposed several constructed BMPs, such as bioswales and stream bank restorations, that were to be implemented in phases beginning in 2016.⁴⁴

⁴² Bethel Park Saw Mill Run Watershed Total Maximum Daily Load Plan (page number?)

⁴³ Brentwood Borough TMDL Strategic Plan and Narrative (page number?)

⁴⁴ Dormont Borough Total Maximum Daily Load Strategic Plan (December 2015)

City of Pittsburgh

Pittsburgh Water & Sewer Authority most recently updated their Saw Mill Run TMDL strategy in February 2019. The plan outlines two primary missions, the first of which is identifying “BMPs that can be implemented in the near term to reduce the sediment loads to the stream to make immediate, quantifiable, incremental progress towards the specified load reductions”⁴⁵. Secondly, PWSA will continue to work with the other municipalities in the watershed to finalize an Integrated Watershed Management Plan to implement the required pollutant load reductions most effectively.

Municipal Financial Resources for Water Infrastructure

As discussed in the cases of the lower Lehigh River and upper Conestoga River watersheds, water infrastructure budget data for the municipalities in the watershed varies in both its availability and clarity. In general, the municipalities in the Saw Mill Run watershed are well resourced and able to meet their sanitation expenses through tax revenues and often carry a positive balance to the next year. Only three of the twelve municipalities in the study area currently have a dedicated stormwater fee. The findings for each municipality are summarized below.

Baldwin Township

Baldwin Township allocated \$481,560.58 to their sewer fund for ALCOSAN treatment expenditures in the 2021 fiscal year, which is 120% of the estimated cost. There is an additional \$50,000 budgeted for 2021 to cover MS4 requirement and engineering expenses. The only debt service payment listed in the budget summary is \$18,000 slated for Police Car/Truck/Backhoe, so it appears that Baldwin Township is covering its water expenses yearly through taxes and other income. Baldwin Township does not impose a separate stormwater fee.⁴⁶

Bethel Park Borough

Bethel Park operates an independent sewage fund that supports the operation of the “municipality’s sanitary sewer collection and treatment system and the maintenance of the sanitary sewer infrastructure”⁴⁷. The sewage fund revenue is derived from sanitary sewer utilization fees. The budget report notes that bonds were issued in 2020 for collection and conveyance system improvements as well as pumping and wastewater treatment facility capital improvements. The increased expenses for 2021 are related to debt service on the bond issuance, but the sewage fund maintains a fund reserve of 62% and is in good fiscal health. Bethel Park does not impose a separate stormwater fee.

Brentwood Borough

According to the proposed 2021 Brentwood Borough budget, the projected general fund balance at the beginning of 2021 will be \$1,500,000. Brentwood also maintains a separate sanitary sewer fund, which has a \$400,000 proposed balance for 2021. Stormwater management expenditures for 2021 are proposed to be \$297,000, including \$186,000 for capital construction. Brentwood does not impose a separate stormwater fee.⁴⁸

Castle Shannon

Castle Shannon is another relatively well-resourced borough. Projected revenue in 2021 for the Castle Shannon sanitary sewer fund is \$4,981,050 while projected expenditures are \$3,492,964, leaving close to a 30% fund reserve. Storm sewer expenditures are made out of the capital projects fund, which is projected to be in good standing for 2021, with revenue at \$1,367,300 and expenditures at \$1,192,000. Castle Shannon has budgeted \$217,000 for a storm sewer infrastructure project and \$192,000 for a PRP demonstration project for 2021. Castle Shannon does not impose a separate stormwater fee.⁴⁹

Crafton Borough

Crafton Borough was 11.78% under budget for 2020. Crafton Borough operates a separate sewer fund budget paid for by sewerage fees. There does not appear to be a starting balance for the sewer fund in 2021, and revenues are projected to match expenses for the year. Stormwater projects are paid for through the capital fund,

⁴⁵ PWSA and City of Pittsburgh Draft Updated Saw Mill Run TMDL Strategy (Feb. 2019)

⁴⁶ <https://baldwintownship.com/pdf/2021-BaldwinTownship-BudgetForAdoption.pdf>

⁴⁷ <https://bethelpark.net/download/administrationfinance/budget/2021-Adopted-Budget.pdf>

⁴⁸ <https://www.brentwoodboro.com/applications-and-documents/send/5-budgets/19433-2021-proposed-borough-budget.html>

⁴⁹ <https://borough.castle-shannon.pa.us/wp-content/uploads/2021/06/Castle-Shannon-2021-Budget-Approved.pdf>

which for 2021 is significantly funded through the ALCOSAN GROW Grant. Crafton Borough does not impose a separate stormwater fee.⁵⁰

Dormont Borough

Dormont Borough is in good financial standing. The Borough's general fund had over \$2,000,000 cash at the start of the year. The sewer agency fund had a cash balance of \$5,523,266.64 at the start of the year. Dormont Borough has established a separate municipal stormwater authority and imposes a stormwater fee consisting of an equivalent stormwater unit component and an impervious surface component. In both 2018 and 2019 Dormont received approximately \$330,000 in stormwater fee revenue, with an additional \$40,000 (2018) and \$120,000 (2019) in delinquent fees. In 2020, Dormont received \$340,000 in stormwater fee revenue with \$17,500 in delinquent fees. The Authority is projecting \$350,000 in fee revenue for 2021, with \$20,000 in delinquent fees.⁵¹⁵²

Green Tree Borough

Green Tree Borough's general fund balance at the beginning of 2021 was \$10,019,921 and the borough is in good financial standing despite the challenges presented by the COVID-19 pandemic. Green Tree has a special sanitary sewer fund which is the sole revenue source for funding the treatment, maintenance, repairs, and upgrades of the Borough's sanitary sewer system. In light of ALCOSAN's increase in treatment costs, the Borough manager is proposing a \$0.50 increase to the sanitary sewer surcharge. Green Tree does not impose a separate stormwater fee.⁵³

Mt. Lebanon Borough

The residents of Mt. Lebanon have the highest median income in the Saw Mill Run watershed, which provides a healthy tax base for the Borough. The Borough will not raise any municipal tax rates for the 2021 fiscal year. In the 2021 budget review, the council recommends sanitary sewer work totaling \$3.85 million, funded by the sewage fund, as well as stormwater management work totaling \$269,200, funded by the stormwater fund. The sewage fund and stormwater fund are supported through a municipal sewage charge and a municipal stormwater fee.⁵⁴

Mt. Oliver Borough

Mt. Oliver Borough approved their 2021 municipal budget for a total of \$2,577,000 with no increase to the property tax. The Borough is also maintaining its \$7.12/1000 gallons sewer rate, despite ALCOSAN raising the rate they charge municipalities by \$0.60/1000 gallons. Mt. Oliver Borough maintains a separate sewer fund to pay for drinking water and sanitation expenses. The sewer fund carried a positive balance of \$137,467 as of May 2021. Mt. Oliver does not impose a separate stormwater fee.⁵⁵

Pittsburgh

The City of Pittsburgh is a unique case among the municipalities in the Saw Mill Run watershed. Pittsburgh's substantially larger population provides a greater revenue base for water infrastructure capital expenses, but the median income in Pittsburgh is 30% lower than the average of the 11 other municipalities in the watershed. The 2021 audit of PWSA's 2020 fiscal year shows that operating income decreased 22.8% compared to 2019, resulting in a net loss of \$0.3 million for Authority. The loss is attributed to decreased operating revenues driven by lower consumption due to the pandemic and it should be noted that operating income increased year over year in both 2018 and 2019. PWSA does not currently charge a stormwater fee, though it is in the process of phasing in a tiered stormwater fee structure based on impervious area.⁵⁶

⁵⁰ Crafton Borough budget information <https://www.craftonborough.com/budgets>

⁵¹ Dormont Stormwater Authority 2021 Budget <https://dormontstormwater.org/wp-content/uploads/2020/12/2021-Budget-Template.pdf>

⁵² Dormont Borough 2021 Municipal Budget Report <http://boro.dormont.pa.us/wp-content/uploads/2021/06/May-Budget-Report-2021.pdf>

⁵³ Green Tree Borough 2021 Municipal Budget <http://www.greentreeboro.com/2021budget.pdf>

⁵⁴ Mount Lebanon 2021 Municipal Budget

<https://www.mtlebanon.org/DocumentCenter/View/17868/2021-Managers-Recommended-Budget>

⁵⁵ Mount Oliver Resource Library <https://mtoliver.com/home/resource-library/>

⁵⁶ Pittsburgh Water and Sewer Authority 2020 Audit

<https://www.pgh2o.com/sites/default/files/2021-04/PWSA%20SA%20FINAL%202020.pdf>

Scott Township

Scott Township is in good financial standing for 2021. The sewer fund began the fiscal year with a balance of \$857,555 and projected revenues totaling \$5,294,668. Numerous sewer projects are planned for 2021, but the Township projects a positive ending fund balance of \$486,748. Stormwater management in Scott Township is within the capital improvement fund, which begins 2021 with a balance of \$1,662,870 and projected revenues of \$1,684,613. Scott Township is planning a number of significant stormwater management investments in 2021, including \$198,231 to address MS4 requirements, \$30,000 for general stormwater improvements, and \$1,826,910 for several large stormwater projects to alleviate localized flooding.⁵⁷

Whitehall Borough

Whitehall Borough is carrying a general fund balance of over \$525,648 into 2021, and their planned expenditures match projected revenues (including the balance). Whitehall has a separate sanitary fund and stormwater fund. The projected budgets for both funds are balanced for 2021. The Borough has a stormwater fee, from which they project \$680,000 in revenue for the year. In addition to the fee revenues, the Borough carries over a \$728,485 stormwater fund balance into 2021 and has over \$1,000,000 of stormwater projects budgeted for the year.⁵⁸

External Financing for Water Infrastructure

External financing strategies for water infrastructure utilized in the Saw Mill Run watershed varied significantly among municipalities. Notably, none of the municipalities surveyed or interviewed reported they utilized US Department of Agriculture (USDA) Rural Development funding (although many would qualify), or PA Department of Community and Economic Development (DCED) grants. The majority of the municipalities utilize local taxes and fees to fund projects on a “paygo” basis, and/or PENNVEST (state revolving fund) as the primary source(s) of funds for capital improvement projects. Several municipalities noted they have utilized a variety of Commonwealth Financing Authority (CFA) grants. The municipal engineer’s or contracted engineering firms’ familiarity with the application process for these funding sources is a significant factor, in some cases the sole factor, in whether or not these municipalities pursue external grant funding. An additional funding stream available in Allegheny County since 2016 is the ALCOSAN GROW Program, which provides grants in an effort to reduce excess water from entering an already overloaded sewer collection system.⁵⁹

PENNVEST

Since 2009, seven water infrastructure projects in the study area have received PENNVEST financing support. Information about the projects is outlined in the table below and can be found on the PENNVEST website.

TABLE 25: PENNVEST PROJECTS IN THE SAW MILL RUN WATERSHED, 2009-2020

PENNVEST Water Sector Entity	Date	Amount Financed	Households Served	Purpose
PWSA*	4/20/2009	Loan: \$8,613,546	113,540	Drinking Water Replacement and upgrade to sludge collectors, water main and storage tank rehabilitation.
PWSA*	1/22/2013	Loan: \$2,713,065	72,493	Drinking Water Replacement of gate valves and fire hydrants.
PWSA*	10/17/2018	Loan: \$35,441,231 Grant: \$13,687,173	2,800	Drinking Water Replacement of residential lead service lines and connections.
PWSA*	1/29/2020	Loan: \$65,220,000	70,481	Drinking Water Replacement of aged water distribution mains and lead service lines.

⁵⁷ Scott Township 2021 Municipal Budget <https://scott-twp.com/wp-content/uploads/2021/01/2021-Adopted-Budget.pdf>

⁵⁸ Whitehall Borough 2021 Municipal Budget <https://whitehallboro.org/wp-content/uploads/2020/12/Proposed-Budget2021.pdf>

⁵⁹ ALCOSAN GROW Program Site <https://www.alcosan.org/our-plan/grow-program>

PAAW*	4/20/2009	Loan: \$1,869,029	-	Drinking Water Construction of metering and pressure reducing valves. Installation of pipeline and rehabilitation of water mains and connections.
Bethel Park	4/17/2019	Loan: \$1,049,834	-	Stormwater Installation of underground detention tanks and rain gardens, flow splitting structures.
Mt. Oliver	7/20/2011	Loan: \$537,577	1,320	Waste Water Rehabilitation of sanitary sewer system.
Total (including PWSA):		Loan: \$115,444,282 Grant: \$13,687,173		
Total (excluding PWSA):		Loan: \$3,456,440 Grant: \$0		

**The bulk of PAAW and PWSA's drinking water service area is outside of the Saw Mill Run watershed, thus a direct calculation of drinking water investments in the SMR watershed is difficult.*

Commonwealth Financing Authority (CFA)

As discussed in the Lehigh Valley and Lancaster cases, CFA has three programs that provide financing for water infrastructure projects. A total of 13 projects have been funded in the Saw Mill Run study area through CFA programs. Bethel Park Borough, Castle Shannon Borough, and Crafton Borough have taken the greatest advantage of available CFA grant funding.

TABLE 26: CFA PROJECTS IN THE SAW MILL RUN WATERSHED, 2009-2020

CFA Applicant	Grant Program	Grant Amount	Purpose
Bethel Park Borough	H2O PA Sewer and Water	\$100,000	Storm sewer improvements
Crafton Borough	H2O PA Sewer and Water	\$250,000	Storm sewer separation
Scott Township	H2O PA Sewer and Water	\$338,613	Storm sewer improvements
Whitehall Borough	H2O PA Sewer and Water	\$150,000	Storm sewer improvements
Castle Shannon Borough	PA Small Water and Sewer	\$300,000	Sewer repairs
Castle Shannon Borough	PA Small Water and Sewer	\$45,900	Sewer inlet additions
Total		\$1,184,513	

ALCOSAN GROW Program

The GROW Program has provided over \$30 million in grant funding for over 100 projects since 2016 that will reduce sewer overflow by an estimated 142 million gallons. Within the SMR watershed, 14 projects have been awarded grants totaling \$8,429,797.

TABLE 27: ALCOSAN GROW GRANTS AWARDED TO PROJECTS IN THE SAW MILL RUN WATERSHED, 2019-2020

Municipality	Year	Grant Amount	Purpose
Bethel Park Borough	2019	\$123,200	Sewer lining and repair
Brentwood Borough	2020	\$149,118	Sewer lining

Castle Shannon Borough	2019	\$96,000	Sanitary sewer structural repair
Crafton Borough	2019	\$466,781	Grandview sewer separation
Crafton Borough	2019	\$2,000,000	New storm sewer
Crafton Borough	2020	\$2,072,731	Woodlawn and Fountain sewer separation
Crafton Borough	2020	\$2,647,400	Crafton Boulevard sewer Separation
Dormont Borough	2019	\$50,400	Sewer lining
Dormont Borough	2019	\$91,870	Sewer lining
Dormont Borough	2019	\$60,300	Sewer lining
Mount Lebanon Borough	2019	\$483,600	Reroute sewers from under homes
Mount Lebanon Borough	2019	\$40,797	Shadowlawn sanitary lines
Mount Lebanon Borough	2020	\$106,200	Sanitary sewer lining
Mount Lebanon Borough	2020	\$41,400	Sanitary sewer lining

Water Infrastructure Survey and Interview Results

Representatives from six of the municipalities within the study area responded to the water infrastructure survey. The following is a summary of their responses:

- Four out of the six respondents noted that their communities do experience localized flooding.
- All respondents noted that their municipality knows how to access PENNVEST funds and that they do have the resources to apply for such funds.
- Five out of the six respondents noted that they have used either PENNVEST, DCEC, CFA, and/or USDA funding in the past.
- Four out of the six respondents noted that they currently have capital improvement projects or projects to meet a regulatory water mandate that they need additional funding for and that they do have the resources and capacity to plan for these projects.

Additional findings from the survey and follow-on interviews include:

Half of the respondents are considering raising rates. There is significant variation in responses regarding the future consideration of a stormwater fee. Two municipalities responded “yes”, two responded “no”, one responded, “not sure” and one noted they already have a stormwater fee. The subsequent question on the survey prompted the municipalities that are considering a stormwater fee to indicate when they are planning on implementing it. Interestingly, one municipality responded that they plan to implement the stormwater fee when legislation permits boroughs to assess one. Current state law prevents boroughs from directly assessing stormwater fees. However, the stormwater fee concept is unpopular among the respondents from some townships as well.

During the interviews, municipal respondents provided more detail on their survey responses. Multiple municipalities noted that since PENNVEST is a primarily loan program, the path of least resistance was often to rely instead on their individual bonding capacity. Use of general-purpose bonds is seen as providing greater flexibility to the municipality on smaller projects, due to the perceived complexity of the PENNVEST process. Not

surprisingly, respondents are eager for PENNVEST to “enrich the mix” of funding streams by moving more into principal forgiveness and grants.

Saw Mill Run municipalities report challenges with aging infrastructure, with impacts including limited capture and inefficiencies in conveyance. Most of the municipalities reported having a queue of “shovel ready” projects for which they intend to seek funding. However, as Mt. Lebanon specifically pointed out, every year municipalities are met with infrastructure “surprises,” prompting the immediate need to operate in crisis mode, further delaying long term but overdue improvements on aging infrastructure. For example, Mt. Lebanon noted that most of their stormwater infrastructure is over 30 years old. This year they experienced a slope failure that displaced a storm water pipe, necessitating the expenditure of over \$200,000 on an emergency basis. This challenge of managing the financial burdens of immediate infrastructure repairs and long overdue infrastructure maintenance is not unique to Mt. Lebanon. One municipality noted that in many cases even grants are associated with high administrative needs and follow up reporting that their council is more inclined to pay for it themselves in order to retain control of the process.

Dormont raised an interesting suggestion to direct statewide educational funding to municipalities so they have more resources to educate their residents on what they can do to manage stormwater on their property.

Municipalities were asked to indicate their level of interest in participating in an integrated, joint, multi-municipality permit for Saw Mill Run on a scale from 1 to 10 (1 - not interested to 10 - very interested). Most of the municipalities were in the 5-7 interest range. Respondents feel they are stretched so thin trying to meet their own MS4 needs that they would need to receive a material credit or some other clear incentive for joint efforts to make it worthwhile. Unsurprisingly, one of the biggest barriers to conducting integrated efforts is funding, as well as the lack of a unified sole entity to execute the plan.

While each municipality claimed to work well in cooperation with its neighboring municipalities on specific projects, many were leery of committing to a more comprehensive integrated approach. This appears to be driven in part by varying SSO, CSO, and MS4 requirements. Perceived variation in enforcement and funding among these programs appears to inhibit the desire of municipalities with a different mix of challenges to risk political and financial fallout from working more collaboratively. This speaks to the recommendation of a sole entity that is responsible and impartial to the municipalities in executing the plan.

ANALYSIS AND RECOMMENDATIONS

The threats to the natural and anthropogenic urban water systems and infrastructure in the three study areas have not changed substantially in the last several decades. In the lower Lehigh River watershed, impervious cover and the pollutants contained in stormwater runoff have had and continue to have a great impact on water quality. Recent changes in land use and development only exacerbate that threat, particularly given the increase in warehousing and distribution center development as an economic driver in the last several years.

In Lancaster County, runoff from crop lands and livestock areas as well as increased development remain significant challenges in the upper Conestoga River watershed and impacts the Susquehanna River/ Chesapeake Bay nutrient and bacteria concerns. In the Sawmill Run watershed a combination of physical constraints, aging infrastructure, and complex governance challenges in an area with numerous municipalities result in a waterway with serious wet weather impacts from stormwater, but diffuse responsibility. Concerted efforts at integrated management have yet to achieve the necessary momentum.

While the municipalities and municipal water authorities and utilities that manage water infrastructure access funding from a variety of sources, there are certain identifiable trends. Large capital projects are supported through PENNVEST, or local general obligation debt financing and smaller infrastructure projects are supported through CFA grant programs or self-financed. It is logical that these entities prefer grant funding, but it has provided far less funding than that accessed through PENNVEST. The municipalities in the three study areas have been funding MS4 project implementation mostly through general funds and a few CFA grants as well as other grant programs such as the ALCOSAN GROW Grants and PA DEP's Growing Greener Grants.

Across the three study areas, we did not find a strong indication that the ARRA funding from 2009 was particularly catalytic in terms of helping these communities address water infrastructure challenges. If it is a goal for future federal funding to be more impactful in specific communities or spread more evenly across the state, it appears that different programs will have to be developed with the input of water infrastructure managers and municipal representatives to ensure those specific outcomes.

PENNVEST has three new programs that could be useful to the municipalities and the municipal water authorities, particularly in support of multi-municipal strategies for stormwater management. The programmatic financing program could support one or multiple entities implementing a set of projects over a three-year period. The small projects program could support projects of \$500,000 or less through loans that can be reviewed outside of the quarterly project approval timeline. The sublevel revolving fund program could be used to support a collaborative approach to financing water infrastructure projects in the region across water sectors. All of these programs, however, center on financing projects through loans so the communities would have to be willing and able to meet the financing requirements.

CFA programs provide more flexibility and address a wider range of needs. However, these resources are limited and opportunistic. In conversation with CFA, they indicated a need for funding to support municipalities and authorities to plan projects. Currently, neither CFA nor PENNVEST has funding programs specifically and solely for project planning and design.

Consolidation could provide some benefits in the three areas studied. In the lower Lehigh River watershed, South Whitehall Authority is in the process of consolidation with LCA. It does not appear this consolidation is driven by affordability as South Whitehall has one of the highest median household incomes in the study area but is driven by wet weather events and sanitary sewer overflows.⁶⁰ The age of infrastructure in this region results in leakage of stormwater into the sanitary system even though the systems are separated. LCA has developed a \$32 million plan to address the wet weather issues in their service areas.

Consolidation of drinking water providers in our study areas is somewhat less likely due to a variety of cost and regulatory factors. Such consolidation projects can be complicated by the more emotive nature of drinking water, and practical limitations such as treated water conveyance distances within the distribution network, existing

⁶⁰ See <https://www.lehighcountyauthority.org/wastewater/sewer-overflows/>;
<https://www.mcall.com/news/local/allentown/mc-nws-allentown-lca-administrative-order-lifted-20190311-story.html>

debt loads, and other compliance challenges such as lead service lines. However, increasing rate pressures due to the age of distribution systems, staffing challenges, and escalating compliance and regulatory costs could ultimately drive some regionalization.

Recommendations

1. At this point in our analysis, MS4 project implementation may be the best opportunity for regionalized, collaborative approaches that create efficiencies in terms of water quality outcomes and financing, particularly to take advantage of PENNVEST's new programs. **PA DEP, PENNVEST, CFA, USDA Rural Development, technical assistance (TA) providers and other stakeholders should coordinate to support collaborations with any available capacity and resources.**
2. There appears to be an enduring reluctance on the part of municipalities to treat stormwater management costs as capital expenditures. Instead, they are often thought of as ongoing compliance costs. Municipalities who make the latter assumption may fail to connect issues of water quantity and water quality - a project framed as a "local flood control infrastructure project with ancillary water quality benefits" might receive a vastly different political reception than an "MS4 compliance project". **Accurately framing these important water quality efforts as durable investments in the health and safety of a community and its economy may unlock more access to capital to allow communities to realize more benefits sooner. In addition, this framing can also open up additional financing opportunities through hazard mitigation resources. Specific examples of how loan financing based on municipal general fund resources could support stormwater management should be developed and shared through existing municipal communication and education opportunities. For communities for whom debt financing is not available, 0% loans, cost-share programs and other financing structures should be considered.**
3. While local political will and financial capacity are clearly drivers, it can seem at times that the differing technical approaches and finance strategies owe as much to the preferences and past experience of the particular engineers and solicitors who are retained by the various municipalities. In addition, the engineers are often the default (official or unofficial) project finance advisors. **Ongoing continuing professional education offerings directed to firms who work primarily at the small municipal level could foster adoption of innovative yet proven technical and finance strategies being cost effectively deployed by larger clients and their engineers and advisors. This education should be structured so that municipal managers and their advisors participate in training together to help empower municipalities to have a more substantive role in these decisions.**
4. A recurring theme across multiple water finance programs at all levels of government is the lack of **comprehensive support for project planning and early-stage design.** This trend is particularly acute for cross-sector approaches involving multiple regulatory programs, and projects involving potential multi-municipal collaborations. While most professionals engaged in this sector acknowledge the great promise of these efforts, they are more costly and time consuming up front, as trust must be developed among the multiple municipal entities, and perhaps multiple regulatory programs as well. The planning process as it stands tends to reward expediency, resulting in go-it-alone approaches using well-established (if not optimal) solutions. Dedicated technical assistance or specific funding programs for early stage integrated planning, permitting, and intermunicipal coordination should be prioritized across multiple water funding programs in order to prove the value of such approaches.
5. Similarly, the **lack of experience with these integrated and collaborative approaches, paired with increased initial complexity and time involved in these integrated projects,** can lead users to question their cost efficiency. Water finance entities should explore cost-share structures, principal forgiveness, and/or preferential rates and terms for projects involving integrated planning, permitting, and intermunicipal coordination to provide incentives for their consideration. Insofar as most projects are driven in large part by a variety of permit requirements negotiated with and enforced by **PA DEP, the agency should more explicitly commit support and technical assistance for integrated planning, permitting, and**

intermunicipal coordination. This should include incentives such as reasonable flexibility or relief in certain permit requirements when they are negotiated as part of an integrated approach.

6. **While federal and state water funding programs often dedicate funding for some level of technical assistance to their end-user communities, these programs tend to be program-specific, stretched beyond capacity, and often poorly coordinated among providers as a result of limited bandwidth and funding.** There is tremendous technical expertise and dedication among existing TA providers, who are often well placed to understand the practical on-the-ground limitations of the existing regulatory and finance systems. These programs should be expanded and amended to explicitly include support for integrated cross-program and multi-municipal approaches.
7. Proposed amendments to the technical assistance framework mostly available through PA DEP programs should include **consideration of a dedicated capacity building program for stormwater management,** similar to that which exists for drinking water and sanitary wastewater.
8. **Fixed transactional and administrative costs impede the ability of existing infrastructure finance programs to address needs of smaller municipalities and smaller projects.** In addition, these programs are often limited in their ability to finance otherwise worthy projects on private property. One area worth consideration is expanding the use of “linked deposits”, whereby the expensive underwriting and administration of project finance is provided by a private bank or commercial credit entity, with the public sector finance entity setting program parameters and providing a backstop to allow for more attractive terms than might otherwise be commercially possible. This could be structured similar to the USDA Farm Credit or Small Business Administration finance programs - both proven models.
9. **More municipalities of under 10,000 in population should be encouraged to consider USDA Rural Development as a funding option.** Many small communities who do not consider themselves “rural” would nonetheless qualify for a number of USDA water programs based on their population. These programs are often more easily accessed, provide more technical assistance, are generally more flexible, and at times have a more “grant rich” mix of options than existing SRF-style programs.
10. Pennsylvania has a disproportionate number of municipalities and permitted water, wastewater, and stormwater systems for its population. In addition, small communities face challenging demographics in many parts of the state, and the cost and complexity of managing water, wastewater, and storm water services continues to increase. It is inevitable that some systems will become unsustainable on their own. The Commonwealth should **seriously evaluate codifying a broader role for county or existing regional entities to respond, in the event a local municipality or authority becomes unable to fulfill its basic duties in preserving public health and the environment.** These entities would serve as a “consolidator of last resort’ in the event a suitable entity for water, wastewater or stormwater systems is not available. This approach is gaining traction in other states with a strong legacy of local governance. As local control and autonomy is rightly prized by many communities, care should be taken to ensure such a program is not perceived as a programmatic effort at forced consolidations. However, the increasing financial and capacity issues faced by small communities cannot be ignored in perpetuity. Eventually actions will need to be undertaken to manage increasing numbers of failing systems, and it is in the interest of the state and its residents that these scenarios are fully contemplated in systems of water regulation, policy, and finance.

APPENDIX A: Survey Questions

Lehigh River and Conestoga River Survey

All 50 states are currently administrating State Revolving Fund (SRF) programs. The programs are federal-state partnerships that provide communities low-cost financing for a wide range of infrastructure projects. Pennsylvania's water-related funds are administered by PENNVEST under two programs:

The Drinking Water State Revolving Fund (DWSRF):

<https://www.pennvest.pa.gov/Information/Funding-Programs/Pages/Drinking-Water-State-Revolving-Fund.aspx>

The Clean Water State Revolving Fund (CWSRF):

<https://www.pennvest.pa.gov/Information/Funding-Programs/Pages/Clean-Water-State-Revolving-Fund.aspx>

There are other sources of funding for water infrastructure in Pennsylvania through the Commonwealth Financing Authority and other entities.

Through this project, the University of Maryland Environmental Finance Center and The Water Center at the University of Pennsylvania are seeking to understand the water infrastructure needs and funding gaps for communities in the lower Lehigh River watershed. We are looking to connect with on-the-ground leaders to understand whether there are existing challenges to accessing or utilizing state revolving funds and other resources for financing needed water infrastructure projects. We will be sharing the results of our work with PENNVEST and other financing policy makers in the Pennsylvania, as well as the William Penn Foundation who is supporting this project.

* Required

-
1. What type of municipal water sector entity do you work for? Check all that apply

Check all that apply.

- Stormwater
- Drinking water
- Wastewater
- Other

2. How many households are in your stormwater/ drinking water/ wastewater service area?
Please include a number for each kind of service area. *

3. Does your municipality/authority have an asset management plan/system? *

Mark only one oval.

Yes

No

Unsure

4. What is your primary source of funds for capital improvement projects? (click all that apply)

*

Check all that apply.

Utility Rates Fees

PENNVEST (State Revolving Fund or SRF)

PA Department of Community and Economic Development (DCED) grants

Commonwealth Financing Authority (CFA)

United States Department of Agriculture (USDA) Rural Development Other:

5. Does the source of funding differ for stormwater, drinking water and wastewater? Please describe briefly.

6. Do you or someone on staff know how to access SRF funds? *

Mark only one oval.

Yes

No

Unsure

7. Has your municipality/authority used PENNVEST, DCED, CFA, USDA funding in the past? *

Mark only one oval.

- Yes
 No
 Unsure

8. Did your municipality/authority benefit from federal stimulus funding through the American Recovery and Reinvestment Act of 2009? *

Mark only one oval.

- Yes
 No
 Unsure

9. Do you currently have any capital improvement projects for which you need additional funding? *

Mark only one oval.

- Yes
 No
 Unsure

10. If yes, do you have the resources and capacity to plan for these capital improvement projects?

Mark only one oval.

- Yes
 No

11. What is your biggest funding challenge in the next 5 years? *

Mark only one oval.

- Aging Infrastructure Operation
- and Maintenance
- Physical system upgrade via technology/innovation investment
- Administrative upgrade via technology/innovation investment
- Challenges resultant of COVID-19 pandemic (e.g. staffing, shutoffs i.e. reduced revenue)
- Other: _____

12. If aging infrastructure is your biggest challenge, do you have lead service lines or lead pipes in homes in your service area?

Mark only one oval.

- Yes
- No
- Unsure

13. Have you utilized or are you currently utilizing any state level entities for technical and/or managerial support? (e.g. Rural Community Assistance Program, Pennsylvania Rural Water Association, or PA Department of Environmental Protection) *

Mark only one oval.

- Yes
- No

14. Do you complete annual cost of service reports? *

Mark only one oval.

- Yes
- No

15. Have you recently or do you intend to raise rates or fees? *

Mark only one oval.

Yes

No

Unsure

16. Are certain parts of your service area more impacted by challenges such as flooding, sewer backups, CSOs/SSOs? *

Mark only one oval.

Yes

No

Unsure

17. Name of your entity *

Saw Mill Run Water Finance Survey

The Water Center at the University of Pennsylvania and The University of Maryland Environmental Finance Center are working to understand the water infrastructure needs and funding gaps for communities in the Saw Mill Run ("SMR") watershed. In order to help us understand your water infrastructure needs, Watersheds of South Pittsburgh provided us with the SMR IWWR. As one of the 12 municipalities that are located in the SMR watershed, we are looking to connect with you to understand whether there are existing challenges to accessing or utilizing state revolving funds and other resources for financing needed potential water infrastructure projects outlined in the report.

All 50 states currently administer State Revolving Fund (SRF) programs. The programs are federal-state partnerships that provide communities low-cost financing for a wide range of infrastructure projects. Pennsylvania's water-related funds are administered by PENNVEST under two programs:

The Drinking Water State Revolving Fund (DWSRF):

<https://www.pennvest.pa.gov/Information/Funding-Programs/Pages/Drinking-Water-State-Revolving-Fund.aspx>

The Clean Water State Revolving Fund (CWSRF):

<https://www.pennvest.pa.gov/Information/Funding-Programs/Pages/Clean-Water-State-Revolving-Fund.aspx>

There are other sources of funding for water infrastructure in Pennsylvania through the Commonwealth Financing Authority and other entities.

We will be sharing the results of our work with all respondents to the survey, PennVEST and other interested policy makers in Pennsylvania, as well as the Heinz endowments and William Penn Foundation who are supporting this project.

* Required

-
1. Please provide your name, profession, and community *

2. In the next five to ten years, roughly how much investment in your community is planned in satisfying regulatory water mandates? Please provide a dollar amount for: 1. Stormwater/MS4, 2. SSO, 3. CSO *

3. Roughly what percentage of your annual budget for addressing water quality mandates comes from state grants or loan programs such as PennVEST? *

4. What is your primary source of funds for capital improvement projects? (click all that apply) *

Check all that apply.

- Utility Rates
- Fees
- PennVEST (State Revolving Fund or SRF)
- PA Department of Community and Economic Development (DCED) grants Commonwealth
- Financing Authority (CFA)
- United States Department of Agriculture (USDA) Rural Development Other:
- _____

5. Do you or someone on staff know how to access PennVEST funds? *

Mark only one oval.

- Yes
- No
- Unsure

6. IF someone on staff does know how to access PennVEST funds, do they have resources to apply?

Mark only one oval.

- Yes
- No
- Unsure

7. Has your municipality/authority used PENNVEST, DCED, CFA, USDA funding in the past?

*

Mark only one oval.

- Yes
 No
 Unsure

8. Did your municipality/authority benefit from federal stimulus funding through the American Recovery and Reinvestment Act of 2009? *

Mark only one oval.

- Yes
 No
 Unsure

9. Do you currently have any capital improvement projects OR projects to meet a regulatory water mandate for which you need additional funding? *

Mark only one oval.

- Yes
 No
 Unsure

10. If yes, do you have the resources and capacity to plan for these projects?

Mark only one oval.

- Yes
 No

11. Is your community considering a stream restoration project? *

Mark only one oval.

Yes

No

Unsure

12. If your community is considering a stream restoration project, how do you expect to fund the project?

13. Have you utilized or are you currently utilizing any state level entities for technical and/or managerial support? (e.g. Rural Community Assistance Program, Pennsylvania Rural Water Association, or PA Department of Environmental Protection) *

Mark only one oval.

Yes

No

14. Have you recently or are you considering raising rates or fees? *

Mark only one oval.

Yes

No

Unsure

15. If you have/are considering raising rates, how much percent increase in the next five to ten years?

16. Are you considering a stormwater fee?

Mark only one oval.

- Yes
- No
- Unsure
- Already have one

17. If you are considering a stormwater fee, when do you intend on implementing it?

18. Do neighbors in your community experience localized flooding? *

Mark only one oval.

- Yes
- No
- Unsure

19. Have you or your community participated in the Saw Mill Integrated Watershed Management Plan (IWMP) Process? *

Mark only one oval.

- Yes
- No
- Unsure

20. If you or your community has participated in the Saw Mill IWMP, in what capacity?

21. If you or your community has participated in the Saw Mill IWMP, what were your expected outcomes in participating?

22. How interested are you in participating in an integrated joint multi-municipality permit for Saw Mill Run? *

Mark only one oval.

1 2 3 4 5 6 7 8 9 10

Not Interested Very interested

23. Do you have any concerns in participating in an integrated joint multi-municipal water quality permit for Saw Mill Run? *

Mark only one oval.

Yes

No

Unsure