Amended Long-Term Control Plan:
Draft

CITY OF
LANCASTER

Prepared by

Jacobs

CDM Smith

Geosyntec consultants

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Contents

Appendices

Tables

Figures

Acronyms and Abbreviations

AADF	annual average daily flow
ACS	American Community Survey
AER	Alternatives Evaluation Report
ARI	Asset Renewal and Improvement
AWWTP	advanced wastewater treatment plant
BMP	best management practice
BOD	biochemical oxygen demand
CAP	Countywide Action Plan
CBP	Chesapeake Bay Program
CBPRP	Chesapeake Bay Pollutant Reduction Plan
CD	consent decree
cfu/100 mL	colony forming units per 100 milliliters
CIP	capital improvement plan
CPH	Cost Per Household
CPI	Consumer Price Index
CSO	combined sewer overflow
CSS	combined sewer system
CWA	Clean Water Act
DMR	discharge monitoring reports
DO	dissolved oxygen
EPA	U.S. Environmental Protection Agency
FCA	financial capability assessment
FCI	Financial Capability Indicators
FOG	Fats, Oil, and Grease
FY	fiscal year
GI	green infrastructure
GLO	Get the Lead Out
H&H	hydrology and hydraulics

HPA	highest-performing alternative
LQPI	Lowest Quintile Poverty Indicator
LTCP	Long-Term Control Plan
MCL	maximum contaminant level
MG	million gallons
MGD	million gallons per day
mg/L	milligrams per liter
MHI	Median Household Income
MS4	Municipal Separate Storm Sewer System
NMC	Nine Minimum Controls
NPDES	National Pollutant Discharge Elimination System
O&M	operations and maintenance
OPCC	opinion of probable cost
PADEP	Pennsylvania Department of Environmental Programs
PCCM	post-construction compliance monitoring
PFAS	per- and polyfluoroalkyl substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctanesulfonic Acid
PI	Poverty Indicator
PoC	Pollutants of Concern
PPT	parts per trillion
PUC	Public Utilities Commission
RAA	rolling annual average
RG	rain gauge
RI	Residential Indicator
RWQM	Receiving Water Quality Model
SDWA	Safe Drinking Water Act
SOP	Standard Operating Procedure
TMDL	Total Maximum Daily Load
TN	total nitrogen

TP	total phosphorus
TSS	total suspended solids
US	United States
WARi®	Weighted Average Residential Index
WIP	Watershed Implementation Plan
WQMP	Water Quality Model Plan
WQMR	Water Quality Modeling Report
yr	Year

1 Introduction

This Amended Long-term Control Plan (LTCP) documents the City of Lancaster's (City's) efforts to meet the objectives of the United States Environmental Protection Agency's (EPA's) April 1994 Combined Sewer Overflow Control Policy (CSO Policy, EPA, 1994). The Amended LTCP is required by a Consent Decree effective February 27, 2018, between the City of Lancaster, Pennsylvania; the Pennsylvania Department of Environmental Protection (PADEP); and the United States (Consent Decree, 2018).

The Amended LTCP identifies the actions that the City will take to achieve compliance with the National Pollutant Discharge Elimination System (NPDES) permit (PA0026743) requirements, the Clean Water Act (CWA), and the Clean Streams Law (PADEP, 2010). Due to the significant capital investments needed for Safe Drinking Water Act (SDWA) compliance, Municipal Separate Storm Sewer System (MS4) obligations, and affordability concerns, the City has developed the LTCP using an integrated planning approach. This approach is consistent with EPA's Integrated Municipal Stormwater and Wastewater Planning Approach Framework (EPA, 2012a), which was adopted into the CWA in 2019.

1.1 CSO Long-term Control Plan History

The City developed its first LTCP in 1998 (Buchart Horn, 1998), which was approved by PADEP. In 2008, EPA issued an Administrative Order and Request for Information, and the City agreed to submit an Amended LTCP, among other items. This Amended LTCP was submitted in 2009 (CDM, 2009).

In 2010, the City submitted an Amended LTCP to address EPA's comments on the 2009 Amended LTCP (CDM, 2010). The 2010 submittal indicated that the City would proceed with system characterization, development and evaluation of CSO control alternatives after EPA approval of the City's collection system model, financial capability assessment, development of a financing plan, and finalizing an implementation schedule, operational plan, and post-construction compliance plan. The 2010 Amended LTCP also included a green infrastructure (GI) program to reduce urban runoff and CSOs on a citywide basis, meet Chesapeake Bay Total Maximum Daily Load (TMDL) commitments, and comply with the NPDES permit for the City's MS4.

1.2 Green Infrastructure Program

The City recognized the significant capital expenditures needed for traditional gray infrastructure CSO controls and upgrading treatment systems to remove nutrients. The City also began to develop Pennsylvania's first Class 3 GI Plan "[t]o provide more livable, sustainable neighborhoods for City residents and to reduce combined sewer overflows and nutrients" (CH2M Hill, 2011). In 2019, the City adopted the Green It! Lancaster plan (Jacobs, 2019) and it was approved by EPA in 2020. Green It! Lancaster includes a GI Design Manual (City of Lancaster, 2024), a GI Operations and Maintenance Plan (City of Lancaster, 2019a), and a GI Monitoring Plan (City of Lancaster, 2019b). Over 80 GI projects have been completed as of June 2025 and future implementation through 2038 was included in the Green It! Lancaster plan. The City also updated its stormwater ordinance in 2022 to facilitate reductions in stormwater volume and pollution. The City has received numerous awards for its GI program and sustainability efforts (Table 1-1). Section 8.2 includes more information on the benefits of GI.

Table 1-1. Green Infrastructure and Sustainability Awards for City of Lancaster Efforts

Year	Award
2025	Governor's Award for Environmental Excellence: Long's Park Wetlands
2025	Best Urban BMP in the Bay Award - Grand Prize Winner for Long's Park Wetlands Project (Chesapeake Stormwater Network)
2024	Excellence in Construction Award for Public Works Infrastructure (Associated Builders & Contractors ABC Keystone)
2024	Diamond Award Winner for Water Resources (American Council of Engineering Companies of Pennsylvania)
2018	LEED for Cities Gold Certification (US Green Building Council)
2017	National Environmental Achievement Award from National Association of Clean Water Agencies
2017	Governor's Award for Environmental Excellence: Mulberry Street
2016	Platinum-Certified Sustainable Community Status from Pennsylvania Municipal League
2016	LEED for Cities Silver Certification (US Green Building Council)
2016	Pennsylvania Horticultural Society Gardening and Greening Contest Award for Brandon Park Stormwater Management
2014	Gold-Certified Sustainable Community Status from Pennsylvania Municipal League
2014	Best Urban BMP in the Bay Award - Grand Prize Winner for Plum and Walnut GI Project (Chesapeake Stormwater Network)
2014	Governor's Award for Environmental Excellence: Plum and Walnut Green Infrastructure (GI) Project
2012	Choose Clean Water Award (to Lancaster Mayor Gray) from the Choose Clean Water Coalition
2011	10,000 Friends of Pennsylvania Award

BMP: best management practice

1.3 Consent Decree Requirements

The Consent Decree allows the City to continue to implement its GI program and to submit an Amended LTCP using either the presumption or the demonstration approach. In December 2019, the City declared that it would pursue the demonstration approach, because it was not possible for the City to reduce the number of CSO events to 4 to 6 overflows per year and, even if this level of control was attainable, the river would not meet water quality standards (City of Lancaster, 2019c). The City also indicated that EPA and PADEP needed to initiate review of water quality standards and their implementation measures to determine the appropriate path forward, consistent with EPA's 2001 Guidance: Coordinating CSO Long-Term Planning with Water Quality Standards Reviews. In 2020, EPA, in consultation with PADEP, approved the use of the demonstration approach (EPA, 2020).

1.4 Asset Renewal and Improvement Baseline

In developing the Amended LTCP, the City established the Asset Renewal and Improvement (ARI) Baseline scenario to reflect resources needed to maintain the wastewater collection and treatment system, expand capacity for growth needs, and incorporate planned CSO projects. The ARI Baseline also reflects asset renewal and improvement resources needed to maintain the City's stormwater system. Features of the

ARI Baseline are described in Sections 5 and 7. The ARI Baseline includes GI projects in the North and Engleside CSO basins and separation projects in the Susquehanna and Engleside CSO basins.

1.5 Integrated Planning Considerations

As discussed in Section 2, the need for asset management and meeting CWA and SDWA obligations puts significant, long-term financial burdens on the City's residents. Under current conditions, 34 percent of the City's households are paying more than two percent of their Median Household Income (MHI) for wastewater and stormwater. With the ARI Baseline, this increases to 42 percent. The Selected CSO Control Plan increases the number of households paying more than two percent of their MHI to 45 percent.

The current and future CWA obligations for wastewater and stormwater collection and treatment are described in Section 3. The significant SDWA obligations for water treatment and distribution are described in Section 4.

EPA's Integrated Planning Framework allows municipalities to evaluate all water-related obligations, conduct a financial capability assessment, and prioritize projects that achieve the greatest public health and environmental benefits. The City is therefore using an integrated planning approach to develop the Amended LTCP.

The City's Comprehensive Plan includes a strategy to "restore the Conestoga River and transform Lancaster City into a center of excellence for clean water, environmental stewardship, and sustainable waterfront development" (City of Lancaster, 2023). The plan includes Policy CRF-1.3: Shared Clean Water Investments whereby the City will cooperate with neighboring municipalities and partner organizations to clean up the Conestoga River and its tributaries upstream of the City.

1.6 Report Organization

Section 2 summarizes the financial capability assessment for the City, including the financial impacts of the required SDWA and CWA projects. Sections 3 and 4 describe the current and future obligations for the City under the CWA and SDWA, respectively. Section 5 summarizes the system characterization, which was submitted to EPA in accordance with the Consent Decree (Geosyntec and Jacobs, 2019), and the implementation of the Nine Minimum Controls (NMC). Section 6 describes the public participation process that was followed for the alternatives evaluation report and the Amended LTCP. Section 7 summarizes the evaluation of CSO control alternatives, which was submitted to EPA in accordance with the Consent Decree (Jacobs et al., 2025). Section 8 identifies the selected CSO control plan and compliance with water quality standards. Section 9 provides the implementation schedule and the adaptive management approach that will be used to refine the CSO control plan over time. Section 10 provides the post-construction compliance program, which will be initiated once the Amended LTCP has been fully implemented. Section 11 summarizes the revisions to the operation and maintenance plans. Additional information is also found in the appendices to this report, including the GI information required by the Consent Decree.

2 Financial Capability

A key component of the City's selected CSO control plan is a determination of financial burden of such controls on the community. As part of the City's Amended LTCP, EPA requires a financial capability assessment (FCA). FCAs evaluate the capability of a community and its households to undertake additional water quality-related capital improvements.

The purpose of this section is to provide a summary FCA for the City's residential customers as evaluated under EPA's *Clean Water Act Financial Capability Assessment Guidance* (EPA, 2024b), herein referred to as EPA Guidance. The affordability of the City's ARI Baseline wastewater and stormwater capital improvement programs (CIPs) and Selected CSO Control Plan was evaluated using EPA Guidance. More detailed documentation of the City's FCA is provided in the comprehensive FCA (Stantec, 2025).

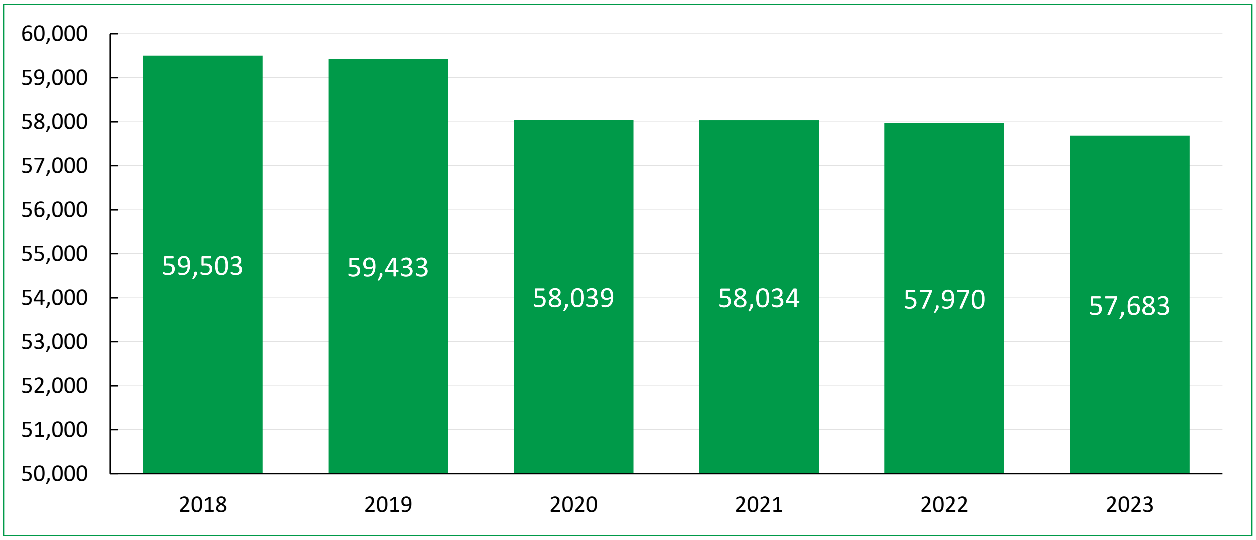
2.1 Lancaster Socio-Economic Setting

When considering financial capability and affordability, it is beneficial to understand the historical trends and current socio-economic setting of a community. Understanding the socio-economic setting for the City provides clarity on the fiscal burden facing citizens, now and into the future. The following sections include data concerning the City's economic conditions. Dollar values representing demographic information in this section are expressed in nominal dollars for the year in which they were reported.

2.1.1 Population

The City's population during the 2020 census[1] was 58,039. Although the census occurs every 10 years, the US Census Bureau updates estimates each year to more accurately depict population. Based on the five-year average census, the City's population has been declining from 59,503 in 2018 to 57,683 in 2023[2], yielding an approximate decline in population of 0.5 percent per year. Figure 2-1 shows the population trend in the City from 2018 to 2023.

Figure 2-1. City of Lancaster Population Trend



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[1] U.S. Census Bureau, Profile of General Demographic Characteristics: 2020, Table DP-1, Lancaster City, PA

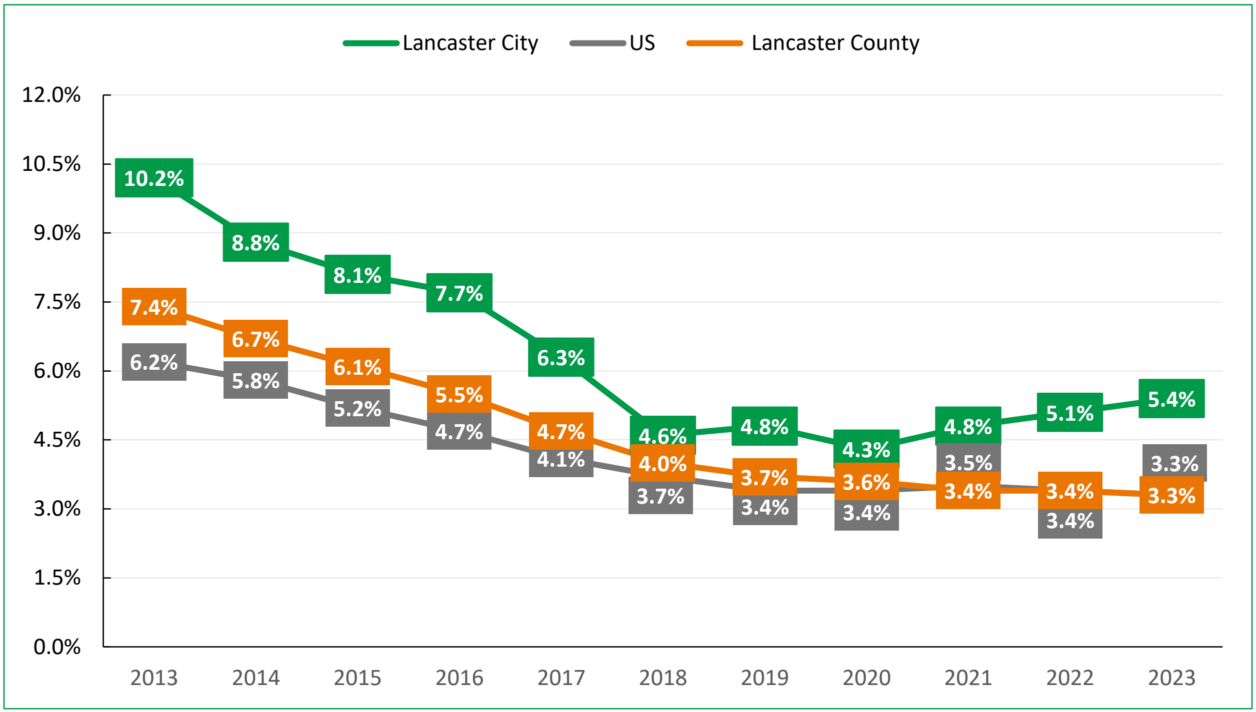
[2] U.S. Census Bureau, City and Town Population Totals Datasets: 2020-2023. Lancaster City, PA

A declining population can have significant implications for the City's utility systems. The fixed costs of maintaining and operating utility infrastructure, such as water treatment facilities, sewer lines, and stormwater systems, remain largely unchanged regardless of a decline in demand. With fewer households sharing these fixed costs, the cost per household can increase. This can place a greater financial burden on remaining residents, potentially leading to affordability concerns and further population decline, creating a feedback loop.

2.1.2 Unemployment

From 2013 to 2023, the City of Lancaster's unemployment rate ranged from a low of 4.3 percent (2020) to 10.2 percent at its peak (2013).[3] On the other hand, the unemployment rate within the County has been decreasing since 2013 to 3.3 percent in 2023.[4] The unemployment rate for the City has trended consistently higher than the United States and the County. Figure 2-2 shows the average annual unemployment rate for the City, the United States (US), and the County from 2013 to 2023.

Figure 2-2. Unemployment Rate Comparison



Labor force participation increased until 2020 while unemployment rates decreased. This implies that the unemployment rate decreases are due to more people actively seeking work and finding jobs rather than people dropping out of the labor market. Lancaster's declining labor force participation over the last few years may indicate that people are changing the way they look at available jobs. The inclining unemployment rate and declining labor force participation rate indicate a weak job market. Figure 2-3 shows the labor force participation numbers for 2012 to 2023.[5]

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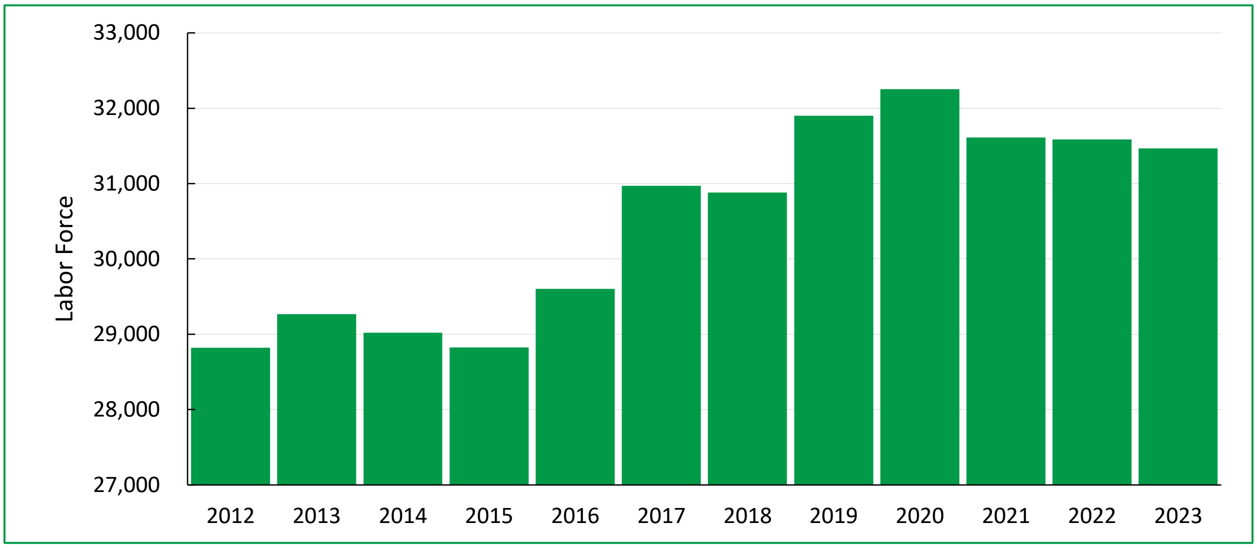
[3] U.S. Census Bureau, Profile of General Demographic Characteristics: 2013-2023, 5-Year Estimates, Table DP03, Lancaster City, PA

[4] U.S. Census Bureau, Profile of General Demographic Characteristics: 2013-2023, 5-Year Estimates, Table DP03, Lancaster County, PA

[5] U.S. Census Bureau, 2023 American Community Survey 5-Year Estimates, Table DP03, Lancaster City, PA

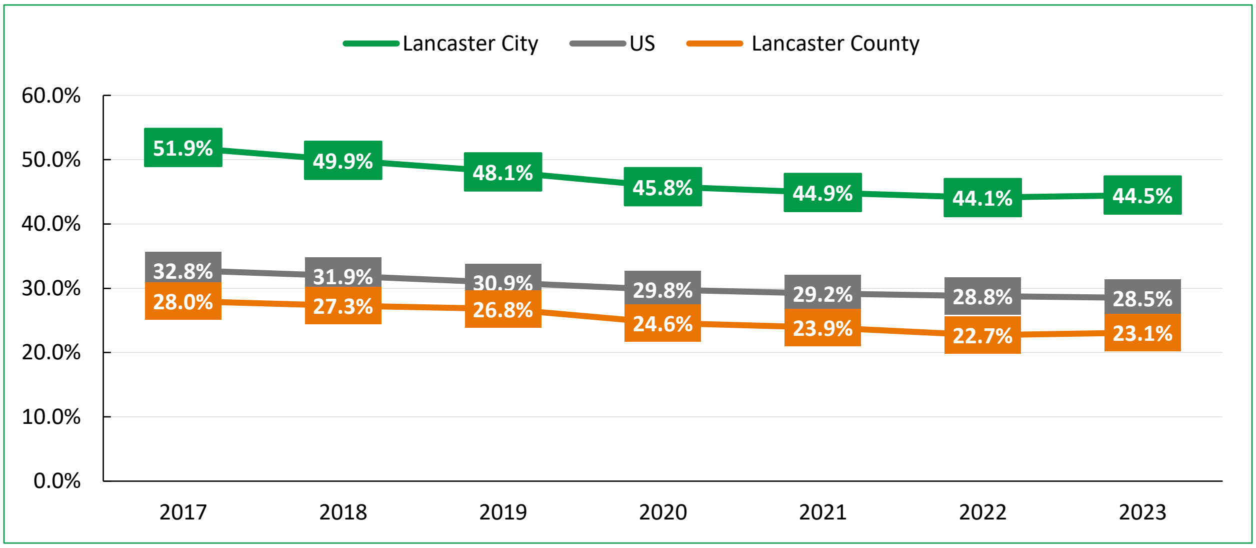
Figure 2-3. City of Lancaster Labor Force Participation



2.1.3 Poverty

Poverty rates in the City have consistently been above the national average and the County's since 2017. The US Census Bureau defined the poverty threshold for a family of three at $24,860 in 2023.[6] In 2023 under those criteria, 20.7 percent of the population in the City was reported below the poverty level including 29.2 percent of the children under the age of 18 years old.[7] Between 2017 and 2022, poverty rates within the City decreased by 9.1 percent, an average of 0.8 percent per year. However, in 2023, the poverty rates within the City started to increase by 2.0 percent between 2022 and 2023. Overall, the poverty rate in the City has been and continues to be significantly higher than poverty rates in the County and the US. See Figure 2-4 for a detailed comparison of poverty rates in the City of Lancaster, Lancaster County, and the US.

Figure 2-4. Poverty Rate Trend



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[6] U.S. Census Bureau. Social Economic and Housing Statistics Division, Poverty Thresholds for 2023.

[7] U.S. Census Bureau, 2023 American Community Survey 5-Year Estimates, Table S1701, Lancaster City, PA

Understanding poverty levels and affordability challenges is crucial when evaluating the financial condition of the City. In the City of Lancaster, 44 percent of households are below 200% of the Federal Poverty Level (FPL). This means that almost half of the City's households are economically vulnerable and at risk of financial instability. Many of these households face severe housing cost burdens, with rent or mortgage payments comprising between 48% and 70% of their income. This far exceeds the commonly recommended benchmark of 30%. For almost half of the residents in Lancaster, their average annual expenses likely exceed their household income.

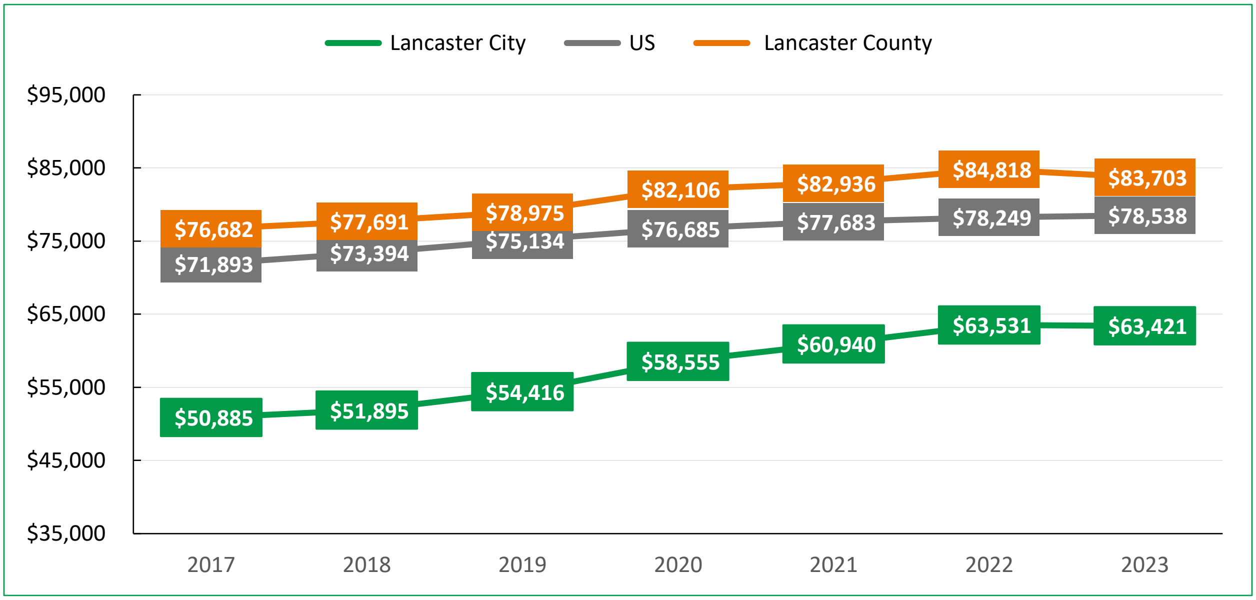
Furthermore, 35% of households cannot afford the basic "ALICE Household Survival Budget." [8] Affordability challenges, such as high housing costs relative to income, can lead to displacement, homelessness, and reduced workforce availability, all of which hinder economic development. When a significant portion of the population is unable to afford utility bills, it can lead to increased delinquency rates, reduced revenue for the utility system, and greater financial pressure on the City.

2.1.4 Household Income and Distribution

The City's MHI has been rising in recent years but still lags behind the county and national averages. In 2023, the City's MHI was $63,421 according to the American Community Survey (ACS) 5-year Estimate for the City census tracts.[9] Lancaster County's MHI has trended closely to the national MHI for at least the last seven years. In comparison to the City's MHI, the national MHI was $76,538, or $15,117 greater than the City MHI.[10] Similarly, the City's MHI was also $20,282 lower than Lancaster County's MHI of $83,703.[11]

A comparison of MHI trends for the City of Lancaster, County of Lancaster, and the United States since 2017 is shown below in Figure 2-5. The MHI in each year has been adjusted to 2023 dollars using the average annual consumer price index (CPI).[12]

Figure 2-5. Median Household Income Trend, Adjusted to 2023 Dollars



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[8] The ALICE Household Survival Budget, developed by the United Way, includes an estimate of the minimum income required to cover basic necessities such at housing, food, healthcare, childcare, and transportation. ALICE stands for Asset Limited, Income Constrained, Employed.

[9] U.S. Census Bureau, 2023 American Community Survey 5-Year Estimates, Table DP03, Lancaster City, PA

[10] U.S. Census Bureau, 2023 American Community Survey 5-Year Estimates, Table DP03, United States

[11] U.S. Census Bureau, 2023 American Community Survey 5-Year Estimates, Table DP03, Lancaster County, PA

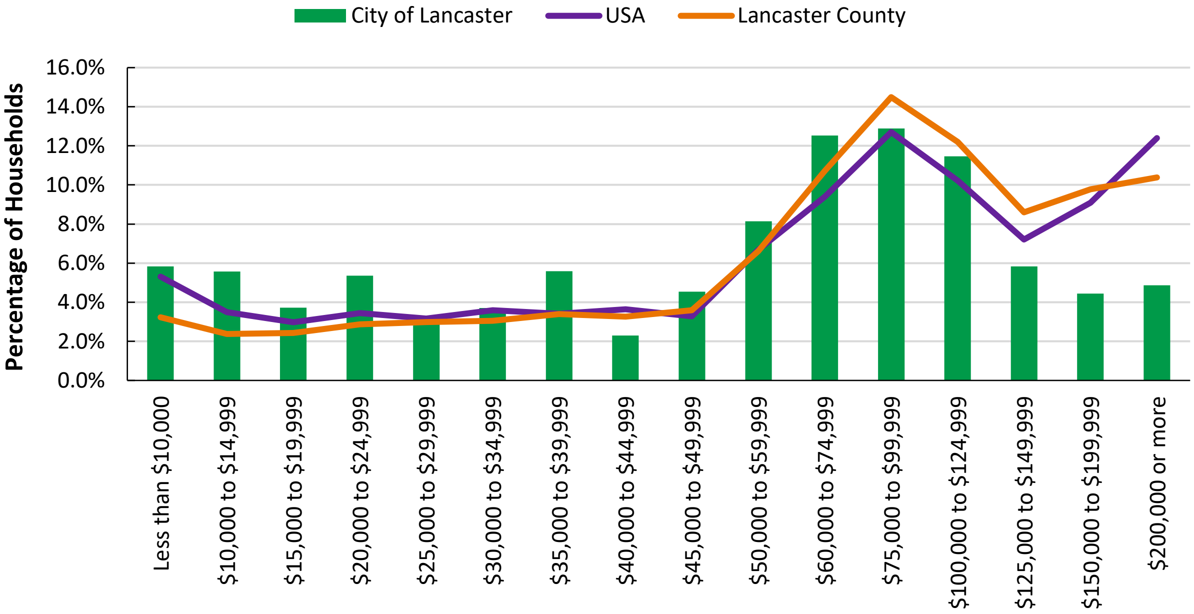
[12] R-CPI-U-RS Homepage : U.S. Bureau of Labor Statistics

The cost of wastewater and household incomes have not kept pace in the City over the past five years. While the cost of sewer service for single-family households has almost doubled since 2018,[13] the MHI has only increased about 20 percent. As a result, utility bills are becoming a larger share of household budgets, making wastewater bills increasingly unaffordable for the average single-family household (see Figure 2-6).

Figure 2-6. Monthly Sewer Bill and Median Household Income (MHI) Comparison from 2018 to 2023 (in 2023 dollars)

When studying household income, it is important to understand the distribution of households among the 16 income bins reported by the ACS. Regardless of a city's MHI, cities may be impacted differently by increasing sewer bills depending on the skew of income distribution. A comparison between the City and County income distributions reveals a greater percentage of the population in the City at lower income levels, and lower percentages with higher income levels. Figure 2-7 illustrates this citywide and countywide comparison of income distribution in 2023.[14]

Figure 2-7. Household Income Distribution



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[13] Assuming a usage of 3,700 gallons.

[14] U.S. Census Bureau. 2023 ACS Survey 5-Year Estimates, Table B19001, Lancaster City, PA

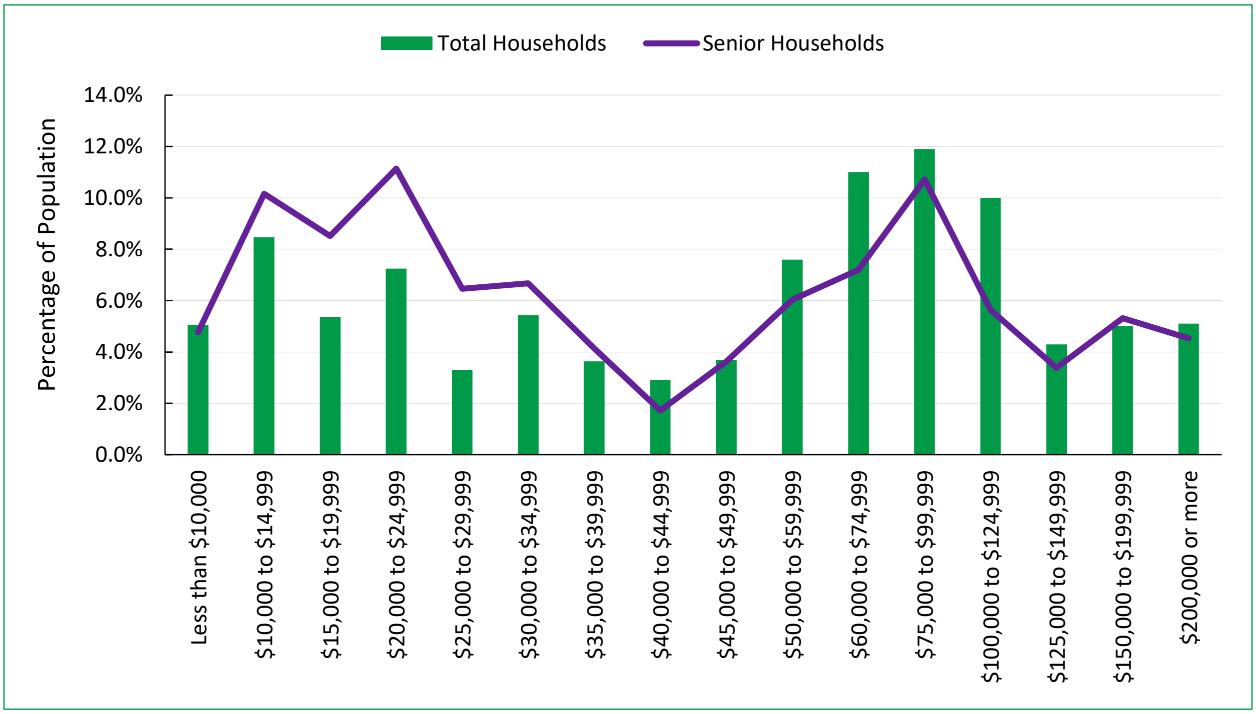
An alternative measure of income distribution is income quintiles. Table 2-1 presents a comparison of income quintile upper limits for the City, the County, and the nation. All quintile upper limits for the City range from approximately 20-40 percent below those for Lancaster County and the nation. The City's upper limit for the lowest quintile is $24,202, meaning the bottom 20 percent of households earn less than $24,202 per year, in 2023 dollars.[15] The top 5 percent of earners in Lancaster have a lower limit of $195,805, which is over 21 percent lower than the County. This indicates incomes in the City are generally below the County and the national average for all income groups.

Table 2-1. Household Income Quintile Upper Limits (in 2023 dollars)

Quintile Upper Limits	City of Lancaster	United States	Lancaster County
Lowest Quintile	$24,202	$31,942	$39,470
Second Quintile	$50,119	$61,190	$69,079
Third Quintile	$74,567	$97,458	$101,749
Fourth Quintile	$110,567	$155,515	$150,535
Lower Limit of Top 5 Percent	$195,805	$250,000+	$250,000+

Understanding senior income distribution can provide insight into the financial condition of a specific portion of the population. Senior households are often on fixed incomes and may be significantly impacted by rising costs. In this analysis, residents older than 65 years of age are considered senior households. Senior households in Lancaster account for 17.8 percent of all households compared to 27.0 percent of all households in the United States.[16] 47.7 percent of all senior households in Lancaster have income below $35,000 a year.[17] See Figure 2-8 for a comparison between senior and all other households the City.

Figure 2-8. City of Lancaster Senior Household Income Distribution



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[15] U.S. Census Bureau, 2023 American Community Survey 5-Year Estimates, Table B19080, Lancaster City, PA

[16] U.S. Census Bureau, 2023 American Community Survey 1-Year Estimates, Table B19037, United States

[17] U.S. Census Bureau, 2023 American Community Survey 1-Year Estimates, Table B19037, Lancaster City, PA

2.2 Impacts on Bills & Affordability

The City, in compliance with the requirements of the CWA, the CSO Policy, and a prior Administrative Order, developed an amended LTCP in 2010 (CDM, 2010) and a GI plan in 2019 (Jacobs, 2019) to control and reduce CSOs. The City's Consent Decree requires the development of an amended LTCP and Final FCA to be submitted to EPA and PADEP with an implementation schedule for the proposed CSO control measures. The ARI Baseline evaluated in the FCA reflects projections of non-CSO-related infrastructure improvements and renewal and replacements. The ARI Baseline includes a plan duration to 2054 which allows for investment in other areas of the City's infrastructure. Both the ARI Baseline and Selected CSO Control plans will have significant impacts on ratepayers and affordability.

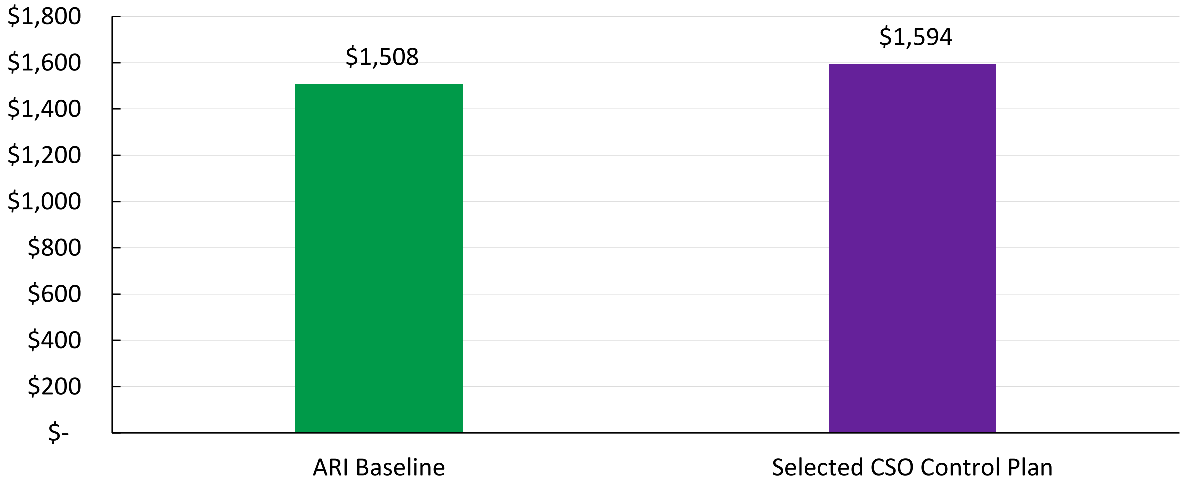
2.2.1 Cost Per Household

FCAs provide information useful in modifying water quality standards, evaluating levels of control, and selecting a recommended LTCP alternative, as well as establishing schedules to meet CSO control requirements. As part of the analysis, the Cost Per Household (CPH) was evaluated for the wastewater and stormwater systems. The ARI Baseline evaluation covers current and projected operation and maintenance (O&M) costs of wastewater collection, treatment, CSO control, regulatory requirements, and stormwater management. The "with Selected CSO Control Plan" includes projected costs for GI controls, storage, and sewer separation selected to cost-effectively further reduce CSO discharges, as described in Section 8 of the Amended LTCP.

The City's Advanced Wastewater Treatment Plant (AWWTP) manages and treats not only wastewater from retail customers located both within and outside of the City, but also inflow and infiltration and wastewater from the City's wholesale partners, referred to as Tributary Municipalities and Tributary Authorities in the Consent Decree. According to agreements with these wholesale partners, CSO control costs cannot be shared; therefore, the FCA findings evaluate financial capability factors only for City retail customers.

CPH is determined by dividing the residential share of costs by the number of households, following EPA guidance. The residential share of costs is calculated by dividing the inside-city residential flow by the total flow. Flows are allocated between residential and non-residential classes based on billed flows. Figure 2-9 compares the CPH between the ARI Baseline and the Selected CSO Control Plan.

Figure 2-9. Comparison of Cost per Household (CPH) Between the Asset Renewal and Improvement Baseline and the Selected CSO Control Plan



It must be noted that all cost data included in the CPH determination are expressed in 2024 dollars. Although Lancaster may intend to finance the bulk of projects proposed in the CIP, the implementation period to accommodate available financing and debt service will extend many years. The costs included in the CPH calculation are all present worth costs and are not intended to be considered real/escalated future costs.

2.2.2 Residential Indicator

Table 2-2 presents EPA's scoring for the CPH. If the CPH is less than 1 percent of the MHI, the Residential Indicator (RI) is assigned a low Financial Impact score. If the CPH is between 1 and 2 percent of MHI, the RI is assigned a mid-range Financial Impact score. If CPH is more than 2 percent of MHI, the RI is assigned a high Financial Impact score.

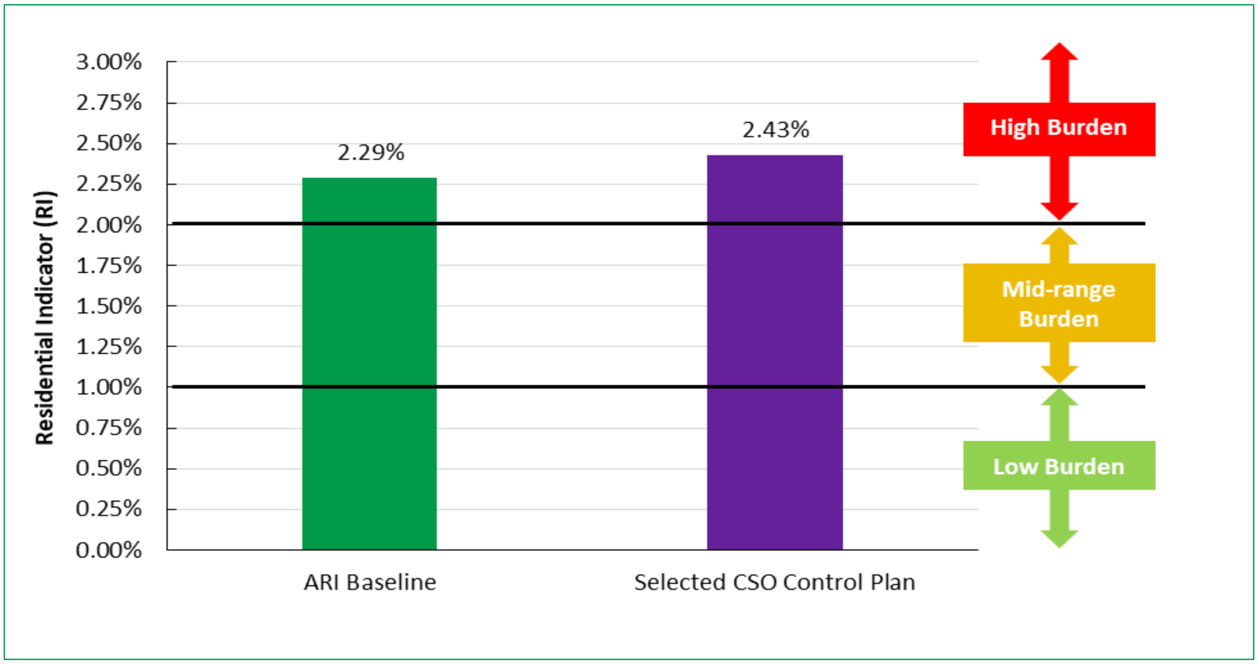
Table 2-2. EPA's Residential Indicator Scoring Criteria

Financial Impact	Cost Per Household
Low	Less than 1.0 percent of MHI
Mid-Range	1.0 - 2.0 percent of MHI
High	Greater than 2.0 percent of MHI

MHI = Median Household Income

The RI computation divides CPH, as determined in Figure 2-9 above, by MHI. The 2023 MHI is adjusted to 2024 based on a five-year average change in CPI adjustment factor of 3.6%.[18] The calculated 2024 MHI for the City is $65,731. Figure 2-10 presents the RI for both the ARI Baseline and the Selected CSO Control Plan. The RI for the 2024 ARI Baseline capital plan equals 2.29% and 2.43% for the Selected CSO Control Plan, yielding a High-Range or high burden score for both capital plan scenarios. In other words, the CPH as a percent of MHI is over 2 percent for both the ARI Baseline and Selected CSO Control Plan.

Figure 2-10. Residential Indicator for the ARI Baseline and Selected CSO Control Plan



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[18] Source: US Bureau of Labor Statistics: Consumer Price Index, All Urban Consumers - (CPI-U), U.S. city average, All items - CUUR0000SA0

2.2.3 Permittee Financial Capability Indicators

In addition to the RI, the analysis also considers the financial health of the community. There are six Permittee Financial Capability Indicators (FCIs):

- Debt Indicators
  - Bond Ratings
  - Overall Net Debt as a Percent of Full Market Property Value
- Socioeconomic Indicators
  - Unemployment Rate
  - MHI
- Financial Management Indicators
  - Property Tax Revenues as a Percent of Full Market Property Value
  - Property Tax Revenue Collection Rate

A summary of the FCIs is presented in Table 2-3. The ARI Baseline and the Selected CSO Control Plan scenarios have identical FCI results. EPA Guidance provides that each 'Weak' financial capability indicator shall be assigned a numeric value of '1', 'Mid-Range' indicators are assigned '2', and 'Strong' indicators are assigned '3'. Lancaster scored a '1' on two indicators and a '3' on three of the indicators. The arithmetic average of the six indicators for the City of Lancaster is 2.17.

Table 2-3. Summary of Financial Capability Indicators

Row	Item	Sewer Value (Score)
901	Bond rating	A3 (3)
902	Net debt percent of property value	8.3% (1)
903	Unemployment rate compared with national average	2.0% (1)
904	MHI compared with National Average	(18.4%) (2)
905	Property tax revenue percent of property value	0.76% (3)
906	Property tax revenue collection rate	99.2% (3)
907	**Permittee indicator score**	**2.17**

In accordance with EPA Guidance, the average FCI evenly weights a bond rating level to attain future debt against the unemployment rate and level of MHI. This simple approach, shown in Table 2-3 blends the factors and ultimately hides the true impact to a utility's customer base.

The Residential Indicator is determined to be in the "High" category for the ARI Baseline Capital Plan since the score is greater than 2 percent. Similarly, the RI is determined to be 'High" category for the Selected CSO Control Plan. The average score of the Permittee FCIs (2.17) is between 1.5 and 2.5 for both scenarios: resulting in a score of "Mid-Range." Given this, the overall assessment results place the ARI Baseline Capital Plan and the Selected CSO Control Plan in the "High Burden" category.

2.2.4 Lowest Quintile Poverty Indicators Analysis

The Lowest Quintile Poverty Indicator (LQPI) combines the lowest quintile income element with five additional poverty indicators (PIs) to establish a numeric score for poverty prevalence within the community's service area, as compared to a national average. Each of the factors in this analysis is evaluated based on the values of the City relative to national statistics. The LQPI is then calculated as the weighted average score of the six indicators. The lowest quintile income element is weighted 50% and the remaining PIs are all equally weighted 10%. An LQPI above 2.5 is characterized as low impact, LQPI between 2.5 and 1.5 is a mid-range impact, and a LQPI below 1.5 is high impact. The LQPI calculation for the City of Lancaster's residents is shown in Table 2-4 and indicates that EPA considers the City to have a mid-range poverty prevalence.

Table 2-4. Lowest Quintile Poverty Indicator Calculation

Item	Entity	Score
Upper Limit of Lowest Income Quintile	City of Lancaster	$24,202
	Nation	$32,232
	LQPI1 Score	**2**
Percentage of Population with Income Below 200% of the FPL	City of Lancaster	44.5%
	National	28.5%
	LQPI2 Score	**1**
Percentage of Population Receiving SNAP Benefits	City of Lancaster	27.1%
	Nation	11.8%
	LQPI3 Score	**1**
Percentage of Vacant Households	City of Lancaster	5.3%
	Nation	10.8%
	LQPI4 Score	**3**
Trend in Household Growth	Total Households in City in 2023 Census	21,243
	Total households in City 2018 Census	21,118
	LQPI5 Score	**1**
Percentage of Unemployed Population 16 and Over in Civilian Labor Force	City of Lancaster	5.4%
	Nation	3.3%
	LQPI6 Score	**1**
Lowest Quintile Poverty Indicator (LQPI)		1.70
Lowest Quintile Poverty Characterization		**Medium Impact**

Upon completion of the Initial LQPI analysis, the LQPI score and the FCA score were combined to provide the final expanded FCA result. The expanded FCA score demonstrates a "High Burden" for both the ARI Baseline Capital Plan and the Selected CSO Control Plan.

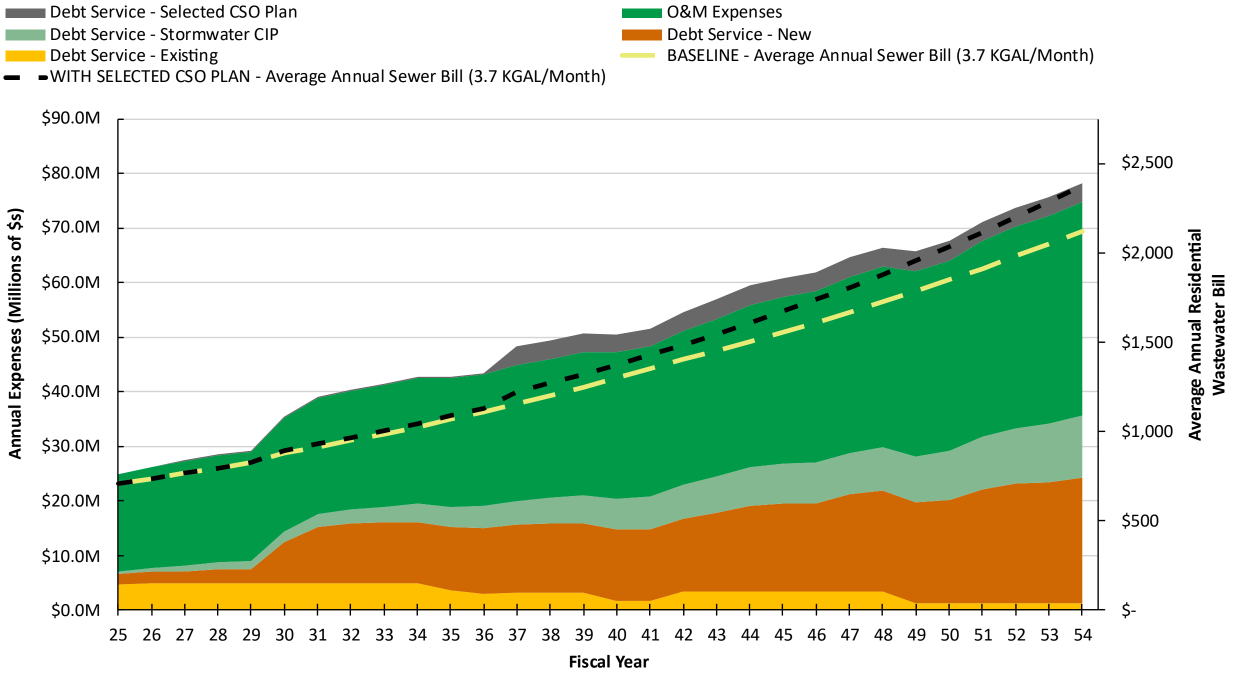
2.2.5 Financial and Rate Models

Forecasts of affordability over time can be made through long-term financial planning. Rate increases used to analyze affordability over time were projected in a long-term financial plan developed for the City. The sources and uses of funds are evaluated on an annual basis. Deficits in sources of funds relative to uses yield annual rate revenue increases necessary to manage the utility and complete implementation of the City's CIPs. Rate revenue projections consider targets and requirements such as debt service coverage ratios and minimum fund balances. These are items omitted from EPA's recommended CPH calculation.

Figure 2-11 depicts a 30-year forecast of the annual expenditure requirements for the sewer fund and a projection of annual single family residential sewer bills.[19] Annual expenditure for the sewer fund includes the following:

- Existing sewer debt service,
- New debt service associated with planned Wastewater CIP,
- Forecasted O&M,
- New debt service associated with planned Stormwater CIP, and
- New debt service associated with the Selected CSO Control plan.

Figure 2-11. Sewer Fund 30-Year Forecast of Annual Expenses by Type, in Millions of Dollars



The FCA follows an Integrated Planning framework and allows inclusion of all CWA costs such as stormwater, asset management, and system rehabilitation programs in addition to current and future CWA obligations. Through EPA's Integrated Planning Framework, communities are encouraged to implement the most cost-effective CWA solutions in a schedule which will prioritize projects such that the most serious water quality and system issues can be addressed sooner. Inclusion of SDWA capital requirements for the City's water fund adds greater financial burden on ratepayers on top of the significant sewer rate increases.

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[19] Typical usage for a single-family is assumed to be 3,700 gallons per month based on average monthly billed volume from City billing data

Figure 2-12. Cumulative Rate Increases for Water and Sewer Bills

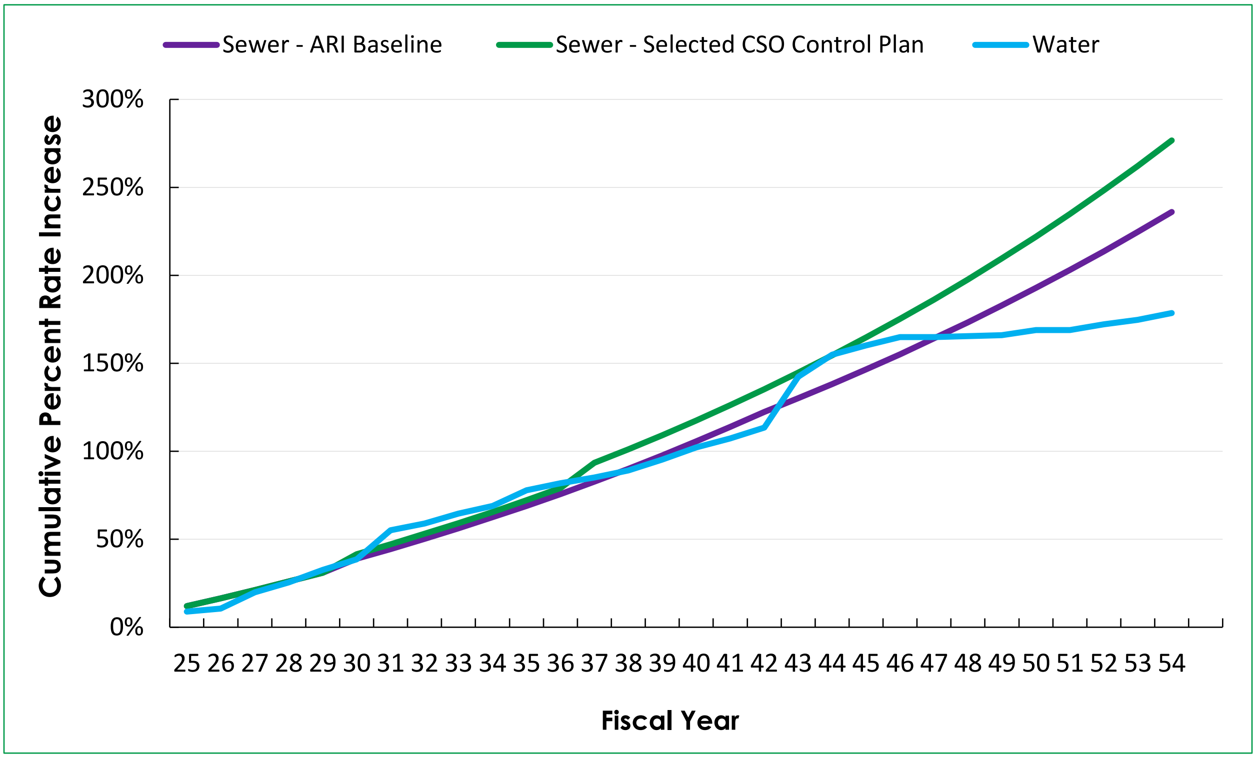

Figure 2-12 depicts the forecasted cumulative annual rate increase for both water and sewer plans for the next 30 years.[20] Stormwater rate increases are expected to remain at 0% throughout the forecast for both sewer capital plans. Water rate increases are dependent on the level of capital improvement projects planned each year. Over the 30-year forecast period, total annual utility bills (sewer, stormwater, and water) may increase by over $2,500. The 30-year forecasted impact of both the ARI Baseline, the Selected CSO Control Plan with SDWA compliance is depicted in Figure 2-13.

Figure 2-13. Weighted Average Residential Index (WARi®) Approach

+$400M	Capital projects expected to be financed with new debt
$1,200 → $4,200	Forecasted change in annual single-family bills from Fiscal Year 2024 to FY 2054
+300%	30-year cumulative rate increase in utility bills

2.2.6 Weighted Average Residential Index (WARi®) Approach

EPA Guidance allows the City to present additional metrics that demonstrate the community's financial and demographic information. A detailed approach to evaluating affordability was previously developed

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[20] Forecasted rates have not been approved by City Council and are subject to change.

by Stantec to properly account for income distribution, unique neighborhoods, and actual monthly wastewater and stormwater bills for households in each census tract of the City's inside-city service area. This approach, called the weighted average residential index or WARi®, was applied to the City's inside-city service area and customer base to evaluate affordability at a localized level. This census tract approach uses actual numbers of households and MHI for each census tract and scales the financial burden to the EPA Guidance CPH for a community's wastewater and stormwater service for each census tract. This yields a more location-specific depiction of the financial impacts on individual communities.

To identify the financial impact by census tract, color coding is assigned to each level to clearly present the results. Maps depicting financial impacts by census tract were created for both the ARI Baseline and the Selected CSO Control plans. Census tracts are color-coded based on each tract's RI value. The threshold values for each level of financial impact and the corresponding colors are presented in Table 2-5. Increments of financial impacts were developed to demonstrate more granularity than standard EPA ranges and are equidistant intervals from zero to the high-burden threshold. A WARi® of 3.65% is equivalent to EPA's RI high burden threshold of 2.0%.

Table 2-5. WARi® Affordability Table and Map Key

Financial Impact	Modified EPA Index	Color
Low	Less than 1.83 %	🟩
Low-Mid	1.84% to 2.74%	🟨
Mid	2.75% to 3.19%	🟧
Mid-High	3.20% to 3.65%	🟧
High	Greater than 3.65%	🟥

The current system-wide WARi® value based on 2025 typical wastewater and stormwater bills equals 2.57%, yielding a baseline financial impact level of low to mid financial impact according to values in Table 2-5 and Figure 2-14 presents a map of financial impacts across the City's inside service area for the ARI Baseline (A) and Selected CSO Control (B) Plans.

Figure 2-14. Fiscal Year 2025 Wastewater & Stormwater Census Tract WARi® Results for ARI Baseline Capital Plan (Left) and Selected CSO Control Plan (Right)

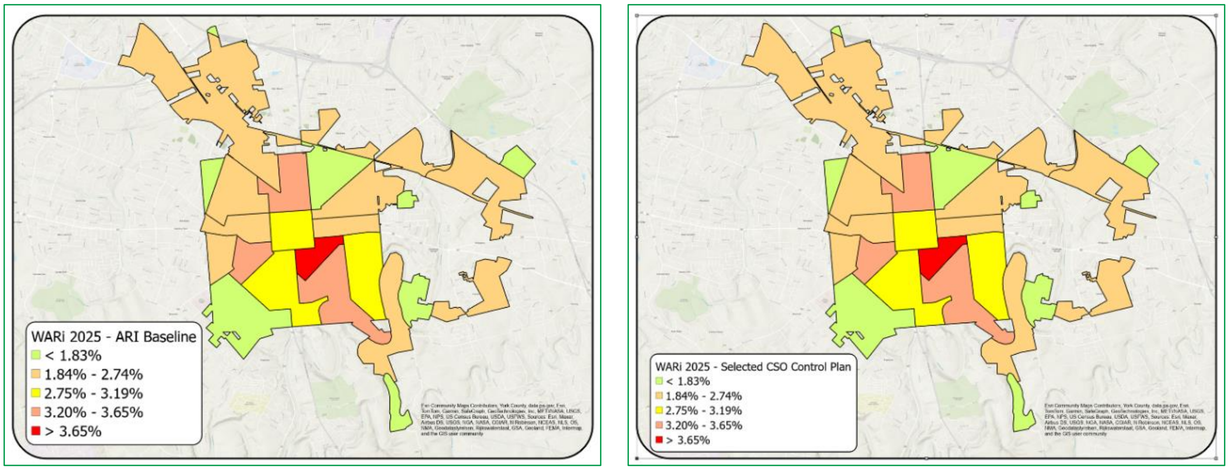
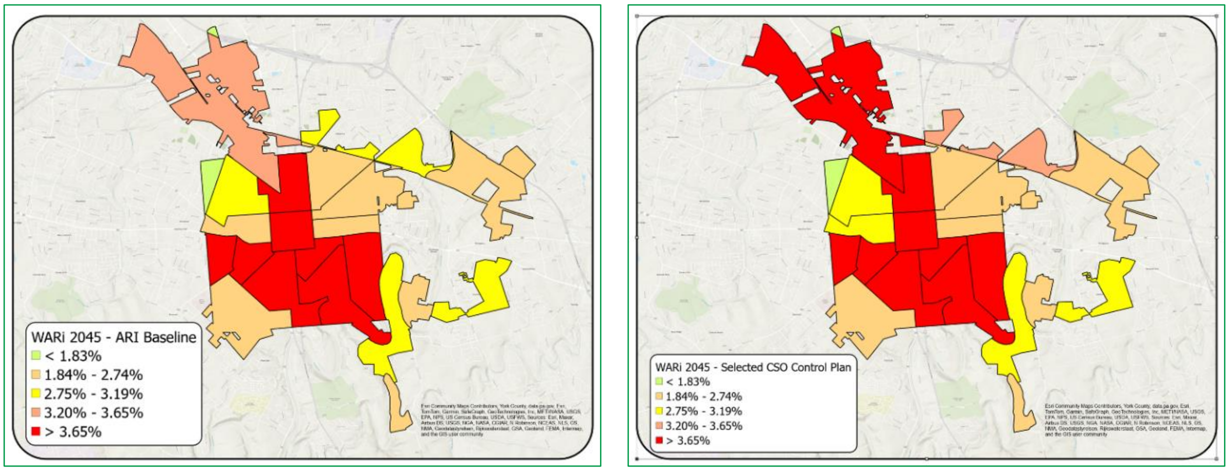


Figure 2-14 demonstrates that the affordability challenges for both the ARI Baseline Capital Plan (Left) and Selected CSO Control Plan (Right) are located primarily in the central tract of the service area, demonstrating unaffordable bills (high impact) on average across the census tract. The burden is identical between both capital plans in fiscal year 2025 (FY 2025) because the CSO reduction is assumed to be in FY 2037.

2.3 Projected 2045 Affordability Impact

The WARi® analysis was completed using the projected wastewater and stormwater rates for both the ARI Baseline and Selected CSO Control Plans (using Figure 2-12 rate increases) to forecast the affordability of service. The results of the affordability analysis are shown in Figure 2-15 for 2045. Projections for 2045 demonstrate that the affordability challenges for both the ARI Baseline Capital Plan (A) and Selected CSO Control Plan (B) are more widespread across the City's census tracts.

Figure 2-15. FY 2045 Wastewater & Stormwater Census Tract WARi® Results for ARI Baseline Capital Plan (Left) and Selected CSO Control Plan (Right)



As depicted in the census tract maps, the impact on specific census tracts for the ARI Baseline (Left) demonstrates an increased financial burden on actual bills throughout the extent of the CIP forecast. The number of census tracts in the high burden category has increased from one to eight. The inclusion of the Selected CSO Control Plan (Right) continues to exacerbate the financial burden for most census tracts within the City.

2.4 Summary of the Financial Capability Assessment

Consistent with the extent of capital improvements needed both to maintain its existing water, wastewater, and stormwater systems and to meet regulatory obligations, the results of the City's FCA indicate a high financial impact on its residential households. The FCA evaluated the financial impacts on the City's residents for the ARI Baseline needs and the Selected CSO Control Plan. Both the snapshot of financial burden and the year-over-year rate increases required to accomplish the CWA requirements identified in the FCA indicate a strong need for a longer LTCP schedule. A longer schedule minimizes the financial impact on the City's households.

Including the drinking water costs demonstrates significant additional needs for the community. Ultimately, the effect on the City's residents depends on multiple systems, projects, and schedules. Financial impact is affected by the cost of inflation which historically has been 3 to 4% per year. Cost of borrowing for projects drives the annual debt service costs and will depend on the City's success in securing Pennvest loans. New regulatory requirements such as lead service line replacements and the PFAS requirements at the water treatment plant affect the scheduling of borrowing and rate increases.

These projects require the immediate use of the City's resources, limiting the ability of the City to fund CSO Control Plan projects and ultimately delaying the implementation, as shown in Section 9.

Figure 2-16. Percent of City Households with Annual Wastewater & Stormwater Bills > 2% of MHI

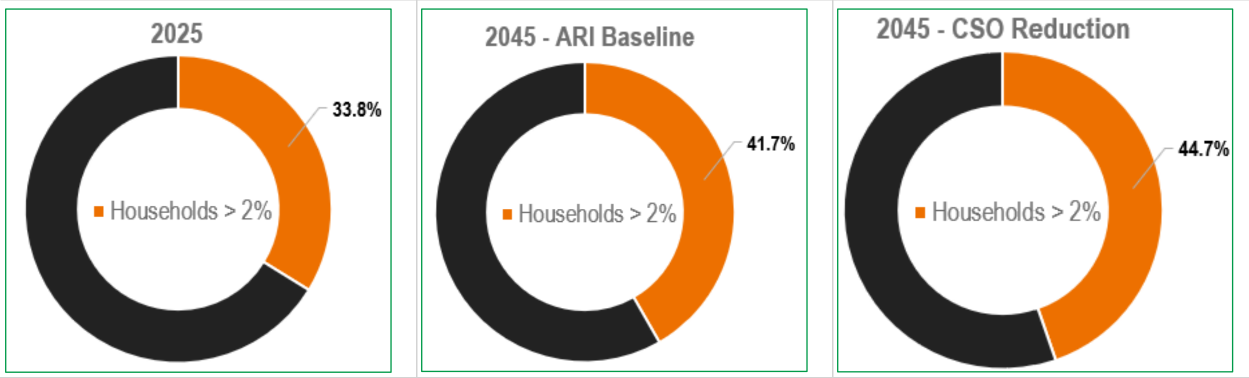


Figure 2-16 shows the proportion of households with unaffordable bills (bills greater than 2% of the City MHI) for the ARI Baseline Capital Plan as well as the Selected CSO Control Plan. Based on the analysis, in 2025, over one-third of the inside-city households are expected to have unaffordable bills. By 2045, over two-fifths of the inside-City households are forecasted to have high-burden bills for the ARI Baseline Plan and over two-fifths for the Selected CSO Control Plan.

The implementation of the Amended LTCP depends on the implementation schedule approved by EPA and PADEP. Given the demographic trends for the City and the City's CIP requirements, the impact on residents' bills indicates that the City needs at least a 20-year implementation period for its LTCP.

3 Clean Water Act Obligations

The CWA requires the City to obtain an NPDES permit for the City's AWWTP and collection system. The City is also required to obtain an NPDES permit for its Phase II MS4. The report, Existing Collection Area Characterization for the City of Lancaster, Pennsylvania (Geosyntec and Jacobs, 2019), provides detailed descriptions of the wastewater and stormwater systems in the City.

The EPA regulations at 40 CFR §122.44 require that NPDES permits include technology-based effluent limitations and standards, standards for sewage sludge use or disposal, and limitations necessary to achieve water quality standards established under § 303 of the CWA. NPDES permits also include requirements for operation and maintenance of the wastewater and stormwater assets. NPDES permits must be renewed every five years and new requirements are typically introduced to address changes in permitting regulations such as water quality standards or TMDLs.

In addition to the NPDES permits for the AWWTP and MS4, the City entered into a Consent Decree with EPA and PADEP. The Consent Decree requires the City to develop, among other reports, an Amended LTCP for the City's CSOs (Consent Decree, 2018). It also requires that the City work to obtain flow reductions from Manheim Township and entities that pump groundwater into the combined sewer system.

As discussed in Section 1.3, the City chose to use the demonstration approach under EPA's CSO Policy to develop the Amended LTCP. The City's CSO Alternatives Evaluation for Amended Long Term Control Plan (Jacobs et al., 2025) documents the CSO control alternatives and the baseline condition that was used to compare the alternatives – the ARI Baseline condition.

This section describes the CWA obligations related to the City's wastewater and stormwater systems. This includes nutrient and solids removal in wastewater and stormwater to meet Chesapeake Bay requirements, wastewater and stormwater ARI, stormwater program, Consent Decree requirements, and future CWA requirements.

3.1 Chesapeake Bay Program Requirements

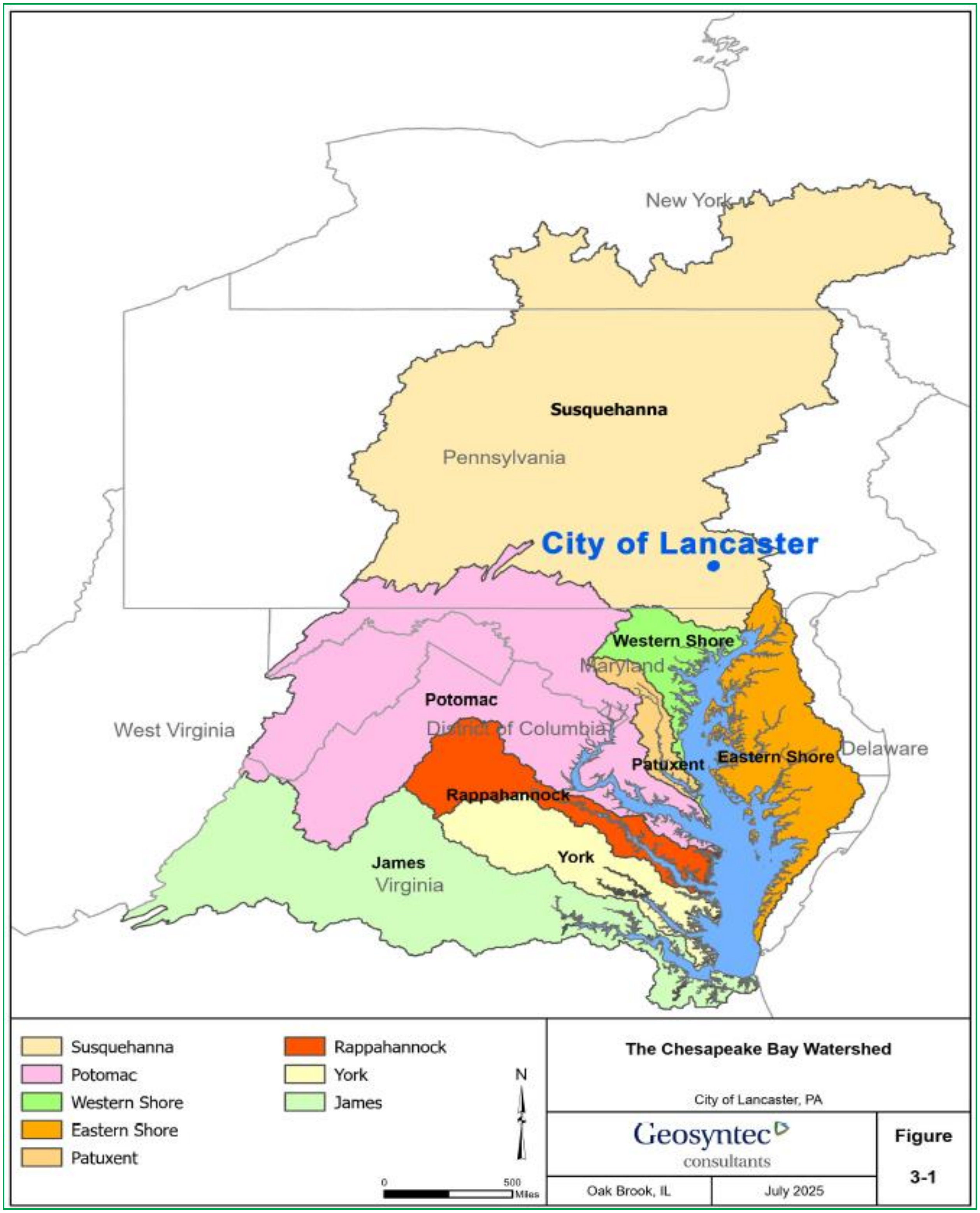
The Commonwealth of Pennsylvania is part of a federal-state partnership to protect and restore the Chesapeake Bay. The Chesapeake Bay Program (CBP) partnership was established in 1983. The partners signed a new agreement in 2014 which established adaptive management as a core principle, to be collaboratively implemented across all states in the Chesapeake Bay watershed. The agreement was amended in 2022 and most of the agreement's goals and outcomes had a target deadline of December 2025. The Partnership therefore developed the Beyond 2025 Report (CBP, undated). One of the recommendations is "adapting the partnership's portfolio of outcomes as needed to be more compatible with anticipated future landscape conditions, accounting for climate, population growth and projected land use change."

In 2010, EPA established a TMDL for the Chesapeake Bay (EPA, 2010). The TMDL is a "pollution diet" for total phosphorus (TP), total nitrogen (TN), and total suspended solids (TSS) for the entire watershed. To implement the TMDL, the CBP jurisdictions are required to prepare and update Watershed Implementation Plans (WIPs).

The City is located in the Susquehanna River watershed as shown in Figure 3-1. Pennsylvania's WIP is implemented through county plans; **Lancaster County was one of four county's that were first to**

volunteer to develop a local Countywide Action Plan (CAP) in 2018 (PADEP, 2022). Pennsylvania is on track to meet the 2025 reduction goals in the TMDL.[21]

Figure 3-1. The Chesapeake Bay and Susquehanna River Watersheds



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[21] [Track Pennsylvania's Progress | Department of Environmental Protection | Commonwealth of Pennsylvania]

In 2010, the City was one of the first in Pennsylvania to adopt/accept nutrient wasteload allocations for a wastewater treatment plant. The allocations were based on a TN concentration of 8 milligrams per liter (mg/L) and a TP concentration of 1 mg/L. Upgrades to the AWWTP completed in 2007 added an anoxic stage for TN removal, and upgrades completed in 2023 added a second anoxic stage for additional biological nitrogen removal. These investments cost more than $10 million. Over the next 20 years, the flow to the AWWTP is projected to increase from about 21 million gallons per day (MGD) to 28.6 MGD. With the improvements to date, the City's AWWTP can biologically remove nitrogen and phosphorus to meet its wasteload allocation up to an annual average daily flow of about 25.4 MGD. Additional investments in nutrient removal technologies will be required within the next 20 years to keep the nutrient loads from the AWWTP at or below the City's waste load allocation.

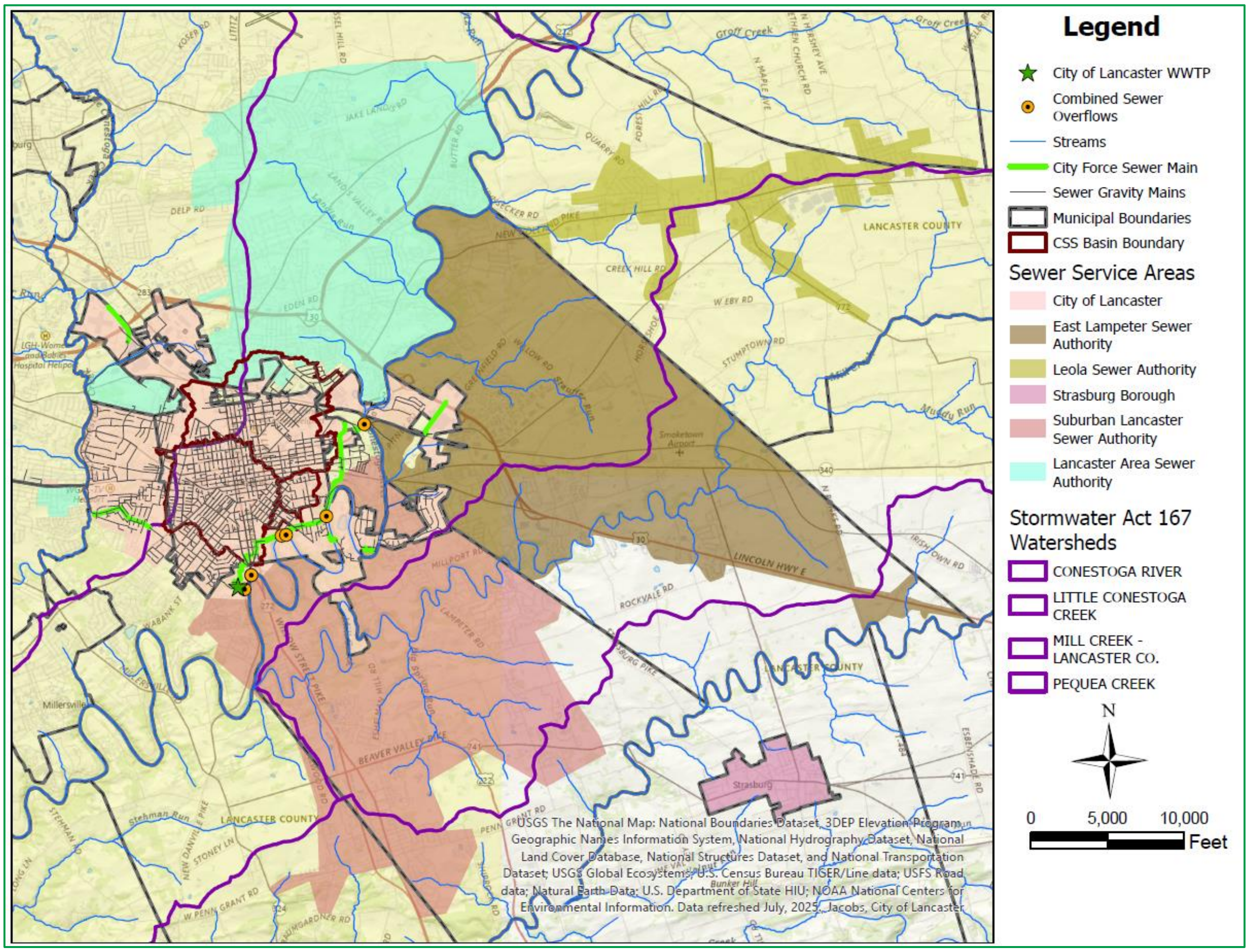
The City has also developed and implemented a Chesapeake Bay Pollutant Reduction Plan (CBPRP) to meet the Chesapeake Bay-related component of the MS4 permit (City of Lancaster, 2017). The CBPRP meets the requirements of the Chesapeake Bay WIP and addresses impairments in local receiving waters. Implementation consists of specific best management practices (BMPs) with calculated annual TSS load reductions, which are also surrogates for TP and TN reductions. The CBPRP demonstrates that the City is on track to meet the MS4 reductions required in the TMDL with the BMPs.

3.2 Wastewater Asset Renewal and Improvement

The City is responsible for the collection, conveyance, and treatment of wastewater within City limits and portions of Lancaster, East Hempfield, Manheim, and Manor Townships. The City also has agreements with four wholesale customers to convey and treat the areas that those customers serve, as shown in Figure 3-2.

The City has developed a 20-year CIP to address repair and rehabilitation and new capital projects needed for the wastewater system. The wastewater CIP is $178 million and includes several large projects that represent significant investments, as discussed in Section 8.

Figure 3-2. City of Lancaster Wastewater Service Area Map



USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road data; Natural Earth Data; U.S. Department of State HIU; NOAA National Centers for Environmental Information. Data refreshed July, 2025., Jacobs, City of Lancaster

3.3 Stormwater Program

The City is responsible for managing the City's comprehensive stormwater program. This includes design, implementation, monitoring, maintenance and repair of public stormwater infrastructure; compliance with the MS4 NPDES permit; implementation of the City's Stormwater Ordinance through permitting, design review, and enforcement; and managing the City's stormwater fee including processing credits and appeals. The City has a $47.6 million, 20-year CIP for green infrastructure, stormwater collection system maintenance, and regulatory compliance. The annual investment allocated for new GI implementation in the CIP is approximately $1.5 million per year, which does not include the $0.13 million a year included in the LTCP for GI. The stormwater budget reflects the City's commitment to continued GI implementation.

3.4 Consent Decree – CSO Alternatives

The Consent Decree requires the City to evaluate additional CSO control measures beyond those already implemented. The evaluation of additional CSO control measures resulted in nine high-performing alternatives ranging from $31.1 million to $76.0 million (Jacobs et al., 2025; City of Lancaster, 2025a). Because of the significant affordability concerns (see Section 2) and lack of significant water quality benefit associated with more costly CSO control measures (see Section 8), the City has selected the $31.1 million CSO control alternative. The evaluation of additional CSO control measures is summarized in Section 7; the process used to establish the Selected CSO Control Plan is discussed in Section 8.

3.5 Future CWA Requirements

There are several future CWA requirements that could affect the City's priorities for wastewater and stormwater. These include revisions to the City's NPDES permit for the AWWTP, TMDLs, new or revised water quality standards, and changes in land application regulations.

3.5.1 NPDES Permit for the AWWTP

The City of Lancaster provided comments on the Draft NPDES Permit No. PA0026743 issued by the Pennsylvania Department of Environmental Protection (PADEP) on May 22, 2025. The comments identify several issues associated with provisions in the draft permit. If those issues are not addressed in the final permit, there could be additional compliance costs and some risk of noncompliance in certain high-flow situations.

3.5.2 Total Maximum Daily Loads

According to Pennsylvania's draft Integrated Report, 99.6 percent of the stream miles in Lancaster County have been assessed to determine if they support designated uses such as aquatic life, fish consumption, and recreation (PADEP, 2024). Table 3-1 summarizes the results of the stream assessments for Lancaster County. Leading causes of the aquatic life use impairments are removal of riparian vegetation and siltation. For recreation use impairments, sources of impairment include urban runoff/storm sewers (106 miles) and agricultural activities (165 miles). Based on these assessments, additional investment in mitigating stormwater runoff from urban and agriculture sources may be needed to address stream impairments in addition to CSO control. None of the impaired segments, however, are currently on PADEP's TMDL priorities list.[22]

Table 3-1. Summary of Lancaster County Stream Assessments by River Miles (PADEP, 2024)

County	Assessment Determination	Aquatic Life	Fish Consumption	Potable Water Supply	Recreational	All Uses
Lancaster	Impaired	1,106	60	14	947	1,330
Lancaster	Supporting	282	361	39	91	108
Percent Impaired		80%	14%	26%	91%	93%

3.5.3 New or Revised Water Quality Standards

Every three years, states are required under the CWA to review and update their water quality standards which is called the "triennial review." In those reviews, states consider federally recommended standards. States can choose to adopt EPA's standards or develop different standards as long as the criteria are based on a reasonable scientific basis. Pennsylvania published the latest triennial review in October 2023 and is scheduled to finalize the water quality standards changes by November 2025. These changes include more stringent surface water quality criteria.[23]

Future triennial reviews may include consideration of adopting the federally recommended ammonia nitrogen criteria, per- and polyfluoroalkyl substances (PFAS), and human health water quality criteria for

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[22] TMDL Priorities | Department of Environmental Protection | Commonwealth of Pennsylvania

[23] More stringent water quality criteria are proposed for barium; boron; methyl ethyl ketone; 1,2,3-trichloropropane; 1,2,4-trimethylbenzene; 1,3,5-trimethylbenzene; 2,4-D; and xylene. PADEP also proposed adopting new criteria for 1,4-dioxane; carbaryl; and tributyltin; and more stringent acute criteria for cadmium.

organics and bioaccumulative pollutants. This could mean additional treatment requirements for the AWWTP or the MS4.

3.5.4 Changes in Land Application Requirements

Concerns over PFAS, phosphorus, odor, and other factors may result in changing regulations about biosolid disposal. For example, with L.D. 1911, the State of Maine banned land application of biosolids, tripling annual disposal costs. Local landfills quickly reached capacity to accept biosolids, as there was insufficient dry waste to stabilize the biosolids. Ohio is considering a rulemaking to limit land application due to concerns about legacy phosphorus on fields. The City may need to consider alternative disposal methods if Pennsylvania adopts changes to disposal regulations to address these concerns.

Currently, landfill space in central Pennsylvania is being reduced and available land application areas for the City's Class B lime stabilized biosolids is also becoming more restrictive and reduced. The City is currently evaluating alternatives for solids processing and disposal/end use at its AWWTP with a focus on volume reduction.

3.5.5 Changes to MS4 Program Requirements

A new draft PAG-13 General Permit with significant new requirements was announced in the January 18, 2025 edition of the Pennsylvania Bulletin (55 Pa.B. 601). The draft permit requires MS4 municipalities such as Lancaster to prepare Volume Management Plans to control the volume of stormwater to the maximum extent practicable. The cost implications for the City are currently unknown but could be significant.

4 Safe Drinking Water Act Obligations

The SDWA requires that the City maintain their drinking water treatment facilities and distribution infrastructure to meet maximum contaminant levels (MCLs) for over 90 contaminants. The City is required to regularly test water supplies including routine sampling in the distribution system and notify the public if there is a violation of a drinking water standard or potential health risk. Information on the water supply sources and quality can be found in the City's annual reports on drinking water quality (City of Lancaster, 2025b). This section describes the major infrastructure projects that are needed for the City's water supply and two SDWA required programs with significant capital and operating costs.

4.1 Major Infrastructure Projects

The City's water system is serviced by two water treatment plants. One treatment plant takes water from the Conestoga River; the other takes water from the Susquehanna River. The water treatment plant that takes water from the Susquehanna was put into service in the 1950s. The raw water and transmission mains that serve the system have been installed since that time. There is currently only one main running from the Susquehanna River to the Susquehanna Water Treatment Plant, and from the Treatment Plant to the Oyster Point Reservoir.

Planning started over 10 years ago to replace these transmission mains. The first phase of this plan was the installation of a new line from the reservoir into the City. The second phase is a new line from the Susquehanna Water Treatment Plant to the Oyster Point Reservoir, and the third phase is to install a new raw water transmission main from the Susquehanna River to the Susquehanna Water Treatment Plant. The first phase was completed in 2022. Design of Phases 2 and 3 is underway, and a funding application will be submitted to PENNVEST in July 2025, pending permit approvals. Permits were submitted and are under review. Construction is expected to start in early 2026 and take about 15 months to complete. The construction cost for Phase 2 and Phase 3 is estimated to be $45 to $50 million. This estimate could increase with changes in material costs due to tariffs and availability of the 42-inch pipe and valves.

The City has also designed a new pumping station to serve the South Tank. Construction is pending, as funding of approximately $5.0 to $5.5 million must be secured.

4.2 PFAS Maximum Contaminant Level Drinking Water Compliance

The PADEP promulgated regulations for PFAS compounds effective January 14, 2023. An MCL of 14 parts per trillion (ppt) for PFOA (Perfluorooctanoic Acid) and 18 ppt for PFOS (Perfluorooctanesulfonic Acid) were established for drinking water. The standards require quarterly monitoring, and compliance is set on a rolling annual average (RAA). The City commenced monitoring in accordance with the regulations at both the Susquehanna Water Treatment Plant and the Conestoga Water Treatment Plant.

The City was in compliance with the standards at both plants until September 13, 2024 when the first spike of PFOA was detected at a concentration of 28 ppt (moving the annual rolling average to 16 ppt) at the Conestoga Water Treatment Plant. This coincided with drought conditions in the Conestoga River and throughout Lancaster County and the state. The City believes that the current drought conditions, coupled with potential ongoing upstream illegal third-party discharges of PFOA to the Conestoga River, have caused the City's RAA exceedance. On January 24, 2025, the PADEP issued a Notice of Violation for exceeding the MCL for PFOA at the Conestoga Water Treatment Plant for the fourth quarter of 2024.

There was also an exceedance for the first quarter of 2025. The City has met with PADEP and will continue discussions with PADEP to achieve compliance. The City has issued two Tier 2 letters notifying its service area of the non-compliance with the PADEP MCL.

The City has developed a very preliminary estimate of the capital costs for PFOA compliance. More detailed studies will commence in 2025. Adding carbon adsorption or ion exchange to the Conestoga water treatment plant is currently estimated to cost $34.8 million. A new transmission main to pump water from the Susquehanna River to the Conestoga Plant would be around $90 million. The City will refine these capital costs and evaluate net present value of the alternatives. Under existing EPA regulations, the use of ion exchange or granular activated carbon would generate contaminated media that could be considered a hazardous waste. Costs of disposal of the contaminated media must be factored into the decision-making process.

Also complicating the decision is a new PADEP water withdrawal permit that will limit the use of the Conestoga River in times of drought. A pass-by flow requirement is mandated. Meeting that limit in times of drought will be difficult. Expanding the Susquehanna Water Treatment Plant (and closing the Conestoga Plant) is costly, at an estimated capital cost of $164.2 million. This alternative also complicates compliance with the SDWA as water age[1] will increase if the entire Lancaster service area is served by only the Susquehanna Water Treatment Plant.

EPA has established MCLs for certain PFAS, including PFOA and PFOS, with a compliance date of April 2029. The American Water Works Association and others, however, have filed suit against the EPA questioning the underlying basis for the MCLs and claiming that the cost of compliance and the benefits of the new regulations was not fully evaluated. The current EPA MCL for PFOA is 4 ppt. At this level, the Susquehanna Water Treatment Plant would still be in compliance, barring any changes in the water quality of the Susquehanna River.

4.3 EPA Improved Lead and Copper Rule

The City is subject to the EPA Improved Lead and Copper Rule. The initial lead line inventory was submitted in October 2024 and efforts are underway to identify City and customer material lines for the final inventory due in October 2027. Under the current rule, lead lines must be replaced by 2037. The City is also regulated by the Pennsylvania Public Utility Commission (PUC) as it serves individual customers outside of the City's municipal boundaries. Under the PUC regulations, both sides of the service line must be replaced if they are made of lead. The City treats all customers the same. Complicating the identification of service lines, is the current PADEP guidance that two forms of identification must be available to classify a service line as non-lead. The City commissioned Trinnex to develop an inventory model, using machine learning, which would predict lead and galvanized lines in the system. At the present time, the City is potholing to develop data to calibrate the model.

The City inventoried 49,714 water service lines in its service area. On the customer side, 51 were lead, 67 galvanized, and 26,237 were unknown. On the City side, 467 were lead, 2 were galvanized, and 19,939 were unknown. Using the rate of lead and galvanized incidence in the known inventory of service lines, an extrapolation was made to calculate the incidence of lead/galvanized in the unknowns. This was used to estimate the capital cost of replacement. This resulted in an estimate of 250 customer lines and 768 City-side lines to be replaced. Capital estimates to replace the lead lines total $10.6 million. However, under current PADEP guidance, the cost to pothole to confirm a second verification would exceed $21 million. This estimate is based on 19,339 City side unknowns and 26,237 customer side unknowns at a cost of $800 per pothole. The estimated cost of identification and replacement would exceed $31.6 million, substantially more than the cost of replacement alone.

The City expects to refine this estimate with assistance from the EPA’s Get the Lead Out (GLO) program. GLO is providing 190 potholes to help calibrate the LeadCast model. Once the LeadCast model is calibrated, a better estimate of the future lines that must be replaced can be made. The City is focusing its efforts on reducing the number of customer side unknowns through public outreach and door-knocking to inventory the customer service lines. In the summer of 2025, interns were hired to review all City tap cards and records to improve the accuracy of the City-side inventory.

5 System Characterization

This section summarizes key findings from the Existing Collection Area Characterization for the City of Lancaster, Pennsylvania (Geosyntec and Jacobs, 2019), which was submitted to fulfill Paragraph 23 of the Consent Decree. It addresses the combined sewer system condition, the receiving water condition, and completed gray infrastructure CSO projects, and completed green infrastructure projects within the combined system and within the MS4.

5.1 Combined Sewer System Condition

The City has monitored rainfall and flow at each CSO location for over two decades and conducted hydrologic and hydraulic (H&H) modeling since the 1980s. The City's characterization report provides a detailed overview of the available monitoring and modeling data (Geosyntec and Jacobs, 2019). This section provides a summary of the NMCs and the monitoring programs and presents estimated CSO discharge volumes, frequencies, and percent capture based on the most recent H&H model.

5.1.1 Implementation of the Nine Minimum Controls

An updated NMC report was filed on February 27, 2019 as a deliverable under the consent decree. Comments on the City's updated NMC report were received in an EPA letter dated August 15, 2019. Responses to these comments were supplied in a September 24, 2019 submission. A second set of EPA comments dated February 21, 2020 were received by the City on February 27, 2020. The City addressed all EPA comments, and this was finalized with a January 4, 2021 letter from the City to EPA.

5.1.2 Combined Sewer System Monitoring Programs

The City monitors rainfall and sewer flows and levels within its conveyance and treatment system at several locations. The City's meters that were used to calibrate the H&H model are described in detail in previous documentation, most recently in the City of Lancaster Hydrologic & Hydraulic Model 2016 Calibration and Validation Report (CH2M, 2017). To summarize, the meters included:

- Flow and level sensors at all CSO locations
- Flow meters at all major pump stations
- Level sensors and gate position sensors at all control gates within diversion chambers
- Flow meters at the AWWTP north influent, effluent, and CSO-related South Secondary Bypass Outfall-100 (AWWTP south influent flow is calculated based on the sum of south influent flow at Main Pump Station and Maple Grove Flume)
- Four rain gauges (located at the Conestoga Water Filter Plant, Engleside Screen House, Stevens Avenue Pump Station, and City Hall)

In addition to the City-owned rain gauges, there is also a U.S. Geological Survey rain gauge (#01576500) located just north of CSO-005 and two Weather Underground rain gauges just outside the City, one in the River Bend Park and the other in the Baker Campus.

The City has also conducted temporary flow metering campaigns in 2008, 2009, 2013, and 2016. Details of these efforts are provided in Jacobs et al., 2019 (Section 4.1).

5.1.3 H&H Modeling and Typical Year CSO Discharge

The City developed a H&H Model in 2016 (CH2M, 2017) which was approved by EPA on April 27, 2017 (EPA, 2017). The 2016 H&H model represented the City's wastewater infrastructure at that time and was calibrated and validated to monitoring data for use in developing the City's updated LTCP. Since then, the model has been updated to reflect:

- **2022 Existing Conditions:** Incorporating recent infrastructure improvements at the AWWTP, pump stations, and other facilities.
- **2023 ARI Model:** Representing planned upgrades and operational changes outlined in the City's 20-year CIP.

A detailed description of both the 2022 Existing Condition Model and the 2023 ARI Model is provided in Appendix A of the City's CSO Alternative Evaluation for Amended Long Term Control Plan report (Jacobs et al, 2025).

A historical precipitation analysis identified 1962 as the representative "typical year" for modeling purposes, as documented in the Selection of Typical Year Update (CH2M, 2017). Table 5-1 and Table 5-2 summarize calculated typical year CSO discharges and CSO percent capture from the three models described above.

Table 5-1. Calculated CSO Frequency and Volume for the Typical Year

CSO	2016 H&H Model		2022 Existing Condition Scenario Model		2023 ARI Model	
	CSO Volume (MG)	Number of Events [a]	CSO Volume (MG)	Number of Events [a]	CSO Volume (MG)	Number of Events [a]
CSO-002 Engleside	322	48	277	46	266	48 [b]
CSO-005 North/Clay Street	175	40	86	38	53	32
CSO-004 Stevens Avenue	8	19	7	17	6.7	16
CSO-003 Susquehanna	3	21	2	17	0.7	9
CSO-006 Strawberry	<0.1	1	<0.1	1	0	0
Systemwide	508	48	371	46	326	48

[a] CSO events were defined by a 24-hour System Reaction Inter-Event Period, as established from analysis of AWWTP flow records (CH2M, 2016).

[b] Base sanitary flow in Engleside basin is projected to increase from 5.63 million gallons per day (mgd) in 2022 to 8.14 mgd in 2042, causing the higher number of CSO events in the ARI model. Applying 2022 base sanitary flows in the ARI model calculates 43 events at CSO-002.

ARI = Asset Renewal and Improvement

H&H = hydrologic and hydraulic

MG = million gallons

Table 5-2. Comparison of Annual CSO Percent Capture for the Typical Year

CSO Percent Capture	2016 H&H Model	2022 Existing Condition Scenario Model	2023 ARI Model
AWWTP North Influent	85	94	96
AWWTP South Influent	72	75	79
Total	78	85	89

ARI = Asset Renewal and Improvement

H&H = hydrologic and hydraulic

5.2 Receiving Water Condition

The Conestoga River, which receives discharges from the City of Lancaster's Combined Sewer System (CSS), is designated for warm water and migratory fish species, as well as for recreational and water supply purposes. As mentioned in Section 3.4.1, numerous streams in Lancaster County do not fully support these designated uses. According to PADEP's 2024 Integrated Report (PADEP, undated), the Conestoga River downstream of the Conestoga Water Treatment Plant supports warm water fish use. However, the river upstream of the water treatment plant does not. This section covers the identification of sensitive areas and pollutants of concern in the receiving waters, reviews available monitoring data for characterizing these waters, and discusses the receiving water quality modeling used to support the Amended LTCP.

5.2.1 Identification of Sensitive Areas and Pollutants of Concern

EPA expects that an LTCP will give the highest priority to controlling CSO discharges to sensitive areas. Sensitive areas are defined in the CSO Policy as designated Outstanding National Resource Waters, National Marine Sanctuaries, waters with threatened or endangered species and their habitat, waters with primary contact recreation, public drinking water intakes or their designated protection areas, and shellfish beds (EPA, 1994). Pollutants of concern (PoCs) are used in NPDES permitting to establish water quality-based effluent limits.

The City assessed the sensitive areas downstream of the CSO discharge and submitted the Sensitive Areas Identification report required by Paragraph 15 of the CD on May 24, 2018 (City of Lancaster, 2018). This report concluded that there were no sensitive areas that would affect the CSO control alternatives analysis. On November 19, 2018, EPA, in consultation with PADEP, provided comments on the City's submittal (EPA, 2018a). The City responded on January 2, March 29, and April 10, 2019, providing additional information (City of Lancaster, 2019d; Barnes & Thornburg, 2019a; Andes, 2019). On May 16, 2019, the EPA submitted a letter stating that the agencies determined that the City's submittals met the consent decree requirements (EPA, 2019b).

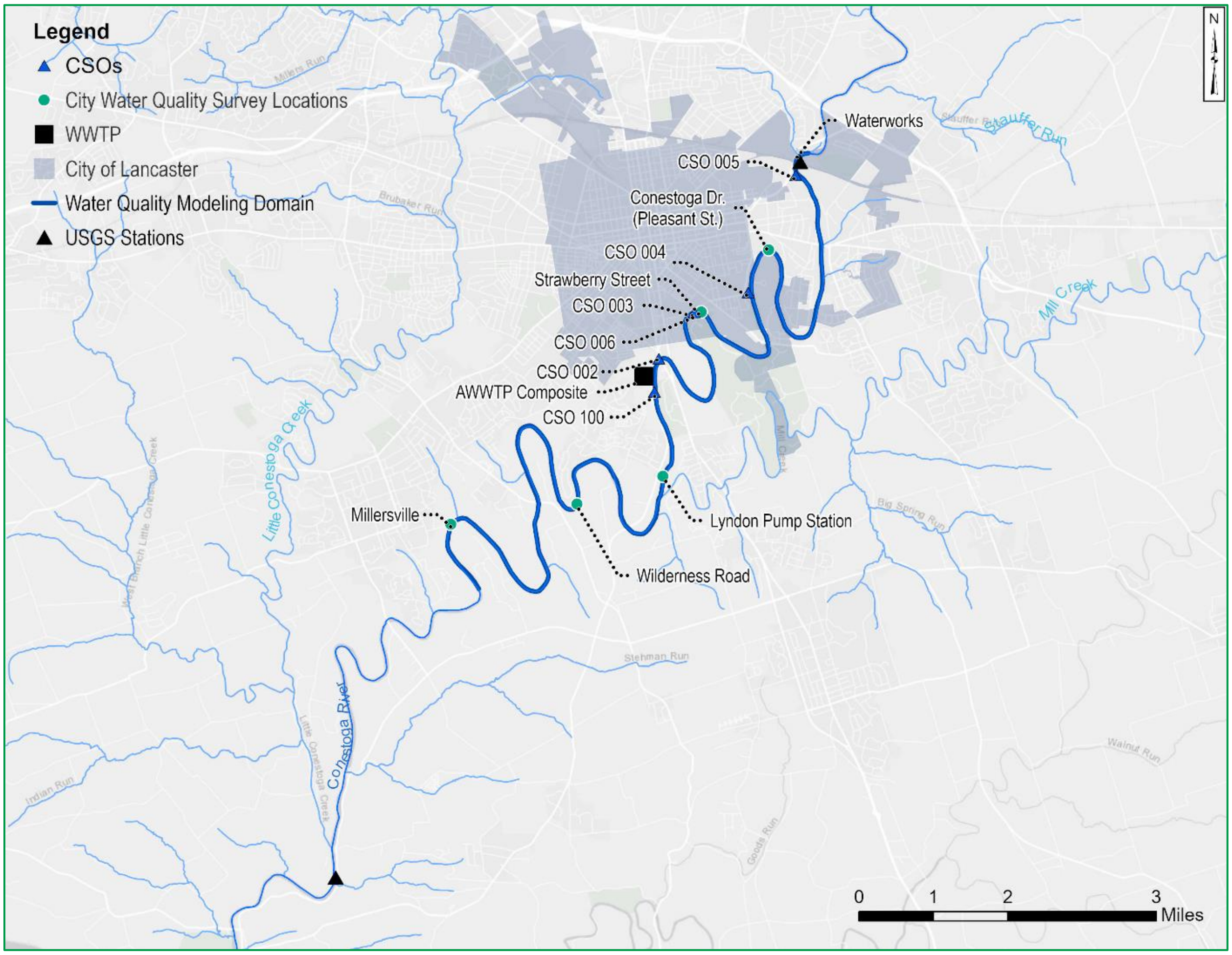
The City conducted an analysis of the receiving water data spanning from 2005 to 2017 to identify PoCs in the Conestoga River. This analysis was documented in a report submitted to the EPA on May 23, 2018 (Geosyntec, 2018). This analysis identified fecal coliform as the sole PoC associated with the City's CSO discharges. After consultations with the EPA and PADEP, biochemical oxygen demand (BOD) and TSS were added as additional PoCs for further evaluation in the LTCP (Barnes & Thornburg, 2019b). On August 20, 2019, the EPA approved these additions as meeting the conditions of the Consent Decree (EPA, 2019a). Subsequent water quality modeling confirmed that fecal coliform was the only PoC (Geosyntec, 2022).

5.2.2 CSO and Receiving Water Monitoring

Special Condition V.B.1(i) of the AWWTP's previous NPDES permit mandated monitoring to evaluate CSO impacts and the effectiveness of CSO controls. Item 1 required a stream survey during two storm events every five years. Item 2 necessitated the sampling of CSO-related bypasses. Between 1996 and 2020, the City completed eight stream surveys. These surveys were conducted immediately before and after CSO discharges and included sampling for CBOD, fecal coliform, TSS, and other water quality parameters at five locations in the Conestoga River (Figure 5-1). Additionally, the City sampled selected CSO discharges during these stream surveys. Detailed information regarding monitoring locations and collected data can be found in the Water Quality Modeling Plan (WQMP, Geosyntec 2020). The results of the stream survey water quality monitoring are documented in City of Lancaster (1996, 2002), CDM (2007, 2009), and LandStudies (2014, 2015, 2020, 2021).

The City conducted instream fecal coliform sampling at three locations in the Conestoga River (Conestoga Drive, Strawberry Street, and Lyndon Pump Station) from August to October 2016. The City also collected weekly fecal coliform data at Waterworks from June 2018 to April 2019 to better characterize the upstream fecal coliform boundary condition.

Figure 5-1. Monitoring Locations for Receiving Water Quality Data



The collected CSO and receiving water quality monitoring data were utilized to develop a Receiving Water Quality Model (RWQM).

5.2.3 Receiving Water Quality Model

Paragraph 26 of the consent decree required the City to develop and submit a WQMP if the City elected to use a demonstration approach for the CSO alternative analysis. The City declared its intent to use the demonstration approach for the CSO alternatives analysis on December 9, 2019 (City of Lancaster, 2019c). EPA acknowledged receipt of this declaration on April 2, 2020 (EPA, 2020b) and approved the selection of the demonstration approach on May 20, 2020 (EPA, 2020a). The City developed the WQMP to document the approach for developing and calibrating the RWQM so that it could be applied to evaluate the CSO control alternatives and project compliance with selected water quality standards associated with the PoCs. The City submitted the WQMP to the EPA on August 17, 2020 (Geosyntec, 2020). The EPA and PADEP conditionally approved the WQMP via a letter dated June 7, 2021 (EPA, 2021).

The City then developed and calibrated the RWQM to meet the objectives specified in Paragraphs 3 and 6 and Appendix C of the Consent Decree. The RWQM was developed using the QUAL2kw modeling framework to simulate instream hydraulics and selected water quality parameters, including fecal coliform, carbonaceous BOD, dissolved oxygen (DO), and TSS. The RWQM includes 15.4 miles of the Lower Conestoga River from just upstream of the City boundary at Waterworks to 0.76 miles downstream of Millersville (Figure 5-1). The RWQM was calibrated to instream measured fecal coliform data from May 1 to September 30, 2016. The model was also calibrated to in-stream measured fecal coliform, carbonaceous BOD, DO, and TSS data from January 23 to 28, 2020. In addition, the model was validated to the measured data for two periods: August 9 to 14, 2014 and September 8 to 13, 2015.

The RWQM was used to simulate a typical year and two design storms (refer to the WQMP for more details). The model development and calibration were documented in the Water Quality Modeling Report (WQMR), which was submitted to EPA and PADEP on April 8, 2022 (City of Lancaster, 2022). Following review of WQMR and additional requested information, EPA approved the WQMR as meeting the conditions of the consent decree on September 9, 2024 (EPA, 2024a).

The City utilized the RWQM to evaluate the CSO controls in meeting the water quality standards for fecal coliform, DO and BOD, and TSS as per the procedure documented in Section 5.1.1 of the approved WQMR. Use of the RWQM confirmed that the only PoC is fecal coliform and water quality standards cannot be met due to the upstream boundary, even if CSOs are eliminated. The model results for the evaluation of CSO controls are documented in Section 8.4 of this report.

5.3 Completed Gray Infrastructure CSO Projects

The City has conducted numerous projects to control CSOs over the last 25+ years. Over $80 million dollars in capital has been invested to reduce CSO pollution, modernize treatment at the AWWTP, and improve capacity and pumping in the collection system. Recent capital investments include expanding/upgrading the North, Conestoga Gardens, Stevens Avenue, Susquehanna, Maple Grove, and Main pump stations; upgrading the AWWTP secondary clarifiers and DO control (to improve nutrient removal); South Plant grit removal; North Plant screening and grit removal; South train flow diversion; collection system rehabilitation and replacement; and rehabilitating CSO diversion chambers and screening facilities

5.4 Completed Green Infrastructure Projects

The City of Lancaster has been working on GI projects for over 15 years in both the MS4 and CSS areas. In 2010, the City completed its first public GI project at the 6th Ward Park and then in 2011 adopted its first Green Infrastructure Plan (CH2M Hill, 2011).

As required by the City's consent decree, a GI plan update, Green It! Lancaster, was released in 2019 (Jacobs, 2019) and approved by EPA in 2020. As of June 2025, the City has completed 82 GI projects and two additional projects are under construction. Table 5-3 summarizes the GI projects completed by basin (CSO basin or separate MS4 area) and lists estimates of the impervious areas managed, annual stormwater capture volumes, and construction costs. A map showing the project locations is shown in Figure 5-2. Section 8.2 includes more information on the benefits of GI.

Table 5-3. City Green Infrastructure Projects Completed by Combined Sewer System Basin

Basin	Number of Projects	Total Area Managed (Acres)	Estimated Capture Volume (Gallons/Year)	Construction Cost
Engleside*	32	28.6	24,779,000	$6,986,927
North	27	31.8	25,865,000	$5,547,183
Stevens	7	4.6	4,142,000	$1,392,100
Susquehanna	0	0	0	$0
MS4*	17	16.6	12,539,000	$5,539,449
TOTAL*	**82**	**81.6**	**67,325,000**	**$19,465,659**

* One project was split between Engleside and the MS4 and is included under both those categories, but is not double counted in the totals.

MS4 = municipal separate storm sewer system

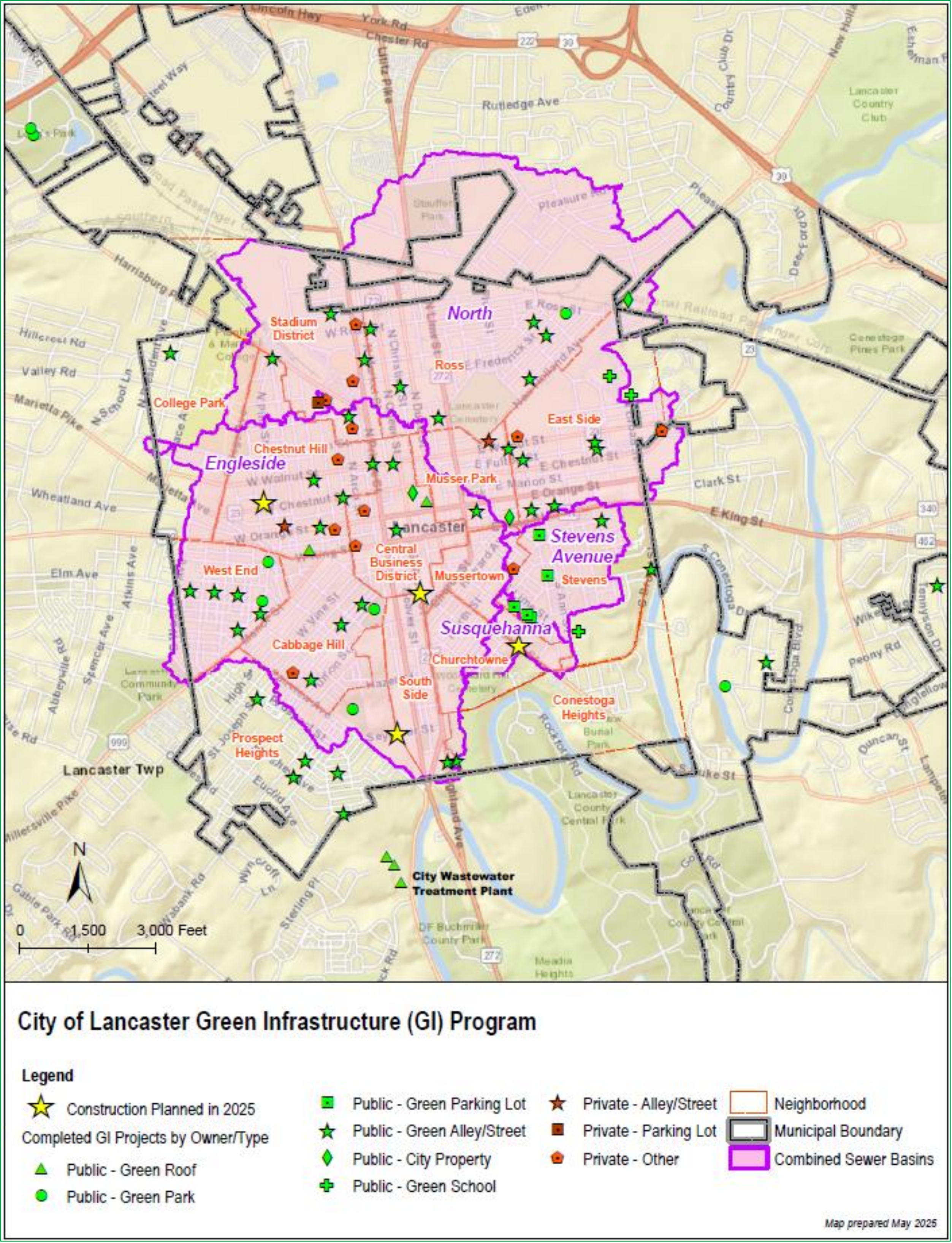
5.4.1 Green Infrastructure Projects Within Combined Sewer System

As can be seen above in Table 5-3, approximately 80% of the City's GI project work has been focused in the CSS, both in terms of the number of projects and the amount of impervious area managed by the projects. These projects are intended to reduce CSOs and pollutant loading, improve drainage conditions, integrate with the City's other capital improvement projects, and provide additional community benefits. The estimated runoff captured by GI projects in the CSS is calculated to be nearly 55 million gallons in the typical year. Much of this volume would otherwise be discharged to the river at the City's CSO outfalls.

5.4.2 Green Infrastructure Projects Within the MS4

As can be seen above in Table 5-3, approximately 20% of the City's GI project work has been focused in the separate MS4 area, both in terms of the number of projects and the amount of impervious area managed by the projects. The City has constructed GI in the MS4 area to manage stormwater, reduce pollutant loading, improve drainage and water quality, provide additional community benefits, and meet MS4 permit requirements and the City's CBPRP requirements. The estimated MS4 runoff captured by MS4 GI projects is calculated to be 12.5 million gallons in the typical year.

Figure 5-2. City Green Infrastructure Project Locations



6 Public Participation

The City of Lancaster conducted a robust public education and engagement program throughout development of this Amended LTCP. The EPA-approved Public Participation Plan (City of Lancaster, 2020; EPA, 2020c) and relevant provisions within the approved NMC Plan established the minimum level of effort required. The City of Lancaster's Strategic Plan, which outlines the administration's commitments to strong neighborhoods, safe streets, secure incomes and sound government, provided further context with the following statements guiding our actions and decisions:

- Lancaster's leaders are approachable, responsive, and always working to make the City a better place.
- Human and financial resources are put to their best use and competing interests are balanced through public dialogue.

6.1 History of Engagement

The City of Lancaster has been actively engaging the public around the CSO issue for many years prior to beginning this Amended LTCP. Early public participation and education activities included: establishment of a Green Infrastructure Advisory Committee; development of Lancaster's first GI plan; postings to social media; direct outreach and engagement of stakeholders including environmental and neighborhood groups, business and industry, civic organizations, faith-based institutions, regulatory agencies, and service organizations and the media; a web-site promoting Pollution Prevention Practices; placards on storm inlets; fliers in City sewer billings; posting of fixed signs at CSO outfalls and public access points; and development of a GI program that engages residents and businesses by providing grants for GI installation on private property.

6.2 Public Engagement During Plan Development

During the years-long LTCP development period, the City employed a variety of strategies and forums for informing and engaging the public. These include:

- **Engage Lancaster:** The City of Lancaster's Public Participation Platform – The COVID-19 Pandemic required the City to quickly establish a means for communicating with and engaging the public around a variety of issues. Engage.CityofLancasterpa.gov became the City's primary digital web-based resource for the Amended LTCP. This highly interactive platform served as a foundation for information sharing and engagement throughout the LTCP development process.
- **Social Media**: The City employs three social media platforms for information sharing: Facebook, Instagram, and LinkedIn. Social media posts focused on meeting and event announcements; prompts for actions individuals can take to help mitigate the impacts of CSOs such as cleaning up litter and properly disposing of Fats, Oils, and Grease (FOG); and general education around things like green infrastructure.
- **Public Meetings:** In accordance with the EPA-approved Public Participation Plan, the City held three public meetings to share information and solicit input from the public.
  - **Public Meeting #1** introduced the Amended LTCP development process and schedule; shared information regarding the FCA; Sensitive Areas; PoCs; System Characterization; Alternatives Evaluation Process; Public Participation Plan; and the NMC Plan with a focus on actions the public can take such as reducing litter and disposing of Fats, Oil and Grease (FOG). Fifty-two (52) people attended the meeting which was held via ZOOM due to pandemic restrictions on public gatherings.

  - **Public Meeting #2**, which was held in person and broadcast via the City's YouTube channel, introduced the CSO Control Alternatives and Evaluation Criteria. Additional factors influencing development of the LTCP were also presented. Those include the City's ability to maintain existing critical drinking water, wastewater and stormwater systems; compliance with new and anticipated regulatory requirements; alignment with policies contained in Our Future Lancaster, Lancaster's Comprehensive Plan; and the ability of customers to afford increased utility fees, which was a top priority according to input from the Advisory Committee. A dozen people attended the meeting in person and close to fifty (50) people have watched the recording since the meeting.
  - **Public Meeting #3** is scheduled for July 31, 2025.

- **Advisory Committee Meetings:** The City formed an Advisory Committee comprised of neighborhood leaders and key stakeholders to advise the City on matters related to development of the Amended LTCP. The Advisory Committee was instrumental in ensuring the City remained focused on ensuring human and financial resources are put to their best use and competing interests are balanced in alignment with the City's Strategic Plan as well as the priorities and policies outlined in Our Future Lancaster, the comprehensive plan developed and adopted by city leaders in 2023.

- **Communication with Stakeholder Groups:** City staff engaged with residents and stakeholder groups, including neighborhood organizations, community service organizations, faith-based organizations, and civic organizations and clubs, throughout development of the LTCP. Most of the interactions with the public were one-on-one at events where the City was tabling. Advisory Committee members also shared vital information through their networks/affiliations.

- **Media Briefings/Press Releases:** These were used to highlight actions, such as the posting of warning lights at CSO outfalls, and to announce public meetings and events.

- **River Connections:** To keep the public engaged in a meaningful way during the extended LTCP development process, the City developed and launched River Connections, a program specifically targeted towards elevating stories of Black and Brown people's connection to the Conestoga River. By storytelling, through various mediums, the River Connections team cultivated a greater sense of stewardship and community around the river. Local artists created and performed works that represent their connection to the river to a broader audience. Through spoken word, visual art, film and music, the need for care and repair of the Conestoga River spread throughout Lancaster's neighborhoods.

  Storm drain murals, designed and installed by local artists, share the message "Clean Water Starts Here" in both English and Spanish, highlighting the connection between our neighborhoods and local waterways. As of summer 2025, 13 murals have been installed beside stormwater inlets throughout the City and one beside a rain garden.

  Several events, held in collaboration with community partners, stand out in terms of their reach and impact. The first featured excerpts from recorded interviews with community elders, live poetry readings, and music. This event, held in conjunction with the kick-off of Lancaster Water Week in 2022, attracted more than 100 people to a local art-house theater. Subsequent events, which were more neighborhood focused, featured a neighborhood cleanup followed by spoken word performance and/or the installation of a storm drain mural. These events focused on educating the public and inspiring community action.

- **Arc GIS Story Map and Poster:** The Conestoga River: Lancaster's Troubled Waters is a story map created to educate the community about the condition of the river, from the headwaters to the mouth at the Susquehanna River. A poster display provides a snapshot of the impaired status of the Conestoga and is used at events to introduce the topic and direct people to the full story map via a QR code.

6.3 Public Comment and Response Protocols

Public comments received during development of the Amended LTCP have been entered into a Comment Registry and reviewed for incorporation into the Amended LTCP as appropriate. Each party submitting written comment received verification that the comment was received. The Comment Registry, which was housed on the Engage Lancaster platform during plan development, has been incorporated herein as Appendix A and includes the city's responses to comments. [NOTE TO READER: The Comment Registry will be completed at the end of public review of this document.]

6.4 Future Efforts

Public engagement continues to be a crucial aspect of the City's efforts in implementing the Amended LTCP. The City will continue employing many of the tactics referenced above. Additionally, a new web presence will be created to help residents and businesses stay informed about implementation of the LTCP.

7 Evaluation of CSO Control Alternatives

To identify and evaluate CSO control alternatives for the City's five outfalls, a comprehensive screening of available CSO control technologies was performed, followed by a detailed alternatives analysis. The City's H&H model of the CSS was used to identify the CSO reduction potential of the CSO control alternatives. The findings of this evaluation were documented in the City's 2025 *Alternatives Evaluation for Amended Long Term Control Plan* report or "AER" for short (Jacobs et al, 2025), as required by the Consent Decree. The AER was submitted to the EPA and PADEP on March 20, 2025. EPA requested clarification on the cost estimate development (Maslowski, 2025) and the City provided the information on May 8, 2025 (City of Lancaster, 2025a). In preparing the response, the City revised the cost estimates for the CSO alternatives in accordance with EPA's comments, thereby superseding the costs presented in the AER.

This section summarizes the screening of technologies, cost-performance considerations, maximization of treatment at the AWWTP, and the optimization of CSO control alternatives. The selection of the preferred alternative (the "Selected CSO Control Plan") is discussed in Section 8. As each of the alternatives included bypassing of the AWWTP, this section also includes the No Feasible Alternatives Analysis.

7.1 Screening of Technologies

The technology screening process involved identifying a wide range of potential solutions, including both infrastructure upgrades and operational strategies. Key approaches included source control through green infrastructure and extraneous flow reduction, improving the collection system's capacity, optimizing in-system controls, expanding storage capacity, and increasing treatment capabilities at both the AWWTP and satellite locations.

To determine the most sui technologies, the City applied qualitative screening criteria focused on performance, ease of implementation, O&M needs, and applicability to the City. This helped ensure that selected technologies would be effective in reducing CSO discharges and would align with the City's infrastructure, environmental goals, and community values.

The screening process yielded a refined list of technologies for further evaluation, including source controls, collection system controls, storage technologies, treatment technologies, and real-time controls. Table 7-1 lists the technologies advanced for detailed evaluation and those that were determined to be not feasible for the City. This strategic selection supports the City's long-term wet weather management and integrated planning objectives.

Table 7-1. Wet Weather Control Technology Screening Results Summary

Control Technology Category	Technologies Advanced for Detailed Evaluation	Technologies Not Advanced
Source Control	▪ Green Infrastructure ▪ Extraneous Flow Removal	
Collection System Controls	▪ Pump Station & Force Main Upgrades ▪ Diversion Chamber Modifications ▪ Partial Sewer Separation ▪ Increased Sewer Capacity ▪ Inter-basin Transfers	▪ Full Sewer Separation ▪ Stream Daylighting ▪ Inflow & Infiltration Reduction*

Control Technology Category	Technologies Advanced for Detailed Evaluation	Technologies Not Advanced
Storage Technologies	▪ Underground Storage ▪ Deep Tunnel Storage	▪ Aboveground Storage
Wastewater Treatment Plant Technologies	▪ Rerating Existing Primary Clarifiers ▪ Rerating Existing Secondary Clarifiers ▪ Eliminate Hydraulic Restrictions ▪ Chemically Enhanced Primary Clarification ▪ High Rate Clarification ▪ High Rate Filtration ▪ Primary, Secondary, & Solids Treatment Upgrade/Expansion	▪ Step Feed Aeration ▪ Integrated Fixed Film Activated Sludge/Moving Bed Biofilm Reactor ▪ Membrane Bioreactor/Biologically Active Filter
Satellite Treatment Technologies	▪ High Rate Clarification ▪ High Rate Filtration ▪ Vortex Separators/Swirl Concentrators ▪ Retention/Treatment Basins ▪ Floatables Control ▪ Disinfection & Dechlorination	▪ Receiving Water Technologies
Real-Time Controls (RTC)	▪ RTC in the Collection System	

* Inflow & infiltration reduction was not considered system-wide but was considered in different CSO control strategies.

7.2 Cost – Performance Considerations

Using the screened wet weather control technologies, various alternatives were developed, considering the land use availability and specific constraints of the collection and treatment systems. The preliminary performance evaluation of alternatives focused on identifying cost-effective and technically feasible solutions for managing wet weather flow and reducing the City's CSOs.

The performance of alternatives was evaluated by calculating an estimated number of untreated CSO events and total discharge volume for each CSS basin during a typical year using the City's H&H model. Alternatives were developed that resulted in 0, 2, 4, 6, and 8 untreated overflows in a typical year per the Consent Decree requirements. Alternatives at higher levels of control (e.g., up to 30 untreated overflows) were also evaluated. CSO percent capture was also used as a performance metric, consistent with the approach outlined in Section 5 - System Characterization. Although the City is using the demonstrative approach to CSO control, the presumptive approach metrics in the CSO Policy were used to evaluate the performance effectiveness and benefits of the alternatives on a quantitative basis.

For cost estimates, present value life-cycle costs were developed assuming a 20-year life cycle period and 5 percent discount rate that include capital costs, O&M costs, and replacement and rehabilitation costs.

A range of 25% to 50% construction contingency was utilized in the Opinion of Probable Construction Cost (OPCC) to account for unknowns in construction requirements or pricing at the planning stage as follows:

- AWWTP Primary and Secondary Treatment = 30%
- High Rate Clarification = 25%

- High Rate Filtration = 50%
- Wet Weather Disinfection = 25%
- Storage = 50%
- Wet Weather Pumping = 35%
- Wet Weather Screening = 25%; except for Engleside basin where 50% was used due to site restrictions and limited hydraulic head.

Green infrastructure construction costs for the medium implementation levels were generally taken from the 2019 updated GI plan (approved by EPA in 2020), escalated using the Engineering News Record Construction Cost Index. Twenty-five percent was added for engineering costs (construction contingency was not included since the construction costs are based on actual costs from many similar projects already completed in the City). For the high and highest implementation levels, an additional 12.5% and 25%, respectively, was added to the capital costs for the incremental GI. This is to account for the anticipated increased costs of higher implementation levels (e.g., having to work on more constrained sites and a reduced ability to integrate with and cost share with other City improvement projects).

A Project Contingency was applied across all alternatives at 25% of the Construction Cost to account for level of planning and design completed, level of difficulty, risks associated with unknown underground site conditions, and the requirements for including contingencies for loan/grant programs.

A residual (salvage) value was not incorporated in the life-cycle calculation as these are planning level costs where most of them do not have a detailed enough breakdown to separate out all the cost elements with different life cycles. In addition, it is not a true cash value that offsets the City's capital outlay. At the end of 20 years, the City is not selling or getting a residual payment on its investments. A Replacement/Rehabilitation (R&R) cost was incorporated for items that have less than a 20-year design life. This is estimated at 20% of the Total Capital Cost.

More information on the development of these costs is provided in Appendix C of the AER. The cost estimates are to be considered Level 4 cost estimates, as designated by The Association for the Advancement of Cost Engineering Recommended Practice No. 18R-97 (AACE, 2020) and actual costs are expected to fall within a range of 30 percent less to 50 percent more than these estimates. This estimate class and accuracy is appropriate for CSO long-term planning.

Based on the preliminary performance evaluation of alternatives, several wastewater treatment plant alternatives and satellite treatment alternatives, as well as deep tunnel storage options, were excluded from further optimization due to affordability concerns and the high cost per gallon treated or reduced compared to other options that achieved similar or better results. Oversized solutions targeting rare, large storm events were also excluded. Additionally, several decentralized alternatives presented challenges in implementation related to cross-jurisdictional issues, and uncertainty in their effectiveness.

The remaining viable alternatives advanced to the optimization stage. Details on the selected alternatives for optimization are provided in Appendix D of the AER.

7.3 Maximization of Treatment at the AWWTP

The City completed multiple pumping station upgrades over the last 15 years to provide reliable conveyance capacity and maximize flows to the AWWTP. The five major upgrades are summarized in Table 7-2.

Table 7-2. Major Pumping Station Upgrades/Expansions

Pumping Station	Year Upgraded/ Expanded	Previous Peak Capacity (MGD)	Current Peak Capacity (MGD)
Conestoga Gardens	2013	6.83	8.40
Stevens Avenue	2013	8.90	11.00
North	2016	26.10	43.00
Main	2012	19.50	19.50
Maple Grove	2025	8.00	9.69

MGD = million gallons per day

The interceptor downstream of the Maple Grove Pump Station was also expanded in 2024. With these completed projects, the City is now capable of conveying a peak flow to the plant of 86.1 MGD (54 MGD to the North Plant and 32.1 MGD to the South Plant).

The City is also conducting a clarifier stress testing program to verify clarifier performance over a range of flows. The City utilized a hydraulic model of the AWWTP to evaluate the hydraulic capacity of the North Plant and the South Plant. The analysis was performed over a range of peak flows to identify potential bottlenecks

The South Plant primary clarifier stress testing was performed in 2022. The results showed a hydraulic peak capacity of 38 MGD with all four primary clarifiers in service. The results indicated that removal efficiency decreases above a surface overflow rate of 2,000 gallons per day per square foot; however, the AWWTP consistently meets NPDES permit limits during periods of high flow. The South Plant primary clarifiers are currently being upgraded (concrete rehabilitation and internal mechanical equipment replacement), which may improve performance at higher surface overflow rates.

In addition, the City is currently completing design of improvements to the South Plant screenhouse and construction is anticipated to start in 2026. The completion of these projects will allow the South Plant screening and primary clarification to handle a peak flow of about 32.1 MGD which is the maximum flow that can be conveyed to the South Plant with the recent expansion of the Maple Grove pump station and interceptor. The South Plant grit removal units still need to be evaluated to see if they can handle a peak flow of 32.1 MGD as they were designed for a peak flow of 27.5 MGD. If expansion is required, it will be addressed as part of the liquid plant expansion after 2030 as discussed later in this section which is part of the City’s ARI Baseline plan.

The North Plant primary clarifier stress testing is planned once hydraulic improvements are completed to facilitate operating at higher flows with one clarifier out of service. To be able to stress one North Plant primary clarifier sufficiently while the other one is out of service and not cause an unpermitted overflow the following modifications were identified:

- Increase the wall height on the North Plant primary clarifier distribution box by 4 feet. This was completed in 2024.
- Modify the North bioreactor effluent splitter box to seal off the gate openings from the abandoned scum removal system to prevent backflow to the head of the South Plant. This was also completed in 2024.
- The final modification needed is to raise the weirs in the North Plant grit effluent distribution box to prevent overflow into the North primary clarifier out of service. The City is currently evaluating temporary versus permanent options to complete this cost-effectively. The City may consider installing slide gates in the grit effluent box to achieve higher throughput with one primary clarifier out of

service. This will be evaluated as part of the North primary clarifier upgrade project in the next five years which is in the City's ARI Baseline plan.

Secondary clarifier stress testing is also planned for both the North and South plants. Since the South Plant secondary clarifiers were upgraded, their performance has improved significantly and this is no longer considered a limiting factor in South Plant capacity. The limiting factor for treatment is now the biological reactors and the peak hydraulic capacity is limited by the available head in the hydraulic grade line in the South Plant. The South Plant is also limited by available space.

The City is currently finalizing the design of a fourth secondary clarifier in the North Plant to help meet the growth needs of its municipal partners and provide better reliability/redundancy. This will provide an additional 13.5 MGD of peak capacity, for a total of 54 MGD at the North Plant with all four secondary clarifiers in service. 54 MGD is the maximum peak flow that can be conveyed to the North Plant since the expansions at North (43 MGD) and Stevens Avenue (11 MGD) pumping stations were completed. This is one of the ARI Baseline plant projects.

The AWWTP annual average daily flow (AADF) is projected to increase to 28.6 MGD by the year 2042. The AWWTP's estimated design AADF from a nutrient capacity standpoint is estimated to be about 25.4 MGD with the recent completion of the secondary clarifier upgrades and the DO and biological nutrient removal improvements project. It is projected that the City will need to expand the AWWTP nutrient capacity to meet the growth needs of its municipal partners between 2030 to 2040 . Timing will depend on growth and the corresponding increase in flows. The City has developed a 20-year CIP that includes a liquid and solids expansion of its AWWTP to provide this capacity, as well as projects that are needed to replace/upgrade infrastructure in the City's wastewater collection, conveyance, and treatment system. These projects are required to continue to maximize flow to the AWWTP and are described further in Section 8.

7.4 Optimization of CSO Control Alternatives

The selected alternatives, as summarized in Appendix D of the AER, were advanced to the optimization stage. Optimization is a process to systematically evaluate a wide range of wet-weather improvements and their combinations. The optimization process primarily focused on achieving significant reduction in CSO during a typical-year H&H simulation and minimizing cost.

Using the 2023 ARI model as the baseline condition, the selected alternatives were initially simulated to evaluate their performance individually. Following that, additional simulations were conducted using combinations of these alternatives to explore combined effects and identify the most cost-effective solutions for each basin and the overall CSS. In a subsequent stage, the optimization process focused on evaluating the highest-performing alternatives (HPAs) with respect to water quality benefits and performance. These alternatives were assessed through simulations for the typical year, ensuring their robustness and effectiveness under varied conditions.

Based on the insight from optimization, nine HPAs were selected to represent low, medium, and high-cost ranges. The selection criteria for HPAs included:

- **Cost-effectiveness:** Achieving significant reductions in system-wide CSO volume and event frequency while optimizing expenditure.
- **Equitable improvements:** Providing CSO reduction across all CSS basins and preventing localized disparities.
- **Diverse options:** Offering multiple alternatives within each cost range to provide flexibility in decision making.

Following the selection of the HPAs, the typical year model runs for these alternatives were thoroughly reviewed. To maximize the utilization of treatment facilities, the operation and control rules for the system's control structures were further refined. Table 7-3 summarizes the selected HPAs, their estimated costs, and their corresponding model calculations for the typical year including performance metrics for CSO volume and frequency. These HPAs provide a variety of options across different cost ranges.

7.5 Water Quality Considerations

The water quality model was used to evaluate the potential for the HPAs to achieve compliance with water quality criteria for fecal coliform bacteria, as documented in Section 5.5 of the AER. Results, which are discussed in Section 8, showed no significant improvement in compliance between the different HPAs.

Table 7-3. Summary of Selected High-Performing Alternatives and Model Results during Typical Year

	Alternative				Systemwide Performance			Number of CSO Events				Untreated CSO Volume (MG)			
Scenario	North Basin (CSO-005)	Stevens Basin (CSO-004)	Susquehanna Basin (CSO-003)	Engleside Basin (CSO-002)	Total Untreated CSO (MG)	CSO Percent Capture	City Life Cycle Cost ($M)	North CSO-005	Stevens CSO-004	Susquehanna CSO-003	Engleside CSO-002	North CSO-005	Stevens CSO-004	Susquehanna CSO-003	Engleside CSO-002
Baseline (ARI)	44 GI projects managing 36.8 ac of impervious area, equivalent to GI - Medium		Duke St/ Susquehanna flow separation (8.7 impervious ac)	48 GI projects managing 44 impervious ac, equivalent to GI - Medium Water St/Fairview/Seymour flow separation (28.2 impervious ac)	326.1	89	N/A	32	16	9	48	53.1	6.7	0.7	265.6
702732		GI - Medium King St Separation	GI - Medium	Storage 30 MGD (2 MG)	243.3	92	$32.0	30	16	7	34	52.8	3.8	0.5	186.0
702731		GI - Medium King St Separation	GI - Medium	Storage 45 MGD (4 MG)	195.2	93	$46.5	30	16	7	30	53.3	3.8	0.5	137.5
697697		GI - High King St Separation	GI - High	Storage 45 MGD (4 MG)	193.8	94	$50.8	29	9	3	30	53.9	2.2	0.4	137.0
702734	Screening &Storage 8 MGD (0.16 MG)	GI - Medium King St Separation	GI - Medium	Storage 45 MGD (4 MG)	190.3	94	$54.4	24	16	7	30	48.5	3.8	0.5	137.5
702730		GI - Medium King St Separation	GI - Medium	Storage 60 MGD (5 MG)	175.3	94	$54.3	30	16	7	23	53.1	3.8	0.5	117.7
697696		GI - High King St Separation	GI - High	Storage 60 MGD (5 MG)	173.8	94	$58.6	29	9	3	23	53.7	2.2	0.4	117.6
702733	Screening & Storage 8 MGD (0.16 MG)	GI - Medium King St Separation	GI - Medium	Storage 60 MGD (5 MG)	171.0	94	$62.3	24	16	7	23	48.8	3.8	0.5	117.8
697699	Screening & Storage 8 MGD (0.16 MG)	GI - High King St Separation	GI - High	Storage 60 MGD (5 MG)	170.1	94	$66.6	24	9	3	23	49.9	2.2	0.4	117.5
697755	Screening & Disinfection 53 MGD	GI - High King St Separation	GI - High	Storage 60 MGD (5 MG)	131.3	96	$76.0	5	9	3	23	11.2	2.2	0.4	117.6

MG = million gallons

ARI = asset renewal & improvement

MGD = million gallons per day

CSO = combined sewer overflow

GI = green infrastructure

7.6 No Feasible Alternatives Analysis

The Consent Decree requires the City to perform a No Feasible Alternatives Analysis, if the proposed CSO control measures include bypassing at the AWWTP, in accordance with Section II.C.7 of the CSO Policy for inclusion in the amended LTCP.

7.6.1 Regulatory Requirements

The CSO Policy refers to the EPA bypass regulations in Title 40 C.F.R. § 122.41(m) that has provisions to allow for intentional diversion of waste streams from any portion of a treatment facility, including secondary treatment, under specified limited circumstances. To implement a bypass, it must be demonstrated that (1) the bypass is unavoidable to prevent loss of life, personal injury, or severe property damage; (2) there is no feasible alternative to the bypass; and (3) the permittee submitted the required notices. The CSO Policy requires that any proposed bypass must receive at least primary clarification, solids and floatables removal and disposal, and disinfection. The bypass cannot cause effluent limitations to be exceeded.

7.6.2 Background

The City’s AWWTP currently has a permitted flow diversion of the South Train secondary treatment process via Outfall 100 for flows up to 15 MGD during wet weather events. The South Train screening, grit removal, and primary clarification facilities have more capacity than the South Train bioreactors (anaerobic, oxic, and anoxic tanks), secondary clarifiers, and chlorine contact tanks. A portion of the South Train primary effluent is conveyed to the North Train bioreactors for secondary treatment. During wet weather events, flow that exceeds the secondary treatment capacity, up to 15 MGD, is diverted upstream of the South bioreactors and chlorinated prior to discharge to the stormwater and plant effluent outfall to the Conestoga River. This was a 2005 NPDES permit requirement which did not require the City to meet a certain disinfection standard.

With the potential for the South Train flow diversion to have a future disinfection standard, the City has incorporated a disinfection project into its capital improvement program, which is part of the ARI Baseline. Continued use of the South Train flow diversion is part of the City’s strategy to cost-effectively maximize flow to the AWWTP by utilizing available primary treatment capacity.

7.6.3 Alternatives to Bypass

There is no feasible alternative to the bypass, as demonstrated by the following evaluation of alternatives for (1) storage, (2) sewer separation, and (3) secondary treatment.

Storage

The South Train flow diversion is modeled in the H&H model to discharge up to 15 MGD. Based on the results for the largest event during the typical year, if all flows directed to the diversion were captured in an underground storage tank, the total tank capacity would need to be about 8.5 million gallons. A dewatering pumping station would be required to empty the tank over 48 hours once wet weather flows at the AWWTP have receded. The estimated opinion of probable construction (OPCC) for the storage tank and pumping station is $50.8M, which greatly exceeds the cost of the lowest cost HPA. Providing storage for the bypass flow also does not provide the benefit of additional CSO reduction.

Sewer Separation

As part of the alternatives analysis, the City determined that full sewer separation was not feasible due to the excessive cost and disruption to the urban environment. To effectively eliminate 15 MGD of wet weather flow from the AWWTP, partial sewer separation would also not be within the City's financial capability. Partial sewer separation to eliminate the 15 MGD bypass would result in excessive cost that could be utilized towards increasing CSO capture of untreated overflows.

Secondary Treatment

Secondary treatment for the 15 MGD bypass flow could be provided at a satellite location or at the AWWTP. By capitalizing on the existing conveyance infrastructure and the available space at the AWWTP and neighboring properties, the most feasible location for an additional 15 MGD of secondary treatment is at the AWWTP. The estimated OPCC for 15 MGD of secondary treatment and disinfection is $75.7M, which greatly exceeds the cost of the selected alternative. Providing treatment for the bypass flow also does not provide the benefit of additional CSO reduction, whereas the selected alternative does.

7.6.4 Effluent Limitations

The City currently utilizes the South Train flow diversion during wet weather events and is able to meet the limits of its current NPDES permit. During future AWWTP upgrades, an additional disinfection facility is proposed for the flow diversion to increase disinfection capability.

8 Selected CSO Control Plan

Following the financial capability analysis (discussed in Section 2), a range of CSO controls were selected. This section provides details of the Selected CSO Control Plan.

8.1 Selected CSO Controls

The City developed a 2023 ARI plan, which represents anticipated improvements to existing facilities and operations that are planned in the City’s 20-year CIP. These improvements are represented in the ARI baseline condition and include multiple CSO control projects. Additional CSO control projects were identified through the alternatives analysis as discussed in Section 7.

The selected CSO controls fall into two categories based on the project status:

- **Ongoing and planned improvements**: ARI projects currently being implemented by the City as of year 2025 and additional projects included in the City’s 20-year CIP.
- **Future improvements**: Projects beyond the ARI baseline, selected via the CSO control alternatives analysis.

8.1.1 Ongoing and Planned AWWTP Improvements

The AWWTP 20-year design annual average daily flow for nutrient treatment is projected to increase to 28.6 MGD. The ARI projects identified to provide the additional capacity include: additional primary clarifiers in the South Plant, an additional secondary clarifier in both the North and South Plants, an additional secondary treatment train in the North Plant, supplemental carbon addition to further enhance nutrient removal, and chlorine disinfection of Outfall 100. It also includes new and upgraded solids handling facilities (sludge storage, thickening, anaerobic digestion, drying, and associated pumps and equipment) as the existing lime stabilization system is at the end of its useful life and is no longer cost effective.

It is anticipated that the solids handling facilities upgrade project will be done in the next five years. The conceptual construction cost of this project is $100 million ($49.6 million City share). The liquid expansion of the AWWTP is anticipated to occur between the years of 2031 and 2040, subject to how fast the adjacent municipalities grow. The conceptual construction cost of this project is $61 million ($30.1 million City share).

Based on the City’s 20-year CIP, the design flow capacity of the AWWTP will be increased to enhance capture of combined sewer flow (CDM Smith, 2023a). Wet weather treatment capacity for primary treatment is based on peak hourly flow of primary clarifiers, and wet weather treatment capacity for secondary treatment is based on peak daily flow for the secondary treatment system. Table 8-1 provides a summary of the designed wet weather treatment capacities and the modeled flow as represented in the 2023 ARI model, along with the life cycle cost.

In addition to these AWWTP expansion projects, there will be asset renewal and replacement projects to keep the plant running effectively over the next 20 years. These total about $85.4 million ($42.4 million City share) and include security system improvements; Supervisory Control and Data Acquisition and controls upgrades; mechanical and electrical equipment replacement; tank rehabilitation; oxygen plant system upgrade/replacement; yard piping upgrades; odor control system upgrades; building upgrades; chlorination/disinfection facility improvements; and heating, ventilation, and air conditioning upgrades.

Table 8-1. Asset Renewal and Improvement Advanced Wastewater Treatment Plant Wet Weather Treatment Capacities and Costs

Location	Design Peak Daily Flow (MGD) [a, b]	Design Peak Hourly Flow (MGD) [a, b]	ARI Modeled Wet Weather Treatment Capacity (MGD) [c]	Life Cycle Cost ($Million)
South Screening	27.0	32.1	32.4	**334**[f]
South Primary Treatment	27.0	41.3	32.4	
South Secondary Treatment	10.5	12.6	10.2	
South Secondary Flow Diversion (disinfection)	10.5	15.0	15	
South to North Transfer	6.0	13.7	7.2	
North Primary Treatment	43.8	70.2	53.7	
North Secondary Treatment	49.8	83.9	60.9	
Solids Handling Facilities[e]	--	--	--	
TOTAL	**70.8** [d]	**111.5** [d]	**86.1** [d]	

[a] Source: CDM Smith, 2023b.

[b] The updated plant capacities are the result of additional tankage but would require further conveyance upgrades beyond the ARI so the peak hourly flow capacities were not used for modeling purposes.

[c] The ARI modeled AWWTP capacities include the Maple Grove Pump Station and Interceptor Expansion project completed in 2025.

[d] Total effluent is the summation of flow at South Secondary Treatment, South Secondary Bypass, and North Secondary Treatment.

[e] Peak flows not applicable for these facilities.

[f] The City's share of AWWTP project costs is approximately 50%.

MGD = million gallons per day

8.1.2 Ongoing and Planned Collection and Conveyance Improvements

The wastewater 20-year CIP includes projects that are needed to replace/upgrade (i.e. renew and improve) aging infrastructure in the City's wastewater collection and conveyance systems. These projects involve improvements at the City's six pumping stations, including wet well lining repairs, replacement of controls, replacement of pumps and ancillary equipment, etc. Collection system improvements include rehabilitation projects, like cured-in-place pipe lining and sewer replacement. The collection and conveyance projects will cost an estimated $64.4 million ($55.6 million City share).

8.1.3 Ongoing and Planned Sewer Separation Improvements

Water St./Fairview/Seymour Sewer Separation Project (Ongoing)

This is an ongoing ARI project which will separate significant impervious area within the Engleside Basin (at the time of the ARI modeling, 28.2 impervious acres was conservatively assumed based on the information available at that time, additional information collected during design has increased the estimated area to 37 acres). Figure 8-1 provides an overview of the drainage area and the proposed new storm network.

The estimated cost of this project is approximately $10.8 million. Phase 1 was put out to bid in July 2025 with construction planned to begin in late 2025 and be completed in 2026.

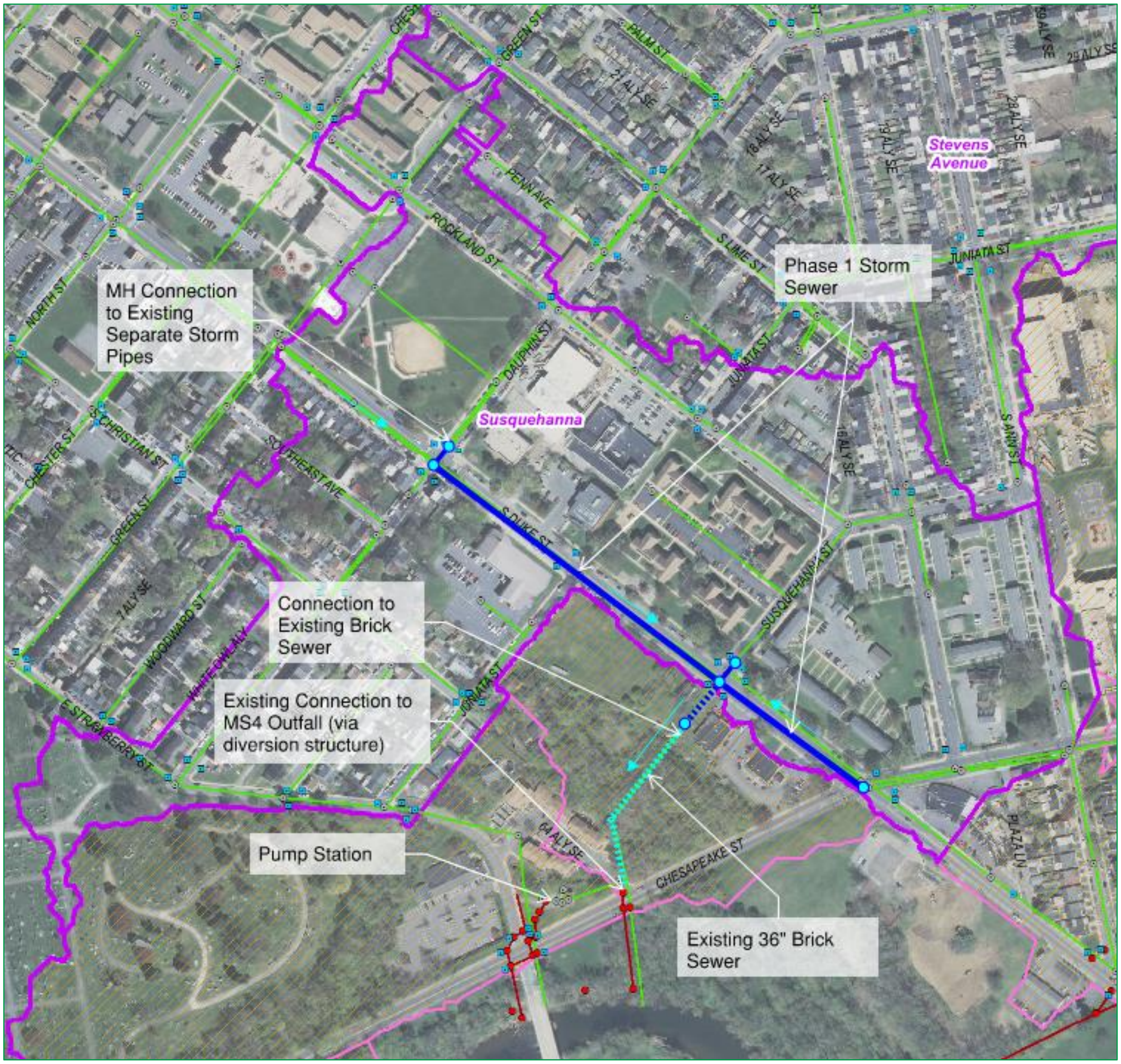
Figure 8-1. Overview of Water St./Fairview/Seymour Sewer Separation Project

Duke Street/Susquehanna Sewer Separation Project (Ongoing)

This is an ongoing ARI project which will separate significant impervious area within the Susquehanna Basin (at the time of the ARI modeling, 8.7 impervious acres was conservatively assumed based on the information available at that time, additional information collected during design has increased the estimated area to 19.5 acres). The stormwater will be routed to a new parallel storm sewer in Duke Street from Dauphin to Susquehanna and from Chesapeake to Susquehanna, as shown in Figure 8-2.

The project has been awarded to Flyway Excavating, Inc. for an estimated cost of $5.3 million ($1.3 million is for sewer separation and green infrastructure). Construction is planned to begin in September 2025 and is anticipated to be completed by May 31, 2026.

Figure 8-2. Overview of Duke Street/Susquehanna Sewer Separation Project



King Street Sewer Separation Project (Future)

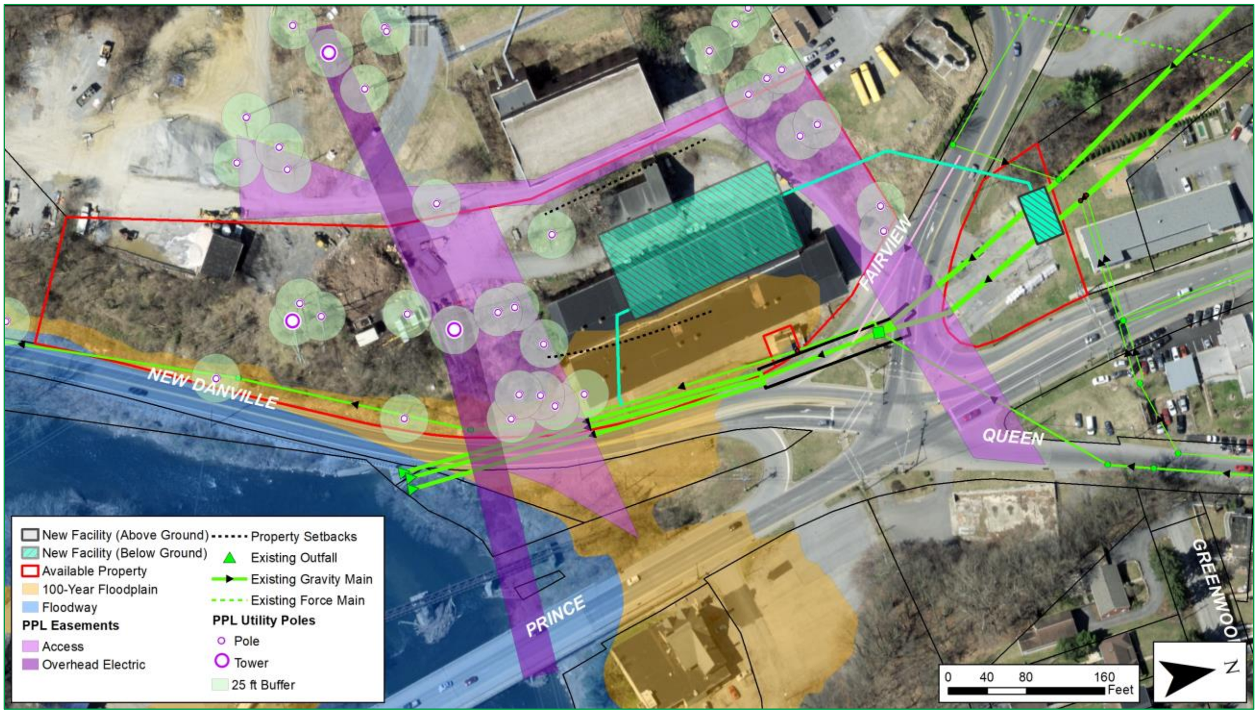
This project was evaluated as part of the alternative analysis, and the concept is to separate areas along East King Street between Ann and Broad Streets. The project is expected to separate 6.7 acres of impervious area from the North and Stevens basins, and the estimated life cycle cost of this project is approximately $0.89 million.

8.1.4 Future Underground Storage in Engleside Basin

For the Engleside Basin, a 2-million-gallon (MG) underground storage tank has been identified as a proposed future improvement based on the alternatives analysis. The underground storage is planned for the Old Streets Building site near CSO 002. The storage tank would have a 15-foot side water depth, and length to width dimensions of approximately 2:1. To accommodate the 2-MG storage capacity, the tank would require a footprint of approximately 95 feet in width and 190 feet in length after allowing for structural walls and building mechanical systems. In addition to the storage basin, a superstructure would be constructed to house supporting infrastructure. The conceptual tank layout is provided in Figure 8-3.

The estimated life cycle cost of this project is approximately $27.38 million.

Figure 8-3. Engleside Basin Underground Storage Conceptual Layout



8.2 Green Infrastructure Controls

Green Infrastructure plays a critical role in the City's long-term strategy to manage stormwater, reduce CSOs, and enhance community resilience to climate change. The City began developing its GI Plan in 2009 and has been evolving and implementing it ever since. The City elects to implement GI for many reasons including stormwater management, flood reduction, CSO reduction, pollutant reduction, community support, and the creation of a range of co-benefits.

EPA conducted a study with Lancaster's 2011 GI Plan to demonstrate how accounting for multiple benefits of GI can provide a more complete assessment of infrastructure and community benefits. Findings are documented in the report *The Economic Benefits of Green Infrastructure: A Case Study of Lancaster, PA* (EPA, 2014). A summary of the monetized co-benefits of GI is presented in Table 8-2. The total annual monetized co-benefit of $5,588 per impervious acre is applied to the planned/proposed GI in the following sections. The report also noted that GI provides significant benefits that were not monetized, stating: "It is important to note that in addition to the specific benefits valued in this case study there are a number of other benefits green infrastructure can provide that were not assigned a dollar value […] these additional benefits include reduced urban heat island effect, increased property value, reduced noise pollution, increased recreational opportunities, habitat improvement, public education, and community cohesion. While the Guide does not outline a specific valuation method for these benefits, other studies have demonstrated their value, and it is important to acknowledge the additional worth (monetary or otherwise) that they can provide to Lancaster and other communities" (EPA, 2014).

Table 8-2. Estimated Annual Co-Benefits of Green Infrastructure per Acre in Lancaster

Related Co-Benefit	Per Impervious Acre Annual Benefit (2014 dollars)*	Per Impervious Acre Annual Benefit (2023 dollars)**
Total Energy Cost Savings ($/acre)	$1,872	$2,563
Total Value of Air Quality Benefits ($/acre)	$809	$1,107
Total Value of Reduced CO2 ($/acre)	$621	$851
Annual Pumping/Treatment Cost Savings ($/acre)	$780	$1,067
Total Co-Benefits in CSS ($/acre managed)	$4,082	$5,588

*Unitized to per acre benefits from the total benefits in The Economic Benefits of Green Infrastructure: A Case Study of Lancaster, PA (EPA Report 800-R-14-007), assumed to be in 2014 dollars (ENRCCI = 9806)

** Using 20-City Engineering News Record Construction Cost Index (ENRCCI) of 13,425 for July 2023

Green Infrastructure's Role in Pollutant Reduction for the Conestoga River and Chesapeake Bay

GI plays a crucial role in reducing pollutant loads to the Conestoga River and Chesapeake Bay. Its effectiveness in removing key pollutants from stormwater, including TSS, TP, and TN, is well-documented. According to PADEP's "BMP Effectiveness Values" (PADEP, 2018) document 3800-PM-BCW0100m), GI solutions typical of Lancaster, such as bioswales, demonstrate high pollutant removal rates:

- 80% for sediment (TSS)
- 75% for TP
- 70% for TN

Recognizing these significant benefits, GI was integral to the City's CBPRP, which was successfully completed in 2023 with an estimated sediment reduction of 141,373 pounds per year (the City's required reduction was 140,151 pounds per year). Building on this success, the City plans to continue implementing GI to further reduce pollutant loads to the Conestoga River and the Chesapeake Bay, demonstrating the City's ongoing commitment to environmental stewardship and water quality improvement. For example, the 2025 Amendment to the CBPRP includes the Little Conestoga Creek Blue/Green Corridor Floodplain Restoration Project which is calculated to generate a minimum credit of 25,000 pounds per year of sediment reduction (City of Lancaster, 2025c).

The following sections outline the City's ongoing and future commitments to GI implementation, including projects planned through 2038 and additional cost-effective projects identified in other basins.

8.2.1 Planned GI Projects Included in ARI

Based on the 2019 GI Plan update, there are 92 projects remaining to be implemented in North and Engleside from 2024 to 2038 (Jacobs, 2019). Furthermore, the City's 20-year stormwater CIP includes additional GI projects (as discussed below). Table 8-3 provides a summary of the GI projects planned to be implemented by 2038. These projects will be implemented through various GI programs, including green streets and alleys, public parks, public schools, and GI on other city-owned parcels and may include private implementation through ordinances and incentive programs. The total annual monetized co-benefit of $5,588 per impervious acre applied to the 80.7 acres of GI planned in the ARI Baseline from 2024-2038 yields an estimated benefit of $450,952/year.

Table 8-3. Summary of Planned Green Infrastructure to be Implemented for 2024-2038

CSS Basin	Number of Projects[a]	Estimated Impervious Area Captured by Green Infrastructure (Acre)
North	44	36.8
Engleside	48	44.0
Total	92	80.7

[a] Planned placeholder projects based on City's green infrastructure budget of $1.2 million/year as estimated in 2018.

8.2.2 Future GI Projects in Stevens and Susquehanna

Beyond the planned projects in the North and Engleside CSO basins, additional GI projects have been identified as cost-effective improvements for both the Stevens and Susquehanna basins. Table 8-4 and Table 8-5 summarize the impervious area to be managed by each GI program within these basins (a potential combination of programs to achieve the total proposed amount in each basin). The estimated life cycle costs for the proposed future GI projects are approximately $2.1 million for the Stevens Basin and $0.7 million for the Susquehanna Basin. The total annual monetized co-benefit of $5,588 per impervious acre applied to the 12.6 acres of GI proposed in the Amended LTCP yields an estimated benefit of $70,409/year. More details on the proposed GI are provided in Appendix B.

Table 8-4. Future Green Infrastructure Projects for Stevens Basin

Green Infrastructure Programs	**Applicability**	**Potential Impervious Area (Acres)**	***Implementation Rate (Percent / Year)***	**Total Implementation (Impervious Acres Managed)**	***Total Implementation (Percent)***
Parking Lot Ordinance Enforcement	Private Parking Lots > 1,200 square feet	5.6	*0.50%*	0.6	10%
Stormwater Ordinance Enhancement	Redevelopment of Private Properties (implementation area accounts for parking lot area managed)	47	*0.10%*	0.9	2%
Incentive Program	Private Properties (implementation area accounts for parking lot and redeveloped areas managed)		*0.20%*	1.8	4%
Green Streets and Alleys (Public)	Public Right of Way including streets, alleys, and sidewalks	28	*0.40%*	2.3	8%
Parks	Public parks	0.7	*1.00%*	0.1	20%
Schools	Public schools	6.9	*0.50%*	0.7	10%
Other City Parcels	Other City-owned parcels	1.4	*0.40%*	0.1	8%
Southeast Separation (Hands Woods)	Separation of streets north & west of school	13.7	*1.30%*	3.4	25%
Total (may include overlap between programs & completed projects)				**9.9**	

Table 8-5. Future Green Infrastructure Projects for Susquehanna Basin

GI Programs	**Applicability**	**Potential Impervious Area (Acres)**	***Implementation Rate (Percent/Year)***	**Total Implementation (Impervious Acres Managed)**	***Total Implementation (Percent)***
Parking Lot Ordinance Enforcement	Private Parking Lots > 1,200 square feet	2.1	*0.50%*	0.2	10%
Stormwater Ordinance Enhancement	Redevelopment of Private Properties (implementation area accounts for parking lot area managed)	11	*0.10%*	0.2	2%
Incentive Program	Private Properties (implementation area accounts for parking lot and redeveloped areas managed)		*0.20%*	0.4	4%
Green Streets and Alleys (Public)	Public Right of Way including streets, alleys, and sidewalks	12	*0.40%*	1	8%
Parks	Public parks	0.6	*1.00%*	0.1	20%
Schools	Public schools	2.8	*0.50%*	0.3	10%
Other City Parcels	Other City-owned parcels	3.1	*0.75%*	0.5	15%
Total (may include overlap between programs & completed projects)				**2.7**	

8.3 Compliance with Water Quality Standards

The RWQM (see Section 5.1.2) was used to simulate instream water quality and assess the water quality compliance for the ARI Baseline and the CSO alternatives. This section presents the results of the assessment for compliance with the fecal coliform standard since the RWQM confirmed that fecal coliform is the relevant PoC.[24]

The RWQM was run for ARI Baseline and CSO alternatives scenarios. A hypothetical scenario assuming no CSO discharge was run to assess the impacts of the sources of bacteria upstream of the City. The simulated water quality results for the ARI Baseline, the hypothetical scenario with no CSO, and the Selected CSO Control Plan are described below. The results of other evaluated CSO alternative scenarios are included in the Alternative Analysis Report (Jacobs et al., 2025).

For assessing compliance with bacteria standards, the RWQM simulated fecal coliform values for the typical year were used to calculate the following:

- **C1:** The number of 30-day periods from May 1 to September 30 where the geometric mean of 200 colony-forming units per 100 milliliters (cfu/100 mL) was exceeded;
- **C2:** The number of 30-day periods from May 1 to September 30 where the single sample maximum threshold of 400 cfu/100 mL was exceeded more than 10% of the time; and
- **C3:** Whether or not the geometric mean of simulated values for the rest of the typical year (January 1 to April 30 and October 1 to December 31) exceed 2,000 cfu/100 mL.

The C1 and C2 criteria were previously used in Pennsylvania's water quality standards to be protective of the water contact sports designate use. The C3 criterion was used to be protective of boating and fishing designated uses. These criteria were replaced with Escherichia coli; however, EPA agreed that modeling of fecal coliform and use of the previous criteria was appropriate for the Amended LTCP given the lack of Escherichia coli monitoring data.

Model simulated results were also compared to thresholds of 400 cfu/100 mL (T1) and 1,000 cfu/100 mL (T2) from May 1 to September 30 (recreation season) which are not used in water quality standards but can be used to assess water quality benefit. Model results are reported at key locations in the Conestoga River (Waterworks, Conestoga Drive, Strawberry Street, Lyndon Pump Station and Wilderness Drive).[25]

8.3.1 ARI Baseline Scenario

The RWQM was run for the ARI Baseline scenario during the typical year, using the weekly fecal coliform data collected at the Waterworks station from June 2018 to April 2019 to characterize the upstream boundary. Table 8-6 presents the results of fecal coliform compliance evaluation for the ARI Baseline scenario during the typical year, revealing consistent exceedances of water quality standards during the recreation season (May 1 through September 30) across all key locations. The geometric mean criterion of 200 cfu/100 mL was also exceeded for all 30-day periods (125 in number) at all key locations. The single sample maximum threshold criterion, where fecal coliform levels exceed 400 cfu/100 mL more than 10% of the time within a 30-day period, is also exceeded for more than 100 30-day periods in the recreation season across all key locations. During the non-recreation season, compliance improves significantly, with no exceedances of the 2,000 cfu/100 mL geometric mean criterion at any location.

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[24] The assessment of compliance with the dissolved oxygen and total suspended solids standards is discussed in the Alternative Evaluation Report (Jacobs et al., 2025).

[25] Key locations are shown on Figure 5-1.

Table 8-6. Evaluation of Compliance with Fecal Coliform Water Quality Standards for Asset Renewal and Improvement Baseline, Selected CSO Control Plan, and Hypothetical Scenario with No CSO

Location	Compliance Criterion	CSO Alternative Scenario		
		Baseline ARI	Selected CSO Control Plan	No CSO
Waterworks (RM 22.9)	C1	125 (100%)[1]	125 (100%)	125 (100%)
	C2	101 (81%)	101 (81%)	101 (81%)
	C3	No	No	No
Conestoga Drive (RM 19.9)	C1	125 (100%)	125 (100%)	125 (100%)
	C2	112 (90%)	110 (88%)	101 (81%)
	C3	No	No	NO
Strawberry Street (RM 17.9)	C1	125 (100%)	125 (100%)	125 (100%)
	C2	106 (85%)	104 (83%)	97 (77%)
	C3	No	No	No
Lyndon Pump Station (RM 14.8)	C1	125 (100%)	125 (100%)	104 (83%)
	C2	107 (86%)	103 (82%)	75 (60%)
	C3	No	No	No
Wilderness Drive (RM 12.6)	C1	125 (100%)	125 (100%)	125 (100%)
	C2	125 (100%)	125 (100%)	92 (74%)
	C3	No	No	No

[1] Number of 30 day periods (Percentage of 30-day periods)

RM = River Mile

C1 - Number of 30-day periods where the geometric mean >200 cfu/100 mL from May 1 to September 30

C2 - Number of 30-day periods where the maximum threshold of 400 cfu/100 > 10% of the time from May 1 to September 30

C3 – Whether or not the geometric mean > 2,000 cfu/100 mL for the remainder of the year

8.3.2 Impacts of Remaining CSO Discharges

Table 8-7 presents fecal coliform compliance evaluation results for the Selected CSO Control Plan (Alternative 712732). There are some improvements in fecal coliform compliance compared to ARI Baseline. However, the simulated fecal coliform levels are still not compliant with the water quality standards.

Table 8-7. Evaluation of Compliance with Fecal Coliform Water Quality Thresholds for Asset Renewal & Improvement Baseline, Hypothetical Scenario with No CSO, and Selected CSO Control Plan During the Recreation Season

Location	Threshold Exceedance	CSO Alternative Scenario		
		Baseline ARI	Selected CSO Control Plan	No CSO
Waterworks (RM 22.9)	T1	52	52	52
	T2	45	45	45
Conestoga Drive (RM 19.9)	T1	48	48	47
	T2	2	1	0
Strawberry Street (RM 17.9)	T1	39	39	38
	T2	2	2	0
Lyndon Pump Station (RM 14.8)	T1	14	15	7
	T2	5	7	0
Wilderness Drive (RM 12.6)	T1	15	17	7
	T2	6	8	0

T1: Percentage of time FC > 400 cfu/100 mL

T2: Percentage of time FC > 1000 cfu/100 mL

Note: Percentage of time exceeding a threshold is calculated as ratio of number of model timesteps when the simulated values exceed the threshold divided by the total number of timesteps in the period

8.3.3 Impacts of Upstream Sources

The RWQM was also run for hypothetical scenario with no CSO discharges to assess the impact of upstream sources on water quality compliance (Table 8-6). The results show that water quality compliance would not be achieved even with no CSO discharges due to upstream sources.

Figure 8-4 is a longitudinal plot of the percentage of time from May 1 to September 30 (recreation season) when the threshold of 400 cfu/100 mL is exceeded for the ARI Baseline, Selected CSO Control Plan, and hypothetical scenario with no CSOs. These results show that upstream sources result in an exceedance of 400 cfu/100 mL for more than 50 percent of the time at the upstream boundary. The percentage of time exceedance decreases in the downstream reaches due to fecal coliform decay. The CSO discharges in the ARI Baseline scenario result in 14 percent increase in percentage time exceeding downstream of CSO-002 compared to the scenario with no CSOs; however, upstream sources still substantially impact compliance in the downstream reaches.

Figure 8-4. Percentage of Time During the Recreation Season When Simulated Fecal Coliform > 400 cfu/100 mL for the Asset Renewal & Improvement Baseline, Selected CSO Control Plan, and Hypothetical No CSO Scenarios

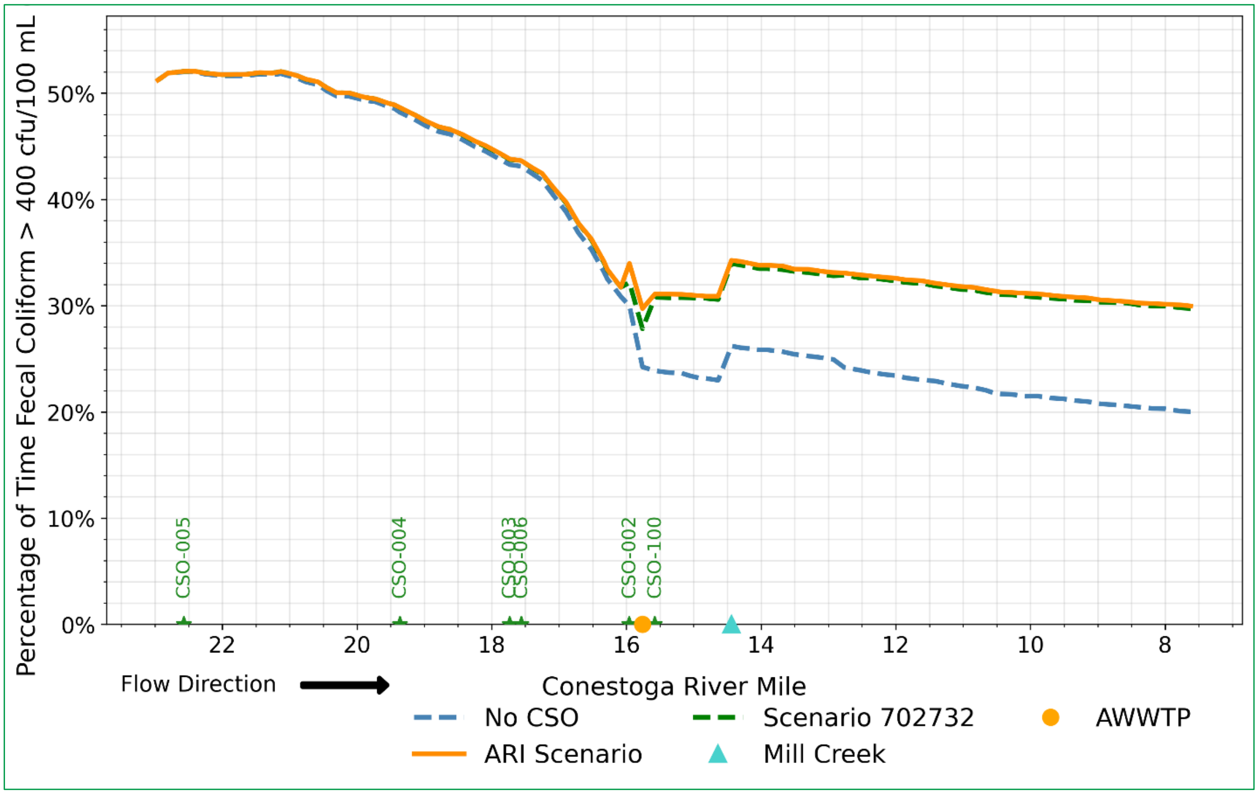

Table 8-7 also provides the calculated percentage of time[26] when the simulated fecal coliform concentrations at key locations in the Conestoga River exceed the 400 and 1,000 cfu/100 mL thresholds for the ARI Baseline, Selected CSO Control Plan, and the hypothetical scenario with no CSO from May 1 to September 30. Even a complete elimination of CSOs, as represented by the "No CSO" scenario, fails to achieve 400 cfu/100 mL, further underscoring the need to address upstream bacteria loads and to adopt a higher threshold for evaluating water quality benefits. When the threshold of 1,000 cfu/100 mL is used, this threshold is exceeded less frequently at the four downstream key locations.

The findings underscore that high fecal coliform levels are a persistent issue during the recreation season in the Conestoga River and would not be addressed by substantial reduction in CSOs due to impact from upstream sources.

8.3.4 Water Quality Standards Compliance Conclusions

The RWQM results for fecal coliform indicate that both the geometric mean and single sample maximum criteria are exceeded throughout the entire modeled section of the Conestoga River. Upstream loading prevents the attainment of these criteria during nearly all 30-day periods of the recreation season, from May 1 to September 30, in the typical year. The RWQM results for the CSO alternatives reveal that none of the seven evaluated options can meet water quality criteria due to the impact of upstream loading (Jacobs et al., 2025). Review and revision of the recreational water quality standards for this portion of the Conestoga River will be necessary through completion of a Use Attainability Analysis.

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[26] Percentage of time exceeding a threshold is calculated as ratio of number of model timesteps when the simulated values exceed the threshold divided by the total number of timesteps in the period

The RWQM results also show that CSO discharges would not violate DO standards for the typical year along the modeled reach of the Conestoga River (Jacobs et al., 2025). Additionally, the CSO alternatives would only marginally improve instream DO levels. Similar to fecal coliform, upstream sources constitute the majority of TSS loading. The RWQM indicates that the evaluated CSO alternatives would have a negligible impact on instream TSS concentrations and loading, as TSS loading from CSOs accounts for only 0.2 percent of the total loading to the Conestoga River during a typical year (Jacobs et al., 2025).

9 Implementation Schedule and Adaptive Management

As discussed in Sections 2 and 4, the City is facing significant capital and O&M costs associated with upgrading drinking water infrastructure. These costs include complying with MCLs for PFOA at the Conestoga water treatment plant and complying with EPA's improved lead and copper rule throughout the City. These projects are critical to ensuring safe and reliable drinking water for the City's customers 24/7.

The City is also investing approximately $181 million ($310 million total with municipal partner shares) in the ARI Baseline which is critical for maintaining reliable wastewater collection and treatment and also reduces CSO discharges as discussed in Section 5.1. Stormwater ARI is also required, and the City is committed to continuing its award-winning GI program. As discussed in Section 8, the water quality and other benefits associated with GI for the City's residents, the Conestoga and Susquehanna Rivers, and ultimately the Chesapeake Bay, warrant continued investment.

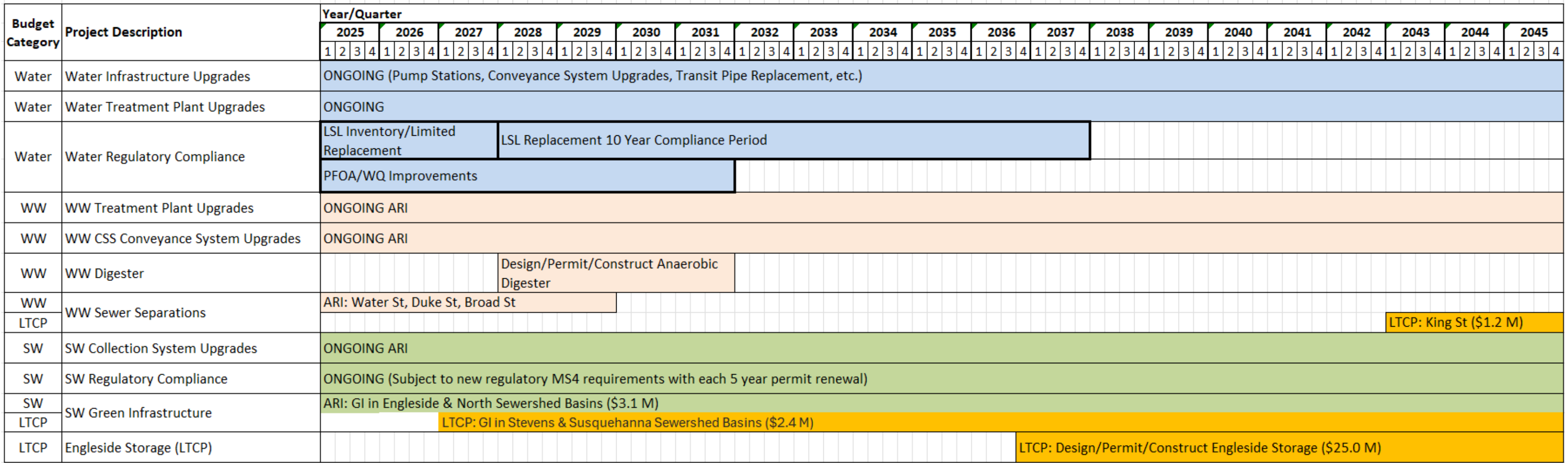
This section discusses the City's integrated approach to scheduling these projects and the CSO projects for the amended LTCP, provides the implementation schedule for the amended LTCP, and discusses the adaptive management process that will be used to evaluate the scheduling of ongoing and future projects.

9.1 Integrated Approach to Scheduling CSO Controls

As discussed in Section 2, the need for critical drinking water projects results in the need to delay additional CSO control projects. Figure 9-1 provides the City's implementation schedule for drinking water, wastewater, and stormwater. The schedule provides for some CSO control in the North, Stevens, and Engleside basins through the use of GI as part of the wastewater ARI. Additional CSO control is planned starting in 2027 in the Stevens and Susquehanna basins as part of the Selected CSO Control Plan. Construction of the Engleside storage, a single CSO control project with an estimated capital cost of $25 million, is currently scheduled to begin in 2036. The King Street sewer separation project, with an estimated capital cost of $1.2 million, is currently scheduled to begin in 2043. The schedule for the Amended LTCP is therefore 20 years.

As shown in Figure 9-2, the City's estimated water infrastructure capital needs (water treatment, wastewater, stormwater, and the Amended LTCP) are $1.1 billion over a 20-year period. As can be seen in Figure 9-3, the financial resources needed for the drinking water infrastructure are significant over the entire 20-year period.

Figure 9-1. Schedule for the Integrated Drinking Water, Wastewater, Stormwater Implementation and Long-term Control Plan



Budget Category	Project Description	Year/Quarter 2025–2045 (quarters 1 2 3 4)
Water	Water Infrastructure Upgrades	ONGOING (Pump Stations, Conveyance System Upgrades, Transit Pipe Replacement, etc.)
Water	Water Treatment Plant Upgrades	ONGOING
Water	Water Regulatory Compliance	LSL Inventory/Limited Replacement LSL Replacement 10 Year Compliance Period PFOA/WQ Improvements
WW	WW Treatment Plant Upgrades	ONGOING ARI
WW	WW CSS Conveyance System Upgrades	ONGOING ARI
WW	WW Digester	Design/Permit/Construct Anaerobic Digester
WW LTCP	WW Sewer Separations	ARI: Water St, Duke St, Broad St LTCP: King St ($1.2 M)
SW	SW Collection System Upgrades	ONGOING ARI
SW	SW Regulatory Compliance	ONGOING (Subject to new regulatory MS4 requirements with each 5 year permit renewal)
SW LTCP	SW Green Infrastructure	ARI: GI in Engleside & North Sewershed Basins ($3.1 M) LTCP: GI in Stevens & Susquehanna Sewershed Basins ($2.4 M)
LTCP	Engleside Storage (LTCP)	LTCP: Design/Permit/Construct Engleside Storage ($25.0 M)

WW = wastewater

LTCP = long-term control plan

SW = stormwater

ARI = Asset Renewal & Implementation

GI = green infrastructure

Figure 9-2. Project Capital Funding Needs for Drinking Water, Wastewater, Stormwater, and Amended Long-term Control Plan over the 20-Year Period from 2025 to 2045

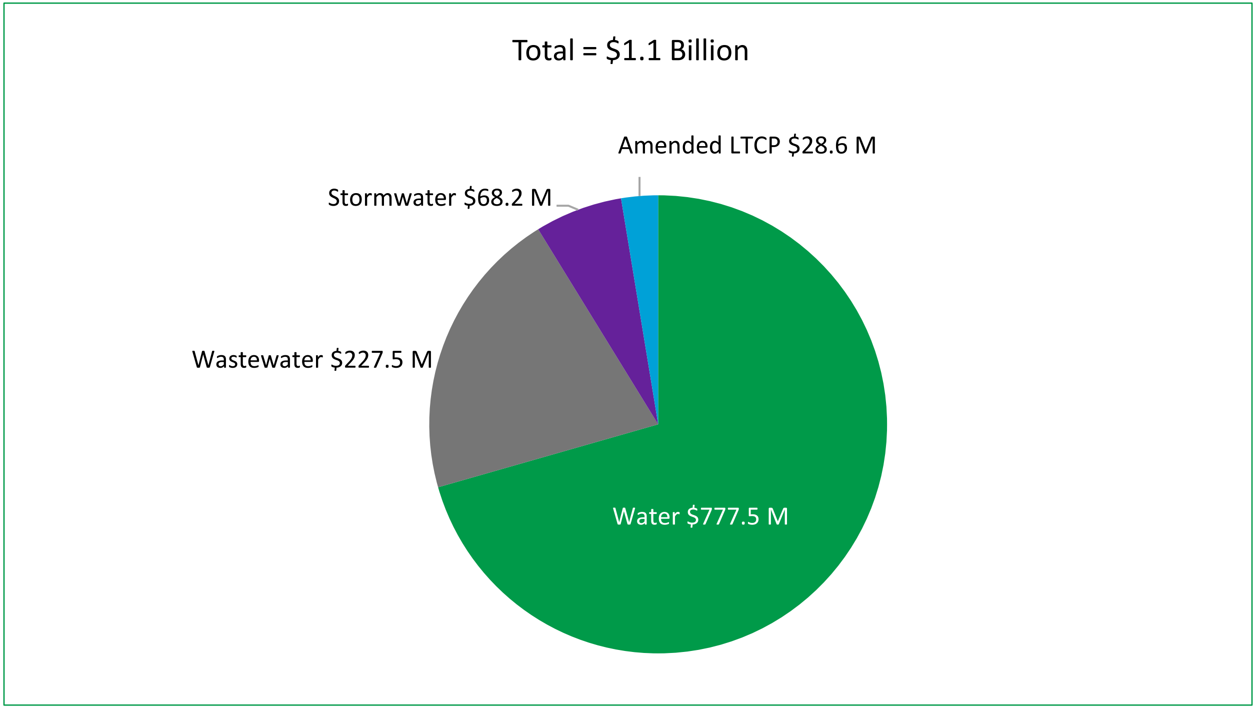
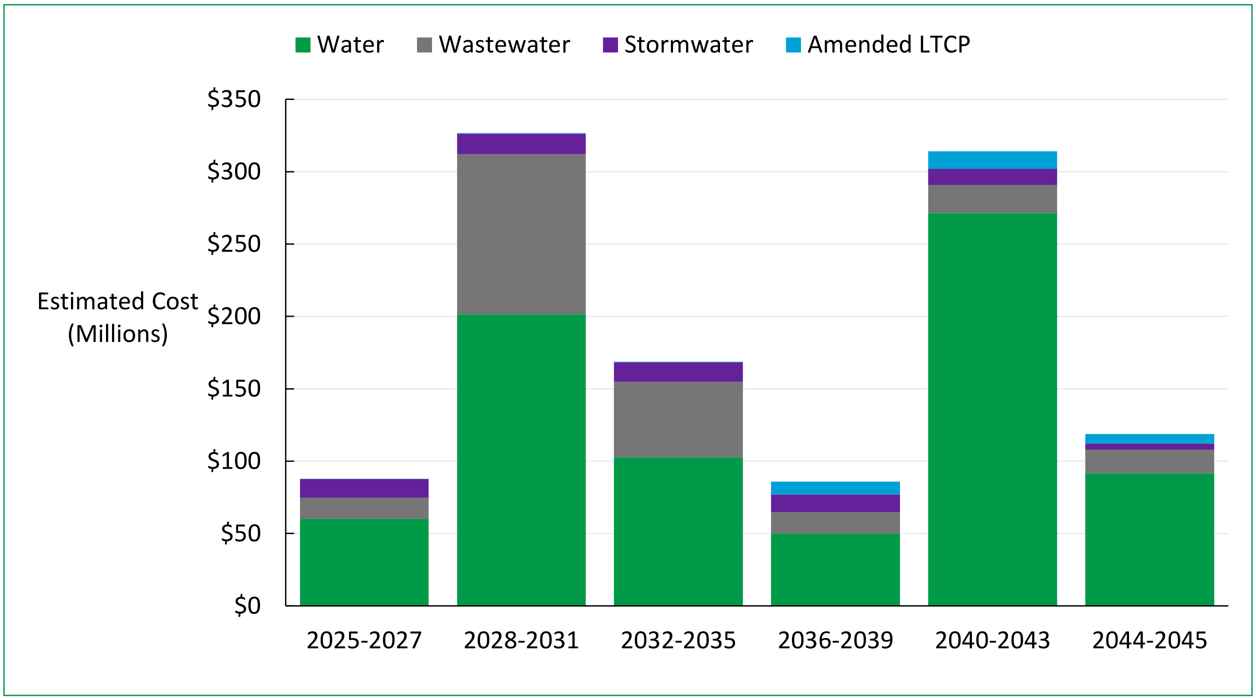


Figure 9-3. Project Capital Funding Needs for Drinking Water, Wastewater, Stormwater, and Amended Long-term Control Plan by Period



9.2 Implementation Schedule for CSO Controls

The City continues to reduce CSO discharges through implementation of the ARI Baseline. The Selected CSO Control Plan will provide further reductions, as discussed in Section 8. Table 9-1 summarizes the implementation schedule for the AWWTP, sewer separation projects, underground storage, and GI projects. The AWWTP expansion project schedule is based on the liquid expansion of the plant which will be dependent on the growth rate needs of the City's municipal partners. A minimum 2-year design schedule and 3-year construction schedule is anticipated within the 9-year window. For the Engleside basin underground storage project, there will be various siting issues and restrictions to address and a 9-year window is therefore shown starting in 2036.

Table 9-1. Asset Renewal and Improvement and CSO Projects Implementation Schedule

CSO Control Technology	Start	End
AWWTP Expansion (*ARI Baseline*)	2031[a]	2040[a]
Sewer Separation		
Water St./Fairview/Seymour Sewer Separation Project (*ARI Baseline*)	Nov 2025	2028
Duke Street/Susquehanna Sewer Separation Project (*ARI Baseline*)	Sep 2025	May 2026
King Street Sewer Separation Project	2043	2045
Underground Storage		
2-million gallon Storage in Engleside Basin	2036	2045
Green Infrastructure (GI)		
GI in North Basin (*ARI Baseline*)	Jan 2024	Dec 2038
GI in Engleside Basin (*ARI Baseline*)	Jan 2024	Dec 2038
GI in Stevens Basin	2027	2045
GI in Susquehanna Basin	2027	2045

[a] The timing of the AWWTP Expansion will be dependent on the growth needs of the City's municipal partners.

ARI = Asset Renewal and Improvement

9.3 Adaptive Management

With the development of the Amended LTCP, the City developed 20-year CIPs for the drinking water, wastewater, and stormwater programs. These CIPs will be revisited on an annual basis and will be used to confirm that the selection and implementation of the recommended CSO control projects is within the City's financial capability or whether the projects and/or schedule in the Amended LTCP needs to be revised.

10 Post-construction Compliance Monitoring Plan

The purpose of a post-construction compliance monitoring (PCCM) plan is to collect data to (1) evaluate if CSO controls are meeting performance goals and (2) assess compliance with water quality standards (EPA, 2012b). For the LTCP, the City declared that it was pursuing the demonstration approach. Both upstream sources and CSOs contribute to exceedances of water quality standards for fecal coliform in the Conestoga River (Section 8). As referenced in Section 1, water quality standards will need to be reviewed and revised, and the City plans to conduct a Use Attainability Analysis pursuant to EPA regulations and policy (EPA, 2001). The City's PCCM plan relies on meeting the performance objectives for CSO control identified in Section 8 and conducting receiving water monitoring and modeling after the Amended LTCP is fully implemented.

The PCCM plan includes ongoing precipitation and CSO discharge monitoring to compare the level of control achieved with the planned level of control. The plan also includes monitoring of GI in accordance with the City's Green Infrastructure Monitoring Plan (City, 2019). Once the selected CSO controls in the Amended LTCP have been fully implemented, H&H modeling, instream sampling, and water quality modeling will be performed to assess compliance with water quality standards.

10.1 Ongoing Monitoring of Discharge and Precipitation

The City monitors rainfall and sewer flows and levels within its conveyance and treatment system at several locations. These permanent meters, part of the City's SCADA system, have continuously collected data as early as 1934 in the treatment system and 1996 in the collection system. The City's permanent meters are described in detail in previous documentation, most recently in the City of Lancaster Hydrologic & Hydraulic Model 2016 Calibration and Validation Report (CH2M, 2017a). Additional information about how these meters were used to characterize existing CSO discharges can be found in the City's CSO characterization report (Geosyntec and Jacobs, 2019).

Table 10-1 lists the meters that will be used to report on the annual frequency, volume, and duration of CSO discharges. The City will also continue to measure flow at the AWWTP North Plant influent, South Plant influent, effluent, and CSO-related South Secondary Bypass Outfall-100. Table 10-2 lists the rain gauges (RGs) that have been used in previous studies. In addition to the City-owned RGs, there is one U.S. Geological Survey RG located within the City and two Weather Underground RGs just outside of the City. The discharge meter and RG locations are shown on Figure 10-1. Changes in available meters and RGs will be reflected in updates to the PCCM plan.

Reporting of CSO discharges is provided in monthly discharge monitoring reports (DMRs). The City will provide an annual report that summarizes the precipitation data and DMR data.

Table 10-1. City of Lancaster Permanent Meters for Reporting CSO Discharges

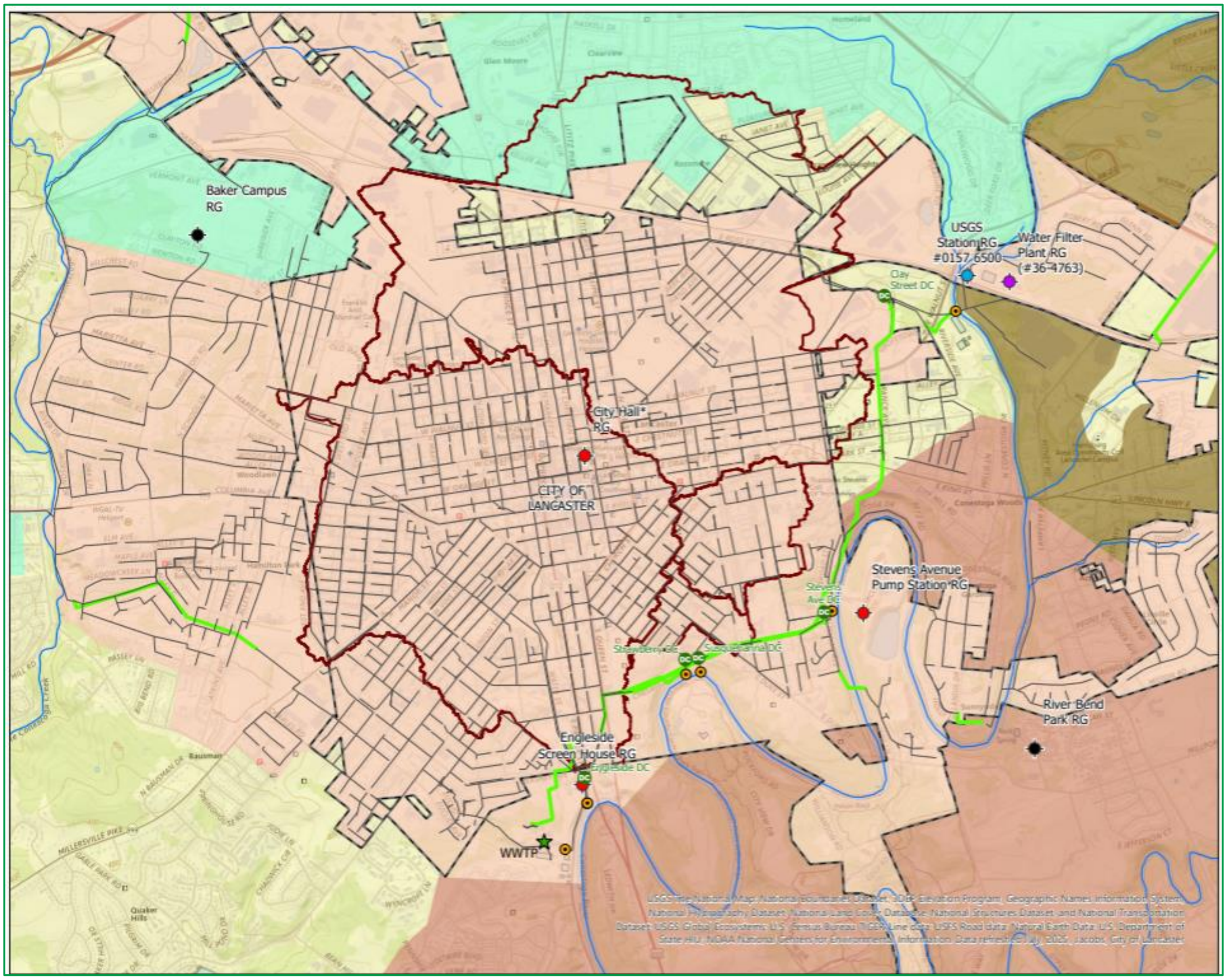
Outfall	Name	Latitude	Longitude
005	Clay Street Diversion Chamber	40°02′57″	-76°17′05″
004	Stevens Avenue Diversion Chamber	40°01′52″	-76°17′15″
003	Susquehanna Diversion Chamber	40°01′42″	-76°17′52″
006	Strawberry Diversion Chamber	40°01′42″	-76°17′52″
002	Engleside Diversion Chamber	40°01′22″	-76°18′20″

Table 10-2. City of Lancaster Rain Gauges

Gauge Location	Latitude	Longitude
Water Filter Plant	40°2′59″	-76° 16′27″
Engleside Screen House	40°1′21″	-76° 18′19″
Stevens Avenue Pump Station	40°1′54″	-76° 17′ 6″
City Hall*	40°2′26″	-76° 18′17″

* The City Hall rain gauge is inactive.

Figure 10-1. Permanent Flow Meters and Rain Gauges



USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road data; Natural Earth Data; U.S. Department of State HIU; NOAA National Centers for Environmental Information. Data refreshed July, 2025., Jacobs, City of Lancaster

The City Hall rain gauge is inactive.

10.2 Ongoing Green Infrastructure Monitoring

The City has been implementing an integrated GI program in the CSS and MS4 since 2010. The City developed a GI Monitoring Plan in 2019 to comply with the Consent Decree requirements for processes and procedures to evaluate the performance of GI projects and improve the runoff retention and detention of GI facilities across the City (City of Lancaster, 2019b). Based on the Consent Decree requirements, the GI Monitoring Plan includes three types of GI monitoring: Field Acceptance Testing, Performance Baseline Testing, and Ongoing Field Performance Testing. Field Acceptance Testing and Performance Baseline Testing is completed for selected GI projects within 60 days following the completion of construction. Ongoing Field Performance Testing is performed at each GI project at least once every five years after the completion of construction for the service life of the GI installation.

The City will continue to submit the testing results for the representative projects in an Annual GI Performance Report.

10.3 Monitoring of Completed Amended LTCP Projects

The Amended LTCP includes GI and separation projects as part of the ARI Baseline and additional GI, separation projects, and a two million gallon CSO storage tank.

After completion of the selected CSO controls, the City will again install temporary flow meters to update the H&H model and confirm that the expected number of overflow events and volume during a typical year has been achieved. The City will also conduct sampling of the CSO effluent and Conestoga River to update the water quality model.

10.4 Receiving Water Monitoring and Modeling

As discussed in Section 10.3, the City will conduct monitoring of the Conestoga River after the Amended LTCP has been implemented. Monitoring will occur during the recreation season, which is May 1 to September 30, and will extend into October or early November if necessary.

Monitoring will consist of twice weekly sampling of the Conestoga River upstream of the CSOs for the recreation season to characterize bacteria levels entering the study area. This sampling will occur at the Conestoga Water Treatment Plant intake (Waterworks).

Sampling of selected CSO diversion chambers, the AWWTP influent, the Conestoga River in the study area, and the mouth of Mill Creek (Table 10-3) will be conducted for a minimum of three wet weather events at 3-6 hours, 6-12 hours, 24-48 hours, and 60-120 hours after the overflow begins. The City will also attempt to collect dry weather samples at these locations preceding each wet weather event. Sampling will be conducted using procedures consistent with the prior stream surveys (LandStudies, 2021).

Table 10-3. Conestoga River and Mill Creek Sampling Locations

Site Name	Sampling Location	Latitude	Longitude
Waterworks	Upstream of outfalls	40°03'05.24"	76°16'38.91"
Conestoga Drive (previously named Pleasant Street)	Between CSO 005 and 002	40°02'09.67"	76°16'53.21"
Strawberry Street	Central Park upstream of outfalls	40°01'41.72"	76°17'47.35"
Lyndon Pump Station	Between Outfall 001 & Mill Creek confluence	40°00'15.49"	76°18'15.51"
Mill Creek	At bridge upstream of confluence	40°00'16.68"	76°18'01.17"
Wilderness Drive	Upstream of Circle M Campground and Millersville wastewater discharge	40°00'02.17"	76°19'14.84"

Parameters that will be sampled include:

- Temperature
- Dissolved oxygen
- pH
- Fecal coliform
- Escherichia coli
- Carbonaceous biochemical oxygen demand
- Total suspended solids

11 Operation and Maintenance Plan

The City employs a comprehensive approach to operation and maintenance for wastewater and stormwater infrastructure, which is centered around a Standard Operating Procedure (SOP) Manual and the Digital O&M Manual Library. Additional supporting documents, like the Emergency Action Plan, provide procedures for specific scenarios or objectives.

During construction completion of each CSO control project, the City will receive O&M manuals for the equipment. These will be incorporated in the City’s Digital O&M Manual Library. Manufacturer preventative maintenance schedules will be added to the City’s work order management system, City Works.

The City will also develop any necessary SOPs for the new facilities, if the facility type is not already covered in the City’s SOP Manual. For example, the City will develop an SOP for the storage tank and dewatering pumping station. New stormwater outfalls will be added to the City’s MS4 outfall maps and any applicable SOPs.

The City will incorporate the updates to the relevant documents with 60 days of each facility commencing operation and distribute the revised information to the appropriate City staff.

The GI O&M Plan will be utilized and updated as needed for GI projects (see Appendix B).

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Appendix A
Comment Registry

The Comment Registry will be finalized and added to the Appendices after the 30-day public comment period closes and the City finalizes responses to comments received.

Appendix B

Supporting Green Infrastructure Information for Amended Long-term Control Plan

B.1 Introduction

Paragraph 34 of the City of Lancaster's 2017 Consent Decree (CD) related to combined sewer overflows (CSOs) requires updated versions of green infrastructure (GI) documents if GI is included in the Amended Long-Term Control Plan (LTCP):

> *If Lancaster… includes GI Projects in the selected CSO Control Measures in the Amended LTCP ("LTCP GI Projects"), then Lancaster shall submit as part of the Amended LTCP, updated versions of the green infrastructure documents required by Appendix A to this Consent Decree.*

Appendix A of the CD required a GI Plan, GI Design Manual, GI Operation and Maintenance (O&M) Plan, and GI Monitoring Plan.

In addition, paragraph 34 of the CD requires:

a. an estimate of the cumulative retention and storage volume of the LTCP GI Projects (both identified and future projects) [see Table B-1];

b. the anticipated cumulative effect of the LTCP GI Projects (both identified and future) on frequency and volume of CSOs; and

c. a description of the location and sizing of identified LTCP GI projects.

Regarding LTCP GI Projects not constructed by the City, paragraph 34 requires:

> *Lancaster shall also include documentation describing the process by which Lancaster will evaluate and monitor LTCP GI Projects not constructed by the City to demonstrate the initial and continued performance of such Projects.*

Since the selected CSO control measures proposed in the Amended LTCP include GI, this document serves to address these CD requirements.

B.2 Updates to the City's GI Plan

The City of Lancaster adopted its first Green Infrastructure (GI) Plan in 2011 and completed a plan update in 2019 (Green It! Lancaster) which was approved by the U.S. Environmental Protection Agency in 2020. Over 80 GI projects have been completed as of June 2025, and future implementation through 2038 in the North and Engleside Basins was included in the 2019 GI plan update. As detailed in the draft Alternatives Evaluation Report in March 2025, GI projects underway and completed in the combined sewer area were included in the 2022 Existing Condition Scenario Model, and future placeholder projects in North and Engleside were included in the 2023 Asset Renewal and Improvement (ARI) Model based on the 2019 GI plan update.

To develop and evaluate GI potential, GI implementation matrices were developed for each combined sewershed based on seven potential GI implementation programs/mechanisms – three focused on private properties and four focused on public property. Impervious area data developed from high-resolution aerial imagery obtained in 2016 and parcel ownership data was used to analyze the distribution of impervious area applicable to the various GI implementation programs. Based on past projects in the City's GI program, City input and goals, other GI programs in the region, and professional judgement, medium, high, and highest levels of implementation were also considered, each blending the seven GI implementation programs.

A summary of the impervious area to be managed at each implementation level, and the retention/storage volume by implementation level, is provided in Table B-1. The proposed GI in the Amended LTCP, beyond the GI in the ARI Baseline, is the medium GI implementation level in the Stevens and Susquehanna basins. The results for the Engleside and North basins are shown in Table B-1 for comparison, although the Selected CSO Control Plan does not include additional GI in those basins beyond the ARI baseline.

Table B-1. Green Infrastructure Implementation Level Summary

Basin	**Impervious Area in City (Acres)**	**Impervious Area (acres) to be Managed by Implementation Level**			**Retention/Storage Volume (MG) to be Provided by Implementation Level**		
		Medium*	**High**	**Highest**	**Medium***	**High**	**Highest**
Engleside	706	57	122	275	1.9	4.1	9.3
North	603	64	132	294	2.2	4.5	10.0
Stevens*	85	**9.9**	24	46	**0.3**	0.8	1.6
Susquehanna*	29	**2.7**	5.8	16	**0.1**	0.2	0.5

* The Amended LTCP proposes the medium GI implementation level in Stevens and Susquehanna CSO basins.

MG = million gallons

The medium implementation level in the Stevens and Susquehanna basins approximately represents the continuation of the City's robust GI program, with some additional focus on private implementation through ordinances and/or incentives. The high and highest implementation levels represent significantly increased GI implementation. The highest implementation level is based on an estimated upper limit that could be practically achieved in a 20 to 25-year period, maximizing all seven GI implementation programs given physical, administrative, and temporal constraints. The GI implementation matrices for the Stevens and Susquehanna basins are provided in Tables B-2 and B-3. While the City is also committed to a rigorous tree planting/urban forestry program, this was not explicitly included in the matrices (trees are also incorporated in City GI projects when practical).

Table B-2. Example Green Infrastructure Implementation Matrix – Stevens Basin

GI Program / Implementation Mechanism	Applicability	Applicable Impervious Area (Acres)	Implementation Rate (%/Year)			Total Implementation (Impervious Acres Managed)			Total Implementation (%)		
			Medium	High	Highest	Medium	High	Highest	Medium	High	Highest
Parking Lot Ordinance Enforcement	Private Parking Lots > 1,200 square feet	5.6	0.5%	1.0%	3.0%	0.6	1.1	3.4	10%	20%	60%
Stormwater Ordinance Enhancement	Redevelopment of Private Properties (excluding parking lots managed above)	47	0.1%	0.2%	0.4%	0.9	1.8	3.5	2%	4%	7%
Incentive Program	Private Properties (excluding parking lots and redevelopment managed above)		0.2%	0.4%	0.8%	1.8	3.5	6.4	4%	7%	14%
Green Streets and Alleys (Public)	Public R.O.W. including streets, alleys, and sidewalks	28	0.4%	1.0%	2.5%	2.3	5.7	14.1	8%	20%	50%
Parks	Public parks	0.7	1.0%	2.0%	4.0%	0.1	0.3	0.5	20%	40%	80%
Schools	Public schools	6.9	0.5%	1.0%	3.0%	0.7	1.4	4.1	10%	20%	60%
Other City Parcels	Other City-owned parcels	1.4	0.4%	0.8%	2.0%	0.1	0.2	0.6	8%	16%	40%
Jackson Middle School GI and Separation	Separation of streets north & west of school	13.7	1.3%	3.8%	5.0%	3.4	10.3	13.7	25%	75%	100%
Total (may include overlap between programs & completed projects)						**9.9**	**24**	**46**	**12%**	**29%**	**55%**

Note: This is based on conceptual GI opportunities which would require further study and engineering analysis to determine project feasibility.

Yellow shaded cells indicate the medium GI implementation level proposed in the Amended LTCP

GI = green infrastructure;

R.O.W. = right of way

Table B-3. Example Green Infrastructure Implementation Matrix - Susquehanna Basin

GI Program / Implementation Mechanism	Applicability	Applicable Impervious Area (Acres)	Implementation Rate (%/Yr)			Total Implementation (Impervious Acres Managed)			Total Implementation (%)		
			Medium	High	Highest	Medium	High	Highest	Medium	High	Highest
Parking Lot Ordinance Enforcement	Private Parking Lots > 1,200 square feet	2.1	0.5%	1.0%	4.5%	0.2	0.4	1.8	10%	20%	90%
Stormwater Ordinance Enhancement	Redevelopment of Private Properties (excluding parking lots managed above)	11	0.1%	0.2%	0.6%	0.2	0.4	1.1	2%	4%	10%
Incentive Program	Private Properties (excluding parking lots and redevelopment managed above)		0.2%	0.4%	1.0%	0.4	0.8	1.6	4%	7%	15%
Green Streets and Alleys (Public)	Public R.O.W. including streets, alleys, and sidewalks	12	0.4%	1.0%	3.0%	1.0	2.4	7.3	8%	20%	60%
Parks	Public parks	0.6	1.0%	2.0%	4.0%	0.1	0.2	0.5	20%	40%	80%
Schools	Public schools	2.8	0.5%	1.0%	3.0%	0.3	0.6	1.7	10%	20%	60%
Other City Parcels	Other City-owned parcels	3.1	0.75%	1.5%	3.0%	0.5	0.9	1.8	15%	30%	60%
Total (may include some overlap between programs & completed projects)						**2.7**	**5.8**	**15.8**	**9%**	**20%**	**54%**

Note: This is based on conceptual GI opportunities which would require further study and engineering analysis to determine project feasibility.

Yellow shaded cells indicate the medium GI implementation level proposed in the Amended LTCP

GI = green infrastructure;

R.O.W. = right of way

The matrix for each basin illustrates a sample distribution of GI programs across each basin – one potential approach to achieve the total level of GI implementation proposed by the City. While maintaining that overall GI implementation level, adjustments between individual programs may occur. For example, if redevelopment and the associated ordinance-mandated stormwater controls occur faster than 0.1% per year (a relatively low rate), then less GI would be needed in other programs to reach the total acres managed. Similarly, the City costs will depend on the implemented mix of GI programs, especially how much cost is borne by other parties (i.e., through the implementation programs targeting private property). As shown in Table B-4, the estimated City capital cost for GI in Stevens would be $1.8M based on escalated costs from the 2019 GI Plan for various GI programs, a site-specific conceptual cost estimate for the Jackson Middle School project, and an assumed amount per acre for the incentive program. O&M costs were based on escalated costs from the 2019 GI Monitoring Manual. Estimated City GI capital costs in Susquehanna are $0.6M.

Table B-4. Estimated Costs for Medium Green Infrastructure in Stevens Basin

GI Program / Implementation Mechanism	Total Implementation (Impervious Acres Managed)	Estimated City Capital Unit Cost ($1000s/Acre)*	Estimated City Capital Cost (Million $)*	Estimated City O&M Cost After Implementation (Million $/Yr)*
Parking Lot Ordinance Enforcement	0.6	$0	$0	$0
Stormwater Ordinance Enhancement	0.9	$0	$0	$0
Incentive Program	1.8	$100	$0.2	$0
Green Streets and Alleys (Public)	2.3	$326	$0.7	$0.03
Parks	0.1	$311	$0.04	$0.002
Schools	0.7	$311	$0.2	$0.01
Other City Parcels	0.1	$326	$0.04	$0.001
Jackson School GI and Separation	3.4	$174	$0.6	$0.02
TOTAL	**9.9**	**$182**	**$1.8**	**$0.06**

*August 2022 dollars (ENRCCI = 13171.07)

Table B-5. Estimated Costs for Medium Green Infrastructure in Susquehanna Basin

GI Program / Implementation Mechanism	Total Implementation (Impervious Acres Managed)	Estimated City Capital Unit Cost ($1000s/Acre)*	Estimated City Capital Cost (Million $)*	Estimated City O&M Cost After Implementation (Million $/Yr)*
Parking Lot Ordinance Enforcement	0.2	$0	$0.0	$0
Stormwater Ordinance Enhancement	0.2	$0	$0.0	$0
Incentive Program	0.4	$100	$0.04	$0
Green Streets and Alleys (Public)	1.0	$326	$0.3	$0.01
Parks	0.1	$311	$0.04	$0.001
Schools	0.3	$311	$0.1	$0.003
Other City Parcels	0.5	$326	$0.1	$0.01
TOTAL	2.7	$237	$0.6	$0.02

*August 2022 dollars (ENRCCI = 13171.07)

B.2.1 Anticipated Cumulative Effect of the LTCP GI Projects on Frequency and Volume of CSOs

The City's system-wide hydrologic and hydraulic (H&H) model was run to estimate the effect of medium GI implementation in the Stevens and Susquehanna basins on the frequency and volume of CSOs. The results are shown in Table B-6. Cumulatively, the model indicates the GI will reduce CSO volumes at Stevens, Susquehanna, and Engleside by a total of 2.4 MG/yr and reduce the frequency at Susquehanna by two events per year.

Table B-6. H&H Model Results for Green Infrastructure in Selected CSO Control Plan

Scenario	CSO Frequency (Number/year)			Untreated CSO Volume (MG/year)		
	Stevens CSO-004	Susquehanna CSO-003	Engleside CSO-002	Stevens CSO-004	Susquehanna CSO-003	Engleside CSO-002
Baseline (ARI)	16	9	48	6.7	0.7	265.6
Medium GI (Stevens and Susquehanna)	16	7	48	5.2	0.5	264.9
Reduction	0	2	0	1.5	0.2	0.7

B.2.2 Description of the Location and Sizing of LTCP GI Projects

Since the City's implementation of GI is often opportunistic and integrated with other public infrastructure projects (e.g., park improvements, road/transportation projects, and school improvements) or reliant on private implementation, most future projects have not specifically been identified. However, many potential projects have been identified and are included in the City's 2019 GI Plan Update (Appendix A of the plan includes a potential project list and GI concept plans). For example, a large potential GI and separation project in Stevens has been identified and conceptually designed in and around Jackson Middle School (GI Project P-193). With a potential drainage area of up to 13.7 impervious acres, this single project could accomplish the 9.9 acres of management in the medium implementation level for Stevens if mostly implemented. In Susquehanna, GI is under design as part of the renovation of the Joe Jackson Tot Lot (GI Project P-227, 95% design completed June 2025). This project is currently designed to manage 1.25 inches of runoff from 0.19 impervious acres, along with another 0.21 acres of impervious area reduction (managing or removing this 0.4 impervious acres represents 15% of the total proposed GI in the Amended LTCP for Susquehanna). The Joe Jackson project is out to bid as of July 2025.

B.3 Updates to the City's GI Design Manual

The City updated its GI Design Manual in June 2024 to improve GI implementation in the City and support compliance with the enhanced stormwater ordinance adopted by the City in September 2022. LTCP GI Projects are expected to be comprised of types of GI covered by the manual (bioretention, porous pavement, subsurface infiltration and detention, etc.) so no updates to the GI Design Manual are required at this time.

B.4 Updates to the City's GI Operation and Maintenance Plan

The City's GI O&M Manual covers the types of GI expected in the LTCP GI Projects. Therefore, the GI inspection and maintenance protocols and scheduling documented in the O&M Plan are expected to remain applicable to the LTCP GI Projects. Not related to the LTCP GI Projects, the City has recently switched to a new computerized maintenance management system (CMMS), so specific references and information in the O&M Plan to the older LucityTM platform are no longer relevant/applicable. The City has transferred the applicable data, workflows, etc. to their new Cityworks CMMS.

B.5 Updates to the City's GI Monitoring Manual

The City's GI Monitoring Manual covers the types of GI expected in the LTCP GI Projects. Therefore, the GI monitoring protocols and scheduling documented in the Monitoring Manual are expected to remain applicable to the LTCP GI Projects. Not related to the LTCP GI Projects, the City has recently switched to a new CMMS, so the limited references in the Monitoring Plan to the older LucityTM platform are no longer relevant/applicable. The City has transferred the applicable data, workflows, etc. to their new Cityworks CMMS.

B.6 LTCP Green Infrastructure Projects not Constructed by the City

Lancaster shall also include documentation describing the process by which Lancaster will evaluate and monitor LTCP GI Projects not constructed by the City to demonstrate the initial and continued performance of such Projects.

The City has implemented a robust process for reviewing and approving stormwater and GI projects required by the City's rigorous stormwater management ordinance and some of these projects may be considered LTCP GI Projects. The ordinance was modified in 2022 to strengthen and clarify the documentation, performance, and O&M requirements for code-required stormwater management facilities. The City's GI Design Manual was also updated in 2024 to facilitate compliance with the revised ordinance. Key elements of the City's process to evaluate potential LTCP GI Projects regarding their initial and continued performance include:

- Technical and administrative review of stormwater/GI design information (e.g., application form, stormwater-related plans and details, geotechnical report, stormwater calculations, post-construction stormwater management (PCSM) report and modeling, and O&M plan).
- Once fully approved, plans and the O&M and easement agreement are recorded with Lancaster County's Office of Recorder of Deeds as a binding covenant on the property in perpetuity.
- Pre-construction, during construction, and final inspections are performed by the City or its contractor. Inspection reports are filed and saved with photo documentation.
- After construction, the applicant is required to provide a certificate of completion and as-built plans, signed by a qualified professional, before any of the escrow funds are disbursed by the City.

Continued performance is ensured by enforceable maintenance plans and evaluated by inspections, both by the landowner and the City. For example, in §260-603 Operation and maintenance (O&M) plan contents:

> *To assure proper implementation, maintenance, and care, SWM facilities should be inspected by a qualified person, which may include the landowner, or the owner's designee (including the City of Lancaster for dedicated and owned facilities), according to the following minimum frequencies:*
>
> 1. *Annually for the first five years.*
> 2. *Once every three years thereafter.*
> 3. *During or immediately after the cessation of a ten-year or greater storm.*

The City is developing inspection checklists/maintenance certifications which will be distributed at the appropriate frequency to owners of LTCP GI Projects for completion and submission to the City. At least every five years, the City or its designee will inspect the LTCP GI Projects not constructed by the City. If there are issues to be addressed, the stormwater ordinance gives the City the authority to require that the property owner complete the necessary corrective actions or for the City to complete them and recoup the costs from the owner. For example, in §260-605 Maintenance of existing facilities/BMPs:

> *If the City of Lancaster determines at any time that any permanent SWM facility has been eliminated, altered, blocked through the erection of structures or the deposit of materials, or improperly maintained, the condition constitutes a nuisance and the City of Lancaster shall notify the landowner of corrective measures that are required, and provide for a reasonable period of time, not to exceed 30 days, within which the property owner shall take such corrective action. If the landowner does not take the required corrective action, the City of Lancaster may either perform the work or contract for the performance of the work and bill the landowner for the cost of the work plus a penalty of 10% of the cost of the work. If such bill is not paid by the property owner within 30 days, the City of Lancaster may file a municipal claim against the property upon which the work was performed in accordance with the applicable laws. The City of Lancaster shall have the right to choose among the remedies and may use one or more remedies concurrently.*

The City may also consider stormwater fee credit projects and other GI projects constructed by others as LTCP GI Projects when appropriate. If so, similar procedures will be followed to demonstrate the initial and continued performance of such projects (for example, stormwater fee credits already have an application and review process, post-construction inspections, and biennial credit renewal requirements).