Economic Impacts of Cape Fear Public Utility Authority's Water and Wastewater Services and Infrastructure Investments

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Contents

Executive Summary

This report demonstrates Cape Fear Public Utility Authority's (CFPUA's) contributions to the local economy by quantifying the economic impacts and benefits associated with the utility's investments in water and wastewater infrastructure. It goes beyond a traditional economic impact assessment of direct spending by CFPUA to also examine the value of water supply reliability for households and businesses, as well as the role CFPUA plays in supporting economic development and growth.

Study area

CFPUA provides water and wastewater services to more than 200,000 customers in the City of Wilmington and unincorporated New Hanover County, North Carolina. Employees and businesses that benefit from CFPUA's activities are located within the broader Wilmington metropolitan area. This study therefore includes the three-county metro region made up of New Hanover, Pender, and Brunswick counties.

In 2022, the three-county region had a gross regional product (value added) of approximately $26.6 billion, while total economic output amounted to more than $49.2 billion. This represents 3.6% of both total value added and economic output for the state of North Carolina, respectively. The businesses and industries in the three-county area employ more than 259,000 people (Table ES-1).

Table ES-1. Key economic indicators, New Hanover County and three-county region, 2022

	New Hanover County	Three-county region
Population	234,921	453,722
Employment	174,925	259,013
Economic Output	$33.4B	$49.2B
Value Added (Gross Regional Product)[a]	$18.8B	$26.6B

Source: IMPLAN, 2022 data

a. Employment is the annual average of monthly jobs in an industry.
b. Economic output represents the total value of industry production (e.g., total sales).
c. Value added or gross regional product is the difference between the economic output of an industry and the cost of its intermediate inputs. It includes labor income, taxes on production and imports, and other property income.

New Hanover County is the economic hub of the region, accounting for 68% of economic output and employment, 71% of value added, and 52% of the population. Key industries include professional, technical, and business support services; finance, insurance, and real estate; communications and utilities; and manufacturing. Tourism is also an important source of economic activity.

Economic impact assessment

An economic impact assessment estimates the change in local economic activity caused by a business, policy, program, activity, or other economic event over a specified period. Within the context of this analysis, examples of economic events include spending by CFPUA on water and wastewater infrastructure, the loss of business revenues resulting from water service disruptions or shortages, and/or the economic growth that is facilitated by the region's access to safe and reliable water and wastewater services. An economic impact assessment traces how economic activity associated with such events

ripples through the local economy, including how it results in changes in economic output, value added, labor income, and employment.

Economists often use Input-Output (IO) models to conduct economic impact assessments. An IO model captures inter-industry relationships within an economy, showing how outputs from one economic sector are used as inputs by other sectors. These models can also capture how incomes from jobs created by economic events are spent in the local economy. For this study, the IMPLAN IO model was used to assess the economic impacts of CFPUA's investments and services.

Economic impact of CFPUA investments

Over the past ten years, CFPUA has invested an average of approximately $44.8 million (2023 USD) annually to improve and expand its water and wastewater systems. The utility has spent another $50.5 million each year (approximately) to operate and maintain these systems. These investments have generated additional economic benefits in the region as directly impacted firms and their employees spend money in the local economy (Table ES-2), creating indirect and induced effects.

CFPUA's investments have supported an average of 1,023 jobs annually over the past decade. **For every $1 million in spending, CFPUA has created 10.7 jobs (or job years) in the local economy**. In addition, over the ten-year analysis period, economic output linked to CFPUA spending amounted to $158 million per year, on average. **Thus, every $1 spent by CFPUA generated a total of $1.66 in economic output in the local economy**. The value added (contribution to gross regional product, GRP) associated with CFPUA expenditures averaged $78 million per year, equal to 0.4% of New Hanover County's GRP in 2022.

Table ES-2. Average annual employment and economic impacts from CFPUA expenditures, 2013 – 2022 (2023 USD)

Impact type	Average annual employment (jobs)	Labor income ($M)	Total value added ($M)	Economic output ($M)
Direct	591	$39.5	$40.4	$88.8[b]
Indirect	215	$12.3	$19.9	$38.6
Induced	216	$9.1	$17.6	$30.4
Total effects[c]	1,023	60.9	$78.0	$157.8

a. Direct employment reflects jobs filled by CFPUA employees, as well as contractors and businesses hired directly by CFPUA. For direct employment, IMPLAN includes all employment created by direct spending, including jobs filled by non-residents, because these jobs occur within New Hanover County.
b. Average annual expenditures are higher than the $88.8 M in direct economic output because margins in retail and wholesale sectors are subtracted from direct effects.
c. Totals may not add due to rounding.

In addition to past spending, CFPUA has significantly increased its planned capital expenditures for the next five to ten years to address aging infrastructure and support a growing population. For fiscal years 2023 through 2027, total operating and capital expenditures are estimated to amount to approximately $142 million per year).[1] These **expenditures will generate $251 million per year in total economic output and support 1,467 jobs annually, on average.[2]** .

[1] Capital expenditure data provided by CFPUA. Operating expenditures for 2023 - 2027 estimated based on historical increases.
[2] Economic output and employment generated by CPFUA varies over time due to differences in the local economy (e.g., percentage of labor and inputs available locally) and differences in spending patterns (e.g., capital/operating expenditure ratio).

Water dependent industries

Water-dependent businesses are those that rely most on the services of water utilities to grow their business. **Water-dependent industries served by CFPUA account for approximately 37% of total economic output and 40% of total employment within New Hanover County.** These businesses generate additional economic activity across the three-county region in the form of indirect and induced spending. **In total, water dependent industries support more than $11.1 billion in economic output and $6.2 billion in total value added within the three-county region, supporting close to 65,500 jobs**.

Value of reliable water services to businesses and industries

Water is an essential input for many industries; even temporary disruptions in service can have major impacts on local businesses. The project team estimated the economic impacts of water service disruptions on municipal and industrial customers by applying industry-specific "resiliency factors" from the literature. Resiliency factors reflect the percentage of economic output that can be achieved in different industry sectors when water service is reduced to zero.

Results indicate that **each day of water service disruption would result in a total economic output loss of between $70.4 and $93.2 million**, depending on the length of the overall outage (e.g., less than one week, one to two weeks, greater than two weeks). Daily impacts within New Hanover County amount to between $650 and $860 per household.

Importance of water services in supporting economic development

Between 2013 and 2022, total economic output in New Hanover County increased by 28% ($7.3 billion in real terms, over and above inflation), while employment grew by 27%. The growth in New Hanover County created an additional $774 million in economic output in Pender and Brunswick Counties through indirect and induced effects.

The economic growth that occurred in New Hanover County over the past decade could not have been achieved without CFPUA's provision of reliable water services. Between 2013 and 2022, CFPUA's total expenditures amounted to $953 million (total capital and operating). **Every $1 spent by CFPUA contributed to $8.5 in growth across the three-County region.**

Comparison to other utilities

Comparison of CFPUA's average annual operating and capital expenditures for fiscal years 2020 to 2022 to expenditures by 14 other utilities across the Southeast indicates that spending across these utilities varies widely. Across the other utilities, per capita capital and operating expenditures amount to $333 and $367, respectively. CFPUA falls below the average with per capita capital and operating expenditures of $271 and $298, respectively.

The project team also examined multipliers associated with infrastructure investments. Multipliers estimate the impact of spending by a utility on the labor and economic activity in the region. Our analysis indicates that every $1 million spent by CFPUA in 2022 supported ten jobs within New Hanover County. Further, every dollar spent by CFPUA generated an additional $0.79 of economic activity in the local economy. **CFPUA employment impacts and output multipliers are 8% and 9% higher, respectively, than the average for the five other utilities located in North Carolina.**

1. Introduction

Cape Fear Public Utility Authority (CFPUA or Authority) provides water and wastewater services to more than 200,000 customers who reside within the City of Wilmington and unincorporated New Hanover County in North Carolina. The Authority was created in 2007 through an agreement by the New Hanover County Board of Commissioners and Wilmington City Council to consolidate their water and sewer utilities. Today, CFPUA owns, operates, and maintains an extensive water distribution and wastewater collection system that includes two drinking water treatment plants, two wastewater treatment plants, surface water and groundwater management facilities, elevated water tanks, pump stations, and several thousand miles of water and sewer lines.

As the provider of essential water and wastewater services, CFPUA protects the health and safety of residents, keeps businesses running, and supports economic growth across the region. CFPUA is recognized within North Carolina and nationally for proactively addressing per- and polyfluoroalkyl substance (PFAS) contamination through extensive upgrades to its Sweeney Water Treatment Plant (completed in 2023). The utility has invested heavily in source-water protection efforts and continues to prioritize upgrades and maintenance of water infrastructure approaching the end of its expected useful life. CFPUA is currently planning for the replacement and modernization of its Southside Wastewater Treatment Plant. The new plant will help to ensure continued regulatory compliance and accommodate projected growth within the service area.

This report demonstrates CFPUA's important contributions to the local economy by quantifying the economic impacts and benefits associated with the utility's investments in water and wastewater infrastructure. It goes beyond a traditional economic impact assessment of direct spending by CFPUA to also examine the value of water supply reliability for households and businesses and the role of reliable water services in supporting economic development across industry sectors.

The goal of this effort is to help CFPUA communicate the value of its investments and services and to inform future planning efforts and reports, including budget and financial plans, annual financial reports, bond documents, and other published information. CFPUA can also use these results to inform policy decisions. The target audience of this report is broad and includes CFPUA Board members and staff, customers, community members, and other key stakeholders.

The remainder of this report is organized as follows:

- Section 2 provides background on economic impact assessment and the methodology used for this report.
- Section 3 presents findings from a review of relevant literature on the economic benefits and impacts of water and wastewater investments and water supply reliability.
- Section 4 presents the results of the economic impact assessment, including the positive economic impacts generated by CFPUA's capital and operating expenditures, the benefits of avoided water service disruptions due to continued investments, and the role of CFPUA in supporting economic growth and development.
- Section 5 compares CFPUA's economic impact with those of other utilities.

2. Economic Impact Analysis

The study uses economic impact analysis and other approaches to quantify the economic activity generated by water infrastructure projects, the contribution of water-dependent businesses to the local economy, and the value of water supply reliability to households, businesses, and economic growth. These economic impacts and benefits depend on the essential water services that CFPUA provides.

An economic impact assessment estimates the change in economic activity resulting from spending or job creation generated by a local business, government agency, policy, program, or other economic event. In the context of this analysis, examples of economic events include spending by CFPUA on water and wastewater infrastructure, the loss of business revenues resulting from increased water service disruptions, and/or the economic growth that is facilitated by the region's access to safe and reliable water and wastewater services. An economic impact assessment traces how economic activity associated with such events ripples through the local economy, including how it results in changes in industry output, labor income, employment, and profits.

Economists often use Input-Output (IO) models to conduct economic impact assessments. An IO model captures inter-industry relationships within an economy, showing how outputs from one economic sector are used as inputs by other sectors. These models can also capture how incomes from jobs created by economic events are spent in the local economy. Economic impacts are categorized as follows:

- Direct effects are production changes associated with the immediate effects of an economic activity (e.g., spending on public infrastructure projects).
- Indirect effects are production changes resulting from various rounds of re-spending by industries that experience direct impacts.
- Induced effects are the changes in economic activity resulting from household spending of income earned directly or indirectly from additional spending.

For example, as shown in Figure 1, replacing water infrastructure approaching the end of its expected useful life results in direct spending on construction contractors (direct effect). Construction contractors spend this money on goods and services that they need to operate their businesses (indirect effect). Direct and indirect spending generates employment, creating additional income for households, some of which is spent in the local economy (induced effect). Total economic impacts represent the sum of the direct, indirect, and induced effects within a defined study area, accounting for the "leakage effects" that occur when households, businesses, and agencies purchase goods and services from outside the local region.

For this assessment, the project team used an IMPLAN model to assess economic impacts associated with CFPUA's investments and services. IMPLAN is an economic impact/IO model that uses actual dollar amounts of all business transactions occurring in a local economy, as reported each year by businesses and government agencies. IMPLAN contains this data for 546 industry sectors. IMPLAN was selected because it is the industry standard model for analysis done at a local level. In addition, IMPLAN allows for extensive customization (as necessary) and contains significant local economic data that can be used to develop key project assumptions and cast results in context.

Figure 1. Direct, Indirect, and Induced Effects

Using the IMPLAN model, the change in key economic indicators associated with direct, indirect, and induced effects can be calculated, including economic output, total value added, labor income, and employment. Economic output represents the sale of all goods and services in a local economy and the inputs required to produce those goods and services (i.e., the value of industry production). As shown in Figure 2, economic output for an industry or sector is equal to the sum of:

1. the amount that the industry spends on intermediate inputs; and
2. total value added.

Total value added is equal to the sum of labor income, other property income, and any taxes on production and imports that the industry pays. Labor income is the sum of employee compensation (wages and benefits) and proprietor income (profit). IMPLAN calculates employment associated with changes in economic output based on local data for relevant industries.

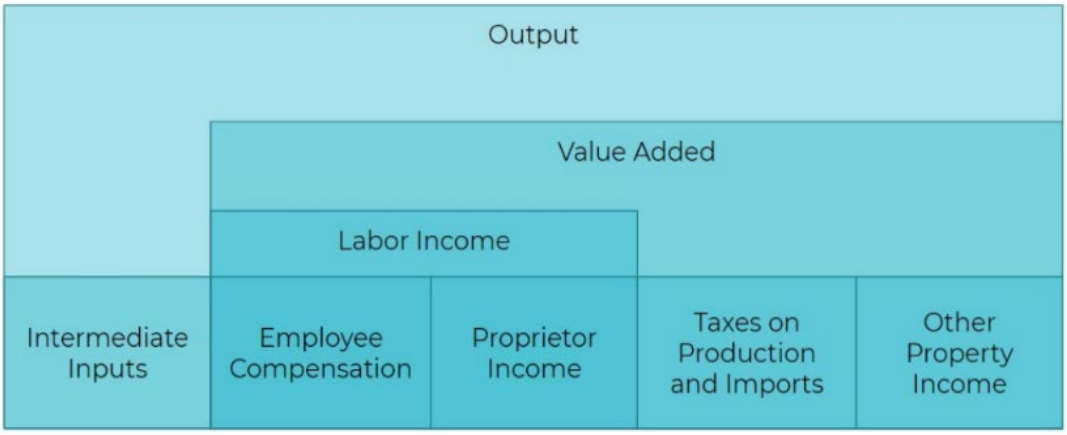

Figure 2. IMPLAN key terms

While this report focuses on economic impact/IO analysis, there are many ways to demonstrate the value of investments in water resources and water infrastructure and the benefits of safe and reliable water sector services. The approach to valuation varies depending on the stakeholder and circumstance in question, as well as whether ongoing expenditures, new investments, or avoided costs are being examined.

3. Findings From the Literature

This section provides an overview of studies related to the economic impact of water sector spending and the value of reliable water and wastewater services for households, businesses, and local economies. The studies exemplify the range of potential benefits and economic impacts that can be examined within this context. The range of studies reviewed also demonstrate that the methodologies applied in this report are based on standard economic practices and the findings are consistent with similar, national-level studies. Unless otherwise noted, dollar values in this section have been updated to 2023 USD.

3.1 Economic impact of water sector spending

Spending to operate, maintain, and expand water and wastewater services generates benefits in the form of direct, indirect, and induced economic activity. Results from studies that have quantified these impacts vary depending on the economic characteristics and size of the study area. For example, much of the research included in this review focuses on national-level assessments; the impact per dollar of spending reported in these studies is typically larger than in smaller economies (e.g., an individual county or service area) because they include a much larger area from which to purchase inputs and hire employees.

National studies highlighting the economic impact of water infrastructure investments include a 2014 survey by the Water Research Foundation (WRF) and the Water Environment Research Foundation (WERF) of 30 utilities that collectively provide (at the time of the study) water and wastewater services to 83 million people across the country. In aggregate, these utilities reported plans to spend $22.9 billion per year that would result in a direct economic impact (from 2014 to 2023), with approximately 60% spent on operating and maintenance and 40% on capital infrastructure investments. The study found that these expenditures would generate $66.9 billion per year in annual economic output over the decade after the survey was conducted. This means that every dollar spent by the utilities would result in an *additional* $1.93 of spending nationally (for a total output multiplier of 2.93, reflecting the original $1 in spending plus the additional $1.93 generated in terms of indirect and induced effects). Utility expenditures were also projected to support 289,000 permanent jobs each year; the study reports that every $1 million in spending by utilities generates a total of 12.5 jobs (Quinn et al. 2014).

Building on the 2014 study described above, in 2016 WRF and WERF commissioned an economic impact study for the Value of Water Campaign (VOWC) to examine the effects of national investments in water, wastewater, and stormwater infrastructure on economic growth and employment. The study reported that if water sector infrastructure needs were fully funded, the national economy would gain close to $280 billion in additional economic output and approximately 1.3 million jobs per year. Every dollar spent on water infrastructure would create an *additional* $1.71 in spending in the form of indirect and induced effect (for a total output multiplier of 2.71).

The study also reported that for every $1 million invested in water sector infrastructure, upwards of 12 jobs are generated in the national economy. The authors found this ratio to be comparable to public investments in energy, health care, and transportation, and greater than military spending and personal income tax cuts. Further, the analysis showed that employment opportunities in water infrastructure sectors are stable, well-paying positions providing an average wage of $63,000 per year (2016 USD), approximately 20% above the national average at the time. Employment gains would be concentrated in construction-related occupations, many of which can be accessed with a high school diploma (Quinn et al. 2016).

A 2020 update of the VOWC study modeled the economic benefits associated with the level of investment necessary to meet 100% of the nation's water infrastructure needs, noting that in 2019 local, state, and federal funding levels met only 37% of this amount. The study found that closing the water infrastructure funding gap would add over $545 billion to our nation's GDP and create $793 billion in economic output by 2039 (in that year). It would also generate 798,000 jobs. More than 60% of the jobs supported by the investments would be in construction and professional services (VOWC/ASCE 2021).

The above-referenced studies are helpful aids in understanding the value of water services at a national scale. However, the 2014 WRF/WERF study described above (Quinn et al. 2014) also reported the economic impacts associated with investments and spending by individual utilities at the local level. Figures 3 and 4 show results for utilities located in the southern region of the U.S. and that are similar to CFPUA in terms of overall spending and size. For example, Figure 3 shows that in Louisville, Kentucky, total water and wastewater spending was projected to be $396 million per year (average over the 10-year analysis period), resulting in $779 million in economic output within the local economy (defined as the Louisville Metropolitan area). This means that every dollar spent on water and wastewater infrastructure would generate a *total* of $1.97 in spending (this represents the total output multiplier). Continuing with the same example, Figure 4 shows that every million dollars spent by the Louisville water and wastewater utilities (combined) creates 10.9 local jobs. In addition to the utilities included in the WRF/WERF study, we have also added Charlotte Water, for which the project team conducted a similar analysis. All results have been adjusted to 2023 USD.

Another local example relevant to the economic effects of a single municipal infrastructure project can be found in a grant proposal for a $9.5 million sewer project submitted by officials in Orange County, Florida. An analysis supporting the grant proposal found that the project would not only lead to immediate employment benefits (i.e., associated with project design/construction), but would enable the creation of new businesses and employment opportunities over the long term in an area that was not previously served by the sewer system. Specifically, the analysis reports that the project would support 188 short term jobs and would generate over $19 million in direct and indirect economic output, while the long-term outlook (over an 8- to 10-year period) envisioned up to an additional 290 jobs and $28.7 million in economic output. Depending on long-term retail employment trends, projected increases annual economic output ranged from $1.7 million to $11.6 million (Orange County BCC 2021).

Even without major investments in infrastructure, the annual operations and maintenance of water and wastewater services have a major impact on local and regional economies. A study conducted by the U.S. Conference of Mayors examined Bureau of Economic Analysis (BEA) benchmark data on input-output multipliers for ongoing operations of the water service sector (Krop et al. 2008). These estimates showed that across the United States, every $1 of output in the water and wastewater industry generates an additional $1.62 of economic output per year (for a total output multiplier of 2.62). Similarly, for every job in the water and wastewater sector, an additional 3.68 jobs are created across all industries.

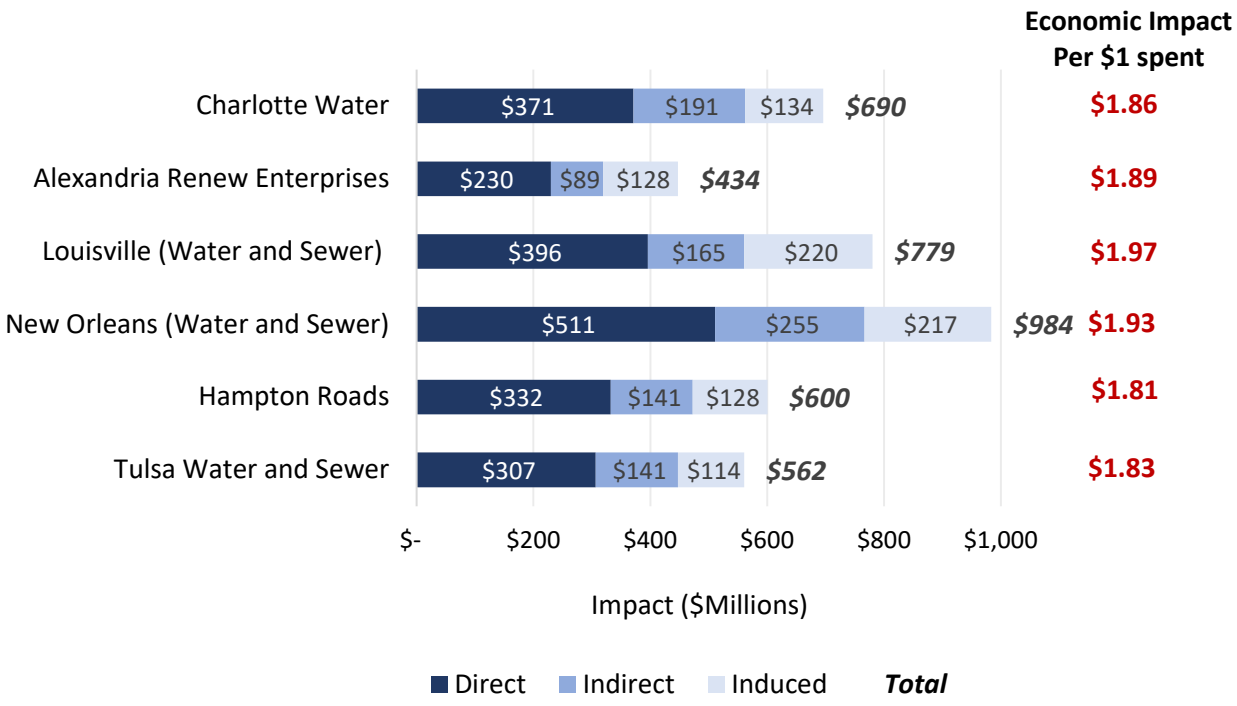

Figure 3: Economic Output Impacts of Utility Spending 2014 –2023

*Select utilities from southern region included in WRF/WERF 2014. Note: Red numbers represent total output multipliers – the total economic output generated in the local economy per dollar spent by the utility.

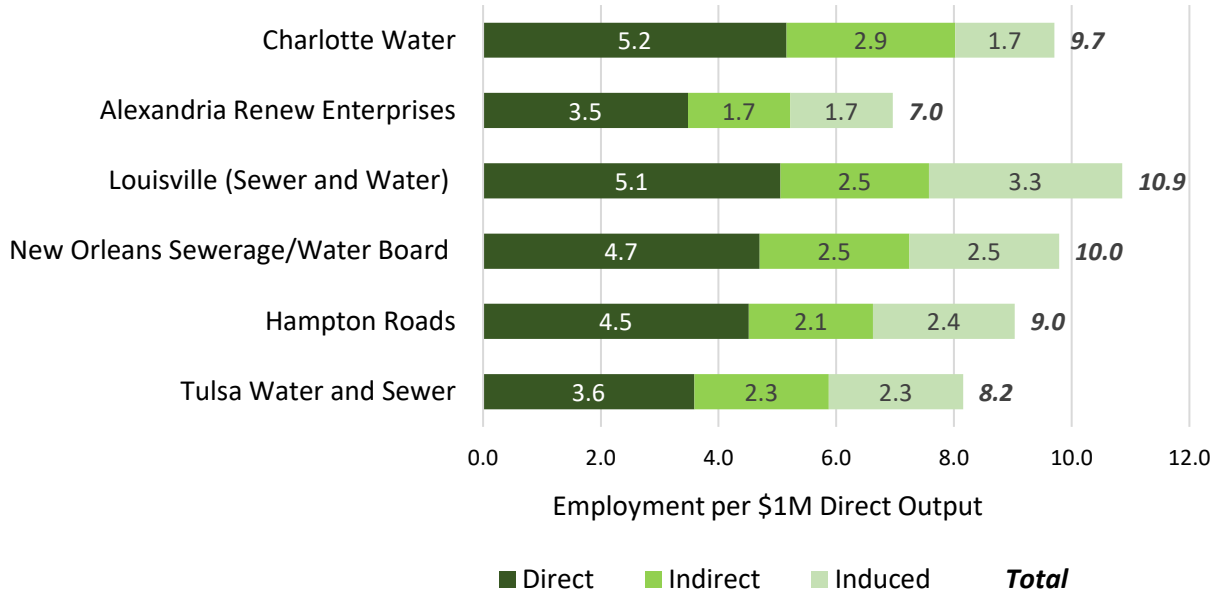

Figure 4: Jobs created per $1 million of utility spending

*Select utilities from southern region included in WRF/WERF 2014.
Totals may not sum due to rounding.

3.2 Value of water supply reliability

Significant portions of the nation's water and wastewater infrastructure rely on aging pipes nearing the end of their useful life and systems with inadequate capacity to deliver water and manage the wastewater needs of growing populations. In some areas of the country, water supplies are becoming increasingly scarce and/or significant investments are needed to ensure that all households have access to safe, clean drinking water. Water infrastructure failures can result in significant water loss, water service disruptions, impediments to emergency response, damages to other essential infrastructure through flooding, and in extreme cases, public health issues. Water is essential not only in households but as an input to many industries; even temporary, minor service disruptions can have major impacts across a localized economy.

As an initial matter, investments in safe, secure drinking water infrastructure are a high priority for voters across the country. A 2023 poll conducted by the Value of Water Campaign (VOWC) determined that over 85% of voters consider a reliable water supply to be either very or extremely important. This result compares favorably with other priorities, including strengthening the economy and reducing inflation, which had nearly identical poll results (VOWC 2023). CFPUA's customer base also highly values water supply reliability – in a recent customer satisfaction survey, 83% of respondents ranked reliability of drinking water service as their top priority for the utility.

Several studies have quantified the economic impact of water service disruptions for businesses and households. In the WRF/WERF (VOWC 2016) study described above, the authors report that at a national scale, every day of water service disruption would result in an aggregate daily loss of $54.8 billion in sales. An average U.S. business would lose $290 in sales per employee. In businesses most reliant on water, such as many manufacturing sectors, laundry services, and others, sales could drop by up to 75%, increasing losses to $7,300 per employee, on average (VOWC 2016). Based on this data, the authors estimate that an eight-day national disruption in water service would amount to a 1% loss in annual GDP (in 2016) and put 1.9 million jobs at risk.

The 2020 update to this study evaluated the "cost of inaction" if the funding gap in water and wastewater infrastructure is not addressed. The authors estimated that if investments continue at current levels (i.e., covering only about one-third of total need), water service disruptions due to deteriorating water infrastructure would cost water-dependent industries $296 billion in 2039, up from an estimated $60 billion in 2019. In addition, service disruptions, street flooding, shutdowns, and storm damage would increase costs for businesses and consumers. Between 2019 and 2039, these impacts would result in a $3.4 trillion reduction in the nation's GDP (a 1.2% decrease) and $5.3 trillion in lost economic output. By 2039, 636,000 jobs would be lost annually (VOWC & ASCE 2021).

The 2020 VOWC study also examined household impacts, finding that full investment in the nation's water-related needs would contribute to an avoided $9.1 billion in medical costs between 2019 and 2039, as people would see fewer incidences of illness, hospitalizations, and lost working days. In addition, if the funding gap is not addressed, household costs associated with drinking water outages, sewer overflows, stormwater drainage problems, and climate-related flooding will increase from $2.4 billion in 2019 to more than $16 billion in 2039. This includes the costs of having to find alternative water supplies and temporarily or permanently relocate, as well as costs associated with cleanup, rehabilitation, and structural repair.

The U.S. Federal Emergency Management Agency (FEMA) also evaluates household costs associated with loss of service. As part of its cost-benefit analysis for proposed infrastructure improvements, the agency requires the application of standard values associated with the loss of water and wastewater service per

person per day. The standard values for Potable Water and Wastewater were determined based on the impact that utilities have on the regional economy and to residential use. FEMA currently values the loss of potable water services at $143 per person per day, and the loss of wastewater services at $68 per person per day (2023 USD, FEMA 2023).

The Water Reuse Research Foundation (WRRF) published two studies on the value of water supply reliability to residential users and to commercial, institutional, and industrial (CII) users (Raucher et al. 2013 and Raucher et al. 2015, respectively). The first of these studies surveyed customers across five water utility service areas to develop estimates of households' willingness to pay for water supply reliability. Values for reliability were determined based on household willingness to pay to avoid future water use restrictions related to drought. Results showed that households were willing to pay $85 to $143 per year to avoid one-year of severe restrictions on outdoor water use over the next 20 years. Customer willingness to pay to avoid less restrictive measures was significantly lower and not statistically significant from $0.

The second study focused on the value of water reliability for CII sectors (Raucher et al. 2015). This research effort derived CII water use from utility billing data for five case study utilities, and overlayed economic data with the utility's water use data. The researchers identified the largest CII water users including industrial businesses, hospitals, hotels, and institutions (e.g., universities, parks departments, military installations). The findings of this research reveal the reliance of CII businesses on water services. The report estimated revenues generated per thousand gallons (kgal) of water used and jobs supported per million gallons (MG). The industrial sector averaged $111,799 per kgal in revenue and 372 jobs per million gallons (MG) annually. For the commercial sector, average revenues were $37,243 per kgal and 186 jobs per MG annually.

In 2019, the authors of this report completed a study on the economic impact of the potential failure of a large water supply pipeline in California that could be caused by a large, catastrophic event such as an earthquake. This study quantified the economic impacts associated with reduced water deliveries resulting from the infrastructure failure, assuming two scenarios for outage duration and percent reductions in delivery (with complete service restored within 60 days under both scenarios). The loss in total economic output for these scenarios ranged from 1.4% to 2.6% of total annual economic output for the County that made up most of the utility's service area. The most significant impacts of a catastrophic failure affected the finance, insurance, and real estate sectors, as well as nondurable manufacturing.

4. Economic Impact of CFPUA

This section presents the economic impacts and benefits associated with CFPUA's investments in providing reliable water and wastewater services. First, we provide a summary of economic indicators for the study region. Figure 5 provides definitions for the key terms discussed in this section.

4.1 Overview of local economy

While CFPUA serves households and businesses in New Hanover County, economic activity does not follow county boundaries. Employees and businesses that support or indirectly benefit from CFPUA's activities are located within the broader Wilmington Metropolitan Area. To ensure the full economic impact of CFPUA's investments are captured, this study includes the three-county region made up of New Hanover, Pender, and Brunswick counties in North Carolina. This section presents data for New Hanover County and the three-county region and compares key indicators to state level data, as relevant.

Figure 5: Key terms for economic impact analysis

Economic output represents the total value of industry production (e.g., total sales).

Value added or gross regional product is the difference between the economic output of an industry and the cost of its intermediate inputs. It includes labor income, taxes on production and imports, and other property income.

Labor income includes employee compensation (wages, benefits, and taxes paid by the employer) and proprietor income (one form of profit).

Employment is the annual average of monthly jobs in an industry. Thus, one job lasting 12 months equals two jobs each lasting six months.

Based on data from the IMPLAN model (Table 1), the three-county region has a gross regional product (or value added) of approximately $26.6 billion (2023 USD), while total economic output amounts to $49.2 billion. These totals respectively represent approximately 3.6% of the total value added and economic output for the state of North Carolina. The businesses and industries in the three-county area employ more than 259,000 people. New Hanover County is the economic hub of the region, accounting for approximately 68% of economic output, 71% of value added, 68% of total employment, and 52% of the population.

Table 1. Key economic indicators, New Hanover County and the three-county region

	New Hanover County	Three-county region
Population	234,921	453,722
Employment	174,925	259,013
Economic Output	$33.4B	$49.2B
Value Added (Gross Regional Product)[a]	$18.8B	$26.6B

Source: IMPLAN, 2022 data; dollar values updated to 2023 USD using consumer price index

a. Total value added is one component of economic output (i.e., value added and economic output are not additive). It includes labor income, taxes on production/imports, and other property income.

Table 2 and Figure 6 present the makeup of economic output and employment by industry sector within New Hanover County. As shown, key sectors include business and repair services and finance, insurance, and real estate (FIRE), which together account for close to one-third of total industry output and 30% of employment. Communications and utilities and the manufacturing sector also make up a relatively significant portion of overall economic output but account for a much lower percentage of total employment. Figure 7 compares the industry makeup of the County (based on economic output) to the state overall. As shown, New Hanover County has a higher relative makeup of communication and utilities, construction, and health services sectors, and a lower relative output in manufacturing.

Although not directly represented in the industry categories above, tourism remains an important component of the Wilmington-area economy. A recent study by Visit North Carolina, a unit of the Economic Development Partnership of North Carolina, reports that domestic visitors to and within New

Hanover County spent an estimated $930 million in 2021. This represents a new benchmark, exceeding the pre-pandemic high of $656 million in 2019. The travel and tourism industry directly employs more than 6,143 people in New Hanover County – close to 4% of total County employment, as reported by IMPLAN. The report states that New Hanover County currently ranks seventh in visitor spending among North Carolina's 100 counties (Economic Development Partnership of North Carolina 2022).

The Wilmington metro area is growing in targeted ways. Over the last ten years, the focus on tourism has shifted toward an increased emphasis on professional services. From 2010 to 2020, the professional and business services sector saw an increase in employment of 31%. The trade, transportation, and utilities sector and the education and health services sector both realized a 22% increase over the same period. Between 2010 and 2019, the leisure and hospitality sector saw a 22% increase in jobs (Dill 2021).

Local business leaders have identified several target industries for growth (Wilmington Business Development 2023):

- Financial services and technology
- Distribution and logistics
- Food processing
- Aviation
- Pharma/clinical research
- Call centers/customer services
- Advanced manufacturing

Table 2. Economic output by industry category, New Hanover County ($M, 2023 USD)

Industry sector	Total Output	% of Total Output
Business/repair services[a]	$5,545	17.4%
Finance, insurance, real estate	$5,117	16.1%
Manufacturing	$3,456	10.9%
Health services	$3,074	9.6%
Communication/utilities	$2,932	9.2%
Construction	$2,453	7.7%
Retail Trade	$2,030	6.4%
Entertainment	$1,931	6.1%
Wholesale trade	$1,763	5.5%
Personal services	$852	2.7%
Other services	$841	2.6%
Transportation and warehousing	$790	2.5%
Educational services	$773	2.4%
Mining	$251	0.8%
Agriculture	$46	0.1%
Total	$31,854	

a. Business and repair services includes a range of professional, technical, and service industries, including scientific research and development, legal services, architecture and engineering, services to buildings, landscaping, business support services, among others.

At least half of the industry sectors on this list are notable for their water dependence (see Section 4.3). On its website, Wilmington Business Development touts the area's abundant water and wastewater infrastructure as a key asset in supporting food processing and beverage manufacturing. The importance of resilient water infrastructure as a driver for economic development is also highlighted in New Hanover County's 2024-2028 Strategic Plan. As discussed below, the provision of safe and reliable water sector services will play a key role in supporting established industries, promoting growth in local businesses, and continuing to attract high-value employers.

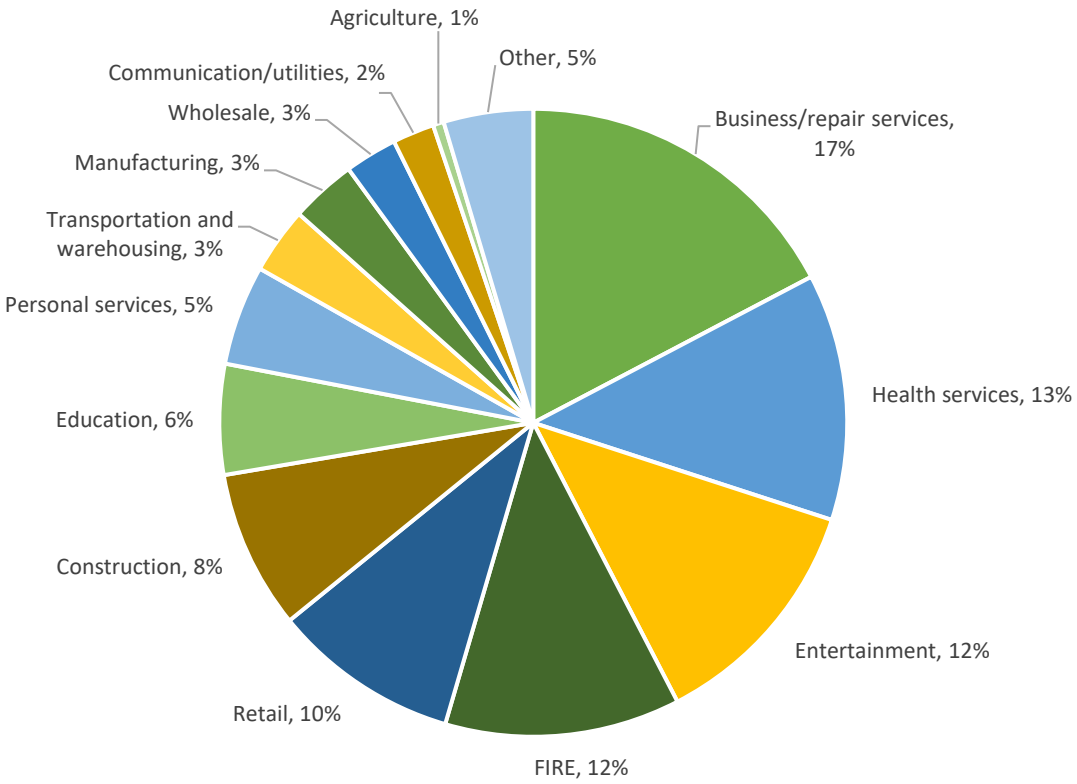

Figure 6. Total employment by industry category, New Hanover County

Source: IMPLAN, 2022 data

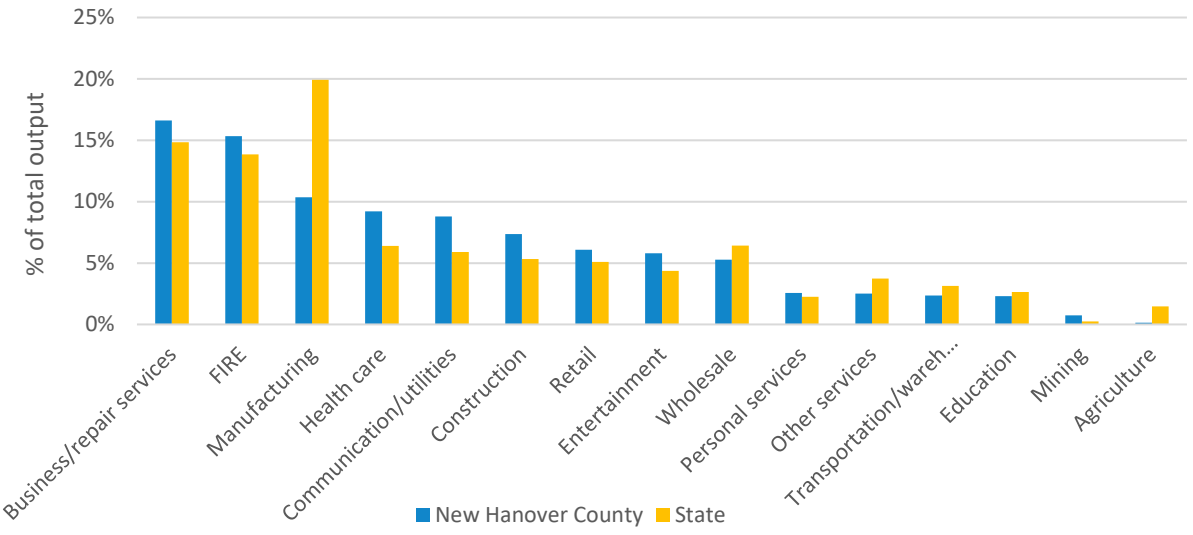

Figure 7. Industry contribution to economic output, New Hanover County and State of North Carolina

Source: IMPLAN, 2022 data

4.2 Economic impact of CFPUA's investments

4.2.1 Historical spending

From FY2013-2022, CFPUA invested an average of approximately $44.8 million (2023 USD) annually to improve and expand its water and wastewater systems (i.e., capital expenditures). The utility has spent another $50.5 million (2023 USD) each year (approximately, on average) to operate and maintain these systems (i.e., operating expenditures).[3] These investments have increased over time to meet needs associated with infrastructure approaching the end of its expected useful life, an expanding customer base, and public health protection.

Table 3 shows CFPUA's operating and capital expenditures for 2013 through 2022. From 2013 to 2022, total CFPUA investments increased by 52% in real terms (i.e., above general rate of inflation); over this period, the number of CFPUA's service connections grew by 15% (CFPUA 2022).

Table 3. CFPUA operating and capital expenditures, 2013 – 2022 ($000s USD, nominal terms)

Year	Operating expenditures	Capital expenditures	Total
2013	$29,964	$18,918	$48,882
2014	$30,285	$28,263	$58,548
2015	$30,579	$33,768	$64,347
2016	$32,993	$28,517	$61,509
2017	$41,501	$24,213	$65,714
2018	$44,463	$31,020	$75,483
2019	$50,926	$54,101[a]	$105,027
2020	$57,612	$67,726	$125,338
2021	$64,365	$66,473	$130,838
2022	$56,826	$37,300	$94,126
Total	$439,514	$390,298	$829,812

Source: CFPUA Annual Financial Reports 2013 – 2022; values shown in nominal terms, meaning they reflect the amount spent in that year.

a. The relatively significant increases in capital expenditures in 2019 through 2021 reflect CFPUA's investments in treating PFAS contamination at Sweeney Water Treatment Plant.

The expenditures shown in Table 3 include payments for goods and services that support the design, engineering, and construction of water and wastewater systems and/or other CFPUA activities. As described above, this spending generates additional economic activity as directly impacted firms and employees spend money in the local economy. To capture this economic activity, the project team used a multi-regional input-output analysis (MRIO) in IMPLAN. This method recognizes that while initial spending occurs in New Hanover County (by CFPUA), the County's economy is closely linked to surrounding counties. An MRIO evaluates impacts across all three counties, essentially expanding the "local economy" beyond

[3] Capital and operating expenditures reflect totals reported in CFPUA Annual Financial Reports.

New Hanover County to better reflect actual conditions. Spending was modeled in 2023 USD; however, each year of spending was modeled in the appropriate IMPLAN data year to account for changing economic conditions over time. Operating and capital expenditures were modeled separately to account for differences in spending patterns, as was compensation for CFPUA employees. Debt service payments were excluded from this analysis. Finally, the analysis assumes that all capital expenditures were spent over the 10-year period.

Table 4 shows the direct, indirect, and induced employment generated by CFPUA's annual spending over the past decade. As shown, the Authority has supported 1,023 jobs annually (on average), including 591 direct jobs and an additional 432 indirect and induced jobs. Every $1 million in CFPUA direct spending generates 6.2 direct jobs and an additional 4.6 indirect and induced jobs in the local economy (10.7 total jobs). The average annual wage associated with the direct jobs created by CFPUA amounts to $66,824. This compares to a median household income of $63,800 for Wilmington (ACS 2022).

Table 4. Average annual employment impacts associated with CFPUA expenditures, 2013 – 2022

Impact type	Average annual employment (2013 – 2022)	Employment generated per $1M spent by CFPUA	Average wages (2023 USD)
Direct	591[a,b]	6.2	$ 66,824
Indirect	215	2.3	$ 57,125
Induced	216	2.3	$ 41,988
Total effects	1,023	10.7	$ 59,532

a. Direct employment reflects jobs filled by CFPUA employees, as well as contractors and businesses hired directly by CFPUA. For direct employment, IMPLAN includes all employment created by direct spending, including jobs filled by non-residents, because these jobs occur within New Hanover County.
b. Numbers may not add due to rounding

Employment impacts change with spending patterns, as well as with shifts in the economy. For example, from 2019-2021, CFPUA significantly increased its ratio of capital to operating expenditures to invest in upgrades to the Sweeney Water Treatment Plant. In those years, the overall number of jobs attributable to CFPUA spending increased, but the jobs created per $1 million spent by CFPUA slightly decreased. This is likely because the CFPUA had to draw more on outside labor to complete the specialized upgrades and/or because the spending was more capital intensive than labor intensive relative to past expenditures.

Table 5 presents the average annual direct, indirect, and induced effects of CFPUA's expenditures on economic output and total value added within the three-county region. Results show that over the ten-year analysis period, average annual economic output linked to CFPUA spending amounted to approximately $158 million. For every $1 dollar spent by CFPUA, a total of $1.66 in economic output was generated in the local economy (output multiplier). The average value added (contribution to gross regional product) associated with CFPUA expenditures was approximately $78 million, equal to 0.4% of New Hanover County's total value added in 2022.

Table 5: Average annual total value-added and economic output impacts of CFPUA operating and capital expenditures, 2013-2022 ($M, 2023 USD)

Impact type	Total value added[a]	Economic output (output multiplier)
Direct	$40.4	$88.8
Indirect	$19.9	$38.6
Induced	$17.6	$30.4
Total	$78.0	$157.8 (1.61)

a. Total value added is one component of economic output (i.e., value added and economic output are not additive). It includes labor income, taxes on production/imports, and other property income.

CFPUA's spending results in different types of jobs and draws upon different services and inputs for implementation. Table 6 shows the top ten economic sectors impacted by CFPUA investments in 2022, based on total employment generated. Results for each sector include employment, labor income, value added, and economic output generated locally.

Table 6: Top ten economic sectors impacted by CFPUA 2022 operating and capital expenditures, by number of jobs generated (2023 USD)

Industry sector	Total employment (jobs)	Labor income ($M)	Value added ($M)	Economic output ($M)
Water, sewage and other systems	330	$26.0	$26.0	$57.0
Construction of other new nonresidential structures	185	$11.1	$12.1	$29.2
Architectural, engineering, and related services	43	$3.4	$3.7	$6.6
Other real estate	21	$1.5	$1.8	$4.1
Truck transportation	21	$0.5	$1.2	$3.9
Employment services	17	$0.7	$0.9	$1.6
Full-service restaurants	15	$0.5	$0.7	$1.2
Limited-service restaurants	14	$0.4	$0.6	$1.4
Hospitals	13	$1.2	$1.5	$2.6
Wholesale - Machinery, equipment, and supplies	11	$1.1	$2.1	$3.7

On the operating side, the utility's spending supports ongoing jobs for employees and contractors who support CFPUA's activities, although the companies or individuals who fill contractor roles likely change over time or by project. Capital expenditures support some permanent jobs within the utility. However, many of the jobs created by capital expenditures are short term, meaning that they may be associated

with a specific project or program. IMPLAN (and most government agencies) counts jobs on an average annual basis, such that two contractors hired full time by CFPUA to complete two projects that last six months each would be counted as one job. While the jobs supported by CFPUA may be viewed as "short term" in a sense (at least for individual contractors hired on a project or program basis), continuous investments by the utility ensure that employment opportunities are generated year after year.

4.2.2 Planned future investments

In addition to past spending, the project team evaluated the impacts associated with CFPUA's future investments. CFPUA has significantly increased its planned capital expenditures for the next five years to address infrastructure approaching the end of its expected useful life and support a growing population. The North Carolina Office of State Budget and Management (2023) projects that the population of New Hanover County will grow to surpass 259,000 by July 2030, a 14.7% increase from 2020. This compares to the 10% increase that the County has experienced over the last decade. Table 7 shows the projected capital and operating expenses for FY 2023 through FY 2027, indicating that total expenditures are expected to total more than $709 million over the next five years (an average of $142 million per year).

Table 7: Estimated CFPUA operating and capital expenditures, FY2023 – 2027 ($M, 2023 USD)

Year	Operating expenditures	Capital expenditures	Total
2023	$61.4	$36.6	$98.0
2024	$65.2	$52.7	$117.8
2025	$69.3	$162.9	$232.1
2026	$73.6	$83.8	$157.3
2027	$78.2	$25.7	$104.0
Total	$347.5	$361.7	$709.2

*Source: CIP capital expenditure data provided by CFPUA. This study assumed operating expenditures for 2023 - 2027 continue to grow at the same rate as over the past 10 years (approximately 6.9% annually).

The methodology described above was used to model the economic impacts of this spending. The IMPLAN model does not project future changes in the structure of local economies. Thus, future spending was modeled based on IMPLAN's 2021 model year (the latest data available at the time of analysis) for the study region. Table 8 summarizes the average annual direct, indirect, and induced effects for employment, labor income, total value added, and economic output associated with future spending. As shown, CFPUA's planned expenditures will result in $250.6 million per year in economic output (on average) and generate an average of 1,467 jobs per year (for a total of 7,334 job years over the 5-year analysis period). Per dollar spent by CFPUA, a total of $1.77 in economic output is generated in the local economy; 10.3 jobs will be created in the three-county study region for every $1 million of spending.[4] Finally, average annual wages

[4] Multipliers (i.e., economic output generated per $1 spent or jobs generated per $1 million spent) are different for future and past spending due to differences in the ratio of capital and operating expenditures each year, as well as differences in the local economy over time (e.g., changes in labor, goods, and services available locally).

will likely increase, amounting to just over $75,000 for the direct jobs created by CFPUA (this compares to $66,800 per employee on average over the past decade).

Table 8: Average annual economic impacts of estimated CFPUA operating and capital expenditures, FY 2023 – 2027 (2023 USD)

Impact type	Annual employment (jobs)[a]	Labor income ($M)	Total value added[b] ($M)	Economic output ($M)
Direct	841	$63.3	$66.7	$139.6
Indirect	296	$18.6	$30.5	$58.5
Induced	329	$16.3	$30.6	$52.6
Total	1,467	$98.1	$127.9	$250.6

a. Employment reported on an annual basis, while other economic impacts represent totals over the five-year study period.

b. Total value added is a component of economic output (i.e., value added and economic output are not additive). It includes labor income, taxes on production/imports, and other property income.

4.3 Economic contribution of water-dependent industries

WRF defines water-dependent businesses as those that rely most on the services of water utilities to grow their business (Quinn et al. 2016). Several studies (e.g., Raucher et al. 2015, Quinn et al. 2016, VOWC & ASCE 2021) have identified water dependent industries by comparing water use to industry output or sales and/or examining water use across sectors. Based on these studies, as well as data on the largest water users within the CFPUA service area, the project team identified and assessed the contribution of water dependent industries to the local economy. Figure 8 shows the list of industries included in this assessment.

Figure 8: Water-dependent industries

- Manufacturing (all sectors)
- Hospitals and other health care facilities
- Hotels and motels
- Greenhouse, nursery, and floriculture
- Breweries
- Restaurants
- Car washes
- Dry-cleaning and laundry services
- Colleges, universities, and other professional schools

Based on data from the IMPLAN model, water dependent industries served by CFPUA account for approximately 37% of total economic output and 40% of total employment within New Hanover County. These businesses generate additional economic activity across the three-county region in the form of indirect and induced spending. Table 9 shows the total contribution of water dependent industries across the study area – together, these industries support more than $11 billion in economic output and $6 billion in total value added within the three-county region, supporting over 65,000 jobs.

Table 9: Annual contribution of water dependent industries to the three-county region (2023 USD)

Impact Type	Employment (jobs)	Labor Income ($M)	Value Added ($M)	Output ($M)
Direct	47,600	$2,707	$4,479	$7,800
Indirect	10,200	$547	$926	$1,900
Induced	7,700	$355	$829	$1,400
Total	65,500	$3,622	$6,234	$11,100

4.4 Value of reliable water services to businesses and industry

Investments in maintaining and upgrading water infrastructure are necessary to prevent disruptions in water and sewer service. Water is an essential input for many industries; even temporary disruptions in service can have major impacts on local businesses. To demonstrate the value of reliable water service, the project team estimated the economic impacts of water service disruptions on municipal and industrial customers by applying "resiliency factors" developed by Chang et al. (2002).[5] Resiliency factors reflect the percentage of economic output that can be achieved in different industry sectors when water service is reduced to zero.

Chang et al. estimated resiliency factors for three different water service restoration time periods - less than 1 week, 1-2 weeks, and greater than 2 weeks. As shown in Table 10, this means that for a water service disruption lasting less than 1 week, the manufacturing sector (bolded in the table) would maintain 42% of typical economic output. If the outage lasts one to two weeks, achievable economic output decreases to 34%. The resiliency factors were used to estimate the daily loss in direct economic output associated with water service outages of differing durations. This information was entered into IMPLAN to estimate total economic impacts across the 285 relevant IMPLAN-defined sectors present in the CFPUA service area.

Results indicate that *direct* losses in economic output associated with each day of water service disruption range from $42.1 million to $55.3 million depending on the length of the overall outage (i.e., less than 1 week, 1 to 2 weeks, greater than 2 weeks). This creates ripple effects throughout the three-county region. As shown in Tables 11 and 12, a one-day outage would result in a *total* economic output loss of between $70.4 and $93.2 million. An outage that lasted 1 week would reduce economic output by $493 million; a water service disruption that lasted two weeks would result in a $652 million loss each week. This is equivalent to 1.0% and 1.3% of total economic output within the three-county region, respectively. The direct, indirect, and induced effects that would occur in New Hanover County under the same 1-week outage scenarios amount to 1.4% and 1.9% of the County's total economic output. Daily impacts amount between $650 and $860 per household in the County.

[5] This analysis is based on national assumptions that are applied to businesses within New Hanover County. Results will vary based on the local dependence of specific industries on reliable water supplies.

Table 10: Resiliency factors by industry sector, representing percent output achieved with disruption in water service

Business Category Description	Outage Length		
	<1 week	1-2 weeks	>2 weeks
Agriculture	0.53	0.35	0.30
Mining	0.73	0.48	0.44
Construction	0.68	0.47	0.43
Manufacturing[a]	**0.42**	**0.34**	**0.28**
Transportation and warehousing, communication/utilities	0.65	0.49	0.43
Wholesale trade	0.51	0.36	0.3
Retail trade	0.46	0.32	0.28
FIRE (finance, insurance, and real estate)	0.44	0.27	0.24
Business/repair, educational, personal, and entertainment services	0.45	0.33	0.27
Health services	0.27	0.21	0.19
Other services	0.45	0.33	0.27

Source: Chang et al. (2002)

a. Manufacturing in bold font because it is used as example in text above.

Table 11: Total economic impacts (per day) associated with water service disruption lasting less than one week (2023 USD)

Impact Type	Employment (jobs)[a]	Labor Income[b] ($M)	Value Added ($M)	Output ($M)
Direct	-228	($13.7)	($25.0)	($42.1)
Indirect	-87	($4.6)	($7.7)	($16.1)
Induced	-76	($3.7)	($7.1)	($12.2)
Total	-392	($22.0)	($39.7)	($70.4)

a. Results reported for employment represent the number of jobs associated with the loss of economic output and labor income. They do not necessarily represent permanent job losses.

b. Labor income is a component of value added; total value added is the sum of labor income, taxes on production and imports, and other property income. Value added is a component of output; total economic output is the sum of value added and intermediate inputs used to produce goods and services.

Table 12: Total economic impacts (per day) associated with water service disruption lasting more than two weeks (2023 USD)

Impact Type	Employment (jobs)[a]	Labor Income[b] ($M)	Value Added ($M)	Output ($M)
Direct	-301	($18.0)	($32.3)	($55.3)
Indirect	-117	($6.2)	($10.4)	($21.7)
Induced	-101	($4.9)	($9.4)	($16.1)
Total Effect	-519	($29.1)	($52.0)	($93.2)

a. Results reported for employment represent the number of jobs associated with the loss of economic output and labor income. They do not necessarily represent permanent job losses.

b. Labor income is a component of value added; total value added is the sum of labor income, taxes on production and imports, and other property income. Value added is a component of output; total economic output is the sum of value added and intermediate inputs used to produce goods and services.

4.5 Reliable water services and economic development

Between 2013 and 2022, New Hanover County's population grew by 10.2%, increasing from just over 213,000 to 235,000 people (American Community Survey 2013, 2022 1-year average estimates). This represents an annual growth rate of 1%, compared to a national growth rate of 0.5% over the same period. Economic activity within the County grew significantly over this period, with total employment and economic output increasing by 27% and 28%, respectively in real terms (i.e., over and above inflation). Overall, the jobs created over this period were relatively high-paying, as labor income in the County grew by 42% in real terms. As shown in Table 13, growth in economic output has varied widely across industry sectors – ranging from a 44% decline in the manufacturing sector to an increase of more than 110% in the construction industry.

When a business looks to expand or open in a new city or region, it considers everything from tax rates to quality of life. One key part of the decision lies with the availability of municipal utilities. Municipal governments as utility providers play a significant role in promoting economic development activity (MASC 2013). The significant economic growth that has occurred in New Hanover County over the past decade could arguably not have been achieved without CFPUA's provision of reliable water services.

The 28% growth in total economic output from 2013 to 2022 in New Hanover County reflects more than $7.3 billion. Economic activity associated with this growth generated an additional $774 million in indirect and induced economic activity in Pender and Brunswick counties (for a total of $8.1 billion in economic activity). Over the same period, CFPUA's total expenditures amounted to approximately $953 million (total capital and operating, 2023 USD). Thus, every dollar spent by CFPUA helped to support $8.50 of growth in economic output in the three-County region ($8.1 billion divided by $953 million).

This analysis is based on the premise that economic growth depends on reliable water services. As noted earlier, economic growth depends on several factors, including reliable electricity and transportation systems, availability of local labor, and quality of life for employees, among others. While some factors may be more important than others, it is difficult to parse the extent to which each of these factors affect local economies. Arguably however, without reliable water and wastewater services, it would be unlikely that businesses would expand or move to the region, and some may have left.

Table 13: Growth in Economic Output by Industry Sector in New Hanover County 2013-2022[a] ($M, 2023 USD)

Industry sector	Economic output 2013 (2023 USD)	Economic output 2022 (2023 USD)	Percent change[b]	Annual growth rate
Agriculture	$39.5	$46.2	17%	2%
Business/repair services	$3,368.7	$5,545.2	65%	6%
Communication/utilities	$2,624.2	$2,932.2	12%	1%
Construction	$1,166.8	$2,452.6	110%	11%
Educational services	$1,038.5	$773.2	-26%	-3%
Entertainment services	$1,307.9	$1,931.5	48%	5%
FIRE	$3,320.8	$5,116.6	54%	5%
Health services	$1,657.6	$3,073.9	85%	9%
Manufacturing	$6,193.8	$3,456.4	-44%	-4%
Mining	$208.5	$250.7	20%	2%
Other services	$642.8	$840.6	31%	3%
Personal services	$557.4	$852.2	53%	5%
Retail Trade	$1,299.1	$2,030.2	56%	6%
Transportation and warehousing	$498.3	$790.1	59%	6%
Wholesale Trade	$1,169.5	$1,762.9	51%	5%
Other	$957.8	$1,518.7	59%	6%
Total	$26,051.2	$33,373.0	28%	3%

Source: IMPLAN 2022

a. IMPLAN data is only available through 2021 at the time this report is being written.

b. Percent change is in real terms, representing increases or decreases, net of inflation.

5. Comparison to Other Utilities

CFPUA is interested to know how it compares to other utilities in terms of overall spending and impacts on the local economy. To explore this topic, the project team compared average annual operating and capital expenditures from fiscal years 2020 to 2022 for fourteen other utilities across the Southeast. These utilities were selected in consultation with CFPUA staff. Apart from Alex Renew (VA) and Hampton Roads Sanitation District (VA), which are both wastewater utilities, the other utilities selected for this analysis provide both water and sewer services.

This analysis provides useful insights; however, results of this assessment must be carefully evaluated/interpreted. A higher (or lower) level of spending by a utility does not necessarily indicate a positive (or negative) message. For example, per capita capital spending can be much lower for utilities with a high population and who have a smaller geographic service area. A high per-capita capital spending amount could also reflect increasing needs associated with growing populations, regulatory requirements,

infrastructure approaching the end of its expected useful life, and/or past years of under investment that is now being addressed. Operating expenditures also depend on a range of factors unique to each service area including geographic extent, population and housing density, age of infrastructure, impact of severe weather events on infrastructure, and local construction costs, among others.

Table 14 shows that spending across other utilities varies widely (this table is sorted by total expenditures per capita from high to low). CFPUA's per-capita operating and capital expenditures amount to $298 and $271, respectively, on average over the three years. This is lower than the average across other utilities, which amount to $367 (per-capita operating expenditures) and $333 (per-capita capital expenditures).

Table 14: Average Per-Capita FY 2020 – 2022
Operating and Capital Expenditures Per Capita, CFPUA v. Other Utilities

City	Population served by water system	Operating expenditures per capita	Capital expenditures per capita	Total expenditures per capita
Charleston, SC	15,612	$635	$535	$1,171
Greensboro, NC	298,263	$466	$686	$1,162
Washington, D.C.	700,000	$627	$207	$834
Raliegh, NC	461,000	$260	$498	$758
Louisville MSD and Louisville Water, KY	1,750,000	$373	$378	$751
Fayetteville, NC	225,000	$301	$410	$710
Charlotte Water, NC	879,709	$220	$350	$570
Cape Fear PUA, NC	**200,000**	**$298**	**$271**	**$569**
Arlington, TX	392,786	$362	$117	$480
Alex Renew, VA[a]	300,000	$109	$337	$446
Tulsa, OK	411,400	$321	$104	$424
Grand Strand WSA, SC	365,579	$178	$97	$274
Hampton Roads SD, VA[a]	1,900,000	$91	$130	$221
Average	**530,577**	**$367**	**$333**	**$700**

a. Utility only provides wastewater services, excluded from averages

Another way to compare relative impacts is to examine the multipliers for employment and economic output across other utilities. Multipliers estimate the impact of spending by a utility on the labor and economic activity in the region. For example, for every $1 million spent on operations and capital investments, how many jobs are created, and how much economic activity is generated? For this assessment, we limited this comparison to utilities located in North Carolina for which we had access to IMPLAN data that allowed us to model these effects. To allow for a direct comparison, the impacts for each utility were constrained to the county in which the utility is located. Note that this means the multipliers for CFPUA only include impacts in New Hanover County (i.e., they do not include the indirect and induced

effects that occur in Pender and Brunswick counties). Figure 9 below shows the employment generated per $1 million in spending and output multiplier for other utilities in North Carolina.

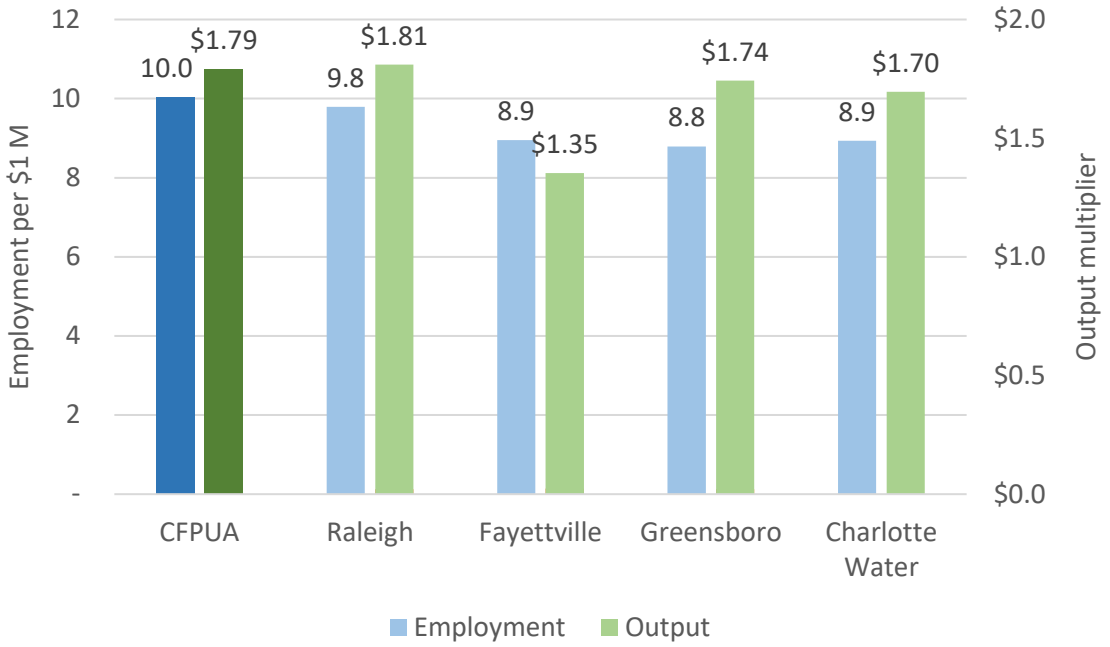

Figure 9. Employment and output multipliers for other North Carolina utilities, FY2022

In FY 2022, CFPUA's operating and capital expenditures amounted to $56.8 million and $37.3 million, respectively, totaling $94.1 million. Using the IMPLAN results at the county level, it was estimated that this spending generated 945 total jobs and $168.7 million in economic output. For every $1 million spent by CFPUA in 2022, 10 jobs were generated within New Hanover County. Further, every $1 spent by CFPUA generated an additional $0.79 of economic activity in the local economy (for a total output multiplier of 1.79). Several of the other utilities in North Carolina have economic multipliers approximately equal in magnitude. However, it is worth noting that CFPUA has the highest employment multiplier and the second highest output multiplier out of the five North Carolina utilities modeled. This means that every dollar spent by CFPUA has a larger impact on the local (i.e., County) economy relative to these other utilities.

In addition, while the numbers may be somewhat similar in magnitude, the percentage differences are more appropriate indicators. Table 15 shows the extent to which the multipliers for CFPUA are higher or lower relative to other North Carolina utilities.

Finally, as an important note, the employment and output multipliers shown for CFPUA are a bit different than shown previously in this report. This is for several reasons, including differences in economic relationships within the County over time (the results shown here are for 2022 only), differences in the ratio of capital to operating expenses in different years (which result in different impacts), and the geographic extent of the analysis (the analysis in this section is limited to New Hanover County only).

Table 15. Employment and output multiplier comparison – CFPUA and other North Carolina utilities

City	Local jobs created per $1 million in spending	CFPUA % increase/decrease compared to other utility	Economic output multiplier	CFPUA % increase/decrease compared to other utility
CFPUA	10.03		1.79	
Raleigh	9.80	+2%	1.81	-1%
Fayetteville	8.95	+12%	1.35	+32%
Greensboro	8.79	+14%	1.74	+3%
Charlotte Water	8.94	+12%	1.70	+6%
Average	9.30	+8%	1.65	+9%

Figure 10 shows per-capita economic output associated with infrastructure investments for CFPUA and the other North Carolina utilities. Of all the utilities, CFPUA's population served of around 200,000 is one of the smallest, and it is smaller than the other utilities in North Carolina included in this analysis. The total economic output generated by CFPUA spending in FY 2022 is estimated to be $168.7 million, resulting in an output per capita of $843. This is the lowest output per capita when compared with the other North Carolina utilities in this report, nearly 20% lower than the average per capita economic output of $1,215 (associated with utility spending) across the five utilities. This is not necessarily a negative outcome but rather indicative of the lower levels of spending by CFPUA and the lower population served compared with the counties served by the other utilities. The opportunities to generate impacts in an economy as (relatively) small as that contained within New Hanover County are limited. For this reason, the preceding sections of this report include impacts in both Brunswick and Pender counties as well.

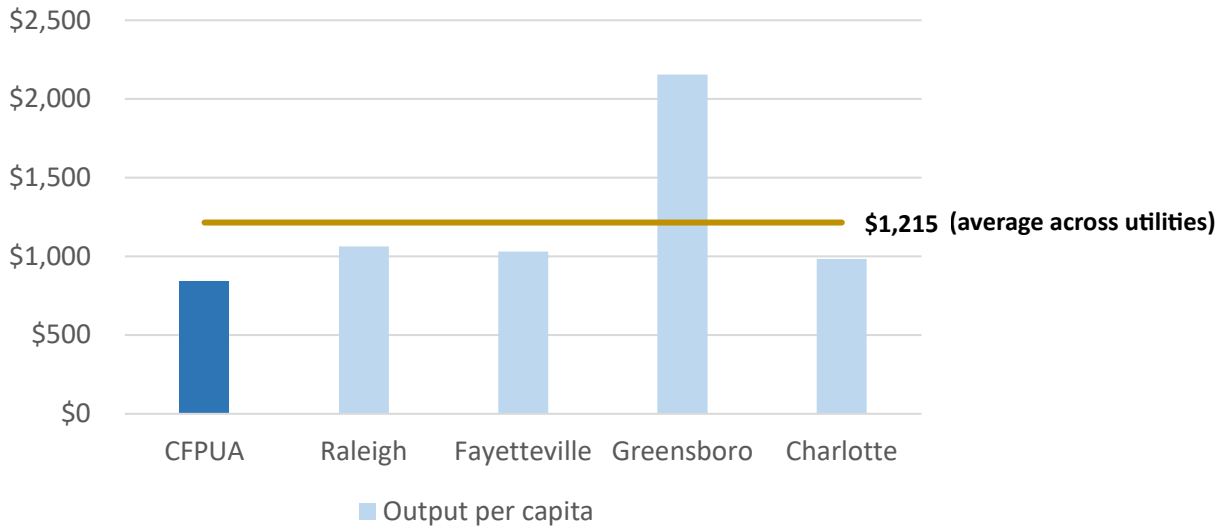

Figure 10. Output per capita for NC utilities, FY2022

6. Summary and Conclusions

This report demonstrates the various ways that CFPUA supports economic activity in New Hanover County and surrounding areas. Over the 10-year study period, CFPUA has invested an average of approximately $95.3 million (2023 USD) annually to improve, expand, and maintain its water and wastewater systems. These investments have generated additional economic activity in the region as directly impacted firms and their employees spend money in the local economy. For every dollar spent by CFPUA between 2013 and 2022, a total of $1.66 in economic output was generated in the local economy, on average.

CFPUA has significantly increased its planned capital expenditures for the next five to ten years to address infrastructure approaching the end of its expected useful life and support a growing population. From 2023 to 2027, total operating and capital expenditures are expected to amount to $142 million per year. These planned expenditures will result in $251 million in economic output and support close to 1,500 jobs per year.

The economic impact associated with CFPUA's water and wastewater services goes beyond the utility's direct spending and associated multiplier effects. CFPUA's activities prevent costly water service disruptions and support water-dependent industries, which account for approximately 37% of total economic output and 40% of total employment within New Hanover County.

The significant economic growth that has occurred in New Hanover County over the past decade could not have been achieved without CFPUA's provision of reliable water services. Between 2013 and 2022, every dollar spent by CFPUA contributed to $8.50 in growth in economic output across the three-county region.

CFPUA also compares favorably, and is on par, with other water and wastewater utilities within the broader region. Analysis of 14 other utilities in the Southeast U.S. indicates that CFPUA spends less per capita to maintain reliable water services. At the same time, every dollar spent by CFPUA generates 8% and 9% greater employment and economic output impacts, respectively, relative to other utilities located in North Carolina.

7. References

American Community Survey (ACS). 2022. *Table S1901: Income in the Past 12 Months (in 2022 Inflation-Adjusted Dollars)*. U.S. Census Bureau. Available: https://data.census.gov/

Cape Fear Public Utility Authority (CFPUA). 2013-2023. *Annual Comprehensive Financial Report*. Available: https://www.cfpua.org/Archive.aspx?AMID=57

Chang, S., W. Svekla, and M. Shinozuka, 2002. *Linking infrastructure and urban economy: simulation of water-disruption impacts in earthquakes.* Environment and Planning B: Planning and Design, Vol 29: 281 – 301.

Dill, Emily. 2021. *Wilmington economy saw a shift in the past decade, with 20,000 jobs added during that time.* Star News Online. Oct. 15, 2021. Available https://www.starnewsonline.com/story/news/2021/10/15/wilmington-nc-jobs-economy-shift-toward-service-sector-20-000/8443178002/

Economic Development Partnership of North Carolina. 2022. *2022 County Level Visitor Expenditures by Percent Change from 2021*. Available: https://partners.visitnc.com/economic-impact-studies.

FEMA. 2023. *BCA Toolkit Version 6.0*. Available: https://www.fema.gov/grants/guidance-tools/benefit-cost-analysis.

Krop, R.A., C. Hernick, and C. Frantz. 2008. *Local Government Investment in Municipal Water and Sewer Infrastructure – Adding Value to the National Economy*. Prepared for the U.S. Conference of Mayors. Available: Estimating the Value-Added to the National Economy from Local Government Investment in Municipal Water and Sewer (cadmusgroup.com)

Lynch, T. 2000. *Analyzing the Economic Impact of Transportation Projects Using RIMS II, IMPLAN and REMI*. Office of Research and Special Programs, U.S. Department of Transportation. Available: https://cefa.fsu.edu/sites/g/files/imported/storage/original/application/18d780904fc532b3cf0bcdcc8a082bfa.pdf

MASC (Municipal Association of South Carolina). 2013. *Municipal utilities play important role in economic development efforts*. Uptown.

New Hanover County, Strategy Department. 2023. *2024-2028 Strategic Plan*. Available: https://www.newhanoversheriff.com/2481/2024-2028-Strategic-Plan.

North Carolina Office of State Budget and Management. 2023. *County/State population projections*. Available: https://www.osbm.nc.gov/facts-figures/population-demographics/state-demographer/countystate-population-projections

Orange County Board of County Commissioners (BCC) and Pine Hills Neighborhood Improvement District. 2021. *Wastewater Treatment System Improvements Purpose and Need Report.*

Quinn, A., C. Safriet, K. Feeney, and V. Lauf. 2014. *National Economic & Labor Impacts of the Water Utility Sector – Executive Report.* Water Research Foundation (WRF) and the Water Environment Research Foundation (WERF). Available: EconomicImpactsoftheWaterUtilitySectorExecutiveReport.pdf (naco.org)

Quinn, A., K. Feeney, and H. Castro. 2016. *The Economic Benefits of Investing in Water Infrastructure*. Value of Water Campaign (VOWC). Available: https://uswateralliance.org/wp-content/uploads/2023/09/Economic-Impact-of-Investing-in-Water-Infrastructure_VOW_FINAL_pages_0.pdf

Raucher, R., J. Henderson, J. Clements, T. Meernik, M. Duckworth, J. Oxenford, J. Kiefer, and B. Dziegielewski. 2015. *The Value of Water Supply Reliability in the CII Sector*. WateReuse Research Foundation. Alexandria, VA.

Raucher, R. J. Clements, C. Donovan, D. Champan, R. Bishop, G. Johns, M. Hanemann, S. Rodkin and J. Garrett. 2013. *The Value of Water Supply Reliability in the Residential Sector*. WateReuse Research Foundation. Alexandria, VA.

Value of Water Campaign (VOWC) & American Society of Civil Engineers (ASCE). 2021. *The Economic Benefits of Investing in Water Infrastructure: How a failure to act would affect the US economic recovery.* Available : https://ascelibrary.org/doi/10.1061/9780784484302.011

Water Environment Federation (WEF) and WateReuse Association (WRA). 2016. *The Economic, Job Creation, and Federal Tax Revenue Benefits of Increased Funding for the State Revolving Fund Programs*. Available: https://watereuse.org/wp-content/uploads/2015/01/WEF-WRA-SRF-Economic-Impact-Study-Report-April-29-2016.pdf

Wilmington Business Development. 2023. *Target Industries***.** Available: https://wilmingtonbusinessdevelopment.com/doing-business-here/target-industries/