Wastewater Collection and Treatment Systems

Asset Management Plan

City of Southport
Brunswick County, North Carolina

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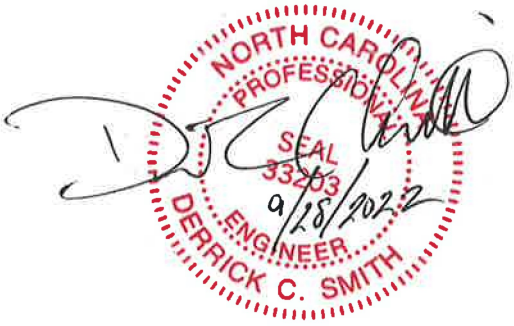

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1. Introduction

This Wastewater Asset Management Plan represents short summaries of technical documents previously completed by The Wooten Company for the City of Southport. These reports were written to investigate and analyze the wastewater collection, reclaimed water system, and wastewater treatment infrastructure. The main bodies of these reports can be found in the corresponding appendices of this Asset Management Plan. This asset management plan focuses on the infrastructure inventory, condition assessment, capital improvements planning, financing, and operation and maintenance of the City's wastewater collection and treatment systems.

2. System Description

The City of Southport is located in the coastal plain of eastern North Carolina. Southport has taken on the responsibilities of constructing and operating its own sewer utilities. The City of Southport operates and maintains a wastewater collection system that consists of approximately 35 miles of gravity sewer lines and 14 miles of sewer force mains ranging in size. Southport currently has an interlocal agreement with Brunswick County for the treatment the City's wastewater.

As the sewer system continues to age, material deterioration has begun to affect the integrity and performance of the entire system. Deteriorating collection infrastructure resulting in increasing levels of infiltration and inflow are just a few of the items in the forefront. With this said, Southport continues to be very proactive in addressing sewer system problems.

3. Current Asset Performance

3.1 Wastewater Collection

The oldest portion of Southport's collection system was constructed in the early 1900s and today consists of approximately 35 miles of gravity sewer lines and 14 miles of sewer force mains ranging in size. The vast majority of the system is composed of PVC pipe, however the downtown area of the City is mainly vitrified clay pipes. The City of Southport currently owns and operates thirty-four (34) pumping stations. From the 2019 lift station inspections, the sites are generally all in adequate working order, however immediate improvements at the lift stations are needed to maintain their continued operation.

The Southport wastewater collection system has a history of excessive infiltration/inflow (I/I) problems. The City is actively pursuing correction of the I/I problems and has plans to continue to identify and correct I/I by rehabilitation and replacement of the sewer lines and manholes. The total wastewater for the City pumped to the WWTP consistently exceeds the total water pumped from the City's deep wells. I/I accounts for an average of approximately 38% of the WWTP effluent flow.

Manhole inspections completed in 2019 manholes showed approximately 177 of the City's 891 manholes were brick manholes considered to be in poor condition, another 26 precast manholes were also considered to be in poor condition. These manholes are a major contributor to the City's excessive I/I problems. A full explanation of the collection system asset's performance can be found in the Capital Improvements Plan (CIP) dated September 2022.

3.2 Wastewater Treatment

The City's wastewater effluent is currently treated by Brunswick County through an interlocal agreement which provides for discharge of up to 0.75 MGD. The City currently has a loan through NCDEQ to expand the Shallotte WWTP (owned by Brunswick County) as part of a long-term agreement with the County.

Table 1 below shows the wastewater treatment plant flows in 2021.

Table 1
2021 Wastewater Treatment Plant Flows

Month	Total WW Flow (MG)	Total Billed Usage (MG)	Precip. (in.)		Month	Total WW Flow (MG)	Total Billed Usage (MG)	Precip. (in.)
January	15.29	8.40	2.56		July	18.23	10.82	N/A
February	19.23	8.85	5.64		August	19.68	11.43	3.58
March	16.43	7.99	4.42		September	22.77	10.76	5.12
April	13.55	9.62	5.67		October	18.59	9.31	2.54
May	12.61	10.99	7.96		November	13.87	9.57	1.59
June	17.28	13.06	7.34		December	13.02	9.54	2.52

The higher wastewater flows recorded by the County compared to the actual billed wastewater flows from the City indicates an inflow problem. Infiltration and inflow can account for up to 53 percent of the total wastewater flow. Based on the data in Table 1, when comparing the total wastewater flow to the wastewater flow and water billed by Southport, it is evident that an I/I correction program is needed by the City to reduce the overall I/I entering into the WWTP.

4. Planned Actions

A prioritized ranking system for the sewer system improvements was developed in the CIP and is based on degree of urgency and the priority of function. The projects have been given a priority 1 or 2 based on importance. Priority 1 represents immediate needs of the City's infrastructure (0-5 years). Priority 2 represents long term goals for the City (6-15 years). A detailed description of each priority can be found in the Capital Improvements Plan dated September 2022. Priority 1 generally consists of wastewater collection system rehabilitation and replacement as well as urgent wastewater treatment plant repairs. Priority 2 involves wastewater collection improvements. There are currently no known improvements needed to the reclaimed water system.

5. Costs

The total estimated construction cost for this work is approximately $54.3 million for Priority 1 improvements, and approximately $0.1 million annually for Priority 2 improvements. A list of the wastewater system improvements is given below.

List of Identified Sewer System Improvements

1) Priority 1

a. Mulberry Branch Wastewater Capacity Increase	$30,451,306
b. Wastewater Asset and Inventory Assessment	$400,000
c. FiFi I&I Reduction	$9,835,000

d. Downtown Sewer Replacement $10,812,107

e. Pump Station Rehab and Replace $2,800,000

2) Priority 2

a. Wastewater System Improvements $0.1 million annually

6. Benefits

Addressing the defects discovered through evaluations of the sanitary sewer system will correct deficiencies that allow groundwater and stormwater into the system also represent points to which wastewater may exit the system. By correcting these locations, Southport will also be preventing harmful contaminates from entering local soils and groundwater aquifers. The measurable benefit to replacing and/or rehabilitating the assets to reduce the amount of I/I and improve WWTP effluent quality.

7. Potential Improvements

Combined I/I can contribute an average of 38% of the WWTP effluent flow. While I/I levels may be much less during drier times of the year, the City's sewer customers are paying for every gallon of wastewater treated at the Southport WWTP. Corrective actions are warranted in this regard.

It is estimated that the proposed improvements from the two prioritized phases will reduce the infiltration and inflow from existing levels.

The remaining Phase 2 priorities, once completed, will provide Southport a structurally sound wastewater collection system that will continue to provide Southport's sewer customers with reliable and efficient service.