Manchester, NH Christian Brook Combined Sewer Overflow Separation

Morgan Conklin, Josh Howard, Eli Moslow, & Carolina Patino

University of New Hampshire Department of Civil and Environmental Engineering

Project Sponsors: Fred McNeill & Jeremy Bouvier | Faculty Advisor: Dr. Weiwei Mo

Project Background

Manchester, NH is the largest city in NH which currently utilizes a combined sewer system to manage both its wastewater and stormwater. Underground pipes carry both wastewater and stormwater to the treatment plant, but during significant rain events the pipe's capacity is exceeded and the combined sewage is discharged into the Merrimack River. In 1994, the Clean Water Act required that all municipalities with active CSO outfalls eliminate them from being used. Therefore, the City of Manchester has been executing a CSO separation program over the past 20-years to remain compliant with regulations. An estimated 250 million gallons of combined flow is discharged annually into the Merrimack River. This project involves the replacement and relocation of over 5,000 linear feet of drainage pipes and the repurposing of a CSO outfall to serve the Christian Brook drainage basin.

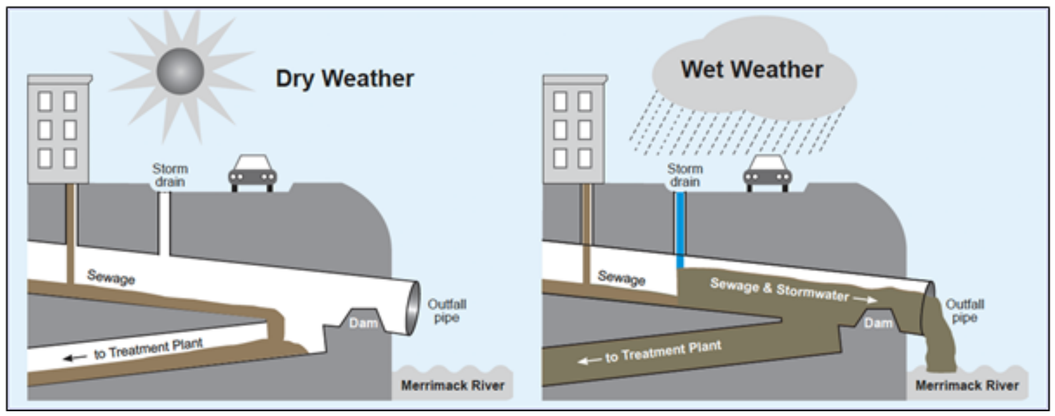

Figure 1: Example of a combined sewer system

Cost Estimation

Table 2: Cost Estimation Table

Drainage	$2,602,600.00
Roadways	$2,261,000.00
Sewer Rehabilitation	$800,000.00
Mobilization	$190,300.00
Total Construction	$5,853,900.00
15% Engineering	$880,000.00
5% Contingency	$300,000.00
Total:	$7,033,900.00

Objectives

- Contribute to designs done by AECOM using existing survey and hydraulic data.
- Identify all permits related to the design and construction of the project.
- Review construction logistics and provide quantity takeoffs on material and labor.
- Provide a cost estimation.

Hydraulic Modeling

Hydraulic design for the project was done using Atlas-14 design storm values. The new drainage system was designed using the 10-year, 24-hour design storm with a climate change adjustment. Climate change has caused the intensity and frequency of large storm events to increase. Accounting for climate change helps ensure the project will function for its expected 100-year lifespan.

Table 1: Design storm values that serve as the basis of the hydraulic design

Storm Design	Atlas-14	RCP 4.5 (2075)	RCP 8.5 (2075)
10-year, 24 hour	4.49 inches	4.97 inches	5.08 inches
25-year, 24 hour	5.51 inches	6.19 inches	6.26 inches

Construction

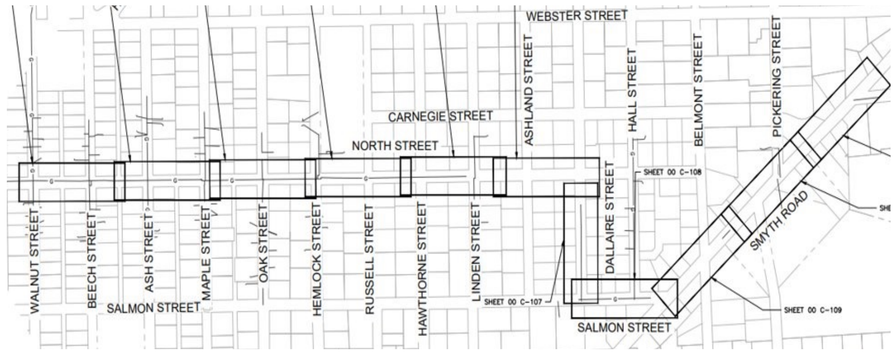

Figure 2: shows the specific streets where the proposed pipeline is located.

- Public Outreach – Meetings, mailings, website information
- Utility Conflicts - Continuation of gas, water, sewer services
- Traffic Control - School bus routes, trash pick-up, access for emergency vehicles
- Site Management - Removal of trees, storage of materials, minimization of site noise, weather event planning

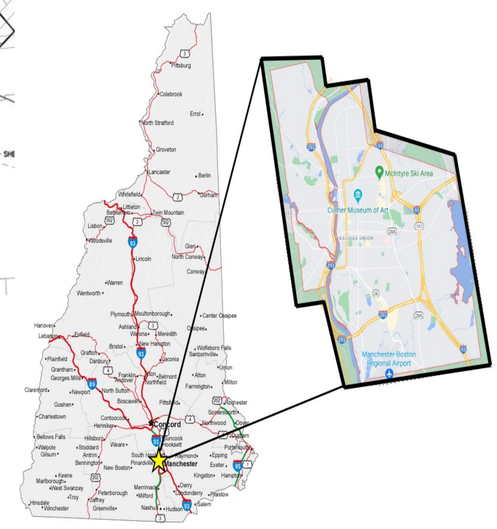

Figure 3: Locus Map showing the City of Manchester

Project Challenges and Lessons Learned

- Extensive utility relocation being required.
- Hydraulic modelling inconsistencies causing extended delays in the project design schedule.
- The COVID-19 pandemic has made everything virtual and limits the range of work that can be done.
- Learned "real world" engineer problems: scheduling, budgeting, terminology, deliverables, etc.
- Better equipped to enter the engineering profession.