Managing Piped Infrastructure to Protect & Improve Water Quality in South Portland

Total Annual CSO Discharge

JUSTIN GOVE, P.E. – Civil Engineer
South Portland’s Historical Context

Sewer Infrastructure

Circa 1900

• No City sewer system, waste managed via cesspools and septic tanks with tile drains
• No public drinking water
• Private wells contaminated with fecal borne pathogens
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Deake Street - 2017
South Portland’s Historical Context

Sewer Infrastructure

1920s

- Constructed a combined storm and sanitary sewer system with outfalls to various surface water bodies
- Improvement to sanitation
- Increasing impacts to water quality with population and industry growth
South Portland’s Historical Context

Sewer Infrastructure

Willard Beach Sewer Blueprint - 1927
South Portland’s Historical Context

Sewer Infrastructure

Willard Beach 1975

- Constructed new sewer pump station directing combined sewer flow to new WWTP
- Installed CSO that discharged to the old outfall
South Portland’s Historical Context

Clean Water Act 1972

- Established structure for regulating pollutant discharges
- Gave EPA authority to establish wastewater standards for industry
- Funded construction of sewage treatment plants
- Recognized need for planning to address nonpoint source pollutants
South Portland’s CSO Reduction Efforts

Reduce Flow Into Combined Sewer
• Disconnect roof and foundation drains
• Install low flow fixtures (toilets etc.)
• Replace/rehabilitate leaking pipes

Increase Combined Sewer Capacity
• Larger Pipes
• Upgrade Pump Stations

Install Separated Storm Drain
• Divert stormwater away from combined sewer
South Portland’s CSO Separation History

- **1986** – begin separation work (28 CSOs, 500 MG/yr)
- **1994** – Original CSO Facilities Plan (15 CSOs, 200 MG/yr)
- **2008** – CSO Facilities Plan Update (6 CSOs, 16 MG/yr)
- **2018** – 4 CSOs, 3.5 MG/yr

33 Years + $45M = **elimination of 24 CSOs** and **discharge reduction of 496.5 MG/year**
Separation Project Examples

**PHASE 1&2 (2014-16)**
- 30 acre catchment
- 15 combined CBs removed
- ~1 mile new storm drain
- 2 gravel wetlands

**PHASES 3&4 (2015-17)**
- 44 acre catchment
- 43 combined CBs removed
- ~2 miles new storm drain
- 11 streetscape BMPs & 2 gravel wetlands
Separation Project Examples

- 4,600’ Storm Drain
- 5,000’ Sanitary Sewer
- 108 Structures
- 32 CBs Separated

PLEASANTDALE (2018-19)
Separation Project Examples

• Agreement between CoSP, Cape Elizabeth & PWD to mitigate CSO at Ottawa Road PS
• 2014 and 2017: I&I assessment and resident inspections to identify non-sewer connections
• Separated connected roof leaders, foundation drains and sump pumps at 11 homes
• Lined 2,540’ of VC sewer main
• Rehabilitated 16 manholes
CSO Mitigation Next Steps...

• SWMM Model Update
  • Post-Pleasantdale flow monitoring
  • Evaluate additional mitigation measures for Cash/Evans/Elm

• Meetinghouse Hill Evaluation

• Update CSO Facilities Plan
Willard Beach Stormwater Outfall Evaluation

- Evaluation conducted in response to periodic washouts of buried stormwater structure
  - Located just above high tide line near end of Willard Street
  - Part of the original 1922 combined sewer system
• Structure found to be in poor condition with multiple abandoned pipe penetrations associated with former sewer connections

• One of two outfall pipes in the tidal zone shows significant deterioration (1922 pipe)

• Outfall pipe below the water line appears to be in fair condition
  • Partially obstructed by sand
Stormwater Outfall – Existing Conditions
Stormwater Outfall – Proposed Alternative 1

**Pros:**
- Constructability
- Maintainability
- Increased resiliency to flood (through elimination of submerged outfall)
- Low Cost

**Cons:**
- New beach outfall
- Beach outfall susceptible to wave damage
- Work in dune system
- Full NRPA and Individual USACE permits required
Stormwater Outfall – Proposed Alternative 2A

Pros:
- Constructability
- Addresses immediate area of concern
- No new beach outfall
- Least costly alternative
- Simple permitting

Cons:
- Work in dune system
- Does not address corroded outfall pipe in tidal zone
- Requires buried structure on Beach
- Outfall pipes will continue to be exposed in tidal zone
Stormwater Outfall – Proposed Alternative 2B

• Pros:
  • Constructability
  • Addresses immediate area of concern
  • No new beach outfall
  • Relative low cost
  • Eliminates buried structure on beach
  • Simple permitting
  • Facilitates potential future replacement of remaining outfall pipe

• Cons:
  • Work in dune system
  • Outfall pipes will continue to be exposed in tidal zone
  • Portion of existing 1930s outfall to remain
Stormwater Outfall – Proposed Alternative 2C

- **Pros:**
  - Most robust of the Alternative 2s
  - No new beach outfall
  - Eliminates buried structure on beach
  - Buries pipe across tidal zone

- **Cons:**
  - Work in dune system
  - High construction cost
  - May require NRPA permit and Individual USACE permit depending on eel grass impacts
Stormwater Outfall – Proposed Alternative 3A

**Pros:**
- Eliminates Willow Street outfall
- Buries outfall across tidal zone

**Cons:**
- Work in dune system
- Highest cost alternative
- Maintenance associated with submerged outfall
- Increased susceptibility to sea level impacts
- Requires Full NRPA and Individual USACE permits
- Susceptibility of proposed cross-beach pipe to wave action and erosion
Pros:
- Eliminates Willow Street outfall

Cons:
- Work in dune system
- Higher cost alternative
- Requires Full NRPA and Individual USACE permits
- Susceptibility of proposed cross-beach pipe to wave action and erosion
- New beach outfall
Stormwater Outfall – Recommendation

Water Resource Protection recommends that the City pursue Alternative 2, Option 2B given the cost, permitting requirements, and simplicity of construction compared to other options. This alternative accomplishes the City’s goals for its current infrastructure needs at a lower cost compared to full replacement options. The construction of Alternative 2B also provides the City with a “phased” construction approach, where the remaining, submerged outfall can be replaced in the future when needed.
Questions