



Manchester's Ongoing CSO Mitigation Program 1995 to 2021

NEWEA Combined Sewer Overflow &
Wet Weather Issues Conference

Portsmouth, NH • September 29, 2021

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Manchester's Ongoing CSO Mitigation Program

Agenda

- Background
- Wastewater system
- CSO history
 - Phase I
 - “Limbo” years
 - Phase II
 - Future work
- Conclusions
- Questions



City of Manchester's History

- Settled in 1725
- Evolved from agricultural to industrial 1725 to 1810
- Amoskeag Mills—largest single mill in the world 1915
- Post industrial depression 1930 to 1980's



City of Manchester Today

- Largest city north of Boston
 - 109,000 population
- Revitalization
 - 1990s to present
- Civic center
- Baseball park
- High tech industries
- “ManchVegas”



Environmental Protection Division

- Created in 1975 – City’s wastewater utility
- Division of Manchester’s Department of Public Works
- An “enterprise”
- Staff of 44
- 15 acre campus at 300 Winston Street
- 10 buildings
 - Administration
 - Operations
 - Maintenance



Wastewater Infrastructure – WWTP

- 1975: 26 mgd
- 1994: upgrade to 34 mgd
- 2016: upgrade to 42 mgd
- Serves four communities
 - Bedford (4.37%)
 - Goffstown (4.11%)
 - Londonderry (10.16%)
 - Manchester (81.36%)
- Metro population 172,000
- Investing \$75 million over 15 years



Wastewater Infrastructure – Pipelines

- 390 miles of sewer
 - 50% “combined” system
 - 11,000 SMHs
 - 15 CSO outfalls
- 100 miles of pipe over 100 years old
- Robust CMOM program ongoing



Stormwater Infrastructure – Pipelines

- 190 miles of drains
 - 14,000 CBs
 - 3,000 DMHs
 - Miles of open channel
 - Robust MS4 program ongoing



Wastewater Infrastructure – Pump Stations

- 12 pump stations
- Constructed from 1973 to 2014
- 68 to 6,000 GPM

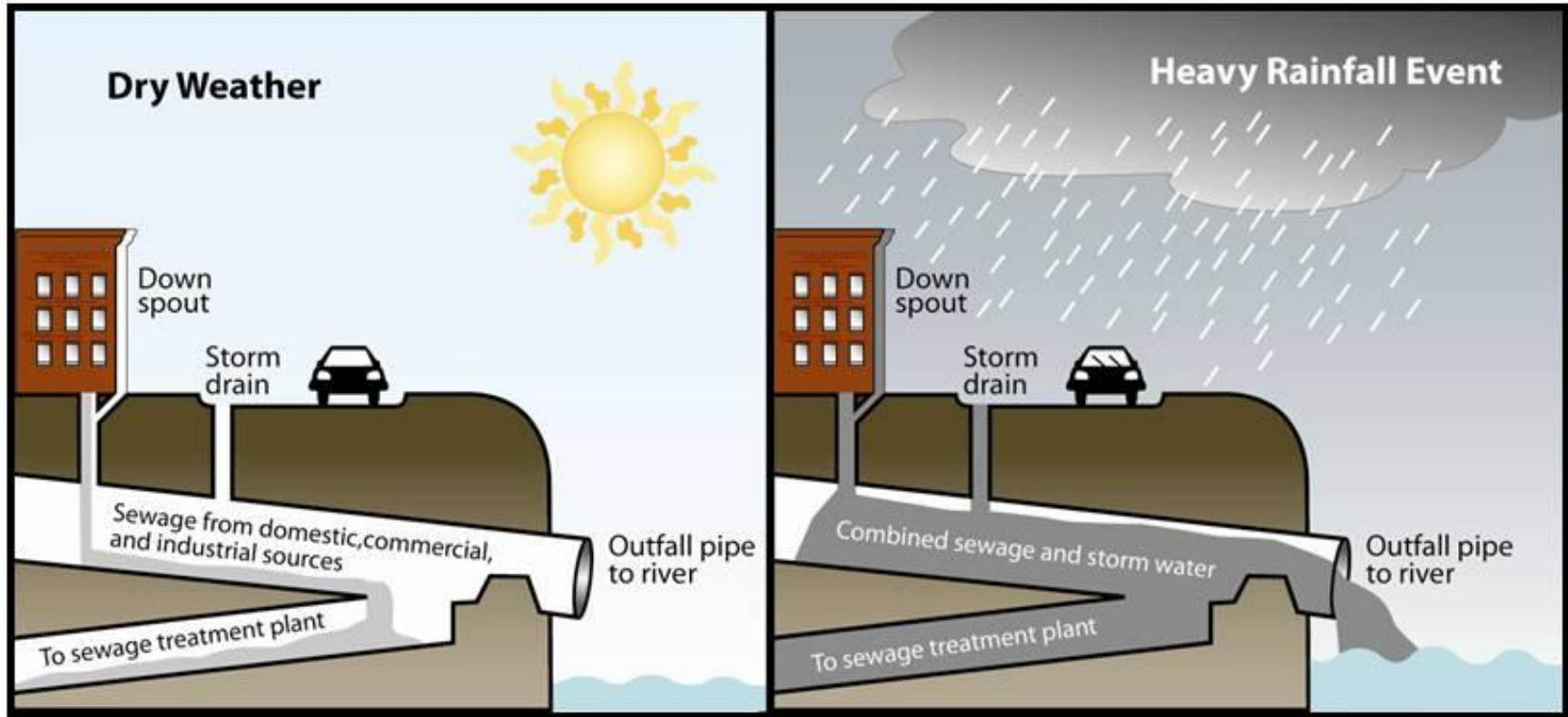


Manchester's Urban Waterways

- Lakes / ponds / streams within our urbanized area
 - Crystal Lake
 - Dorrs Pond
 - Nutt Pond
 - Pine Island Pond
 - Stevens Pond
 - Miles of open channel streams
- Water quality impairments in our waterways
 - Chloride
 - Phosphorous
 - Dissolved oxygen
 - Bacteria
 - Mercury



What is a Combined Sewer Overflow (CSO)?



CSO Outfall



Manchester's CSO History

- 1994: Federal Clean Water Act CSO Control Policy
- Mid 1990s: Various engineering studies
- 1999: CSO Consent Order issued
 - Two phase program
 - West side of Merrimack River first ten years
 - East side of Merrimack River to follow

Phase I: 1999 – 2009 “Nuts and Bolts”

- 10 year \$58 million program
- Fully separated 15 basins
- 8 construction contracts
- Over 53 miles of new or rehabilitated piping up to 60” diameter
 - New drainage system
 - Existing “combined” system used for sewer



Phase I: Very Successful!

- 99% annual CSO reduction
- 53.2 to 0.2 mgd annually
- Goal was three month level of CSO control, program achieved two year level of control
- Merrimack River water quality increases
- Ten year program was completed on schedule and on budget



“Concrete” Benefits

- Road reconstruction (26 miles)
- Other utility construction
 - Water (9 miles)
 - Gas (14 miles)
- Surface reconstruction
 - Curbing (8 miles)
 - Sidewalks (6 miles)
 - Pedestrian ramps



“Social” Benefits

Not just improved water quality...

- Social justice
- Urban revitalization
 - ADA compliant
 - Green infrastructure
- Positive economic impact to local economy



Phase II

- March 2010 - Submitted updated Long-term Control Plan
 - Two 20 year phases
 - Phase II - \$165 million
 - Phase III - \$220 million
- Carried successful themes of Phase I
 - Infrastructure upgrades
 - Urban revitalization
 - Social justice

The “Limbo” Years: 2010 to 2020

- March 2010 submitted updated Long-term Control Plan
- Minimal initial interaction with EPA
- City takes pro-active approach and continue with Phase II CSO projects
 - Chestnut Street Project: \$6.6 million
 - North Chestnut Street Project: \$10 million
 - WWTP Capacity Upgrade: \$23 million

Contract 1

Chestnut Street Sewer Separation Project

- Valley St. to Merrimack St.
- Construction 2013 to 2014
 - 4,400 LF of new drain (12 – 60")
 - 1,640 LF of new sewer (6 – 12")
 - 2,670 LF of new water main (6 – 20")
- Total project costs \$6.6 million



Contract 1

Big Pipe and Deep Cuts in Urban Areas

- 60" ID, 72" OD
- 8' long sections
- Up to 24' deep



Phase II – Contract No. 2

North Chestnut Street Sewer Separation Project

- Merrimack to Bridge Street
- Construction 2014 to 2017
 - 12,000 LF of new drain (12 – 60”)
 - 3,000 LF of new sewer (6 – 12”)
 - 2,000 LF of new water main (6 – 20”)
- Total project costs \$10 million



Leveraging Chestnut Street Projects

- First bike lanes in the City
- Reclaimed and reconstructed all roadways
- Complete infrastructure upgrade
 - Water
 - Gas
 - Fiber optics
- Decorative crosswalks
- “Green infrastructure”
 - Bio-retention islands



WWTP Upgrade: Increased Capacity



- Project Completed 2016
- Project Cost \$22.5 Million
- Project Description
 - Increase WWTP's secondary capacity to 42 mgd
 - The aeration system was modified from two trains of six basins to four trains of three basins with selector basins for TP removal
 - New fine bubble technology diffusers
 - New blower building housing four 300 HP blowers

Phase II: Negotiations

- 2010: Long-term control plan
- 2011: EPA initiates negotiations
- 2015: Resume negotiations
- 2016: Legal counsel becomes involved
- 2018: Resume negotiations
 - First draft of Consent Decree
- September 28, 2020 – Phase II Consent Decree executed and in effect

Phase II: 2020 – 2040

- East side of city
 - 7 CSO basins
 - 15 outfalls
- Phase II: \$231 million over 20 years
 - \$84 million for removal of Cemetery Brook
 - \$80 million in sewer separation
 - \$31 million for removal of Christian Brook
 - \$22 million for WWTP phosphorous removal
 - \$6 million in program assessment / reporting
 - \$5 million in post construction monitoring
 - \$3 million in system optimization

Where are we today after year No. 1?

- Cemetery Brook Tunnel—basis of design report to be completed at end of 2021
- Christian Brook—bidding \$15 million main drain construction contract this fall
- WWTP phosphorous removal—\$22 million three year construction contract ongoing
- CSO real time notification—FAS starting this fall
- System optimization—study completed
- Other—signs, reporting, etc.

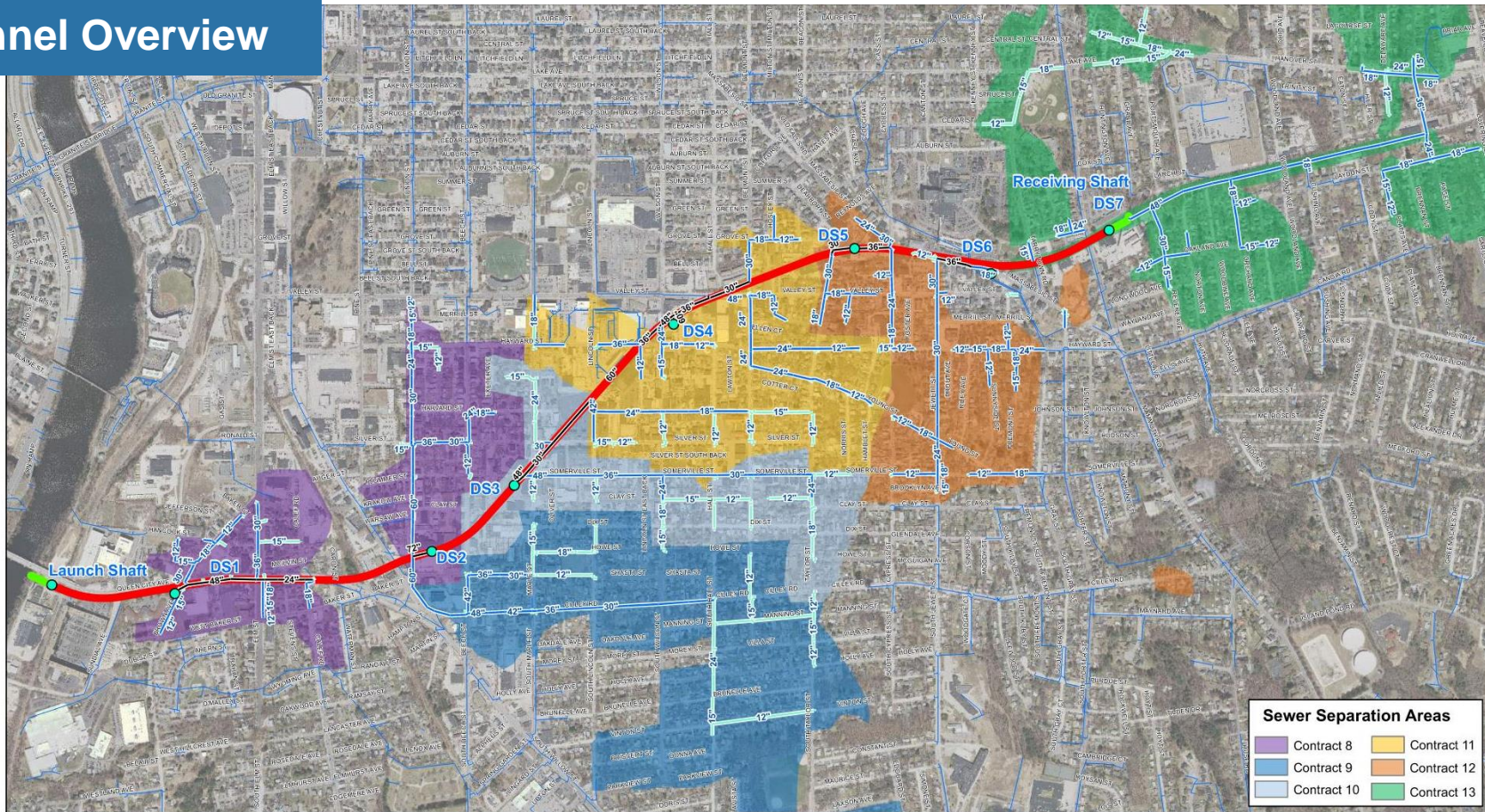
Cemetery Brook

- Largest drainage basin
 - 4,500 acres
 - 3,000 acres served by combined system
 - 50% of remaining combined system
 - Oldest portions of the city's system
- Contributes 70% of the CSO discharges
- Contributes about 3.2 mgd of dry weather flow to WWTP

Cemetery Brook

- Originally proposed “open cut” construction
 - 4 construction contracts
 - 10’ x 12’ box culverts 25” deep
 - 13.5 years
 - \$85 million
- “Open cut” would require complete utility relocations and be extremely disruptive to residents
- Switch to tunneling technology

Tunnel Overview



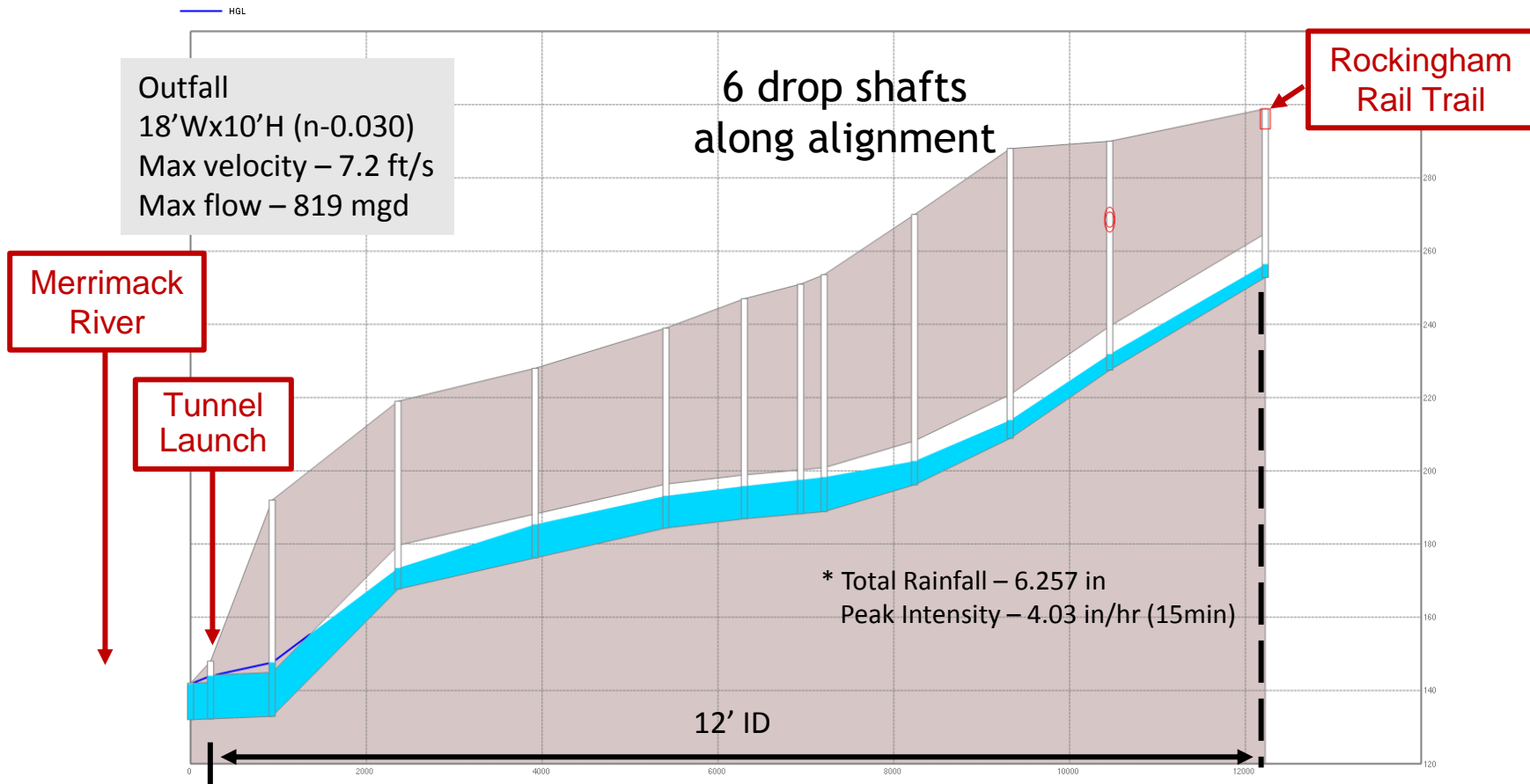
0 500 1,000 Feet

LEGEND

- Cemetery Brook Drain (Tunnel)
- Cemetery Brook Drain (Open Cut)
- Tunnel Shafts (Launch, Receiving, Drop for Collector Drains)
- Consolidation Piping of Future Drains To Drop Shaft
- Future Drain
- Future Small Diameter Drain

City of Manchester
 Cemetery Brook CSO Preliminary Design
 Tunnel Development Overview
 8/24/2021

Tunnel Peak HGL Profile—25-yr Design Storm*



Christian Brook

- Separation of about 25 acre drainage basin
- Two contracts
 - Main drain construction (2022 to 2024)
 - Laterals construction (2024 to 2026)
- Basis of design
 - 10 year storm
 - Climate change factor
 - 25 year storm performance indicator

Other Phase II CSO Projects

- Real time CSO notification
 - Web based
- System Optimization and real time controls
 - Optimize interceptor capacity with gate construction
- Closure of existing outfalls
 - Keep most open due to possible climate change flooding
- Signage
- Reporting

Phase III: 2040 – 2060

- Completion of east side of city
 - 5 CSO basins
 - 4 outfalls
 - \$200 million?
 - Future regulations?
 - Who is going to pay for all this?

How do we pay for all this work? - Rates

- Two sets of rates increase to support CSO program
- 2007 – Implemented four year rate increases
 - 2007 – 25%
 - 2008 – 20%
 - 2009 – 20%
 - 2010 – 15%
 - 2011 – 7% rate decrease
- 2020 - Five years of 4% increases
- Today Manchester's average rate is \$439, below the state's average of \$712

Federal Assistance?

- Phase I – yearly “earmarks”
- “Limbo years” – no federal assistance
- Phase II – no federal assistance at this time
- Chesapeake Bay – \$73 million 2020
- Long Island Sound – \$14 million 2020
- How about Merrimack River Basin?
 - Infrastructure bill
 - ARPA

Conclusions

- Not just improved water quality.....
- Urban revitalization
 - New sewer, drainage, water, gas,
 - New roads, curbs, and sidewalks
 - ADA compliant
 - Green infrastructure
- Positive impact to local economy
- Social justice

Conclusions

- Manchester is investing over \$300 million in CSO mitigation
- 2020 CSO discharge = 154 million gallons
- 2020 River Flows = 1.087 trillion gallons
- This equals less than 1/100 of 1% of annual flows
- Minimum recreational activity ongoing during these storm events
- Downstream WTPs have technology to treat the water
- Is this a cost effective method to address water quality improvements?



Questions???



Thank You