Southern New Hampshire
PLANNING COMMISSION

Manchester's CSO Program
1995 to 2022

April 26, 2022

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Chief Engineer
Environmental Protection Division

Manchester's CSO Program

Agenda

- Background
- Infrastructure
- CSO History
  - Phase I
  - "Limbo" years
  - Phase II
  - Future Work
- Conclusions
- Questions

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 maintenance program ongoing

Wastewater Infrastructure – Pump Stations

- 12 pump stations
- Constructed from 1973 to 2014
- 68 to 6,000 GPM (from tiny to HUGE)

Stormwater Infrastructure – Pipelines

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

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

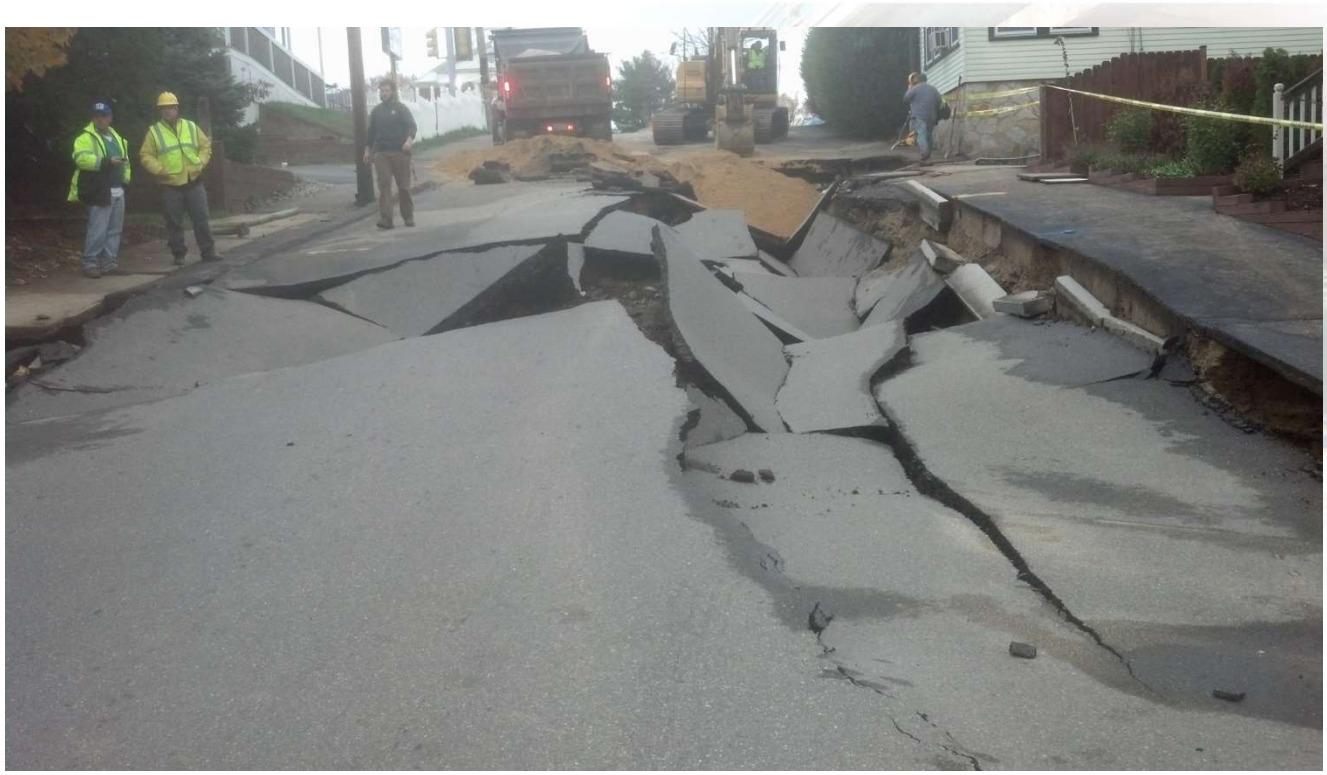
Manchester's Buried Infrastructure

- Manchester Water Works
  - 500 miles of water mains
- Department of Public Works
  - 190 miles of drainage
- Environmental; protection Division
  - 390 miles of sewer
- Over 1,000 miles of buried infrastructure
- Over 250 miles of pipe is over 100 years old
  - "***Ageing and failing infrastructure***"

Failure of 1923 Cast Iron Water Main
Goffe Street, Manchester

November 6, 2014

Goffe Street Water Main Failure
“Up close and personnel”



Water Main Break
Kennard Road, Manchester

January 10, 2015

Sink Hole 93N - Concord

August, 2015

Sink Hole 93N - Concord

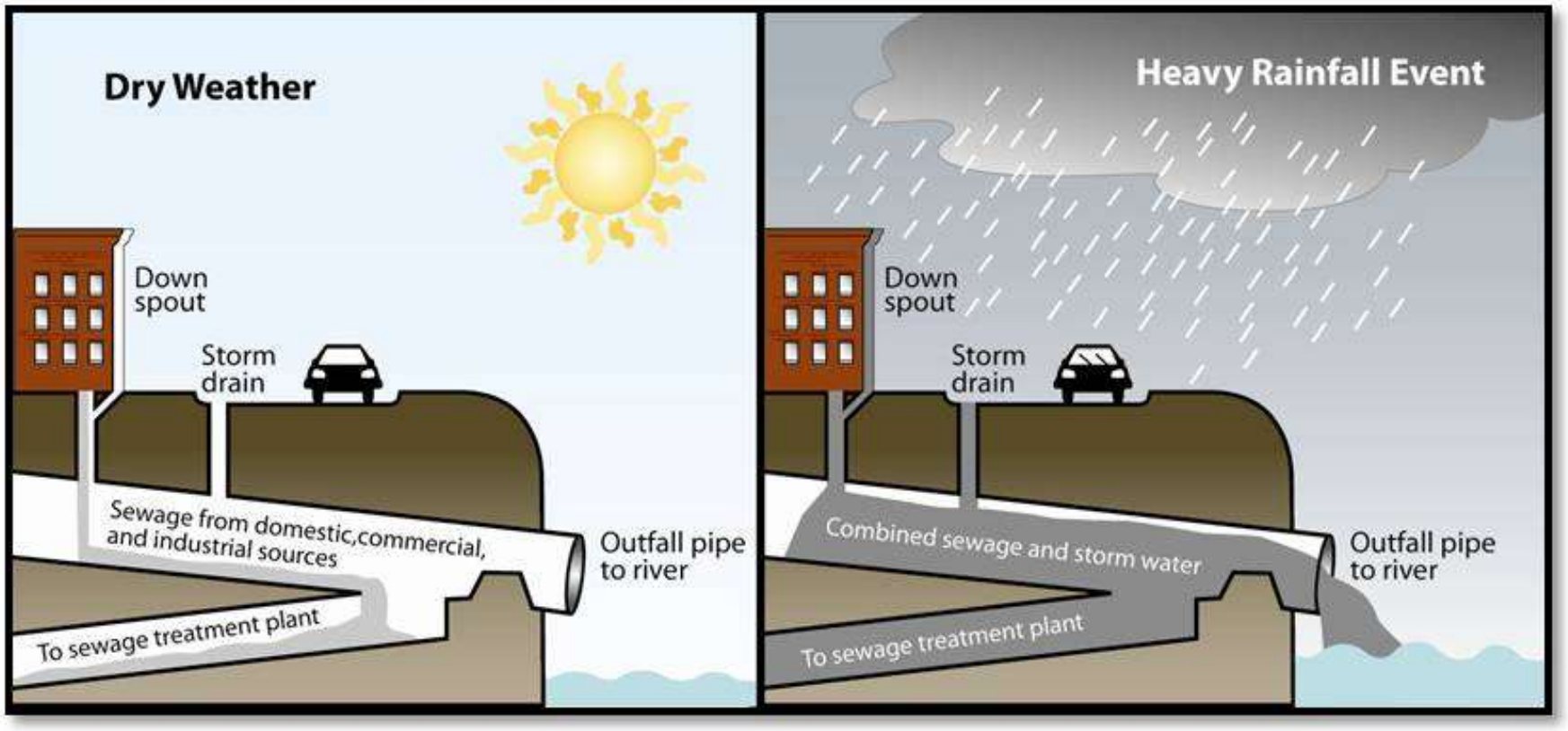
August, 2015

Water Main Break 2012

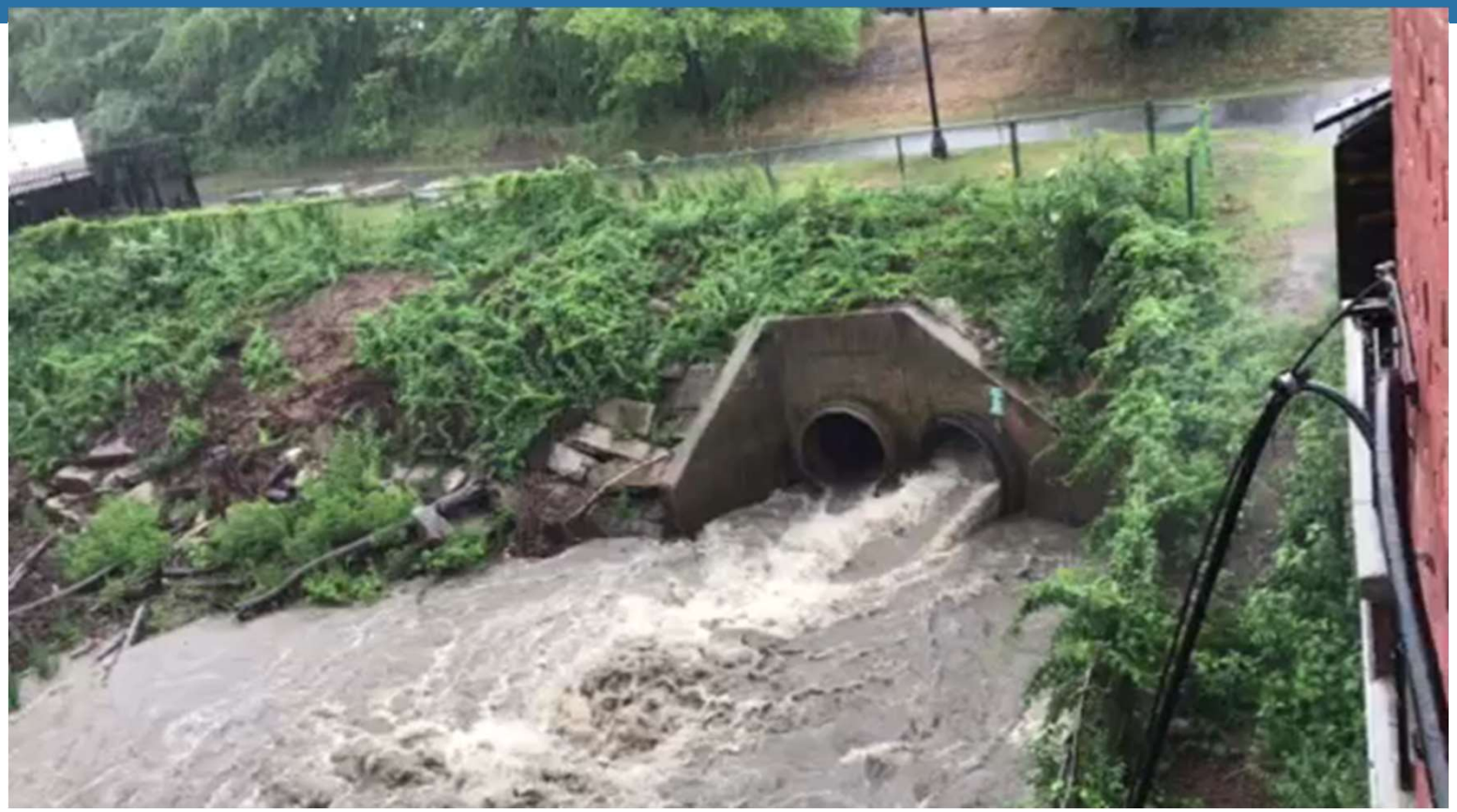
NH's Water Infrastructure "State of the State"

- Aging and Failing Infrastructure
- Increased Regulatory Requirements
- Climate Change
- Aging and shrinking workforce

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
  - 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…

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

Phase II – East Side of the Merrimack River

- 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 over next six years
- City takes pro-active approach and continue with $40 million in 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
  - 1,640 LF of new sewer
  - 2,670 LF of new water main
- Total project costs $6.6 million

Contract 1
Big Pipe and Deep Cuts in Urban Areas

- 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
  - 3,000 LF of new sewer
  - 2,000 LF of new water main
- 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
  - Increase WWTP's secondary capacity to 42 mgd
  - Process changes
  - 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

- Phase II: $338 million over 20 years
  - $191 million for removal of Cemetery Brook
  - $80 million in sewer separation
  - $30 million for removal of Christian Brook
  - $25 million for WWTP phosphorous removal
  - $6 million in program assessment / reporting
  - $5 million in post construction monitoring
  - $3 million in system optimization
- One of the largest civil engineering projects ever undertaken by the City

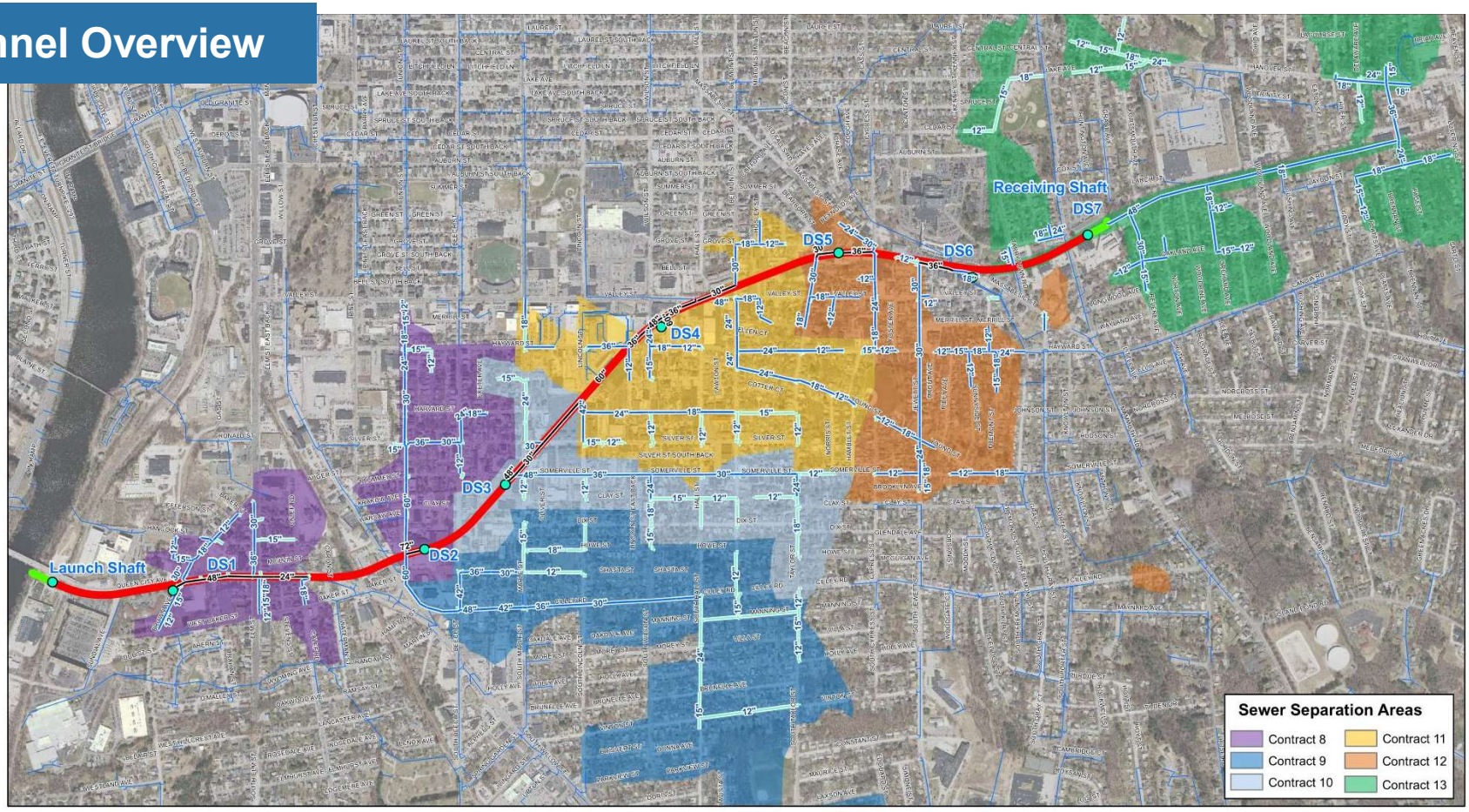
Where are we today in Year No. 2?

- Work ongoing on 8 of the 19 tasks
- Cemetery Brook Tunnel—Basis of design report completed
- Christian Brook—$15 million main drain construction contract to start next month
- WWTP Phosphorous Removal—$25 million three year construction contract ongoing
- System optimization - Design ongoing
- CSO Real Time Notification – On line now
- 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
- Use tunneling Technology

Tunnel Overview



CDM Smith

N

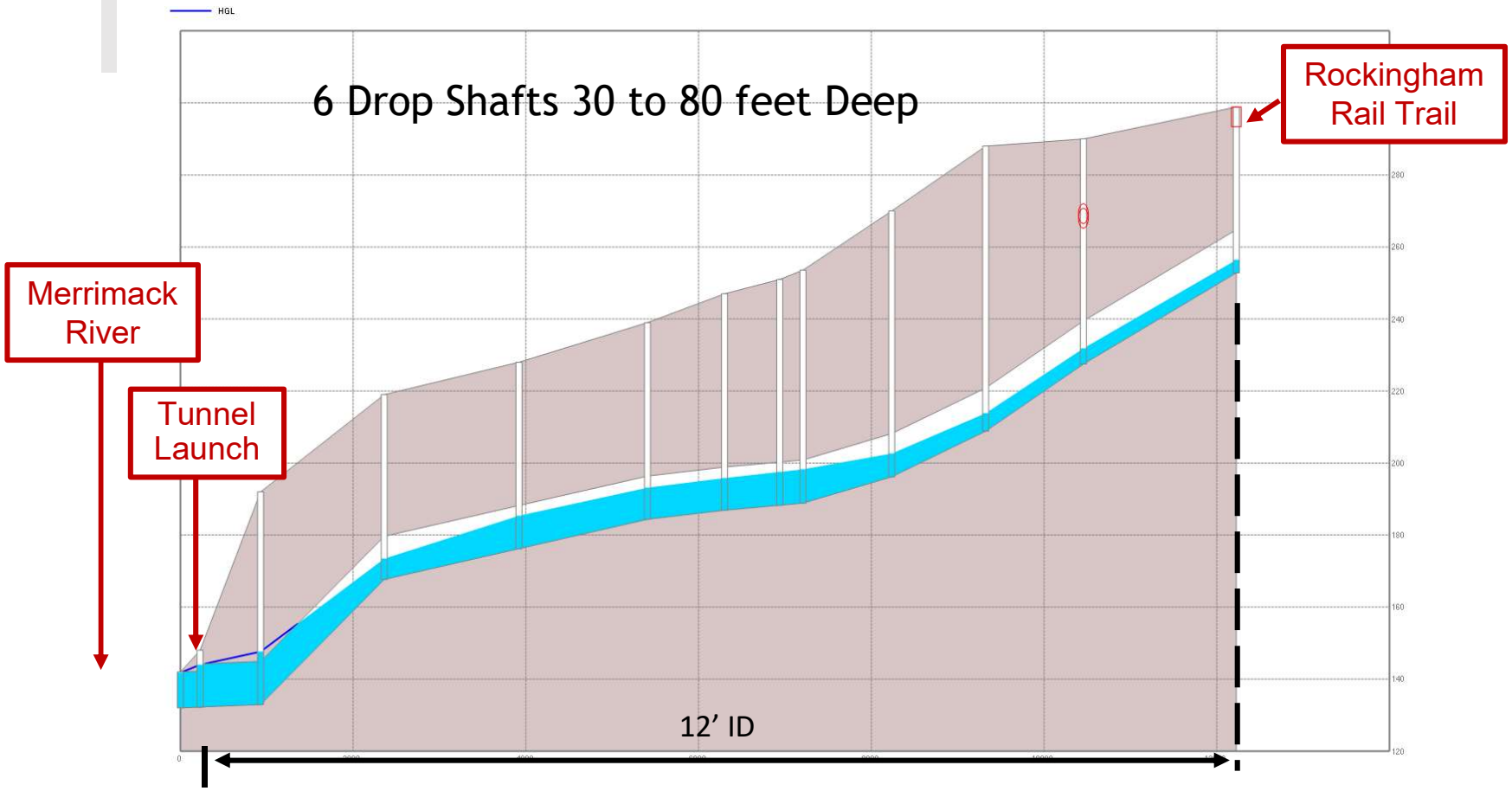
0 500 1,000 Feet

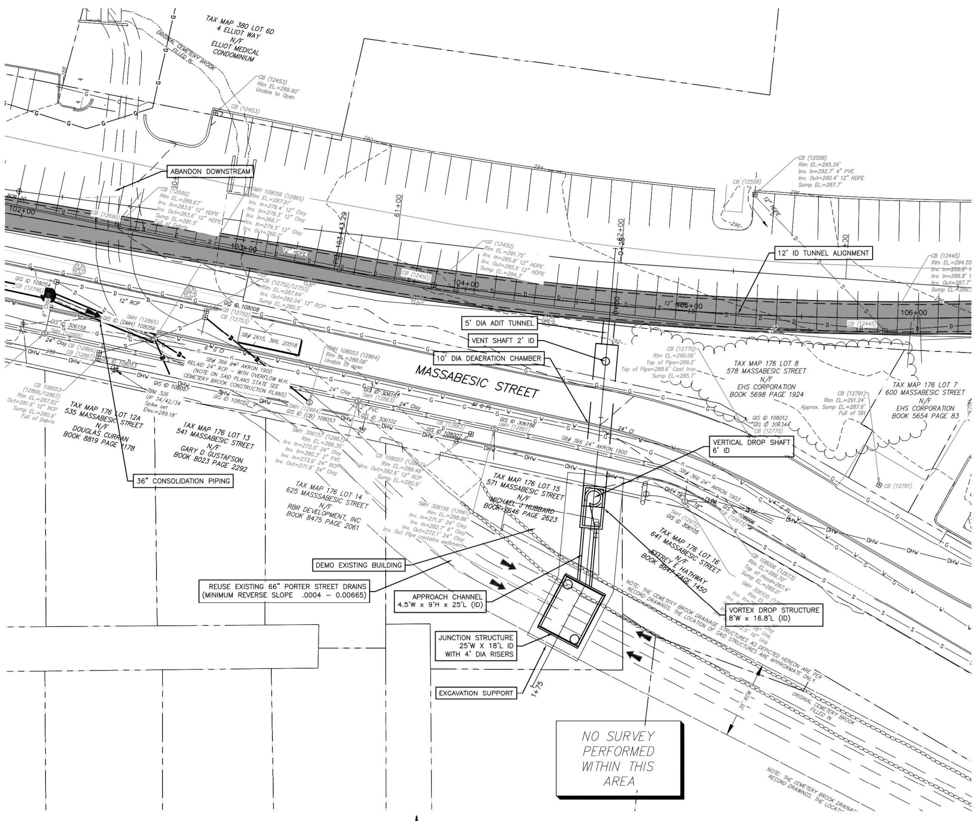
LEGEND

- 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 Profile



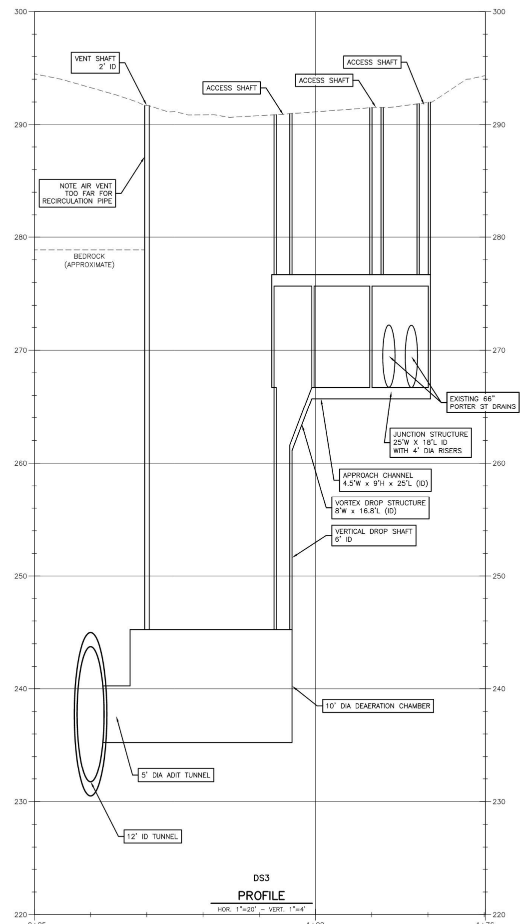


DS6

PLAN

1" = 20'

10 0 20



DS3

PROFILE

HOR. 1"=20' - VERT. 1"=4'

NOTES

1. DROP SHAFT COMPONENTS AND DIMENSIONS ARE ESTIMATED USING 25-YEAR DESIGN STORM FLOWS AND THE IOWA INSTITUTE OF HYDRAULIC RESEARCH (IIHR) REPORT 264 DESIGN SCALING SUGGESTIONS. MODIFICATIONS WILL BE REQUIRED TO MEET SITE LIMITATIONS FOR SOME COMPONENTS SUCH AS VENT SHAFT LOCATION AND DEAERATION.
2. PHYSICAL MODELS TO VERIFY AND FINALIZE DIMENSIONS/CONFIGURATION IS RECOMMENDED.
3. SUPPORT OF EXCAVATION IS DEPENDENT OF ACTUAL SOIL CONDITIONS NEAR SHAFT. ADDITIONAL FIELD INVESTIGATIONS WILL BE NECESSARY.
4. ACCESS SHAFTS WILL BE SECURED WITH BOLTED COVERS. AIR VENTS WILL BE PLACED OUTSIDE PATH OF TRAVEL AND HAVE A 180° ELBOW "GOOSENECK" FITTING AT GRADE.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: S. LAVOIE
DRAWN BY: S. LAVOIE
SHEET CHK'D BY: X
CROSS CHK'D BY: X
APPROVED BY: X
DATE: SEPTEMBER 2021

CDM Smith
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Manchester, NH 03101
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CITY OF MANCHESTER, NEW HAMPSHIRE
PHASE II CSO ABATEMENT PROGRAM
CEMETERY BROOK CSO PRELIMINARY DESIGN
CONCEPT FEASIBILITY STUDY

CEMETERY BROOK DRAIN - TUNNEL
VORTEX DROP SHAFT STRUCTURE

PROJECT NO. 0186-243837
FILE NAME: DS_Overviews
SHEET NO.
DS6

DRAFT 10% CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

Christian Brook

- Separation of about 25 acre drainage basin
- Two contracts
- Main drain construction (2022 to 2024)
  - McIntyre down Smyth Road to North Street
  - North Street to Walnut Street
- Laterals construction (2024 to 2026)

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
  - Infrastructure bill
  - ARPA
  - Earmarks
  - DES grants

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
- Environmental 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?

Celebrating the 50th Anniversary of the Clean Water
1972 - 2022

Questions???

Thank You