

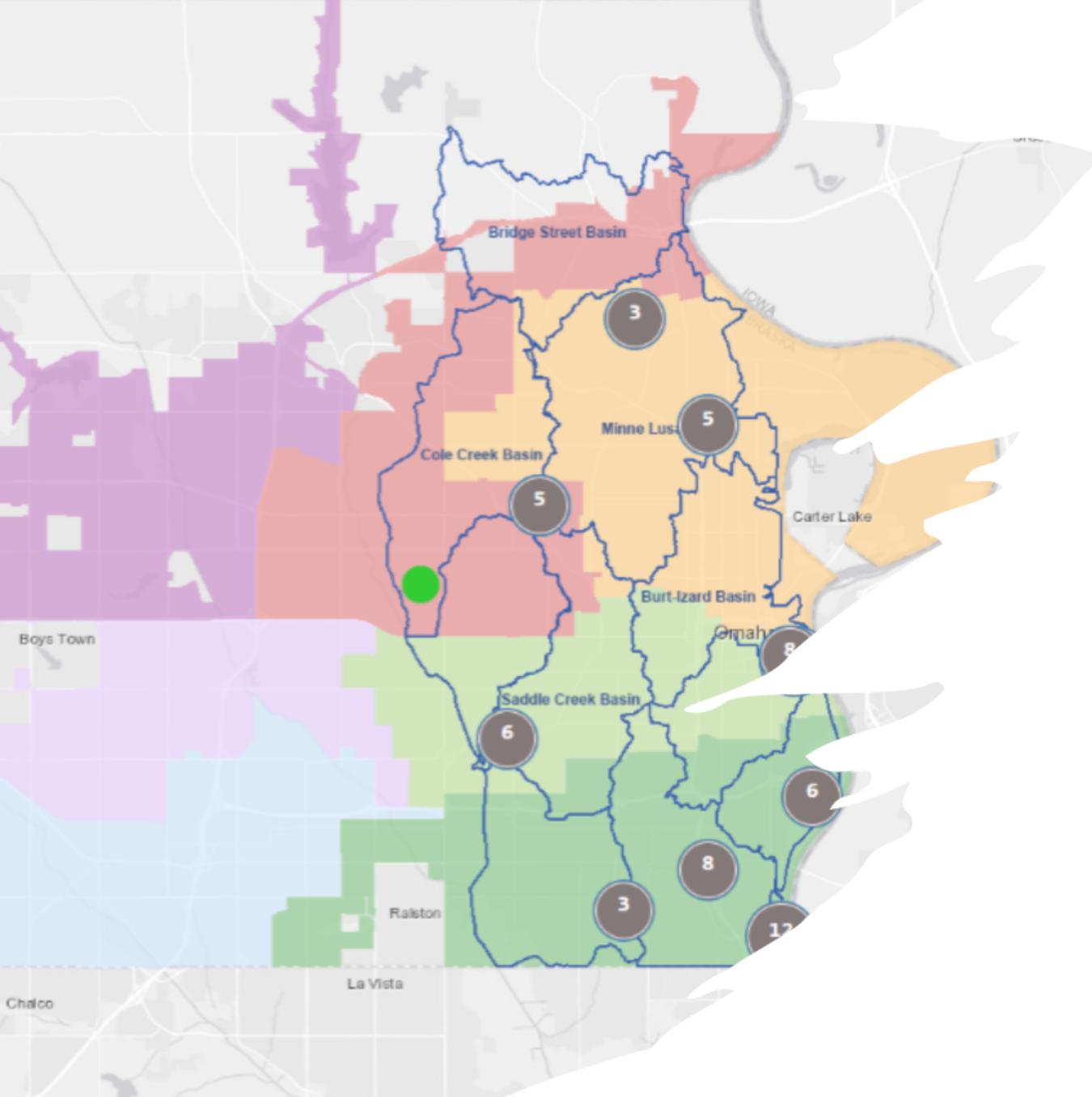
The Omaha Combined Sewer Overflow Control Program: A Case Study in Urban Infrastructure Modernization

Addressing Environmental and
Public Health Challenges



Background

- Omaha is one of the largest cities in the U.S. with a combined sewer system.
- The system covers ~43 sq miles with ~800 miles of combined sewers.
- Historically, 86 overflows/year, discharging 3.5 billion gallons.
- This posed significant risks to public health and the environment.
- The CSO Control Program aims to address these issues.
- Omaha's combined sewer system serves over 700,000 residents.
- The program involves nearly 60 projects.



The Challenge of Combined Sewer Overflows

- Combined sewer systems (CSS) carry both stormwater and sanitary waste.
- During heavy rain, CSS capacity exceeded, leading to CSOs.
- Omaha's CSS historically discharged up to 3.7 billion gallons annually.
- CSOs pose environmental and public health risks.
- The Omaha CSO Control Program aims to address these issues.



Responding to Regulatory Mandates

- Federal Clean Water Act (CWA) of 1972 regulates pollutant discharges.
- EPA issued a consent order to Omaha under the CWA to control CSOs.
- In 2009, Omaha launched the multi-decade CSO program.
- Goal: capture/treat at least 85% of combined sewage volume annually.
- Program considered social, economic, environmental feasibility.
- Budget ~\$2 billion, funded by fees, loans, grants.
- Completion scheduled for 2037.
- Timeline/budget comparable to other large US cities' CSO programs.



Research Question 1:

- Was this program designed in alignment with social, economic, and environmental feasibility?
- Compared to other long-term or large-scale projects, is the budget and duration appropriately allocated?



Social Feasibility

- Assistance for low-income residents
 - Use of LIHEAP and CARES Act funds
 - Over \$21 million distributed in aid
- Community engagement and transparency



Low-Income Home Energy Assistance Program

<https://www.bradigans.com/2022/10/01/liheap-information/>



<https://www.mohave.edu/2020/05/18/mcc-giving-students-100-of-cares-act-funding/>

Economic Feasibility

- Funding Sources
 - Primarily funded through sewer use fees
 - Supplemented with grants and low-interest loans
- Rate Management
 - Annual rate increases capped at 5.25% (2019–2023)
 - 2024 - Rates per CCF: \$3.851
 - 2025 - Rates per CCF: \$3.904
- External Financial Support
 - Grants from Nebraska Environmental Trust
 - Grants from Department of Natural Resources



<https://www.fws.gov/partner/nebraska-environmental-trust>

Sample Calculation Using 6 CCF

Rates per CCF: \$3.851

2024

$$\$44.89 + (6 \times \$3.851) = \mathbf{\$68.00}$$

or

$$\$44.89 + \$23.11 = \mathbf{\$68.00}$$

Rates per CCF: \$3.904

2025

$$\$45.53 + (6 \times \$3.904) = \mathbf{\$68.95}$$

or

$$\$45.53 + \$23.42 = \mathbf{\$68.95}$$

<https://www.mudomaha.com/news/omaha-2025-sewer-use-charges/>

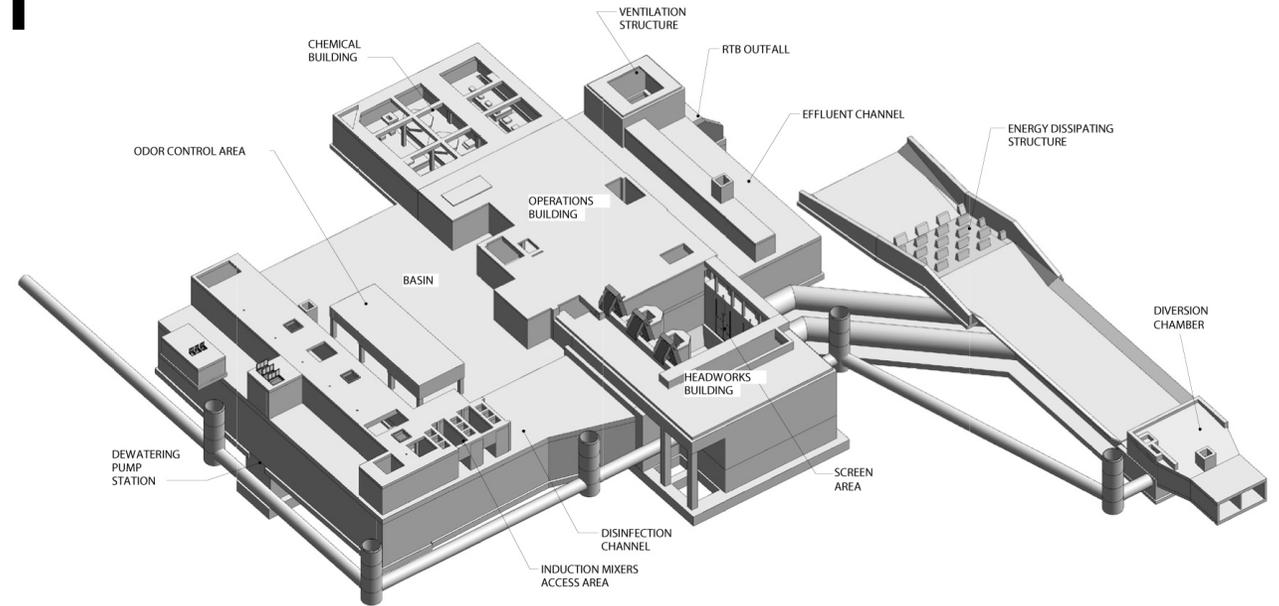
Environmental Feasibility

- Pollution Reduction Goal
 - Capture/treat 85% of annual combined sewage volume
- Green Infrastructure
 - Implementation of bioswales, rain gardens, wetland restoration, etc.
 - Example: Spring Lake Park revitalization project
- Additional Environmental Benefits
 - Habitat restoration
 - Recreational opportunities for residents



Omaha's Program Scope

- Nearly 60 projects in total
- Example: \$93.5 million Saddle Creek Retention Treatment Basin
- Halfway completion point reached



<https://omahacso.com/about-program/program-spotlights/saddle-creek-retention-treatment-basin-project-benefits-re-engineering-efforts>



<https://omahacso.com/projects/saddlecreekrtb>

Similar National Projects

- Philadelphia: 25-year, \$2.4 billion Green City, Clean Waters
- Cincinnati: 25-year, \$3.2 billion Wet Weather Improvement Program
- Kansas City: 25-year, \$4.5 billion Smart Sewer Program

Green
City,
Clean
Waters

<https://www.facebook.com/PhillyWaterSheds/>

Wet Weather Program



<https://msdgc.org/programs/wet-weather-program-consent-decree/#:~:text=It's%20all%20about%20clean%20water,%2C%20and%20addressing%20sewer%20backups.>



<https://www.kcsmartsewer.us/about/10-years-of-progress>

Budget and Timeline

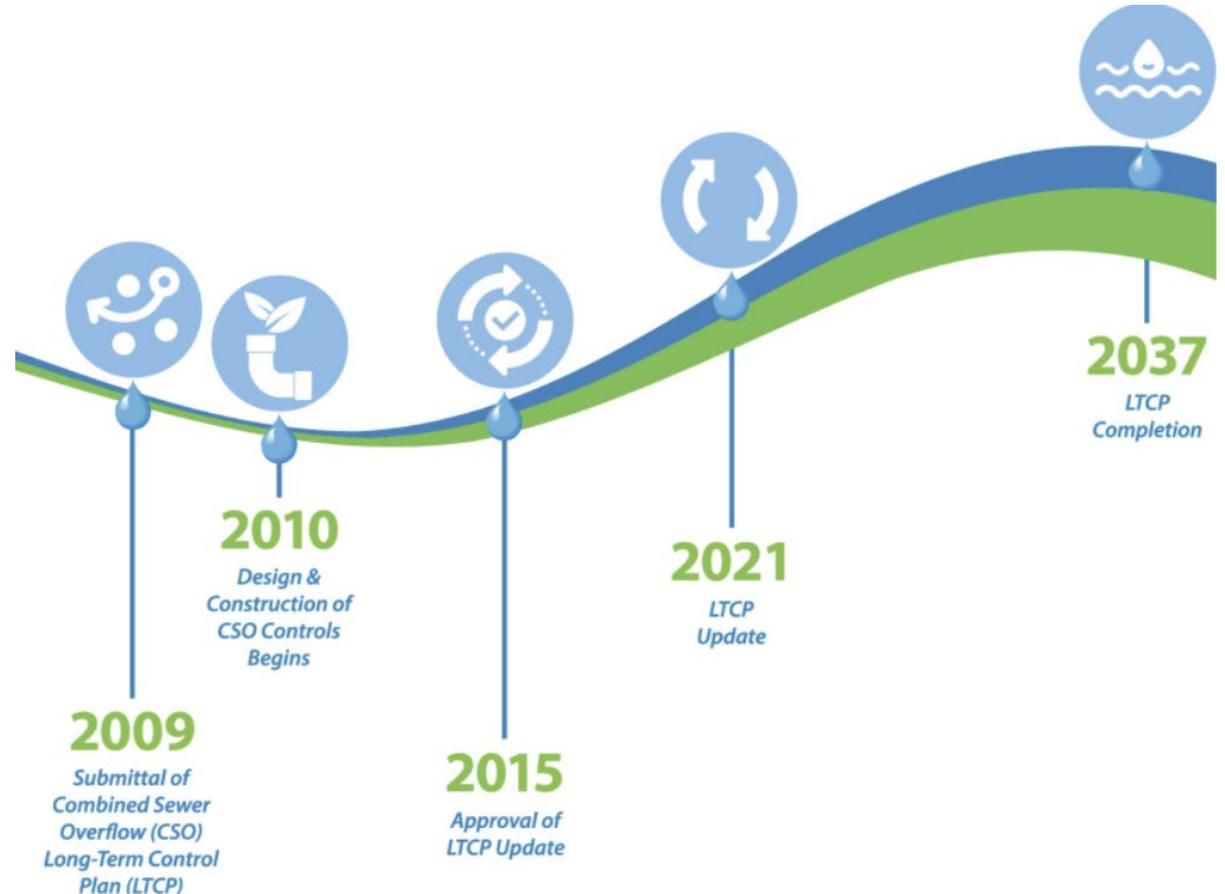
Budget and scope align with comparable programs

Phased implementation supports cost control and flexibility

Allows for innovation and evolving best practices

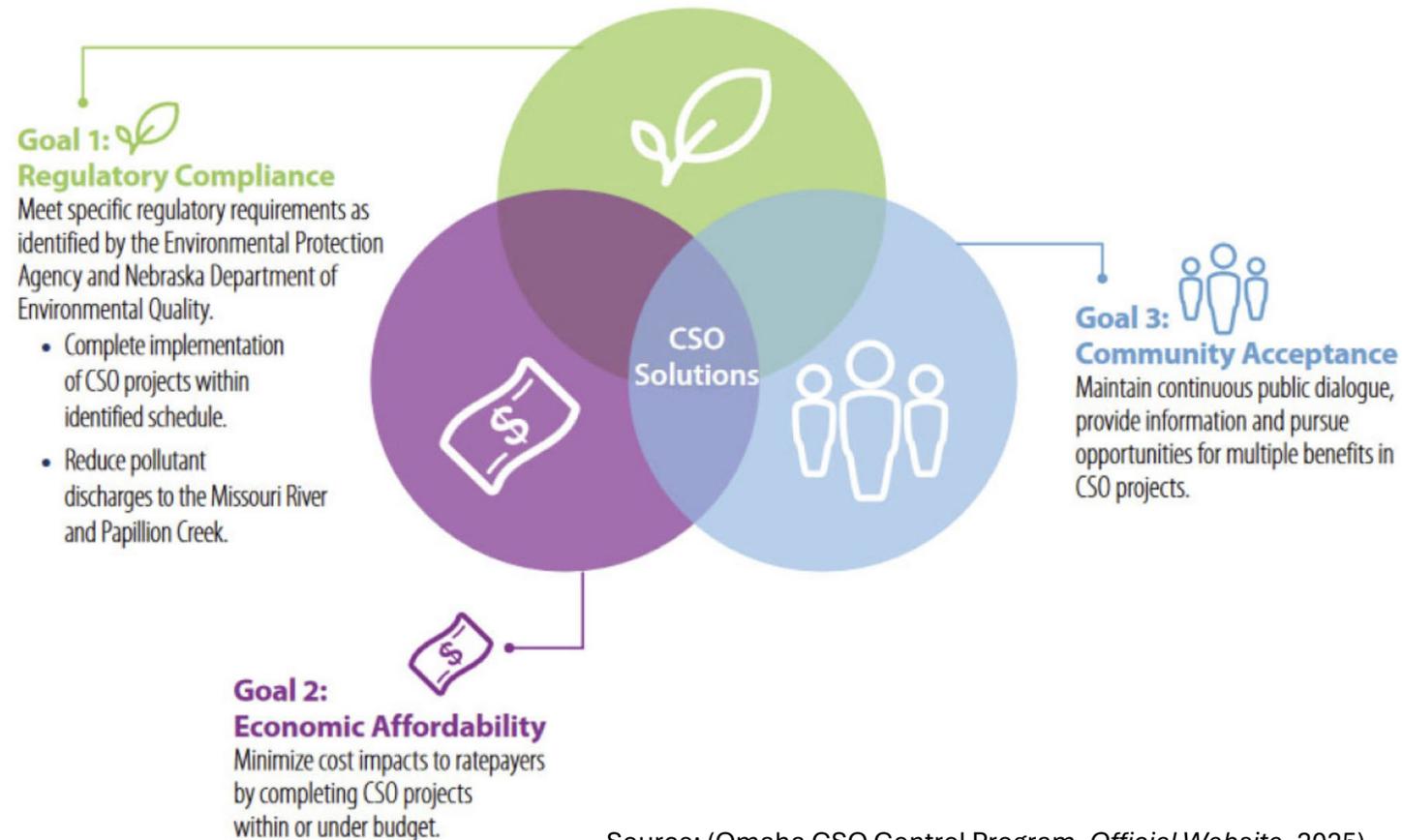
Research Question 2:

- To what extent has the program achieved its goals, and what are its key short-term and long-term outcomes in relation to the community and policymaking?
- What were the outcomes of these projects, and were the goals accomplished?



Goals

- To improve water quality in Omaha's local rivers and streams by capturing or treating 85% of the average annual combined sewage volume.



Source: (Omaha CSO Control Program, *Official Website*, 2025)

Short-term vs. Long-term Outcomes

Short-term Outcomes

- Achieving **initial project milestones**
- Advancing key infrastructure construction
- Implementing community support programs



Study &
Design
Projects



Construction
Projects



Completed
Projects

Long-term Outcomes

- Completing full system upgrades by 2037
- Achieving the 85% pollution control target
- **Broader impact** on Omaha and **residents' quality of life** in terms of social, economic, environment aspects.



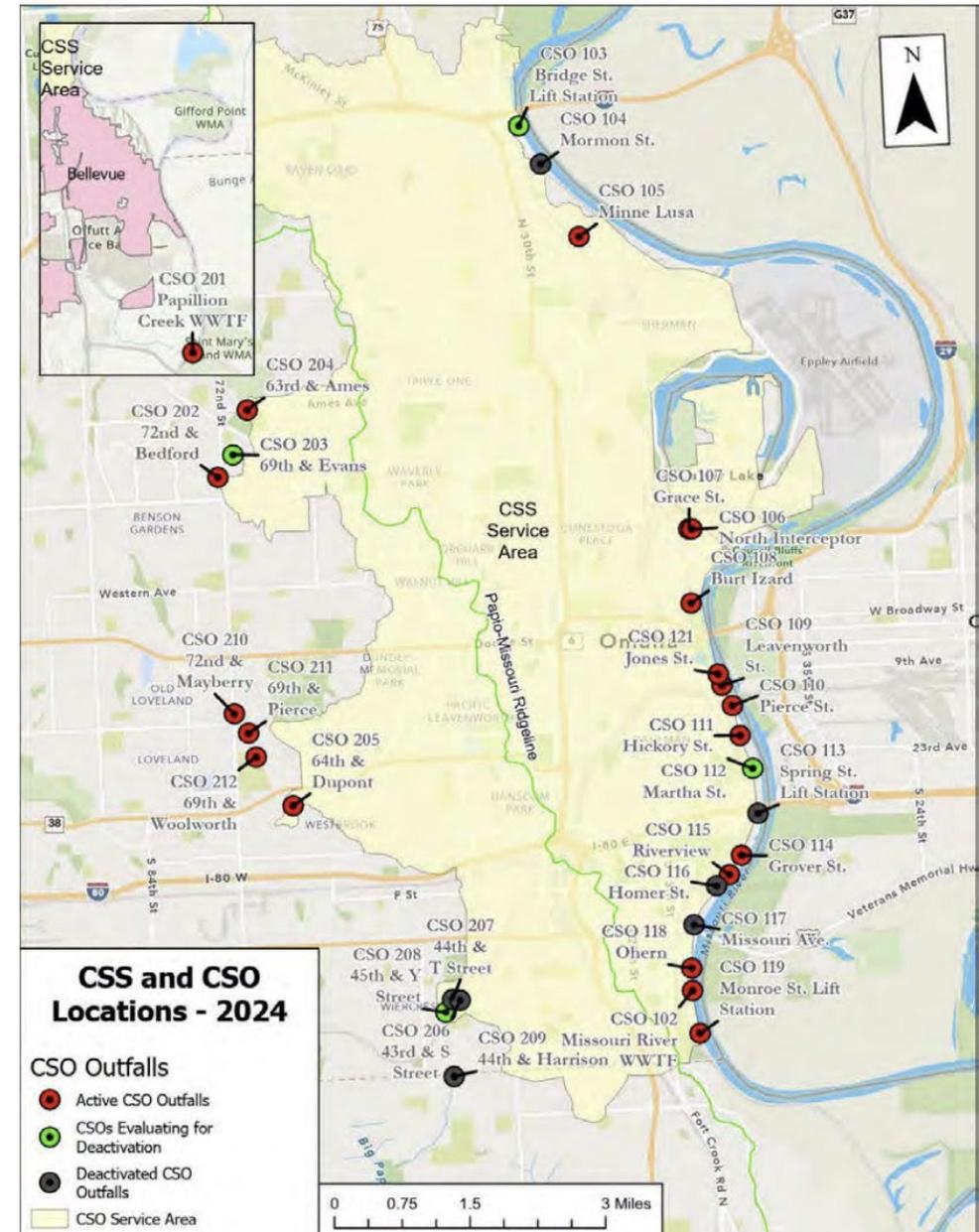
Future
Projects



Green
Infrastructure
Projects

Short-term Outcomes – Environmental Aspect

- Reduced number of overflow events
 - Clear reduction in overflow events: CSOs 112, 203, 208, 211..
 - Zero overflows: CSO 208 (City of Omaha 2024)
- Reduced number of CSO outfalls
 - Five additional CSOs have been eliminated (as of 2024) (City of Omaha 2024)
- Implemented Nine Minimum Controls (NMC) to manage immediate overflow risks
 - Proper Operation and Maintenance
 - Maximize Use of the Collection System for Storage
 - Review and Modification of Pretreatment Programs
 - Pollution Prevention, Public Notification, ...



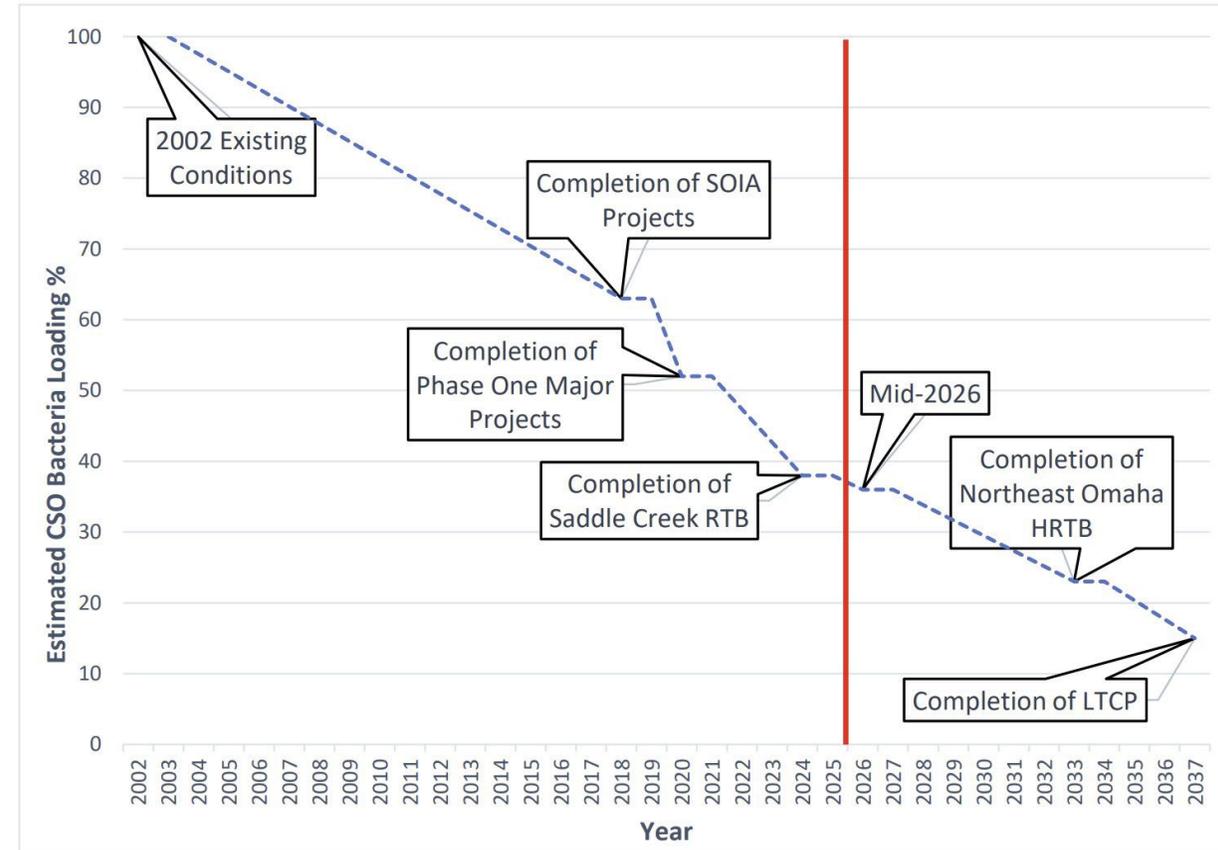
< Overall CSO Map >

Source: (City of Omaha 2024)

Long-term Outcomes

– Environmental Aspect

- Achieve 85% capture and treatment of combined sewage volume by 2037
- Decrease volume of combined sewage discharged from the CSO system (City of Omaha 2024)
 - (2002) 3,655.2 million gallons (MG)
 - (2037) 858.2 - 868.8 MG (estimated)
- Improve in receiving water quality (Missouri River, Papillion Creek)
- Enhance pollution prevention and cleanliness initiatives



< Modeled E. coli (bacteria) Reduction >

Source: (City of Omaha 2024)

Short-term Outcomes – Social Aspects

-
- Strengthened Public Engagement
 - Pre-construction Public meetings
 - Youth Outreach
 - World O! Water, Kid College
 - Rain Barrel Workshops

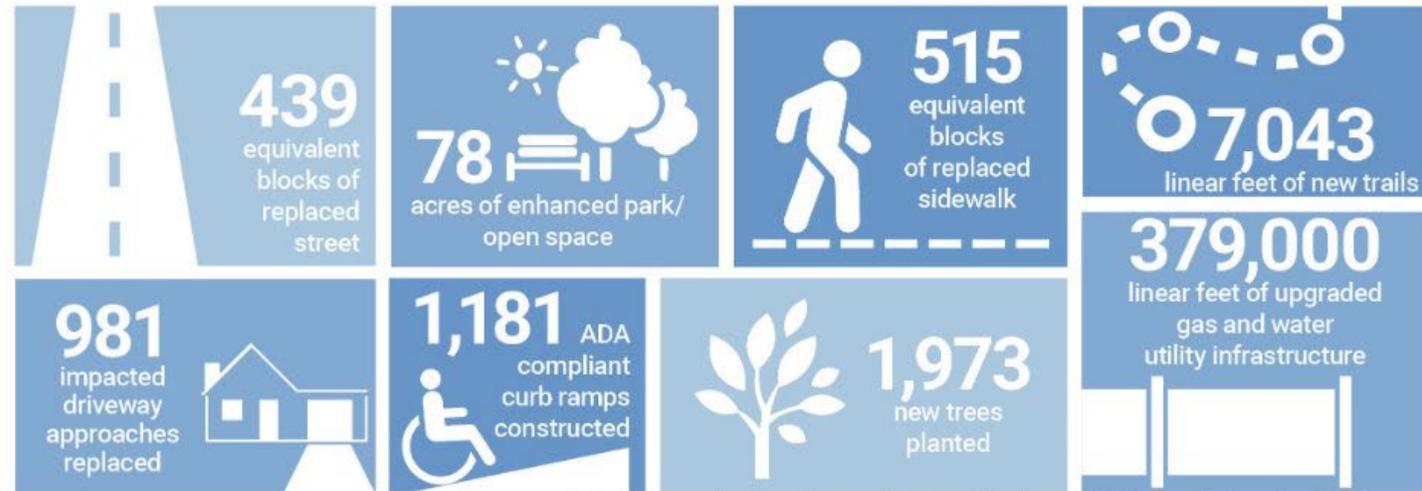


Source: (Omaha CSO Control Program, *Official Website*, 2025)

Long-term Outcomes

– Social Aspects

- Increase public awareness and expanded community engagement on water quality improvement efforts
- Enhance equity and accessibility of infrastructures
- Increase sustainability of community



Includes 31 completed or underway projects as of fourth quarter, 2022, since the inception of the Program.

Source: (Omaha CSO Control Program, *Official Website*, 2025)

Short-term Outcomes – Economic Aspects

- During 2018-2022, **\$247 million** was allocated in General Contractor construction contracts to local Omaha-area companies
(Omaha CSO Control Program, *Official Website*, 2025)
- Awarded approximately **\$21 million** in total contracts to small and emerging small businesses (SEBs) and minority/women-owned businesses
 - **16.3%** of the total construction work contracted through the City's CSO Program
(Omaha CSO Control Program, *Official Website*, 2025)



Long-term Outcomes – Economic Aspects

- Maintain long-term financial sustainability
 - Minimize burden on ratepayers and enhance affordability by preparing a financial strategy by 2028 (City of Omaha 2024)
 - Deliver cost-effective environmental infrastructure
- Support local employment and stimulate the regional economy
 - Empower resilience of disadvantaged business enterprises
 - Create decent job opportunities to community and residents

Ratepayer assistance is provided to low-income households who qualify for LIHEAP* and additionally through a 2020 federal Coronavirus Aid, Relief, and Economic Security (CARES) Act contribution.

*LIHEAP: Low-Income Home Energy Assistance Program



From January through June 2023,
over **\$1,617,000**
has been provided in assistance;
for a total of **\$21,140,000**

The infographic features a stack of coins with a dollar sign on the left and a bar chart with an upward-pointing arrow on the right.

Source: (Omaha CSO Control Program, *Official Website*, 2025)

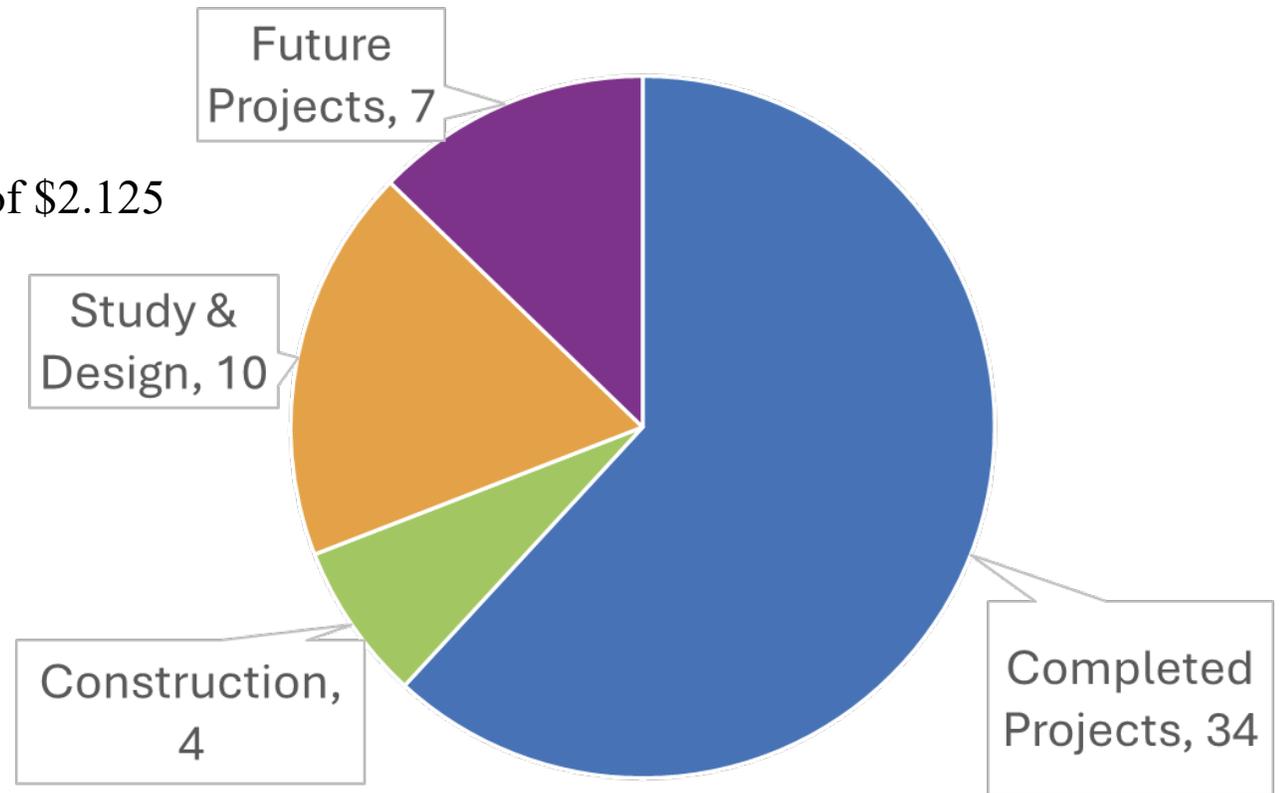
Outcomes Overview

- Budget

- Spent approximately **\$1.02 billion dollars** out of \$2.125 billion dollars (48%) (City of Omaha 2024)

- Project Progress

- **34 Completed projects**
- 4 Under construction
- 10 Study & Design stage
- 7 Future projects

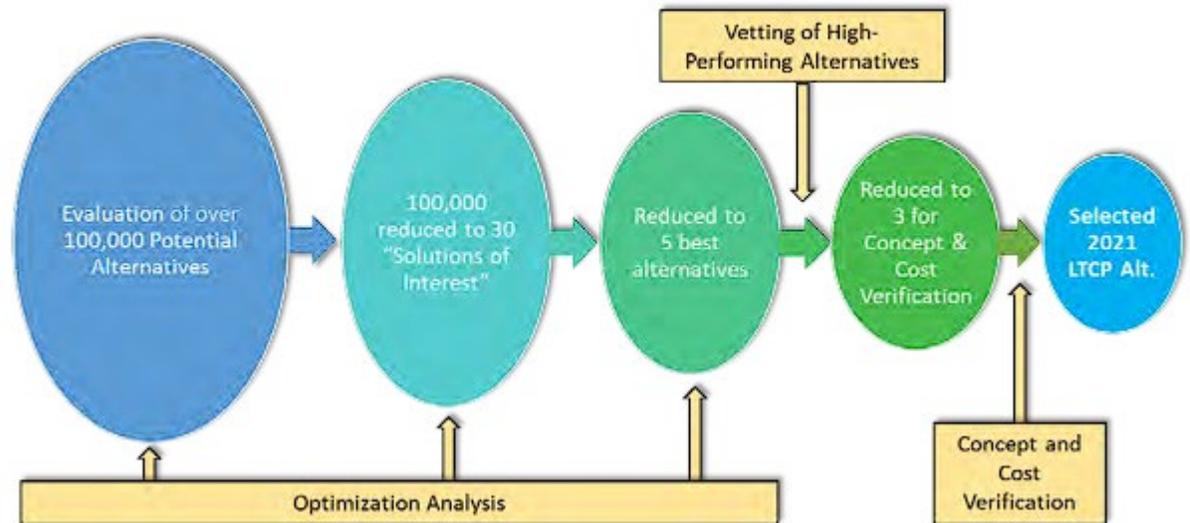


Research Question 3:

- What are the major limitations of the program, and what improvements or alternatives are needed?
- If there were cases of failure, how were they addressed, or how should they be improved?

Limitations

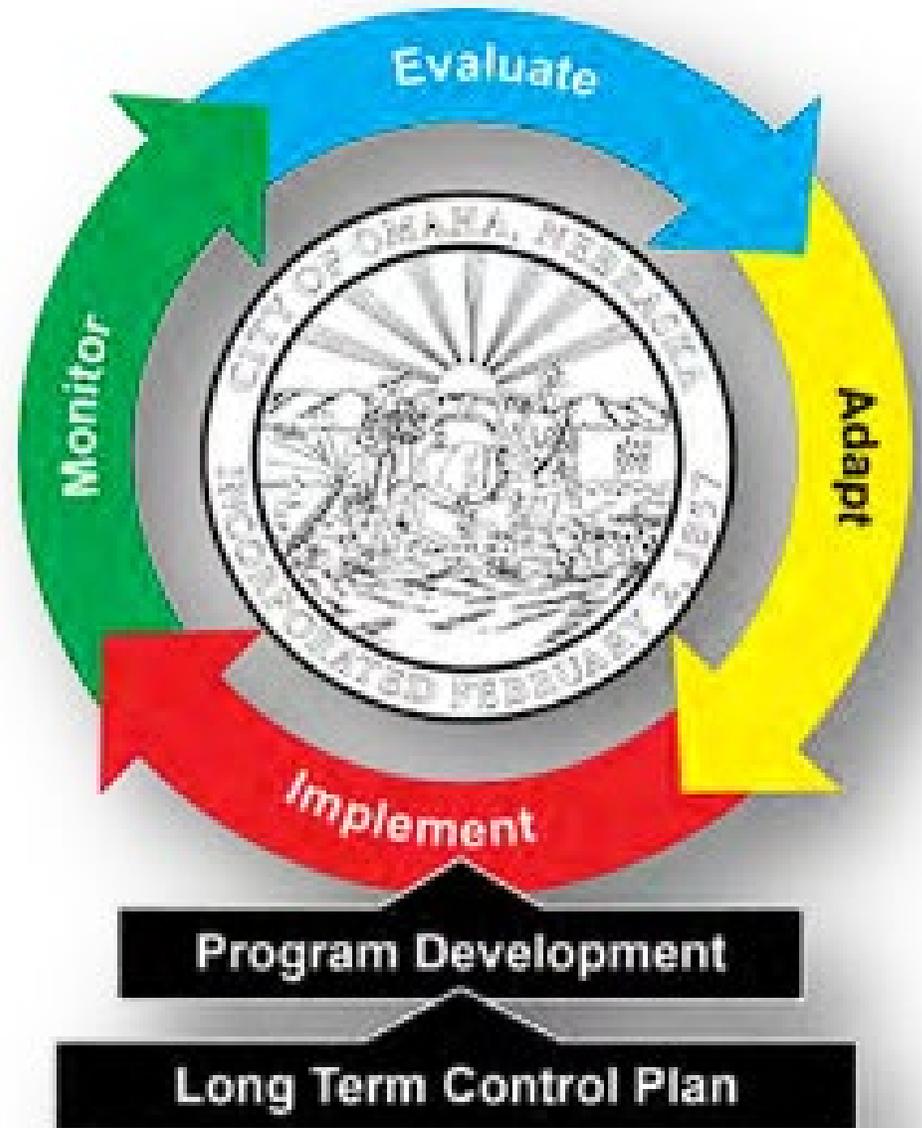
- ~28 year timeline for total completion.
 - Cohesion across short and long-term employee turnover.
 - Regular maintenance on existing infrastructure.
 - Ongoing Climate change bringing unprecedented weather events.
 - Potential for cost snowball due to inflation, market fluctuation and labor costs overtime.



Source: (Omaha CSO Control Program, *Official Website*, 2025)

Potential Improvements

- LTCP Updates in 2014 and 2021 aim to assess current plan progress and reevaluate the next phase of the plan completion.
- The LTCP also acts as a budgeting milestone. The city is required by state statutes to provide the planned financing for the next section of projects.



Addressing Failures

- Going Over Budget
 - Taxpayer burdens relieved through project extensions to lower the short-term costs.
 - Grant and loan program alternatives.
- Climate Change
 - Adjusting the model to rising average river levels and storms with increased frequency and severity
- The Covid-19 Pandemic and associated labor shortages
 - Virtual public meetings and additional outreach to supplement standard operating procedures



Source: (Omaha CSO Control Program, *Official Website*, 2025)

Implementation and Progress: Milestones and Outcomes



Includes sewer separation, high-rate treatment, green infrastructure, optimization.



Phased implementation extends to October 2037.



Timeline extended due to cost, evaluation, flooding. Progress towards 85% capture goal:

Missouri River Watershed: 56% (71% after current projects).

Papillion Creek Watershed: 84%.

Estimated 80% in Missouri River watershed upon current project completion.

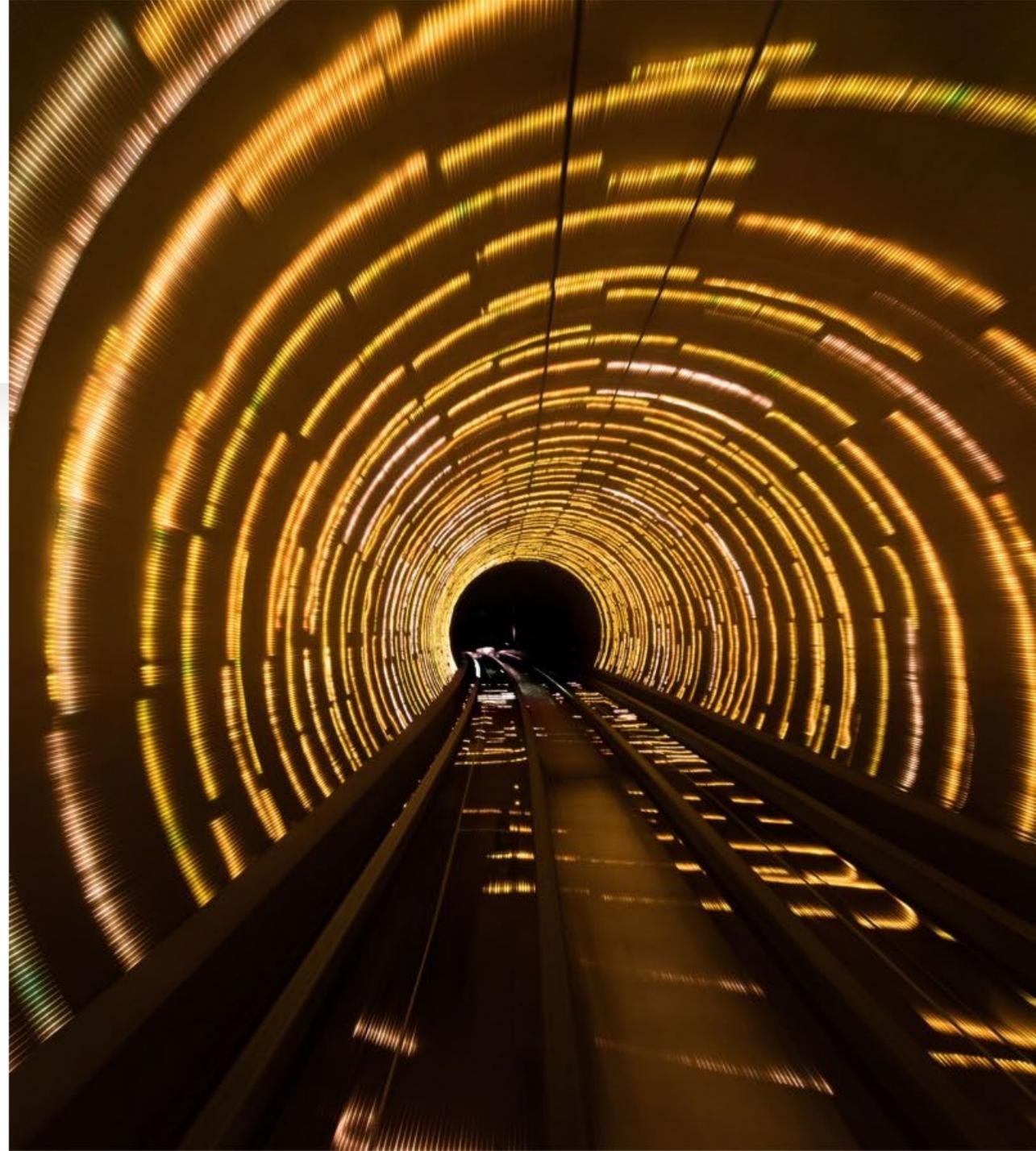


Short & Long Term Outcomes

- Short-term outcomes:
 - ~50% reduction in E. coli to Missouri River.
 - Neighborhood improvements (streets, curbs, trees).
 - Policy updates and Consent Order amendments.
- Long-term expected benefits:
 - Improved water quality in rivers.
 - Public health benefits from reduced overflows.
 - Modernized, sustainable water management.

Addressing Setbacks

- Major challenges:
 - Significant financial cost (~\$2 billion).
 - Rising sewer rates impacting residents.
 - Long implementation timeline (2009-2037).
 - Potential for delays (e.g., equipment).
 - Managing numerous projects/stakeholders.
- Improvements:
 - Optimization efforts led to 2021 LTCP Update.
 - Replacing deep tunnel with treatment/storage.
 - Green infrastructure implementation.

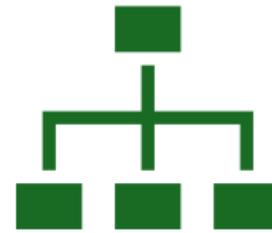


Seeking Improvements



Improvements (continued):

Innovation program for infiltration/inflow (I/I).
Evaluation of real-time controls (RTCs).
Cost control measures to stabilize rates.



Risk management framework to address setbacks:

Risk registers at program/project levels.
Transparency in reporting issues/actions.
Adaptability to unforeseen challenges.

Lessons Learned and Future Directions



Importance of long-term vision, sustained commitment.



Effective financial planning, ratepayer impact mitigation.



Value of adaptive management, embracing innovation.



Crucial role of community engagement, transparency.



Benefits of integrating green infrastructure.



Vital need for proactive risk management.



Future trends: nature-based solutions, digital technologies.

Conclusion and Recommendations

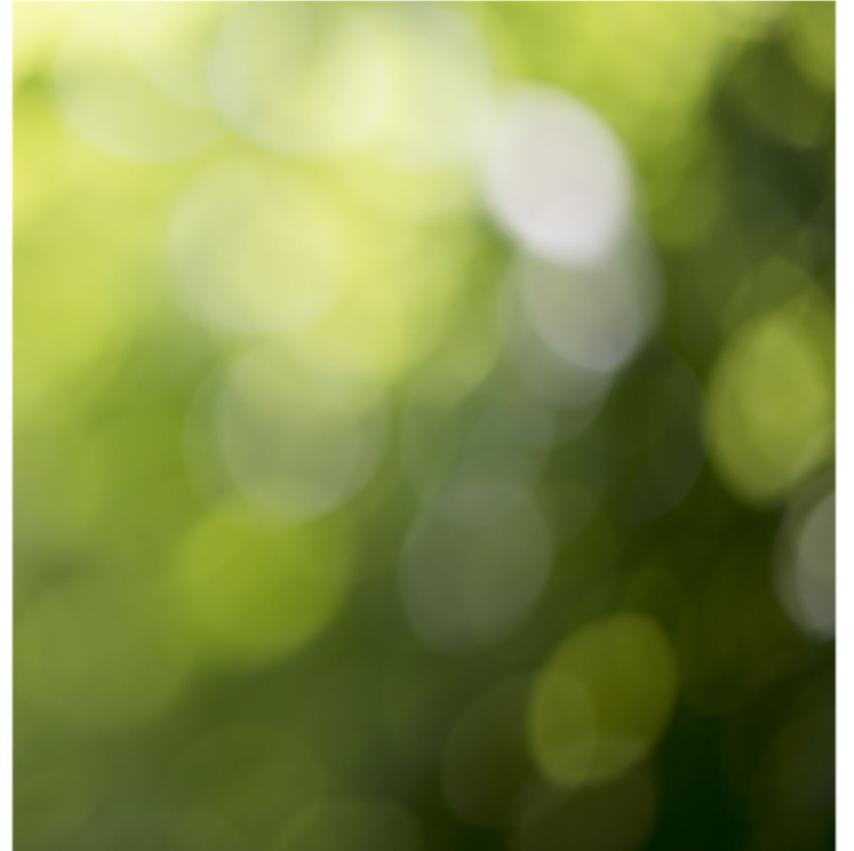
Omaha CSO program is a significant effort to address overflows.

Progress made, but faces financial/logistical challenges.

Adaptive management, innovation are key to success.

Recommendations for other cities:

- Prioritize integrated planning.
- Ensure financial sustainability/equity.
- Engage the community.
- Embrace innovation/adaptation.
- Invest in data-driven decisions.
- Foster inter-agency collaboration.



Thank you!

Q&A