Integrated Planning for Combined Sewer Overflows

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KLEINFELDER

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The CSO Conundrum

- CSOs are a remnant of our early urban infrastructure
  - a belief that the environment had a nearly 'limitless' capacity to assimilate human waste
- So, we built efficient systems to convey unwanted water (wastewater and stormwater) away from the land => Combined Sewer Systems (CSSs)
  - Many built before there was any wastewater treatment
  - With advent of universal wastewater treatment, capacity issues become important
  - Combined Sewer Overflows (CSOs) alleviate the capacity issue
  - A benefit – small stormwater flows actually get treated

The CSO Conundrum

- Our predicament – CSSs are in locations where remedies are difficult and expensive
  - Costs in the range of hundreds of millions of dollars are not uncommon
  - Median Household Income (MHI) statistics in such areas are among the lowest in the country
  - Benefits of CSO elimination not always clear
- Federal mandate to eliminate CSOs
- ***Classic dilemma – lack of funding with high cost and uncertain benefit***

Status of CSO Program in NJ

- CSO program in NJ is evolving
- Draft Individual NJPDES Permits have now been issued for all communities with CSOs
  - Some entities have never had an individual NJPDES permit e.g., Camden and Gloucester cities' sewers drain to regional WWTP at Camden County MUA
  - Previously operated under Master General NJPDES Permit for CSOs
- NJDEP will respond to comments and issue final permits soon => clock will start ticking

Nine Minimum Controls (NMCs)

- Prior program required implementation of NMCs
  1. O&M Program
  2. Max storage in collection system
  3. Pretreatment to minimize CSO impacts
  4. Max flow to POTW
  5. No CSOs during dry weather
  6. Solids and Floatables control
  7. Pollution prevention
  8. Public notification
  9. Monitoring
- *"the low hanging fruit"*

Long Term Control Plans (LTCPs)

- Permits provide 3 years for development of LTCPs
  1. Characterization, monitoring and modeling of CSS
  2. Public participation process
  3. Consideration of sensitive areas
  4. Evaluation of alternatives
  5. Cost/performance considerations
  6. Operational plan
  7. Max treatment at POTW
  8. Implementation schedule
  9. Compliance monitoring

Long Term Control Plans (LTCPs)

- LTCPs require substantial effort including:
  1. Mapping of CSS
  2. Baseline monitoring
  3. Simulation models for CSS and receiving water
  4. Evaluation of WWTP capabilities and upgrades
  5. Public participation process
  6. Coordination between hydraulically connected entities
     - Some have CSOs and some do not
  7. Alternatives evaluation and decision making process
  8. Financial planning

Long Term Control Plans (LTCPs)

- Presumption Approach
  - < 4 overflow events per year, or
  - 85% removal of volume/mass of CSS flows, and
  - remaining CSO gets solids and floatables removal and disinfection
- Demonstration Approach
  - Demonstrate meeting WQ based requirements of CWA
  - Meet WQS and protect designated uses
  - Max pollution reduction reasonably attainable
  - Allow cost effective upgrades if necessary to meet WQS
- Alternative approach – Integrated Planning!

Integrated Planning

- Traditional Approach: focus on each CWA requirement individually
  - unintended consequence of constraining a municipality from addressing its most serious water quality issues first.
- Integrated Planning: identify a prioritized critical path to achieving the water quality objectives of the CWA
  - Protect public health and water quality; satisfy CWA
  - Address most pressing issues first
  - Municipality develops plan
  - Use of innovative solutions / green infrastructure

Traditional vs. Integrated Planning Model

- ***Traditional:***
  - "Adversarial"
  - Regulatory Enforcement silo through AO's
  - Definitive, retrospective
  - Affordability basis: CSO Implementation Plan Only
  - Grey Infrastructure BMPs
  - CSO Impacts on WQ metrics
  - Lack of coordinated infrastructure management
- ***Integrated Planning:***
  - Collaborative
  - Permitting/Enforcement coordination
  - Adaptive/Iterative
  - Affordability basis: considers all CWA requirements
  - Green/Hybrid Solutions
  - Plan for optimal WQ improvement
  - Holistic Asset Management Approach

IP Approach to Compliance

- Satisfy enforcement / permit requirements
- Identify CSO, wastewater collection and treatment system needs
- Develop optimal CSO Abatement Plan and Wastewater / Stormwater Capital Plan
- Integrated Long Term Plan for affordable CSO and Wastewater / Stormwater Program

Approach to Compliance: Steps and Timeframes

Collect Data to Support Analysis

- Existing System
- Environmental
- Social
- Economic
- Regulatory (Compliance)

Started: Month 1 – extends minimum 2 metering seasons
Duration: 9 Months

Input to Analysis Framework

- Update Models
- Develop weights and scoring
- Develop alternatives scenarios

Started: Month 9
Duration: 6 Months

Evaluate the Scenarios

- Include "Green" elements
- Water Quality Impacts
- Human Health Impacts
- Financial Requirements
- Timeline to Implement

Started: Month 15
Duration: 9 Months

Select the Best Scenario

- OUTCOME: Recommended CSO Control Plan
- Maximum environmental and system benefits with limited resources

Started: Month 21
Duration: 9 Months

Steps and Timeframes – Cont.'d

Stakeholder Outreach

- Community Driven
- Involves key community groups
- Environmental justice/equity

Throughout project (or as preferred by client) with public meetings and hearings included

Finalize the Recommended CSO LTCP

- Environmental
- Economic
- Water Quality
- Social
- OUTCOME: accepted plan, path for implementation

Submit CSO Draft/Final LTCP: Month 32/36
Public Comment: Month 30
Duration: 3 Months

Implement Projects

- Phase implementation over 20 to 40 year time frame (or as appropriate)

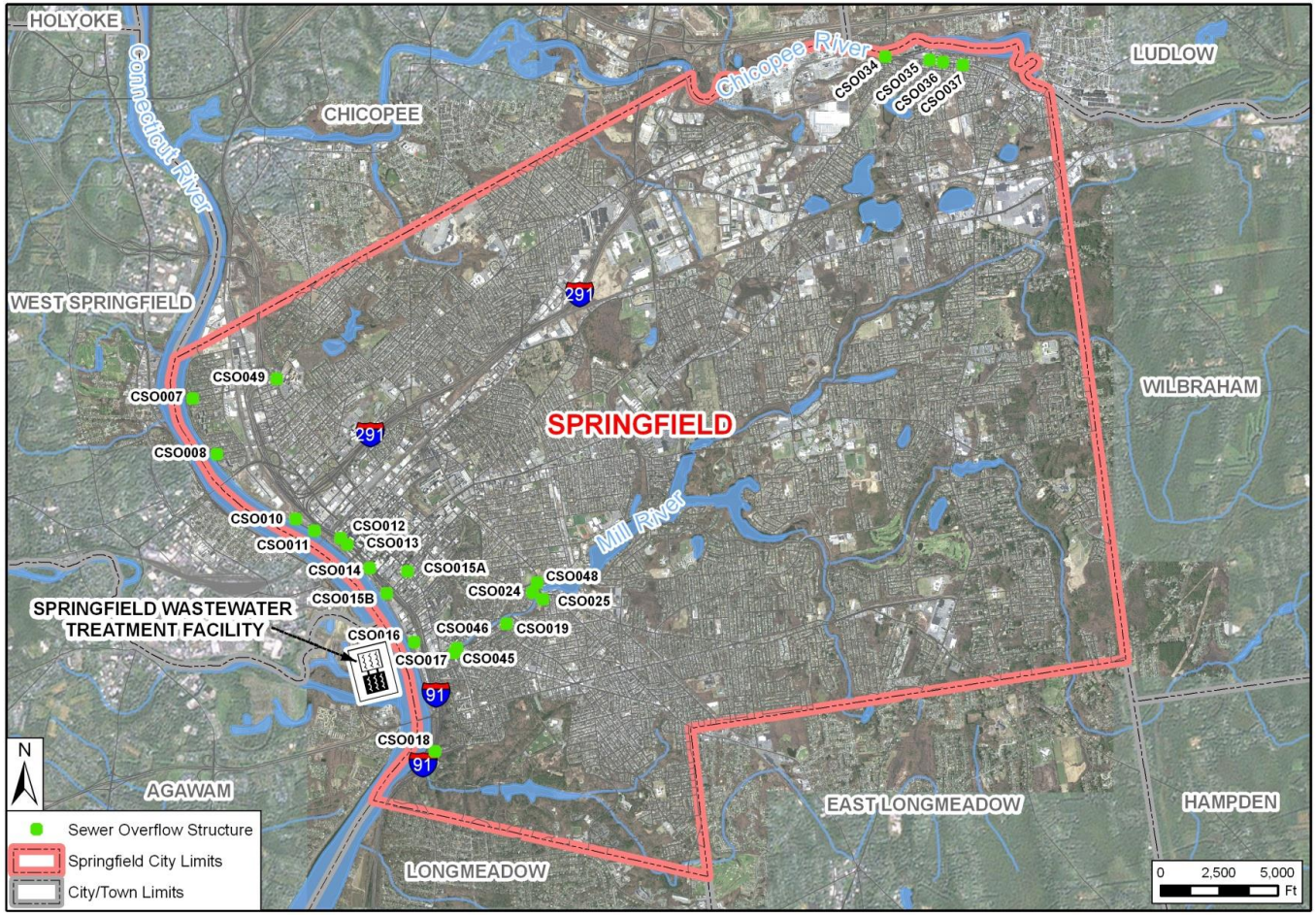
Negotiated and memorialized in permits or AOs

Monitor & Communicate Success

- Monitor and measure results
- Share lessons learned with the community, EPA, and other municipalities
- Adapt controls as indicated

Start: as projects completed

Case Study - Springfield, MA System



Key Facts

- Population Served: 250,000
- 500 miles of sewer and combined sewer
- 220 miles of storm drains
- 23 CSO regulator structures
- 7 Flood Control pump stations
- 27 Sanitary pump stations
- Bondi Island SRWTF: Serving Springfield and 7 Satellite Communities

Comparison to Some CSO Communities in NJ

City	Population	No. of Combined Sewer Outfalls	Median HH Income[1]	% Families below Poverty Level[2]
Springfield, MA	152,082	25	$30,417	19.3%
Jersey City, NJ	240,055	21	$37,862	16.4%
Bayonne, NJ	61,842	28	$41,566	8.4%
Paterson, NJ	149,222	24	$32,778	19.2%
Camden, NJ	79,904	31	$23,421	32.8%
Newark, NJ	273,546	17	$26,913	25.5%
Elizabeth, NJ	120,568	34	$35,174	15.6%

[1] US Median HH Income is $41,994 based on Census 2010 figures.

[2] Percentage of families in America living below the poverty line is 9.2% based on Census 2010 figures.

Why Do Communities Procrastinate?

- Prior to Development of Final Long Term Control Plan, SWSC Spent $88M on CSO Reduction in 12 Years
  - Eliminated 3 CSO Outfalls and 84 MG +/- of CSO in the Typical Year
  - Spent $1,050,000 +/- Per MG Removed
- Results were not cost effective and the program was not sustainable

Springfield's Integrated LTCP for CSO

- Developed Alternative Solutions:
  - CSO elimination with 4 Activations per year
    - Cost = $312M
  - CSO elimination with 8 Activations per year
    - Cost = $196M

Non-CSO Capital Improvement Plan

Recommended Improvement	Estimated Cost (July 2011 $)
Non-CSO Capital Pipe Cost (Assessed Pipe)	$8,200,000
Non-CSO Capital Pipe Cost (Projected)	$76,600,000
Continued Diagnostics and Pipeline Cleaning	$22,800,000
Immediate Non-CSO Improvements at SRWTF	$200,000
Short Term Conditional Improvements at SRWTF	$1,300,000
Long Term Conditional Improvements at SRWTF	$132,100,000
Short Term Pump Station Improvements	$1,700,000
Intermediate Term Pump Station Improvements	$500,000
Long Term Pump Station Improvements	$70,100,000
Totals	**$313,500,000**

Develop Integrated LTCP

- Combine CSO and Other Non-CSO Costs:
  - CSO Costs Ranged from $196M to $312M
  - Non-CSO Capital Costs Were Approximately $315M

Total Program Costs Ranged from $511M to $627M

Affordability Analysis – a Key Component

- Process Focused on Balancing **Total** Future Costs to Provide Wastewater Collection and Treatment With Rate Payers Ability to "Afford" Improvements
  - Impact on Typical Households – Residential Indicator = Typical Household Bill as Percent of Median Household Income
  - Also Consider Broader Financial Capabilities of Community such as Ability to Raise Capital, Unemployment, MHI Trends and Strength of Tax Base

Affordability Analysis

- Set acceptable cost = 2% MHI
  - Resulted in $225M - $266M Available Over 20 - 40 Year Planning Horizon
  - Total Identified Costs $627M Exceeded Affordability by $361M
  - Total Identified Non-CSO Costs $315M Exceeded Affordability by $49M
  - Needed Approach to Prioritize Non-CSO and CSO Related Improvements ➔ an Integrated Plan!

What Does "Affordable" Mean?

- Affordability Considerations Indicated that 0 to 4 Overflow Scenarios Were Not Affordable
- Water Quality Modeling to Further Justify that there was No Benefit in Going from 8 to 4 Overflows

Final Plan Achievements

- Integrated CSO and Non-CSO Elements into a Prioritized Plan:
  - 20 Year CSO and 40 Year Non-CSO Capital Improvement Plan
  - CSO Plan Included:
    - Greater Than 89% Volume Reduction (EPA Goal = 85%)
    - 95% Water Quality Attainment
    - $136M Planned + $88M Spent = $224M for CSO Reduction
    - $496,000 / MG Removed
  - CSO and Non-CSO Components Provide Renewal to Critical Infrastructure and CSO Control While Reducing Risk

Benefits of the Approach

- Defines:
  - What is affordable to the community
  - What is achievable within context of CWA thresholds
  - How projects are prioritized on the basis of community infrastructure needs, capacity, operations and socio-economic benefit
- Creates:
  - Accountability both for regulator (plan "approval") and community (plan commitments)
  - Incentive to act based on environmental and economic rehabilitation, not just regulatory compliance

A Perspective on New Jersey Program Status

- Challenges:
  - Economic conditions analagous to Springfield case
  - Must overcome inertia based on perception of unaffordable spending for modest water quality outcomes
- Advantages:
  - Willingness to apply flexible, cooperative approach
  - The Integrated Planning Approach is evolving quickly – both regulators and regulated have greater confidence in applying the model in enforcement or permit mechanisms

Questions?