Best Practices

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HDR
Getting the Best LTCP

- CSO controls will be expensive
- Include Best Practices to
  - Maximize visible and tangible benefits
  - Create and maintain public support
  - Reduce costs
## Phased Implementation Controls Costs

<table>
<thead>
<tr>
<th>CSO Control Strategy</th>
<th>Techniques</th>
<th>Level of Effort</th>
<th>Life-Cycle Cost</th>
<th>CSO Volume</th>
<th>Co-benefits</th>
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<tbody>
<tr>
<td>Minimize inputs to the combined sewer</td>
<td>Water conservation programs</td>
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<td>Green infrastructure</td>
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<td>Infiltration/inflow removal</td>
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<td>Tide gate repair</td>
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<td>Sewer gate separation</td>
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<td>Catch basin cleaning</td>
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<td>Smart infrastructure and O&amp;M</td>
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<td>Interceptor cleaning</td>
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<td>Maximize storage capacity of the existing system</td>
<td>Weir adjustments</td>
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<td>Off-line storage (tanks/tunnels)</td>
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<td>Maximize treatment</td>
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<td>Treatment Plant upgrade</td>
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<td>✓✓✓</td>
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</tbody>
</table>

*reduces pathogens but does not reduce CSO volume
System Optimization

- Reduce the volume of flow entering the CSS and POTW during rain events
- For implementation in both CSS and separated areas
  - Potable water conservation
  - Reduction of excessive Infiltration and Inflow (I&I) in separate and combined sewer systems
- For implementation in CSS areas
  - Blue roofs, cisterns, underground storage tanks
  - Reduce peak flow rates during wet weather
Water Conservation

• Effects
  – Reduces dry weather sewage flows

• Benefits
  – More plant capacity allows more wet weather flow to be treated
  – More sewer capacity allows for more transmission

• Approaches
  – Advanced metering
  – Monthly billing
  – Conservation rate structure
  – Toilet and fixture replacement programs
Inflow Reduction

Inflow Sources
- Roof drain connection
- Uncapped cleanout
- Faulty manhole cover or frame

Infiltration Sources
- Connected foundation drain
- Root intrusion into lateral
- Faulty lateral connection
- Deteriorated manhole
- Cracked or broken pipe
Green Infrastructure

• Allows for stormwater management close to its source
  – Pervious pavements
  – Street bump-outs
  – Rain gardens
  – Enhanced tree Pits
  – Green roofs
  – Infiltration Swales
Combining GI and System Optimization
Coordination Across Agencies

• Coordinate construction across agencies
• Included needed CSO elements, including enhanced retention, within construction planned for other primary purposes
Integration of GI with Street Work

Street of the Future
Much of Chicago’s adaptation work is about transforming paved spaces, which in the form of alleys and streets account for 25 percent of the city’s ground cover.

NEW TREE SPECIES
The city has replaced native Illinois species with Southern ones that are expected to thrive in higher temperatures.

WIDER SIDEWALKS
These allow more space for pedestrians and include planting areas for trees to provide shade and absorb rainwater.

PLANTING AREAS
Lower than the street surface, these will be filled with drought-resistant plants that sponge up excess water and help to filter pollutants like de-icing salts.

PARKING SPACES AND BIKE LANE
Permeable pavers for these street additions let rainwater filter through. The light-reflecting street surface includes recycled tires to allow the asphalt to expand in summer’s heat without buckling and to contract in winter without cracking.

Sources: City of Chicago; Wight & Company
Integration of Community Facilities with Grey CSO Controls

- Park Constructed over CSO Vortex Facilities
- Walk/Bike Path Constructed over CSO storage/Conveyance Pipe
CSO Storage and Treatment

• Use existing infrastructure
• Effects
  – temporary storage of wet flow
  – Push more flow through treatment plant
• Benefits
  – Uses existing infrastructure

• Approaches
  • Treatment Plants
    – Secondary bypass
  • In-system storage
    – Raise regulator weirs
    – Bending weirs
Flooding and Resiliency

• Approaches
  – Sewer Separation
  – Stream daylighting
  – Green Infrastructure
  – Design Elevations
  – Sediment Controls
## Developing Regional Solutions

### LTCP development

- Public Participation
- Public Notification System
- Area-wide receiving waters characterization (monitoring)
- Water Quality Modeling
- System modeling – same platform, modeling parameters
- Update Cost/Performance control alternatives
- Financial Capability Analysis
- Green Infrastructure pilot programs, monitoring

### LTCP Implementation

- CSO Reduction Opportunities across municipal boundaries
- Maximize flow to local sewage treatment plant
- Consolidate secondary treatment
- Regional GI solutions
Case Study: N. Kentucky SD1

- 3 counties
- Total service area ~ 229 sq miles
- CSO area 12 sq miles
- >1,600 miles of sewers
- 134 pump stations
- 3 regional treatment facilities
- 102,000 Wastewater Accounts
- 94,500 Storm Water Accounts
Case Study: N. Kentucky SD1

- Combined Sewer Overflows
  - 95 CSO locations
  - 1.8 billion gallons annually
- Sanitary Sewer Overflows
  - 166 SSO locations
  - 200 MG annually
- Storm Water Runoff (MS4 & NPS)
  - Flooding
  - Hydromodification
- Impaired Waters
  - Primary pollutants of concern (bacteria, solids and nutrients)
Planning Process

• Process to control highest regional priorities first
• Integrated approach to address wet and dry weather sources
• Additional benefits to the community such as air quality, wildlife habitat, urban beautification, and economic development
• Funding to projects that provide the greatest benefits
• Public input process to support financial investment
Case Study: N. Kentucky SD1

Solution

- Watershed-based approach
- Consider pollution sources beyond sewer overflows
- Iterative Assessment Process
- Consent Decree was entered in Federal Court on April 18, 2007
  - Requires SD1 to improve water quality, eliminate SSOs and comply with the CSO Policy by 2025
  - Watershed management approach allows SD1 to revise watershed plans every 5 years
Public Participation

Informational Meetings

Community Planting

Notification
Case study: Omaha, NE

- 10 Basin Advisory Panels
  - 83 neighborhood associations, utilities, local business, developers, and environmental groups.
- Citywide Community Basin Panel was appointed by the Mayor of Omaha to represent the concerns of the overall community.
- Evaluated alternatives, identified priorities for investment and communicated the financial impacts on ratepayers for implementation.
  - Standardized list of control alternatives -- a hybrid approach combining sewer separation, storage, and treatment – screened, presented to the advisory panels.
  - Criteria that included community enhancements, flood reduction, and water quality.
  - The advisory panels and community members ranked the criteria important to each basin.