Controlling CSO Utilizing Green Techniques in an Urban Environment

Fleet Avenue Green Infrastructure
Presentation Agenda

• NEORSD and Green Infrastructure Requirements
• City of Cleveland Coordination
• Alternative Evaluation and Design Selection
• Design
  – Hydrology and Hydraulics
  – Plan and Sections
  – Plant and Soil Selection
Northeast Ohio Regional Sewer District

- Created in 1972 by Court Order
- Servicing all or part of 62 member communities
- 1 million customers
- 90+ billion gallons wastewater treated each year
- Consent Decree - Project Clean Lake
- 81 square miles in combined sewer area
- 65 square miles are impervious
- 80% impervious
Consent Decree Requirements for Northeast Ohio’s CSO Volume Reductions

![Bar chart showing CSO volume reductions over time.]

- **Baseline (1970s):** 9
- **Early 2000s:** 6.2
- **Re-Baseline (2011):** 4.5
- **Target (2036):** 0.494
Appendix 3: Gray plus Green

District submitted Green Infrastructure Plan in December 2011
NEORSD APPENDIX 3 GREEN INFRASTRUCTURE

- University Circle Green Infrastructure Demonstration Project
- Green Ambassador - Slavic Village Demonstration Projects
- Fleet Avenue Green Infrastructure
- Green Ambassador - Urban Agriculture
- Green Ambassador - Fairhill/MLK
- East 140th Street Consolidation & Relief Sewer Project
- Woodland Hills Green Infrastructure
- Woodland/Central Green Infrastructure Project
- Opportunity Corridor Green Infrastructure Project
- Union/Buckeye Green Infrastructure
- Industrial Corridor Green Infrastructure
- D professionals Valley Green Infrastructure

Your Sewer District  Keeping our Great Lake great.
City of Cleveland Coordination

- Complete and Green Streets Ordinance in effect as of January 2012
- Fleet Avenue Reconstruction project is the first complete and green street since the ordinance to be designed and constructed for the City
- Fleet Avenue was within a target area for CSO removal for NEORSD
- Actively coordinated with Slavic Village Development Corp and the City’s ward councilperson
Project Area Map
Green Infrastructure
Alternatives

We have... SAND!!
Green Infrastructure Alternatives

1. Bioretention along rights-of-way
2. Offloading to Waterway (Burke Brook)
3. Infiltration
Green Infrastructure Alternatives

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Green Infrastructure Alternatives

- Green Infrastructure
- Alternatives
Green Infrastructure Alternatives

1. Bioretention along rights-of-way
2. Offloading to Waterway (Burke Brook)
3. Infiltration
   - wells, trenches, basin(s)
Green Infrastructure
Selected Design

Final Selection: Infiltration Basin

- Reduce Utility Conflicts
- Available Land (Vacant)
- Overall Costs
- Cost per gallon of CSO removed
- No negative effect on schedule
- Controls typical year event, overflows to combined system
- Centralizing O&M
### Project Costs and Schedule

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<table>
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<tr>
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<tbody>
<tr>
<td><strong>Total Project Costs</strong></td>
<td><strong>$9.1 million</strong></td>
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<tr>
<td><strong>GI Project Costs</strong></td>
<td><strong>$1.8 million</strong></td>
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<tr>
<td><strong>Design</strong></td>
<td><strong>Nov 2012 – Dec 2013</strong></td>
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<tr>
<td><strong>Construction</strong></td>
<td><strong>Jul 2014 – Jul 2016</strong></td>
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<td><strong>GI Basin Construction</strong></td>
<td><strong>Apr 2015 – Nov 2015</strong></td>
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Contributing Drainage Area

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<tr>
<th>Total Catchment Area</th>
<th>Area to GICM Feature</th>
<th>Imp. Area to GICM</th>
<th>% Imp. to GICM</th>
<th>Remaining Area to Exist Comb. Sewer</th>
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<tbody>
<tr>
<td>19.4 acres</td>
<td>15.2 acres</td>
<td>10.0 acres</td>
<td>66%</td>
<td>4.2 acres</td>
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<tr>
<td>% Area Captured:</td>
<td>78%</td>
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<td>Annual CSO Reduction = 0.8 MG</td>
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<td>Non-Building Scenario</td>
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<td>6.6 MG</td>
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<tr>
<td>No. of TY “Overflows” to Exist. Combined Sewer:</td>
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Green Infrastructure Control Measure (GICM)
Goals

• Capture of Typical Year rainfall
• CSO Reduction
• Community Amenity

Conceptual Section - Elevation
DESIGN: Plan View
Sub-Surface Infiltration Units

18 Inch Inlet Risers (Typ.)
See Sheet 271.

Item 611 - 48" Conduit, Type A, 707.53, as per plan (Typ.)

G-2 Prop Manhole, No. 3, as per plan, See Sheet 272.

Your Sewer District Keeping our Great Lake great.
DESIGN: GICM Typical Year HGL

- Overflow Structure Elevation
- Planting Elevation/Plant Selection/Soil
- Stone/Pipe Storage Volume

Your Sewer District  Keeping our Great Lake great.
Figure 3: Stormwater Control Measure
(DCIA Method: Non-Building Scenario)

Overflow Elevation = 688.50
Raised Planter = 686.5
Stone Channel = 684.5
DESIGN: Storm Pipe HGL

South Pipe Profile - Maximum HGL

Non-Building Scenario; 5 yr 6 hr 15 min Storm

GICM Overflow Elevation = 688.5
DESIGN: H/H Design Summary

- GICM Capture for Typical Year Storms
- 5-year Design Storm for Pipe Network
- Coordination with Landscape Architecture design for frequency of inundation

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GICM Functional Design

- Creating a Neighborhood Amenity with Multiple Benefits:
  - Reduction in Stormwater Runoff
  - Improving Livability
  - Reducing Heat Island Effect
  - Providing Habitat
  - Cultivating Public Education Opportunities
  - Increase in Groundwater Recharge
  - Reduction in Carbon Dioxide
GI Control Measure Aesthetic Design

- Create a lush, vibrant public space
- Create a natural feeling landscape within a structured framework
- Provide community access that promotes engagement
Why Plants and Soil?

- Short and Long term Infiltration
- Interception and Evapotranspiration
- Nutrient Removal
- Decreased hydrologic flow rates can increase TSS Sequestration
- Soil Mix: 30% Sand / 20% Organic / 50% Silt & Clay
Plant Selection and Landscape Design

Celebration Maple
Autumn Brilliance Serviceberry
Washington Hawthorn
Knock-Out Rose

Green Velvet Boxwood
Grey Owl Juniper
Karl Foerster Reed Grass
Day Lilies (Various Cultivars)

Raspberry Wine Bee Balm
Blue Vervain
Great Blue Lobelia
Iris (Various Cultivars)
Questions

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