Agenda

- Background
- Planning Considerations
- Procurement and Contract Packaging
- 100-year Design Life
BACKGROUND
Magnitude of the Challenge: CSO Control

- 1/3 area is combined (12,478 acres)
- 53 CSO outfalls at start of program (47 currently)
- Significant Flooding in Neighborhoods

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Anacostia</th>
<th>Potomac</th>
<th>Rock Creek</th>
<th>Total System</th>
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<tbody>
<tr>
<td>CSO Overflow Volume (mg/avg yr)</td>
<td>2,142</td>
<td>1,063</td>
<td>49</td>
<td>3,254</td>
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<tr>
<td>No. of Overflows (#/avg yr)</td>
<td>82</td>
<td>74</td>
<td>30</td>
<td>186</td>
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</table>
Magnitude of the Challenge: Flooding Relief

First & P St NW

Rhode Island & T St NW

Rhode Island & First St NW

Rhode Island Metro

Rhode Island & T St NW

Rhode Island Between First & 2nd St

Flagler St NW

First & V St NW
DC Clean Rivers Projects
Anacostia & Potomac River

Federal Consent Decree
US EPA / US DOJ
DC / DC Water

Anacostia River Projects
23 ft. Diameter Tunnels
12.5 miles of Soft Ground Tunnel
22 Shafts
On-line 2018 (South of RFK)
On-line 2022 (North of RFK)

Potomac River Projects
18 ft. Diameter Tunnels
3 miles of Soft Ground Tunnel
1.2 miles of Hard Rock Tunnel
6 Shafts
On-line 2030
PLANNING
Planning Considerations
Complex Technical & Stakeholder Coordination

• Facility Size & Alignment
• Geotech / Environmental
• Protection of Structures
• Risk Analysis

3rd Party Coordination
• Public Outreach
• Agreements / Easements / Permitting
• Maintenance of Traffic

<table>
<thead>
<tr>
<th>Environment Assessment</th>
<th>Shaft Design</th>
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<tbody>
<tr>
<td>Third Parties &amp; Agreements</td>
<td>Tunnel Design</td>
</tr>
<tr>
<td>Public Outreach</td>
<td>Trenchless Design</td>
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<td>Land/ROW/Easement</td>
<td>Underground Connection</td>
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<td>Agency Approval</td>
<td>Near Surface Structural Design</td>
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<tr>
<td>Construction Staging Layout</td>
<td>Constructability Review</td>
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<td>Constructability</td>
<td>Risk Analysis - Mitigations</td>
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<td>Route Selection</td>
<td>Cost Estimating</td>
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<tr>
<td>Boring/Coring</td>
<td>Green Infrastructure</td>
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<tr>
<td>Laboratory testing</td>
<td>Survey Aerial</td>
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<tr>
<td>Geophysical</td>
<td>Survey (Dray &amp; Wet utilities)</td>
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<tr>
<td>Geotechnical Reports</td>
<td>Survey Staging Areas &amp; Control</td>
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<td>Public Outreach</td>
<td>Existing Facility Research</td>
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<tr>
<td>Traffic Study</td>
<td>Maintenance of Traffic</td>
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</tbody>
</table>

Hydraulics
Site Civil (Existing/Final/Staging)
Pipeline Design
Utility Relocation
SCADA
Electrical
Mechanical
Enhancements & Landscaping
Environmental Reports
Security
Wetland Studies
Hazardous Waste/Soil Testing/LSP
Operating Procedures
Commissioning Procedures
## Planning Consideration
### Construction Site Area Requirements

<table>
<thead>
<tr>
<th>Shaft</th>
<th>Contract</th>
<th>Site Area (Acres)</th>
<th>Shaft Diameter (Feet)</th>
<th>Shaft Depth (Feet)</th>
<th>Comment</th>
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<tbody>
<tr>
<td>Blue Plains Pumping Station &amp; Screening Shafts</td>
<td>Division A</td>
<td>4.1</td>
<td>130 &amp; 75</td>
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<tr>
<td>CSO 019 Drop South &amp; North Shafts</td>
<td>Division H</td>
<td>6.1</td>
<td>65</td>
<td>110</td>
<td>Mining Shaft</td>
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<tr>
<td>CSO 005 Drop Shaft</td>
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<td>M Street Drop Shaft</td>
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<td>Channing Street Mining Shaft</td>
<td>Division P</td>
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<td>Adams Street Drop Shaft</td>
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<td>0.25</td>
<td>20</td>
<td>170</td>
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</table>
Site Constraint Challenges

First Street Tunnel Diversion and Adit
Construction of First St. Tunnel - First & V St NW

Shaft

Approach Channel

Diversion Chambers

Adit (below)

First St Tunnel (below)
Community Interface
PROCUREMENT & CONTRACT PACKAGING
Procurement and Packaging Drivers

- Consent Decree Schedule
  - Fixed Completion Milestones
- Complexity and Type of the Work
  - Near surface Facilities
  - Deep Tunnels and Shafts
  - Inside the Plant (PS)
  - Green Infrastructure
- Third Parties
  - Public Agency Projects (DDOT)
  - Private Development (e.g. CSO 021)
  - Neighborhood Impacts
- Other
  - Mayor’s Task Force
Contract Packages

Legend
- Completed
- Construction
- Procurement
- Design

A Blue Plains Tunnel (Completed)
B Tingeys Street Diversions (Completed)
C CSO 019 Overflow and Diversion Structures (Completed)
D JBAB Overflow and Potomac Outfall Sewer Diversion (Construction)
E M Street Diversion Sewer (CSOs 015, 016 and 017) (Construction)
F CSO 007 Diversion Structure and Diversion Sewer (Completed)
G Anacostia River Tunnel (Construction)
H Main Pumping Station and Tingey Street Diversions (Construction)
I Northeast Boundary Tunnel (Design)
J First St Tunnel (Construction)
K Blue Plains Dewatering Pumping Station and ECF (Construction)
L Poplar Point Pumping Station Replacement (Procurement)
Contract Packages

Program at a Glance
Source: FCD Program Master Schedule & Consent Decree Modification

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</tbody>
</table>

Legend:
- Environmental Approvals
- Facilities Plan
- Design
- Bid & Award
- DB Procurement
- Construction
- Monitoring
- Consent Decree Milestone
Procurement Strategies: *Design-Bid-Build*

- Near-Surface Diversion Facilities
  - Familiar with work (sewer, pump stations, vaults)
  - DC Water controls design
    - Maintenance
    - Operation
  - Approach is straightforward
  - Local contractors familiar with the work & associated risks
  - Select the lowest-priced bidder
- Green Infrastructure
Procurement Strategies: **Design-Build**

- Deep Tunnels and Shafts
  - Early Contractor Involvement
    - Design integration with means and methods
    - Mitigate risks
    - Maximize innovation & understand means & methods
    - Reduce contractor contingencies
  - Schedule compression and flexibility
  - Permanent design is influenced by means & methods
  - Successful use of this project delivery approach on tunnel projects in US
- Critical Near Surface Diversion Facilities
  - Schedule Critical
  - Means and Methods Intense
  - Selection based on Best Value (Technical / Price)
## Procurement and Packaging Results

<table>
<thead>
<tr>
<th>Contract Division</th>
<th>Description</th>
<th>Cost (M)</th>
<th>Status</th>
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<tbody>
<tr>
<td><strong>Design-Build</strong></td>
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<tr>
<td>A</td>
<td>Blue Plains Tunnel</td>
<td>$330</td>
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<td>H</td>
<td>Anacostia River Tunnel (DB Hybrid)</td>
<td>$253</td>
<td>Construction</td>
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<td>P</td>
<td>First Street Tunnel (DB Hybrid)</td>
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<td>J</td>
<td>Northeast Boundary (DB Hybrid)</td>
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<td>Main Pumping Station Diversions</td>
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<td>Construction</td>
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<td>D</td>
<td>JBAB Outfall and Diversions</td>
<td>$40</td>
<td>Construction</td>
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<tr>
<td>B</td>
<td>Tingey Street Diversions</td>
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<td>Construction</td>
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<td><strong>Total D-B</strong></td>
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<td>$1,412</td>
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<td><strong>Design-Bid-Build</strong></td>
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<td>W</td>
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<td>Z</td>
<td>Poplar Point Pumping Station</td>
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<td><strong>Total D-B-B</strong></td>
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<td>$106</td>
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100-year Design Life

Diagram:
- Diversion Chamber
- Approach Channel
- Vortex Drop Pipe
- Shaft
- Adit to Main Tunnel
Why Design for 100-years

- Providing system redundancy too costly
- Removal from service for inspection and repair extremely difficult
- Partially funded by Century Bonds
Why Design for 100-years
100 –Year Design Considerations

- ACI 350 Code
- ACI 365.1R Service Life Predictions
- Watertight Construction
- Concrete Mix Design
- Temperature Control
- Limiting service load stresses
- Increase sacrificial concrete cover over reinforcing
Acknowledgements

- Carlton Ray – Director of DC Clean Rivers Project
- All Engineers and Contractors Working on this Project
Questions and answers

Carlton Ray
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phone: 202-787-4469