District of Columbia Water and Sewer Authority
David Gadis, CEO and General Manager

Briefing on:

DC Clean Rivers Project

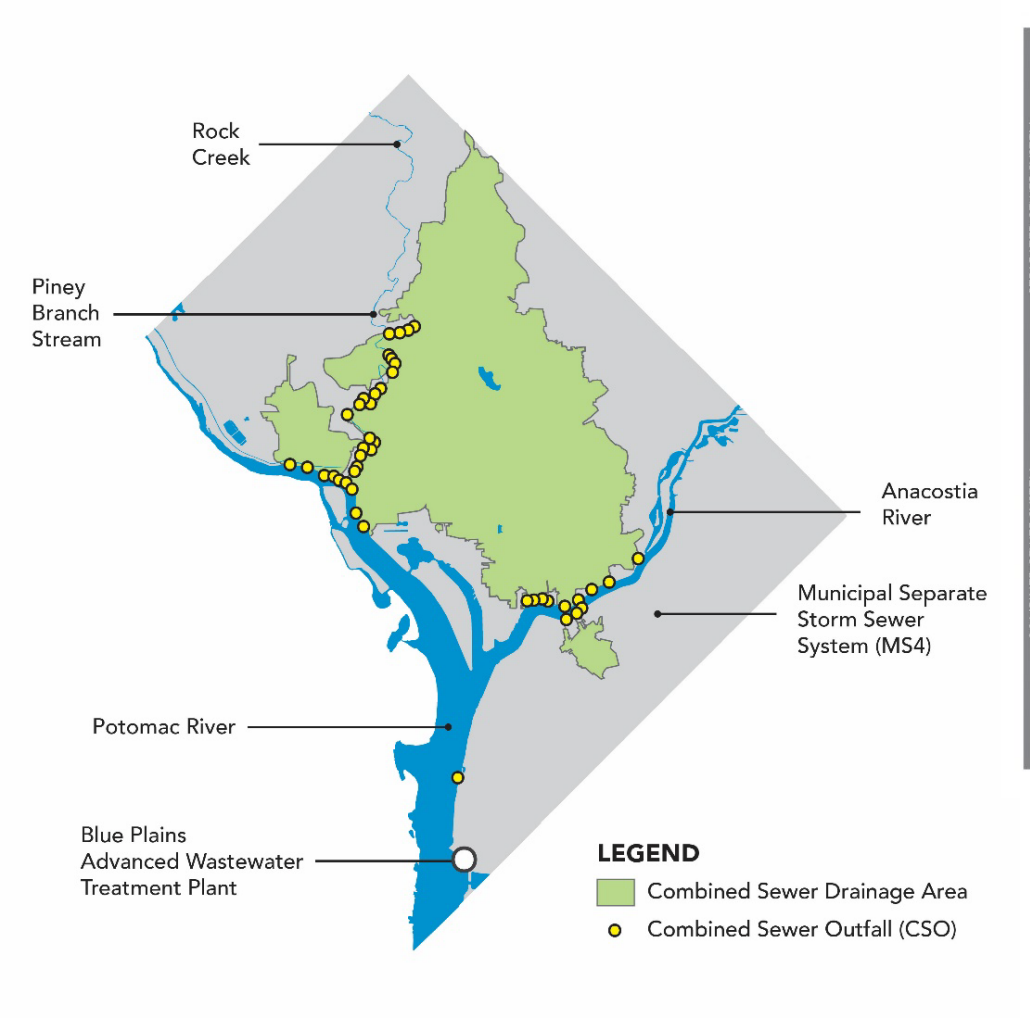
Briefing for:

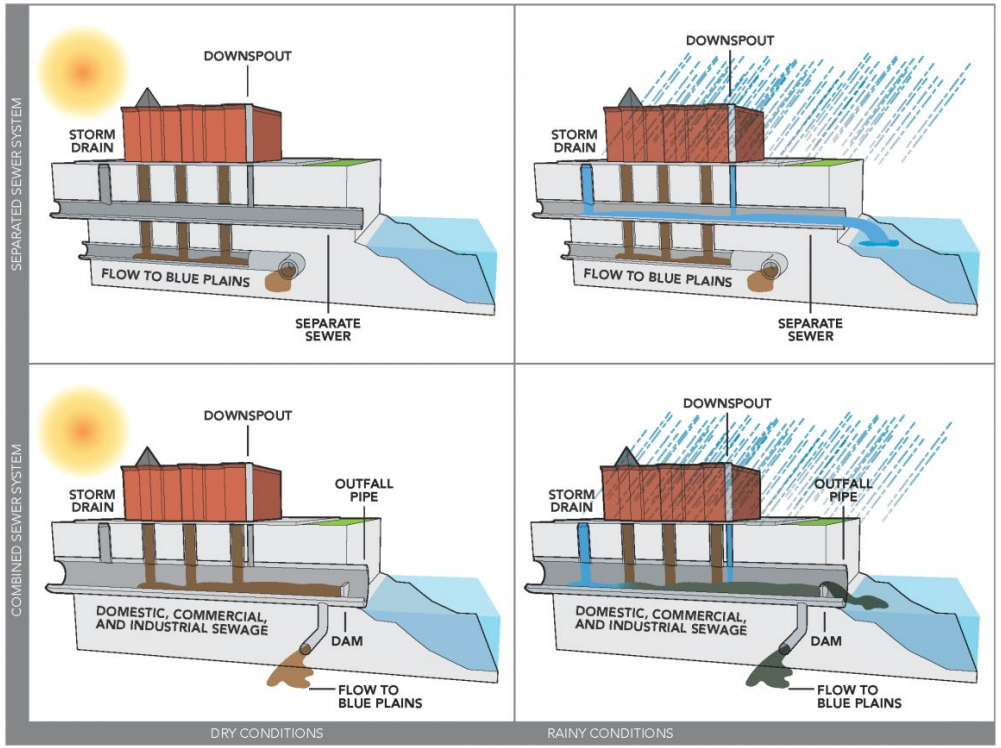
Indiana Water Summit

September 8, 2022

Overview

Separate and Combined Sewer Systems

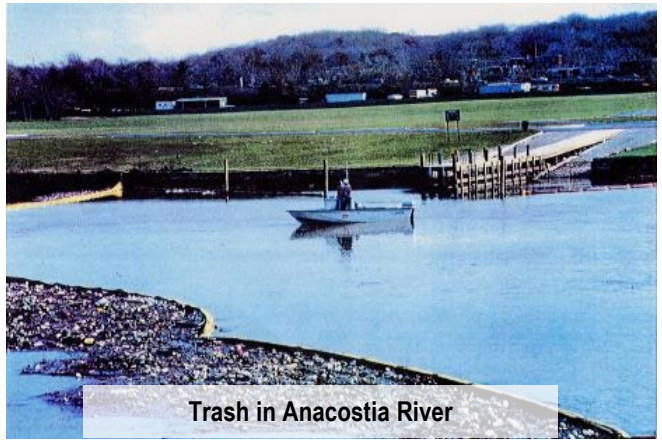




- 1/3 of area within District is served by combined sewers (12,478 acres)
- 48 active Combined Sewer Overflow (CSO) outfalls
  - 15 to Anacostia River
  - 10 to Potomac River
  - 23 to Rock Creek

Magnitude of the Challenge: CSOs and Surface Flooding

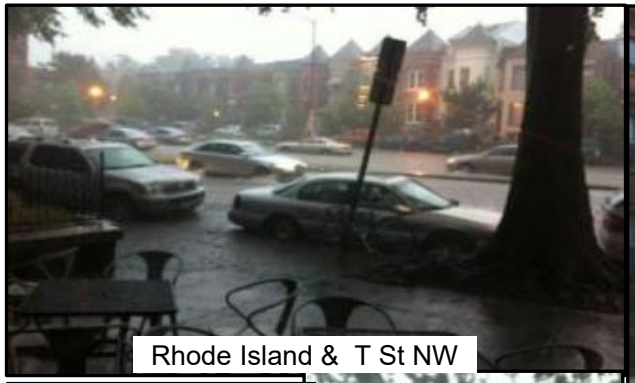
CSO Discharge to Anacostia River



Trash in Anacostia River

Rhode Island & T St NW

Rhode Island & 1st St NW

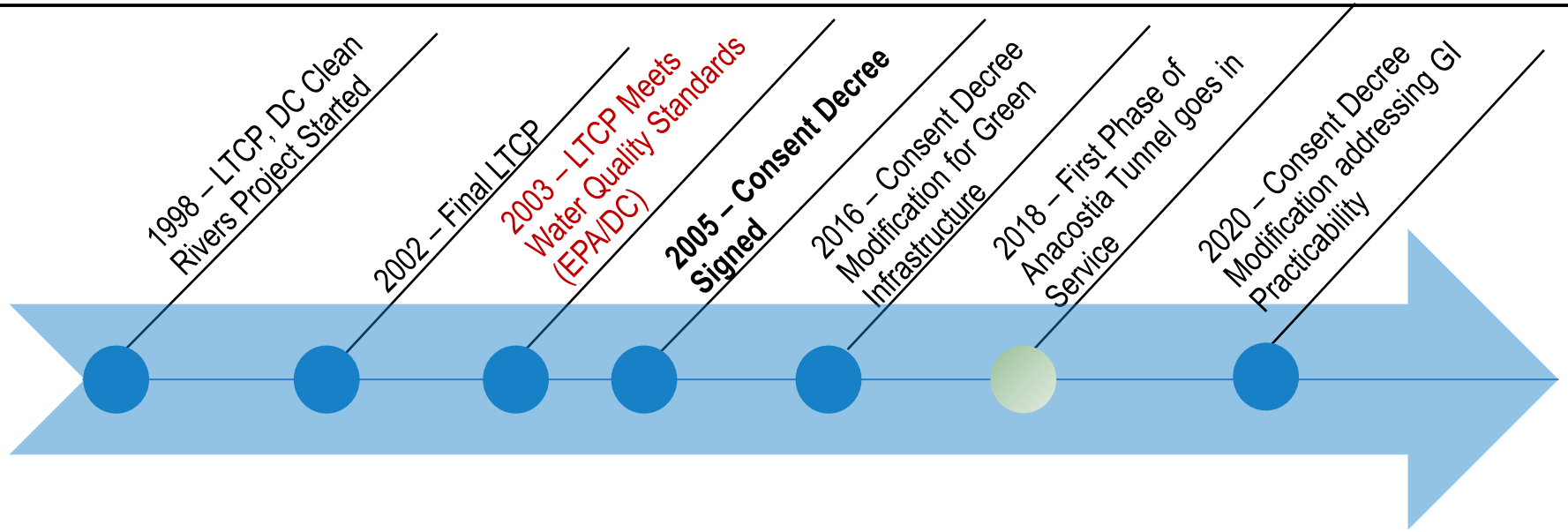


Rhode Island & T St NW

Rhode Island Between 1st & 2nd St NW

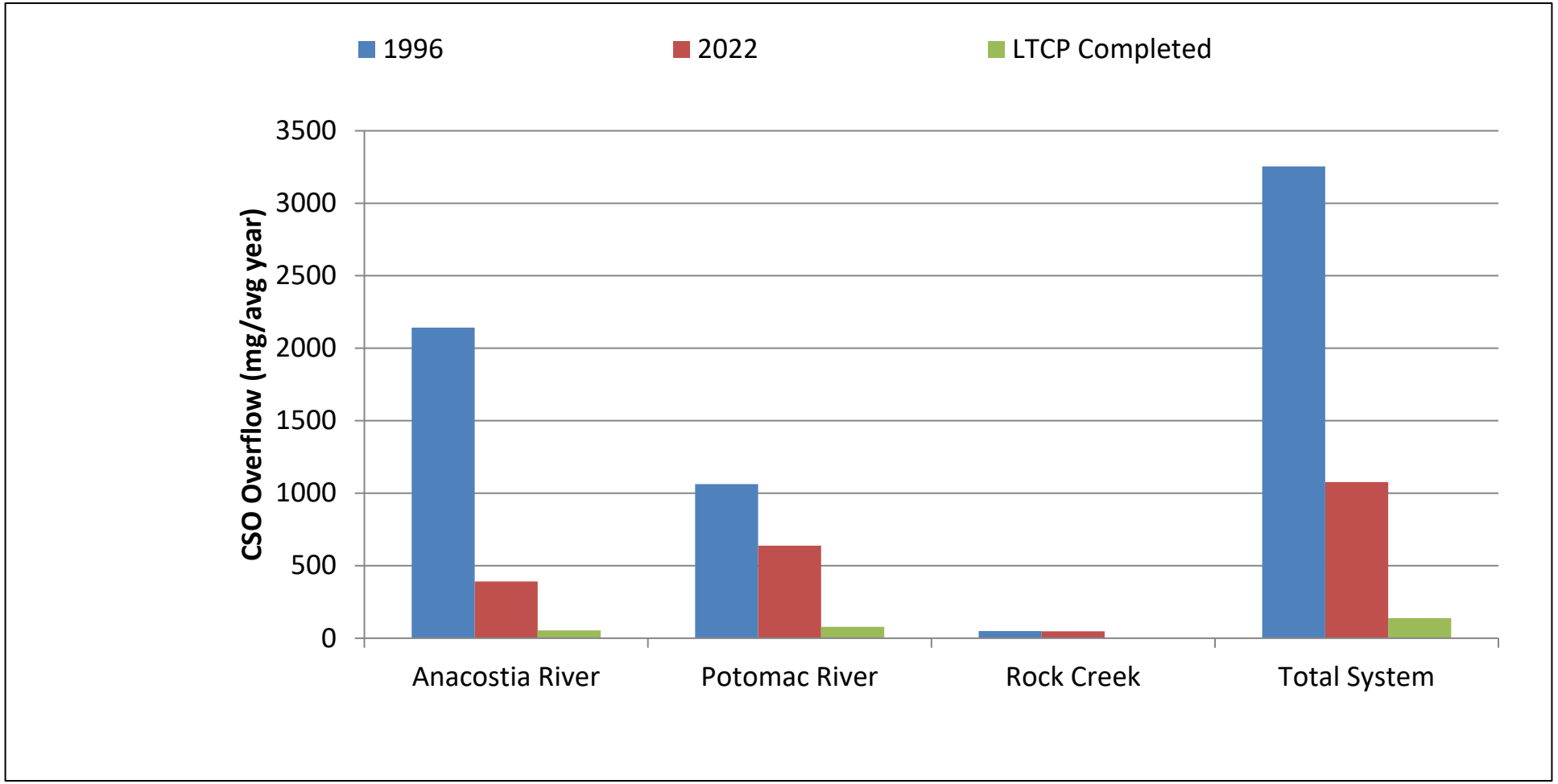
1st & V St NW

Program Development



- Project required by Federal Consent Decree
- Signed by EPA, Dept of Justice, District of Columbia and DC Water
- Stipulated penalties for failure to meet specified schedules

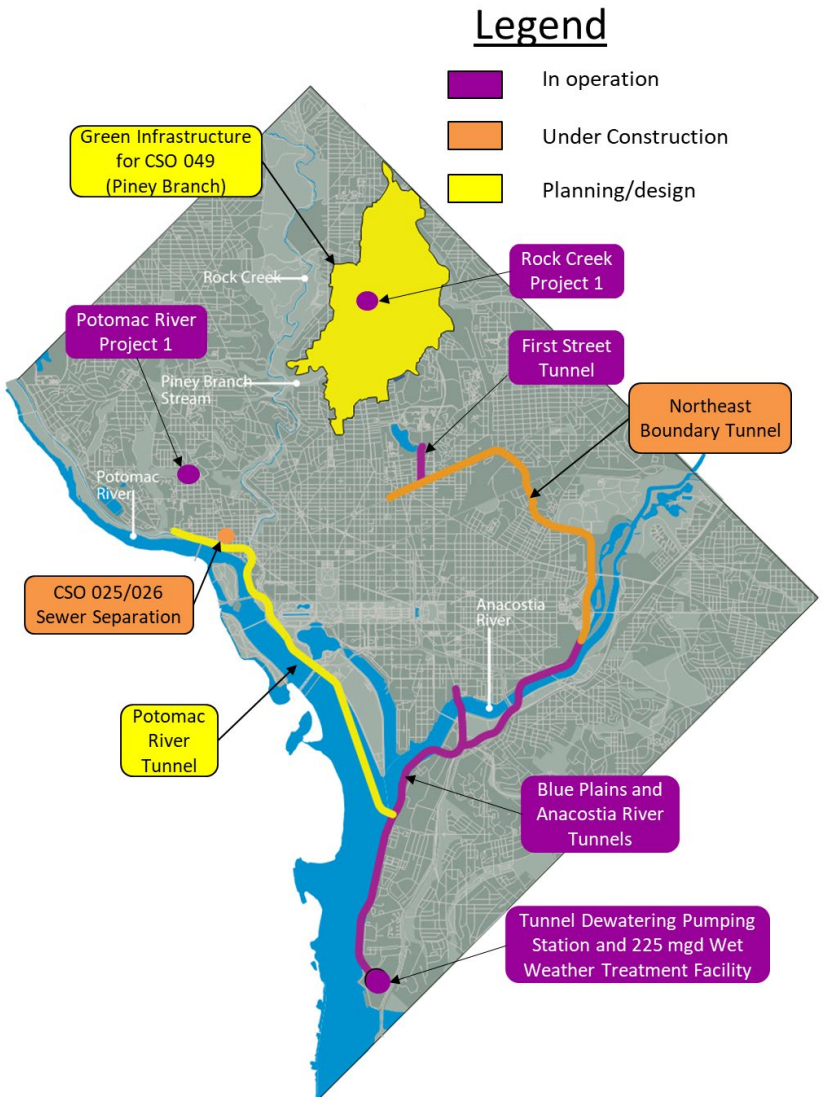
Clean Rivers Project Performance



Project Status

- Anacostia Tunnel from Blue Plains to RFK Stadium in service since March 2018
  - Provides about 100 million gallons of storage
  - 225 mgd Wet Weather Treatment Facility at Blue Plains
- Northeast Boundary Tunnel will add 100 million gallons of storage in 2023
- System performance:

Parameter	Value
Period	Mar 20, 2018 – August 2022
Volume captured	14.23 billion gals (92% reduction)
Solids & debris captured	8,562 tons



Environmental Impact Bond (EIB) for Green Infrastructure

- Background
- Pre-construction predictions from 2016
- Construction of Rock Creek Project (RC-A)
- Post-Construction Assessment
- Findings and Lessons Learned

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Why Green Infrastructure in Addition to Tunnels?
Triple Bottom Line Benefits of GI

Environmental

- Reduce runoff
- Improve air quality
- Reduce summer temperatures
- Reduce energy usage
- Offset climate change
- Habitat improvement

Social

- Enhance aesthetics
- Improve livability through green space
- Reduce scope and duration of disruption during construction

Economic

- Create green jobs
- National Green Infrastructure Certification Program (NGICP)
- Enhance property values
- Improve quality of life

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Background
Environmental Impact Bond

- DC Water issued EIB with a principal of $25M
  - Purchasers of the bond are Goldman Sachs Urban Investment Group (GSUIG) Real Estate Member LLC and Calvert Social Investment Foundation Inc. Facilitation by Quantified Ventures.
  - EIB is "*Public Utility Subordinate Lien Multimodal Revenue Bonds Series 2016B*"

- Financed first GI Project in Rock Creek (RC-A)
  - Modeled after "Pay for Success" Social Impact Bonds
  - Investors repaid based upon the effectiveness of GI in managing the volume of stormwater runoff
    - Greater volume managed would result in a larger repayment to investors
    - Lower volume managed would result in a smaller repayment to investors
- GI has never been constructed on a large scale in the District, so the EIB served as a hedge for the effectiveness of GI in managing stormwater

Goldman Sachs

Calvert Impact Capital™

Quantified® Ventures

2016 Preconstruction Predictions
Monitoring and Modeling

- Documented in
  - "*Environmental Impact Bond Technical Evaluation Memorandum, dated September 13, 2016*"
  - Included in Exhibit D of the Private Placement Agreement
- Flow and rainfall monitoring & modeling to predict performance of GI
- Pre-construction monitoring period:
  - March 1, 2016 – June 2, 2016, used for EIB calibration
- Independent 3rd Party Technical Validator (required per Private Placement Agreement)

2016 Preconstruction Predictions
Sensitivity Analysis Results

- Best- and worst-case scenarios evaluated using range of GI performance parameters
- Performed Monte Carlo analysis with 1000 simulations

Percentile	Percent Reduction	Range
Adjusted 95th Percentile	41.3%	23%
Adjusted 5th Percentile	18.6%	

- EIB Outcome Range

Tier	Runoff Reduction	Payments
1	Greater than 41.3%	DC Water pays Outcome Payment of $3,300,319.00 to Purchasers
2	18.6% to 41.3%	No Outcome Payment or Risk Share Payment
3	Less than 18.6%	Purchasers pay Risk Share Payment of $3,300,319.00 to DC Water

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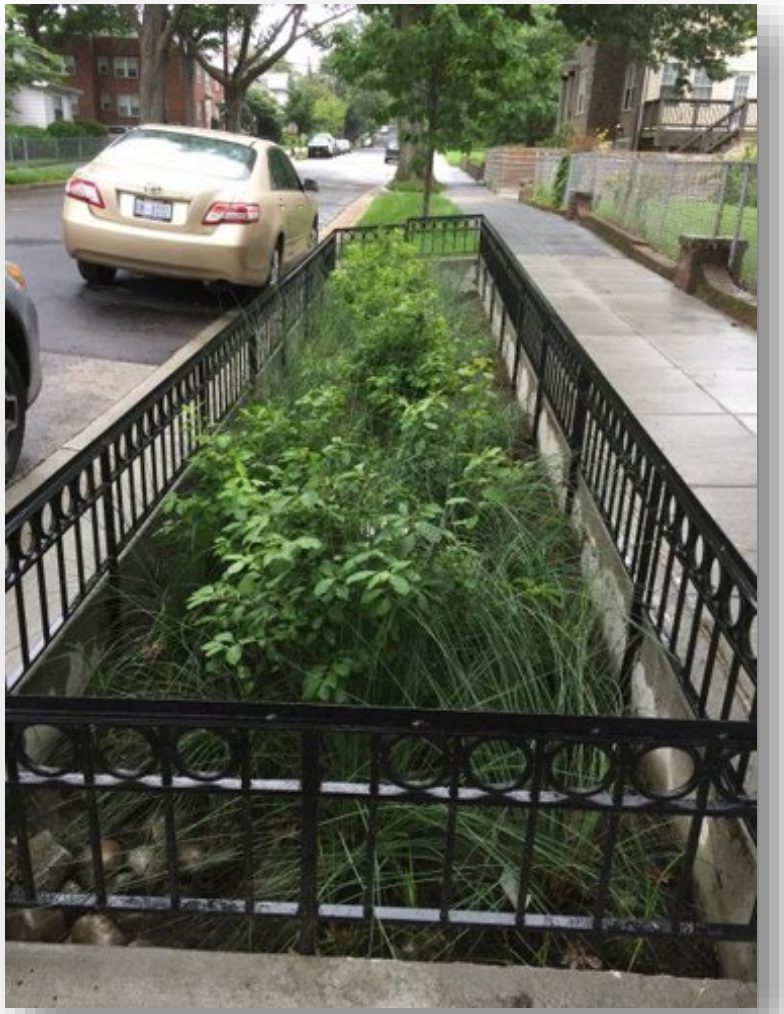
RC-A Construction

Examples of Constructed Facilities

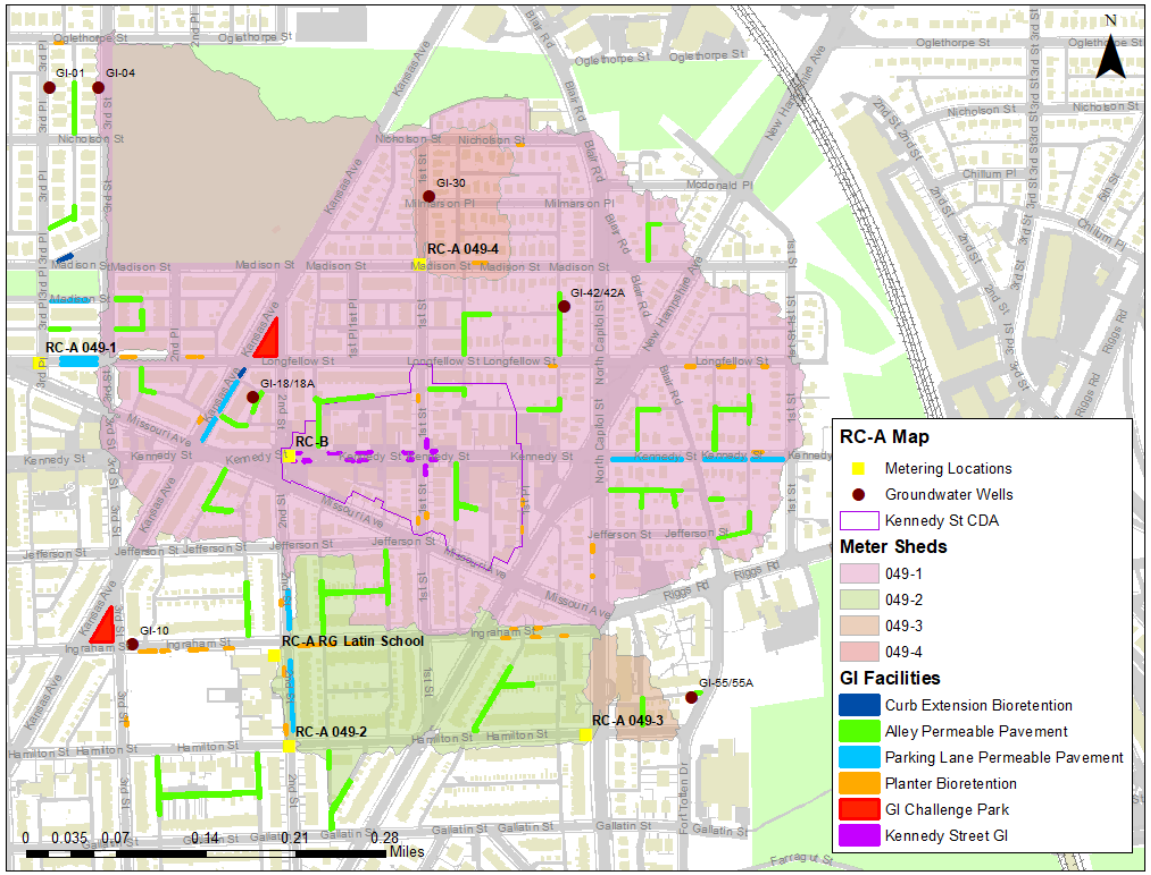


109 facilities in metered area managing more than 19 impervious acres

Post-Construction Assessment

Post-Construction Monitoring

- Sewershed, rainfall & groundwater – 19 months (Mar 1, 2019 – Sep 30, 2020)
  - Sewershed and rainfall monitoring locations unchanged for Pre- and Post- monitoring periods
  - Three groundwater monitoring wells (RCAGI-18, RCAGI-42, and RCAGI-55) were relocated in the immediate vicinity as they were sited within the footprint of the GI facilities constructed
- GI practice level monitoring
  - More than 70 GI practices monitored for 6.5 months (Mar 12, 2020 – Sep 30, 2020)
  - Representative practices monitored for 17.5 months (Apr 19, 2019 – Sep 30, 2020
- Independent 3rd Party Technical Validator (required per Private Placement Agreement)



Findings

- Based on post construction monitoring, runoff reduction is estimated at 19.56%, which falls within Tier 2 outcome range established in the EIB

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Lessons Learned:
Adaptive Management to Improve Project Performance on DC Water GI and Sector-wide

All facilities

- Improve valves/orifices at underdrain outlets
- Select monitoring sites to reduce stormwater flow bypassing inlets and exiting the monitored shed
- Place practices in series to promote sediment removal
- Monitor at site-level instead of at sewershed level to measure performance

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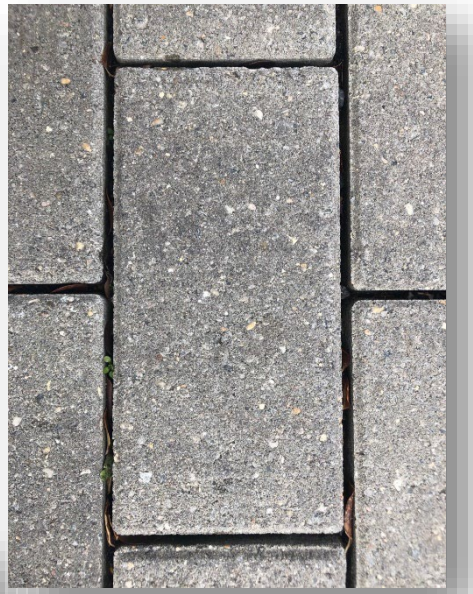
Lessons Learned:
Adaptive Management to Improve Project Performance on DC Water GI and Sector-wide

Porous Pavement

- Maximize the space between the pavers to reduce clogging.
- Install sediment traps upstream of alley to remove sediment and distribute clean flow
- Flatten the “V” shape in the alley center to increase surface area for infiltration
- Provide maintenance access to access underdrain & orifice
- Reduce number of checkdams



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Lessons Learned:
Adaptive Management to Improve Project Performance on DC Water GI and Sector-wide

Bioretention

- Pursue open space facilities that allow for more economical construction
- Install bioretention facilities closer to intersections instead of midblock to limit parking impacts
- Construct high slope or long gutter inlets to reduce flow bypassing along the gutter

Knowledge gained was extremely beneficial:

- **Incorporated into first Potomac GI Project (PR-A)**
- **Will be applied to subsequent GI projects**
- **Lessons learned will be shared with industry partners**
- **Can benefit District's stormwater programs – 2/3 of land area in District**

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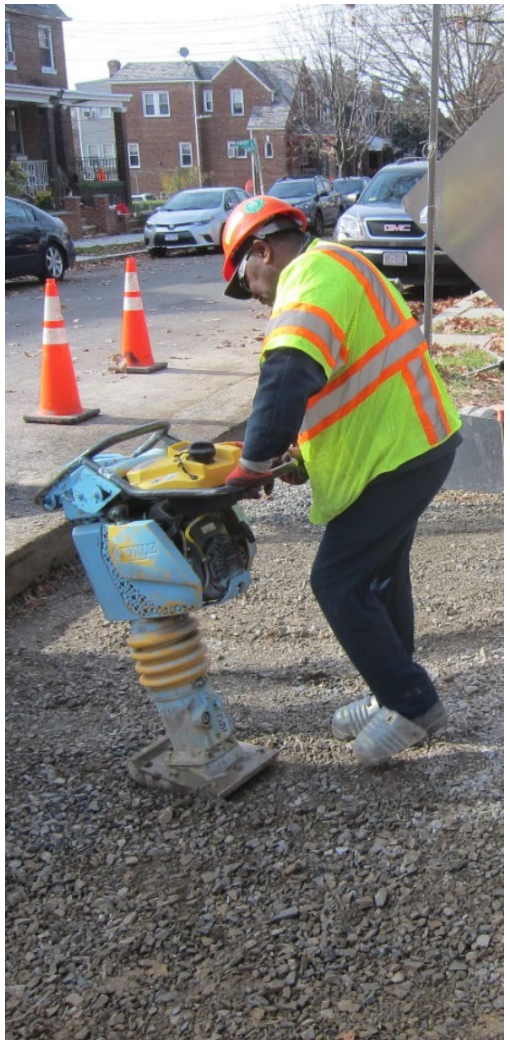
DC Water Green Infrastructure EIB
A Success Story

- Parties pleased with end results
- Provided investors with a new sustainability investment vehicle (environmental improvements, green jobs…)
- Managed risk for DC Water: Green Infrastructure had not been constructed at this scale in the District
- Informed the Program: Incredible Value from Lessons Learned
  - Influenced improvements in design, maintenance, and monitoring approach
    - Changes in designs for future green infrastructure, field tested in Rock Creek Project A and Potomac River Project A
    - Performance Monitoring provided opportunity to optimize facilities
    - Maintenance protocols fine tuned to support performance
- Nearly $100M of future green infrastructure to be constructed in Rock Creek watershed



Questions?

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Special Thanks to:

Calvert Impact Capital™

Goldman Sachs

Quantified® Ventures