Clean Rivers, Green District

a Partnership between DC Water, DC and EPA

Briefing for:

Federal Water Quality Association

Three R's of Water Infrastructure
"Recovery, Resiliency, Renewal"

dc clean RIVERS PROJECT
RESTORING OUR RIVERS
PROTECTING OUR DISTRICT

Maureen Holman, Esq.

March 21, 2013

Agenda

- DC Clean Rivers Project Background
- Green Infrastructure Program Overview
- Partnership Agreement
- GI Demonstration Project
- Opportunities for Collaboration
- Proposed Consent Decree Modifications

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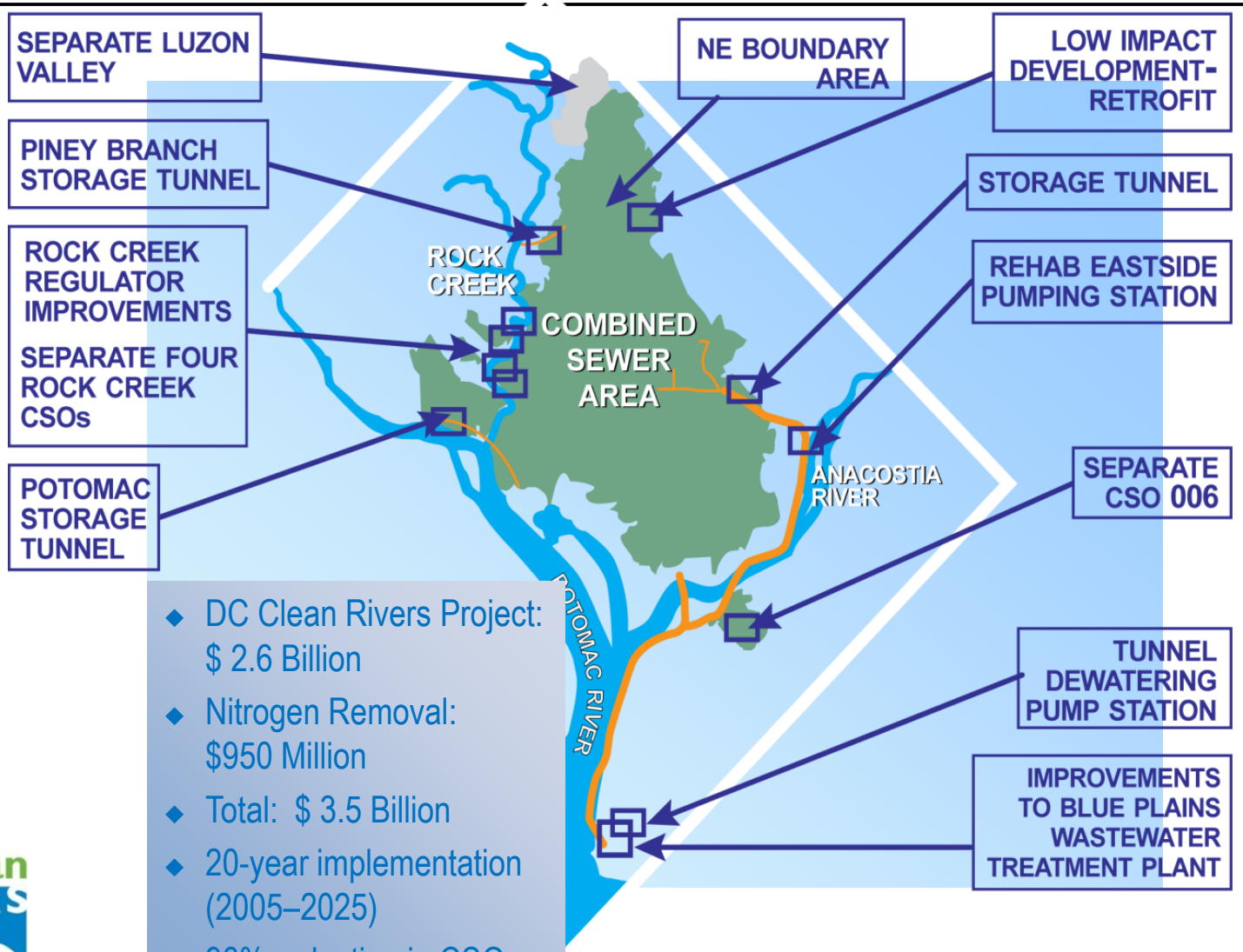
DC CLEAN RIVERS PROJECT BACKGROUND

DC Clean Rivers Project Overview



- DC Clean Rivers Project: $ 2.6 Billion
- Nitrogen Removal: $950 Million
- Total: $ 3.5 Billion
- 20-year implementation (2005–2025)
- 96% reduction in CSOs

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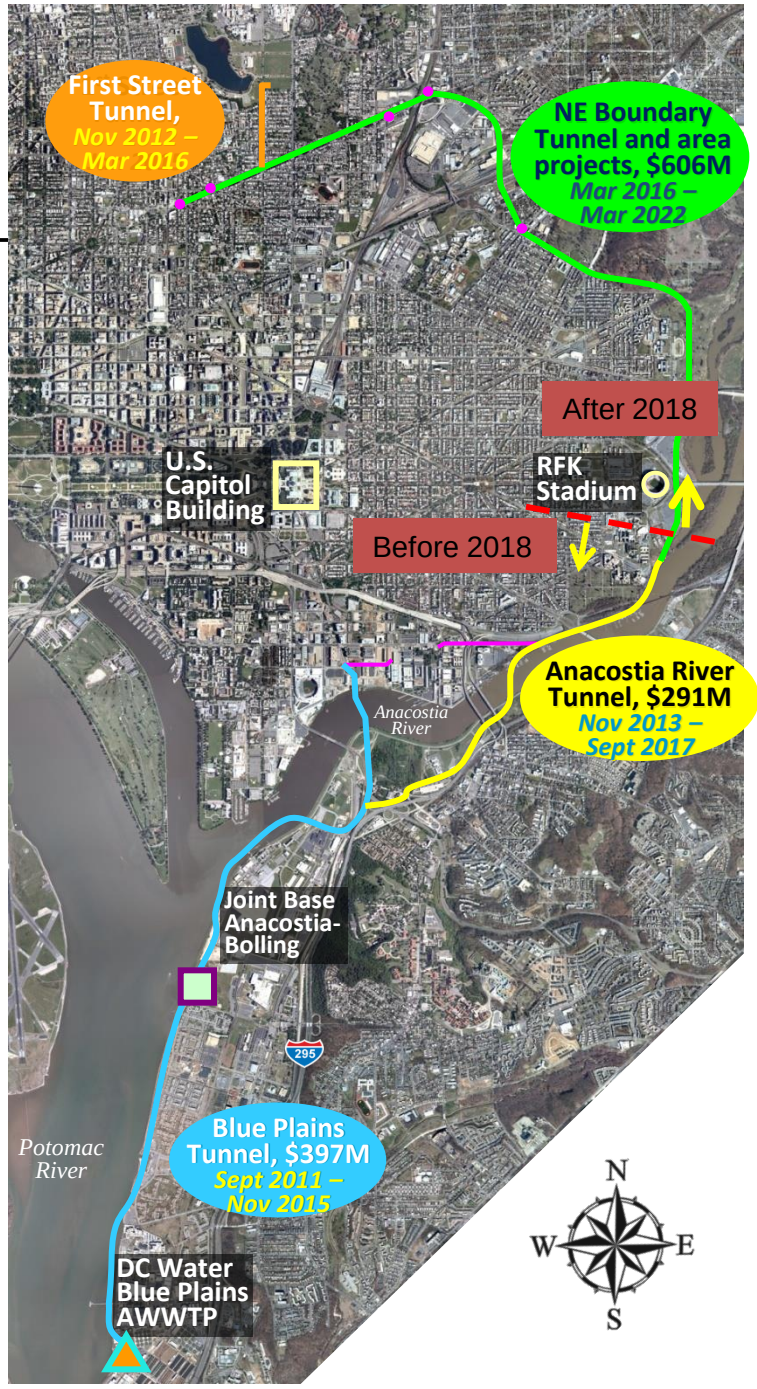
Anacostia River Projects: Implementation on Schedule

2011	2012	2013	2014	2015
	M St Diversion Sewers $41M *Apr*	**LID @ Various DC Water Facilities** $3M *Jan*	**Main PS** $40M *Feb* **Blue Plains Tunnel PS** $333M *Sept*	**JBAB Overflow & Diversion** $25M *Aug*
CSO 019 $40M *Sept*	**CSO 007** $5M *Apr* *Const. Complete Jan 2013*	**Tingey St Diversion Sewer** $17M *Jan*		**Poplar Point PS** $31M *Oct*

Months shown on timeline indicate construction start dates.



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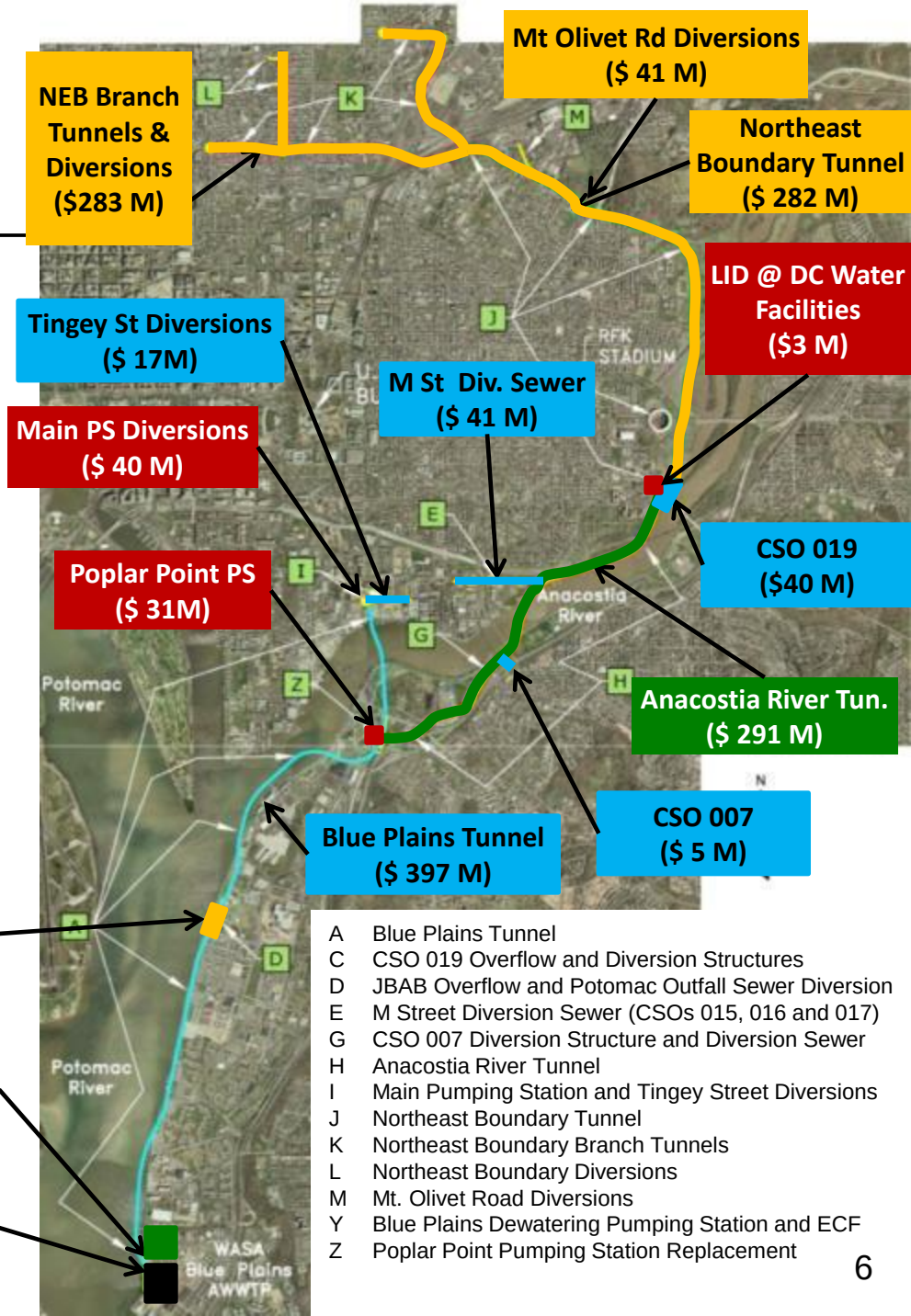
Anacostia River Projects are Being Implemented on Schedule

Project Status Legend:

- Completed
- Construction
- Procurement
- Design
- Prelim Engineering



A	Blue Plains Tunnel
C	CSO 019 Overflow and Diversion Structures
D	JBAB Overflow and Potomac Outfall Sewer Diversion
E	M Street Diversion Sewer (CSOs 015, 016 and 017)
G	CSO 007 Diversion Structure and Diversion Sewer
H	Anacostia River Tunnel
I	Main Pumping Station and Tingey Street Diversions
J	Northeast Boundary Tunnel
K	Northeast Boundary Branch Tunnels
L	Northeast Boundary Diversions
M	Mt. Olivet Road Diversions
Y	Blue Plains Dewatering Pumping Station and ECF
Z	Poplar Point Pumping Station Replacement

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DC Water has Made Major Investments in the DC Clean Rivers Project

Tunnel Mining Site at Blue Plains

- Since consent decree signed, more than $600 M in engineering and construction contracts have been let for DC Clean Rivers Project
- On schedule, on budget

TBM
Fabrication

Slurry Wall
Construction at Shafts

CSO 019 H-Pile
Foundation & Coffer Dam

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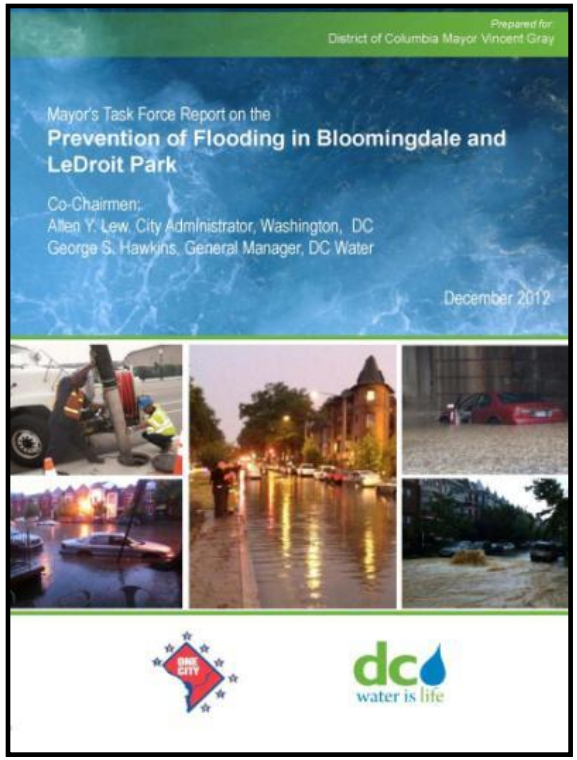
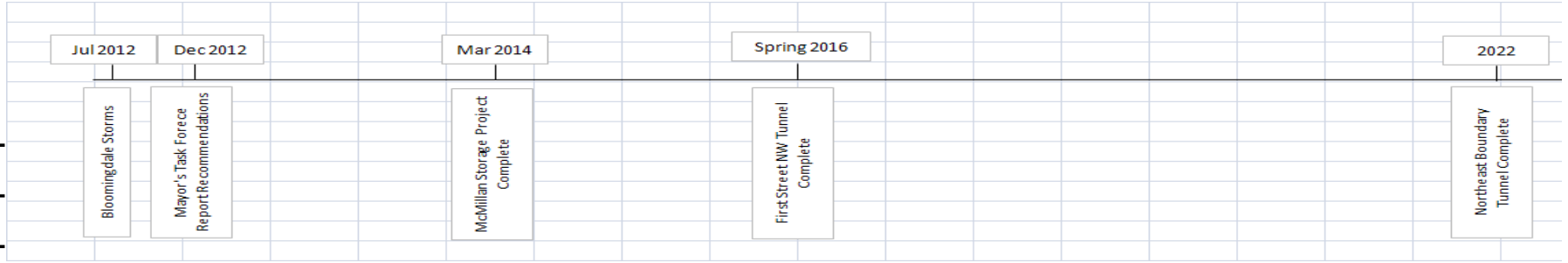
Mayor's Task Force Report on the Prevention of Flooding in Bloomingdale and LeDroit Park



Mayor's Task Force Report (Dec 2012)



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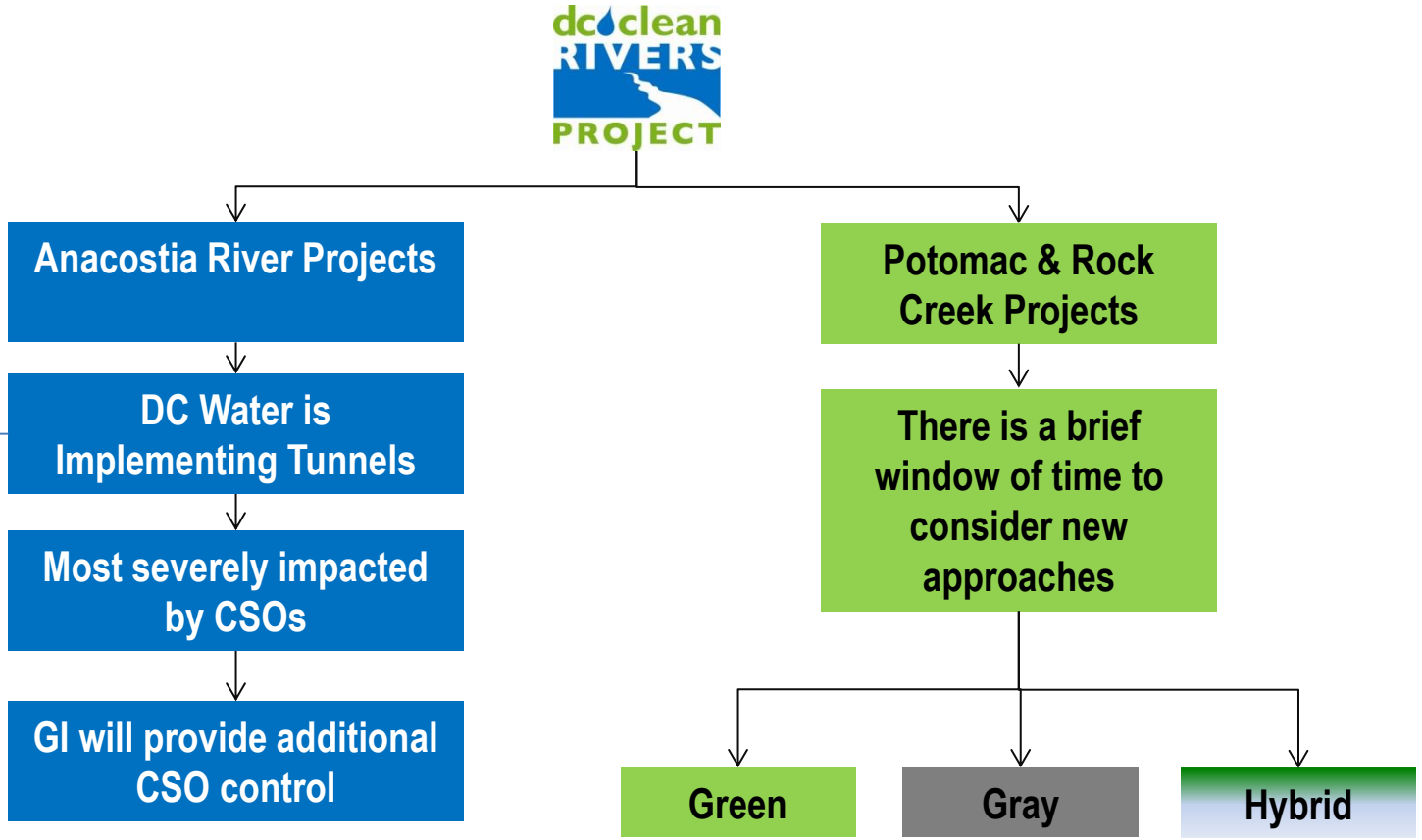
GREEN INFRASTRUCTURE PROGRAM OVERVIEW

Vision



- *74% of tunnel storage volume (116 mg) in service by 2018 (Blue Plains to RFK)*
- *Remainder of 157 mg in service by 2025*

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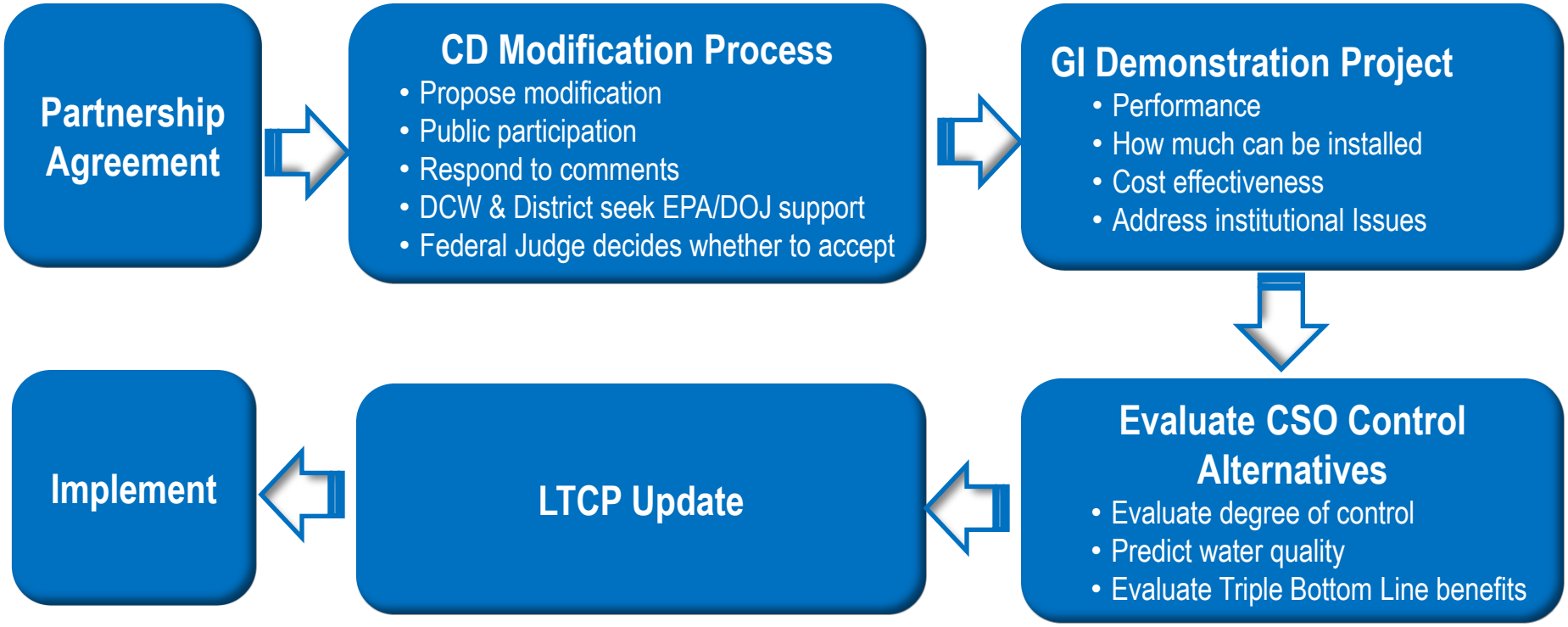
Approach



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Green Infrastructure (GI) Partnership Agreement

- What it IS
  - An agreement that establishes a frame work and working relationship between EPA, the District and DC Water to advance GI
  - Joint support for sustainable storm water management yielding multiple benefits for community livability
  - An agreement that demonstrates the parties' commitment to GI
- What it is NOT
  - A commitment of funds
  - A detailed plan or project agreement
  - A commitment to modify the consent decree
  - A public outreach plan

dc water is life

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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GI Initiative Complements District Visions of Sustainable DC

Supports Mayor Gray's Vision for a Sustainable DC

- Green Economy – more local jobs
- Water – improve stormwater capture
- Climate – heat island reduction
- Nature – increased tree canopy
- Energy – less reliance on pumps

If fully implemented, GI would create over 3,500 jobs in the District over a 35-yr period (average of about 100 jobs per year)

Source: "*Economic Impacts and Benefits of Alternative CSO Control Strategies: evaluation of Green and Grey Infrastructure Approaches for the DC Clean Rivers Project*" by Stratus Consulting, July 24, 2012

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Principal Provisions of the Agreement

All Parties (EPA, District, DC Water)

- Implement a Green Design Challenge to engage private sector in demonstrating and advancing GI
- Enlist participation by public and private organizations in a collaborative effort to develop next generation GI designs
- Facilitate participation by local academic institutions in various aspects of the GI Demonstration Project
- Actively involve the environmental community in the GI initiative to facilitate implementation based on an agreed upon course of action
- Review and assess the water quality benefits and impacts of alternative green and gray/green controls compared to the benefits and impacts of the controls now required in the Potomac and Rock Creek watersheds.

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Intention of Revisions

- Need it to be a large scale demonstration – address entire subsewersheds
- Representative sites - not “cherry picked” so scale-up is realistic
- Sound technical basis
- Potential for innovative solutions and creative alliances
- Targeted performance is high degree of CSO control
- Resolution of institutional issues
- Analysis of other factors
  - Triple bottom line benefits
  - Public acceptability
  - Testing over several meteorological / climate cycles
  - O&M impacts

The magnitude of investment by DC ratepayers to control Potomac and Rock Creek CSOs requires a sound technical and institutional basis for making decisions

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Systematic Analysis will be Documented in Technical and will be Vetted by Project Review Board

Technical Memoranda

- TM 1 – Public Participation
- TM 2 – Model Documentation & Approach to Modeling Green Infrastructure
- TM 3 – Proposed Green Infrastructure Project Plan
- TM 4 – District Green Infrastructure Experience
- TM 5 – Green Infrastructure Experience – Foreign & Domestic
- TM 6 – Green Infrastructure Technologies
- TM 7 – Sewershed Characterization
- TM 8 – Quantifying Added Benefits of Green Infrastructure
- TM 9 - Private Property Initiatives
- TM 10a – District and Federal Institutional Issues – Identification of Issues and Obstacles
- TM 10b – District and Federal Institutional Issues – Identification of Possible Solutions
- TM 10c – District and Federal Institutional Issues – Selection of Remedies
- TM 10d – District and Federal Institutional Issues – Legislation and MOUs
- TM 11 – Final Report on Demonstration Projects
- TM 12 – Bases for Cost Estimating
- TM 13 – Alternatives & Water Quality Standards Evaluation

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What is the Green Infrastructure (GI) Partnership Agreement?

- What it IS
  - An agreement that establishes a frame work and working relationship between EPA, the District and DC Water to advance GI
  - Joint support for sustainable storm water management yielding multiple benefits for community livability
  - An agreement that demonstrates the parties' commitment to GI

- What it is NOT
  - A commitment of funds
  - A detailed plan or project agreement
  - A commitment to modify the consent decree
  - A public outreach plan

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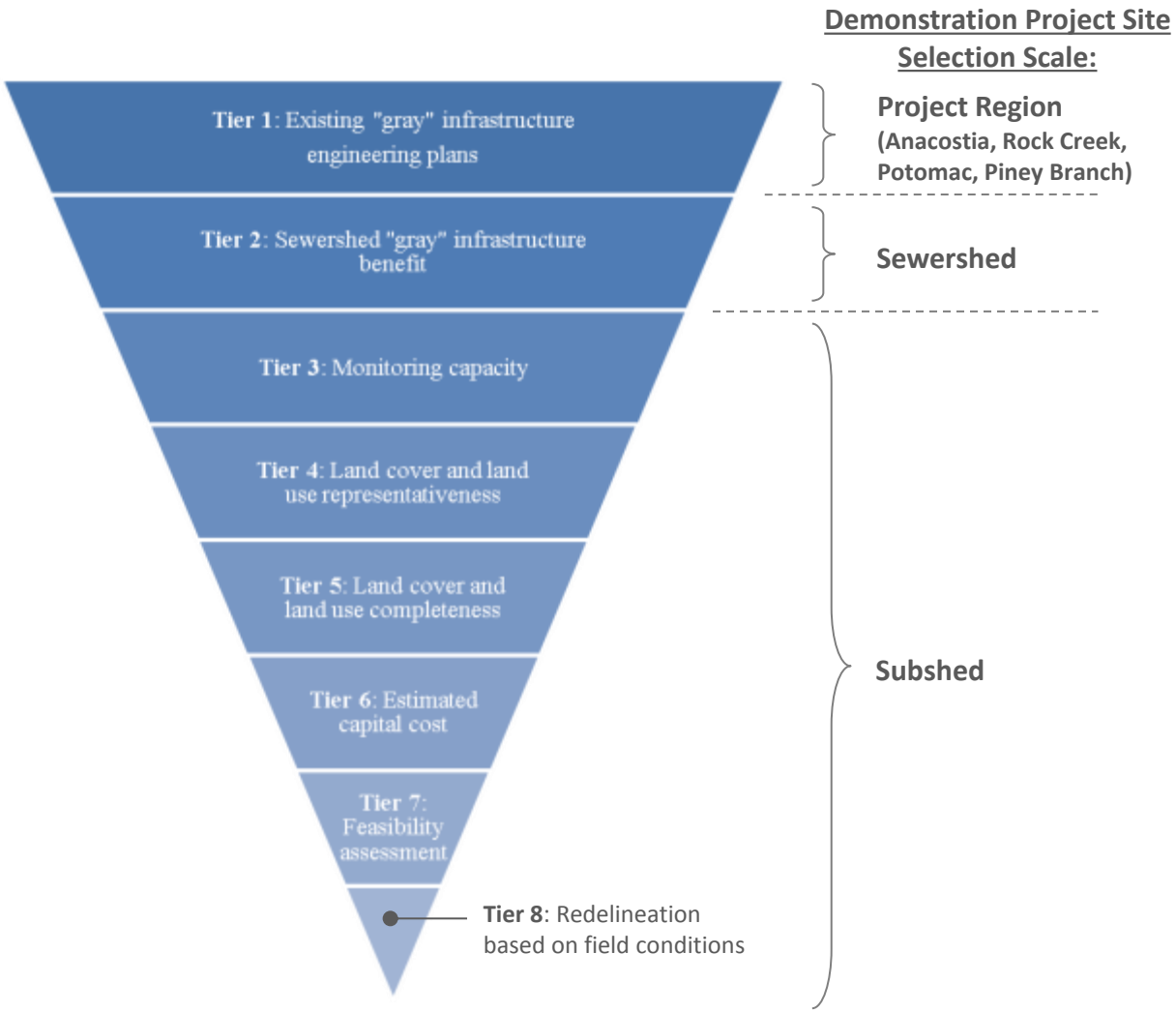
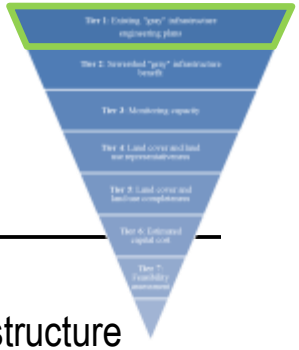
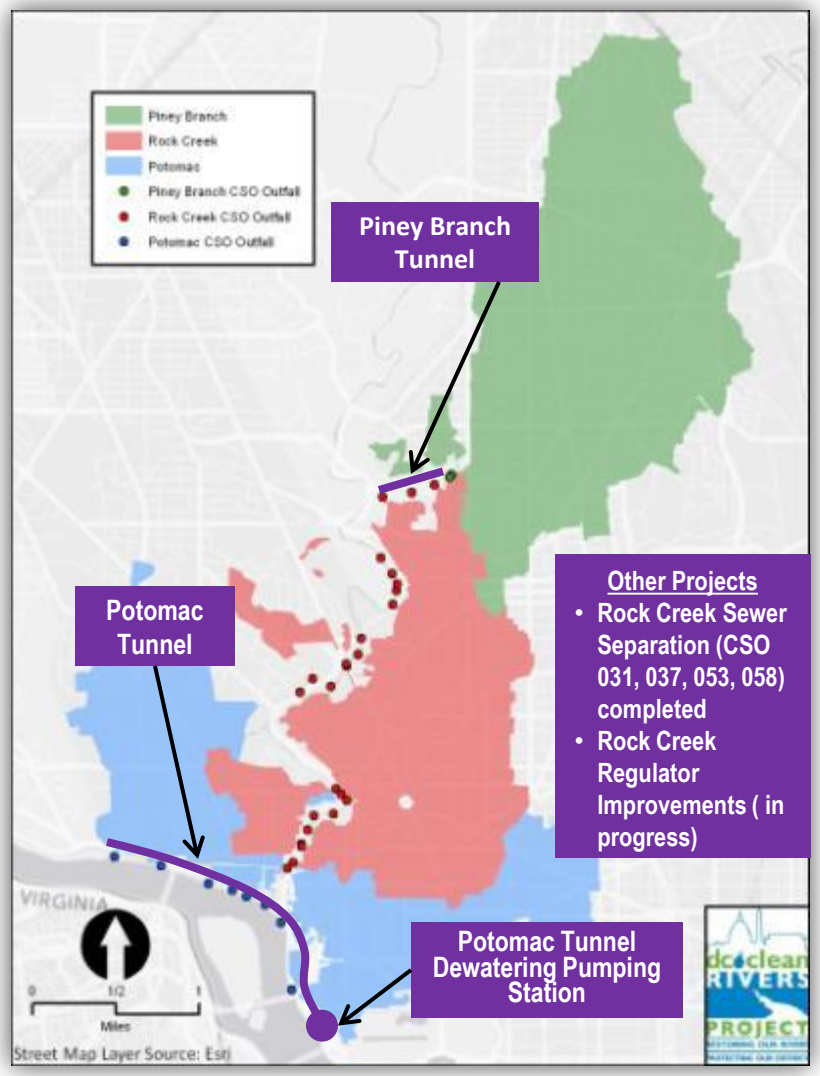
DEMONSTRATION PROJECT

Overall Site Selection Process



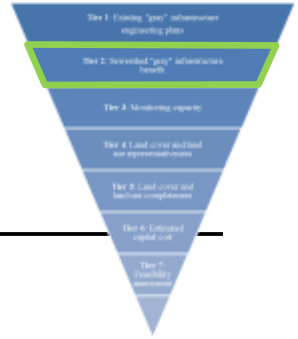
Site Selection Process – Tier 1

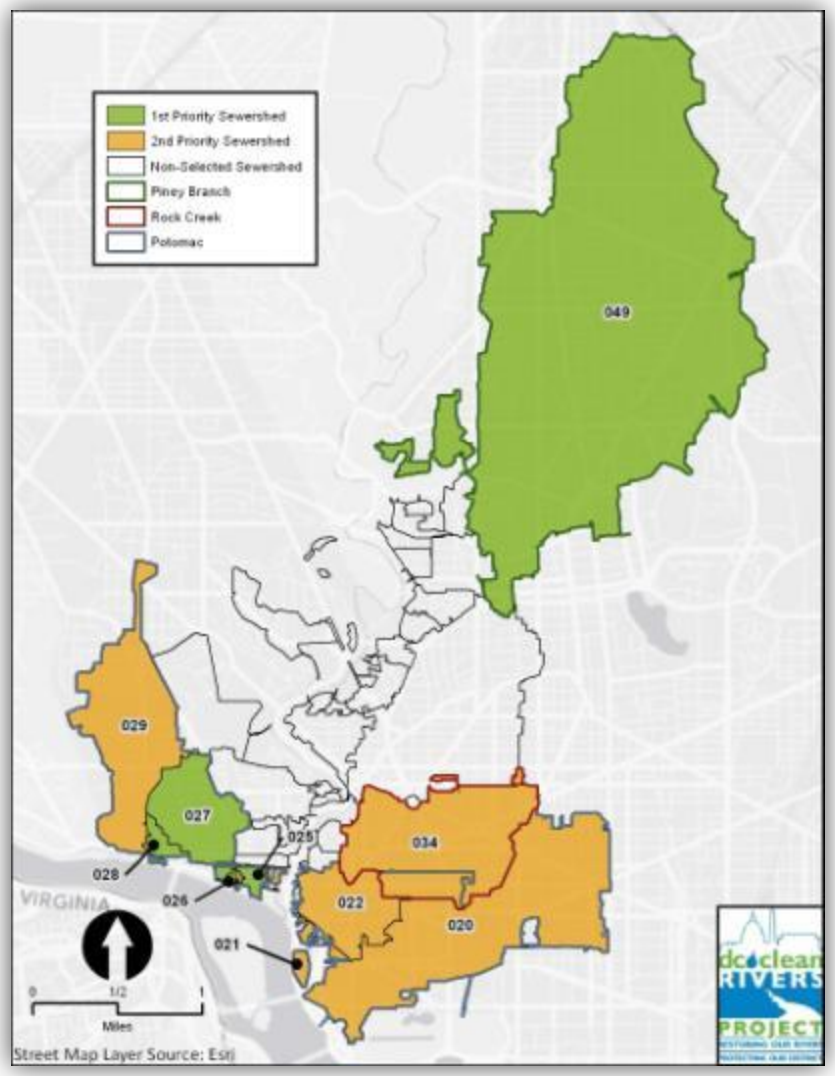




- Tier 1: Existing “gray” infrastructure engineering plans
  - Eliminate areas where “gray” infrastructure plans are substantially complete
- Possible areas narrowed down to:
  - Piney Branch
  - Rock Creek
  - Potomac

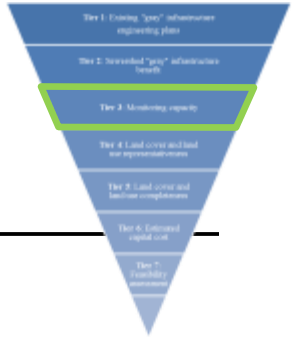
Site Selection Process – Tier 2

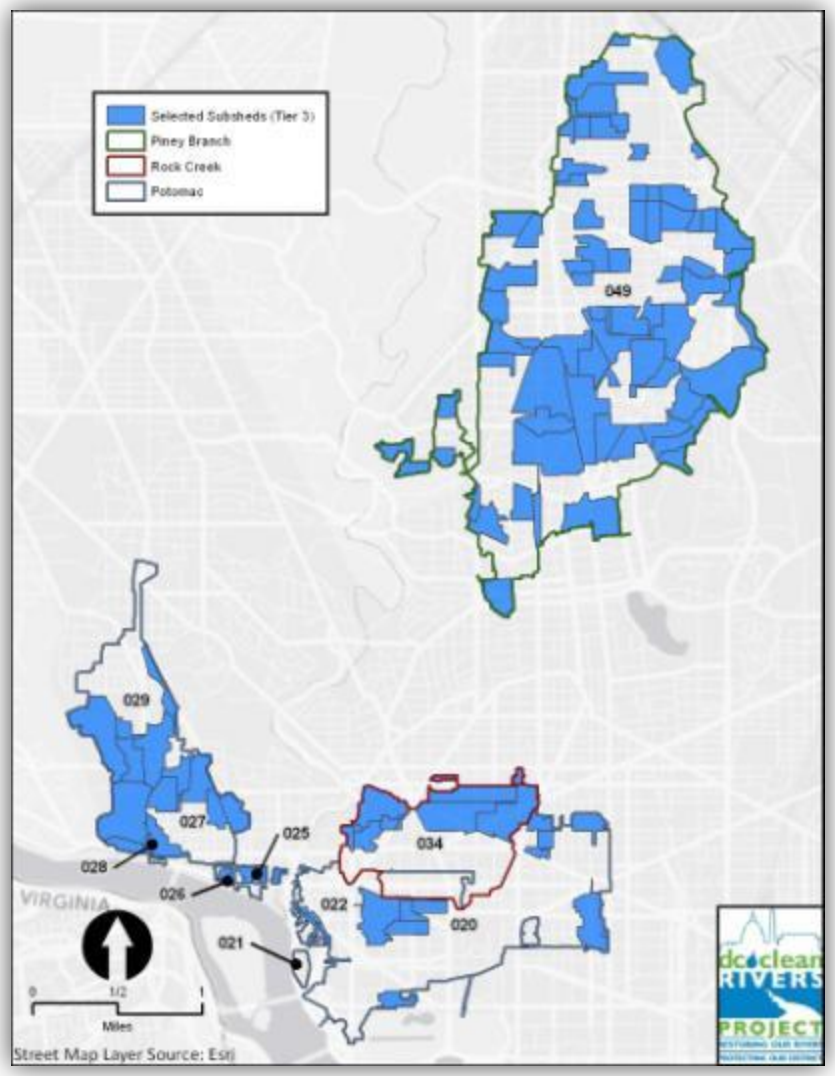




- Tier 2: Sewershed "gray" infrastructure benefit
  - Eliminate sewersheds where Green Infrastructure implementation will likely have negligible effect on the required implementation of gray infrastructure
- Possible areas narrowed down to:
  - 10 sewersheds

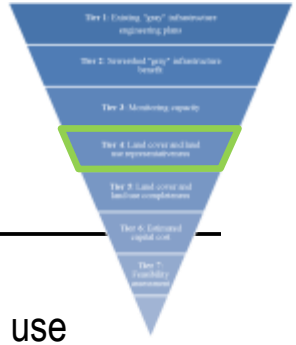
Site Selection Process – Tier 3

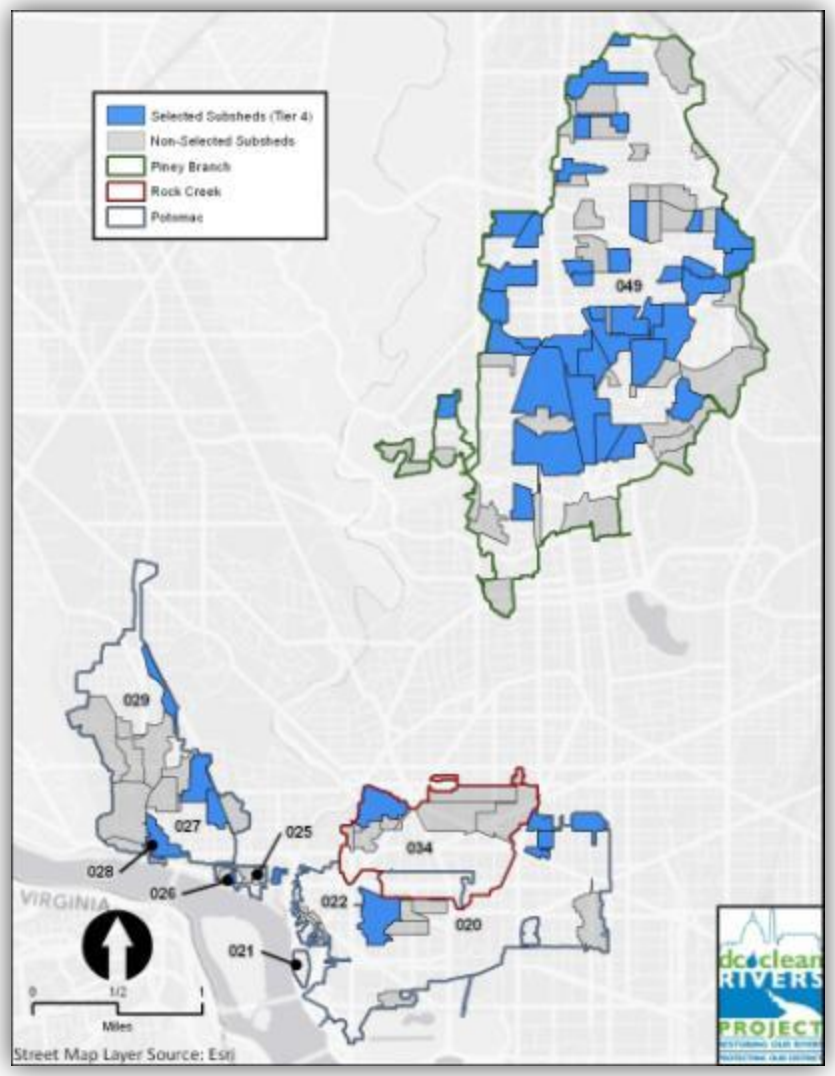




- Tier 3: Monitoring capacity
  - Eliminate portions of each CSO that contain major ambiguities between the GIS database and actual field conditions
- Possible areas narrowed down to:
  - 108 subsheds

Site Selection Process – Tier 4





- Tier 4: Land cover and land use **representativeness**
  - Eliminate subsheds that are not representative of their parent CSOs in terms of:
    - Land cover (perviousness and imperviousness)
    - Land use (public, public/private, and private)
- Possible areas narrowed down to:
  - 48 subsheds

Acceptable Range of Representativeness

Potomac	Overall Sewershed Coverage*	Standard Deviation (σ) of the Subshed Coverage	Acceptable Range for Representative Subsheds** (Sewershed % +/- σ)
Land Cover			
Impervious Area	68%	18%	51 - 86%
Pervious Area	31%	18%	13 - 49%
Land Use			
Public	53%	23%	31 - 76%
Public / Private	14%	27%	0 - 41%
Private	32%	24%	8 - 57%

Piney Branch	Overall Sewershed Coverage*	Standard Deviation (σ) of the Subshed Coverage	Acceptable Range for Representative Subsheds** (Sewershed % +/- σ)
Land Cover			
Impervious Area	52%	11%	41 - 63%
Pervious Area	48%	11%	36 - 59%
Land Use			
Public	50%	17%	33 - 68%
Public / Private	3%	8%	0 - 11%
Private	47%	17%	30 - 64%

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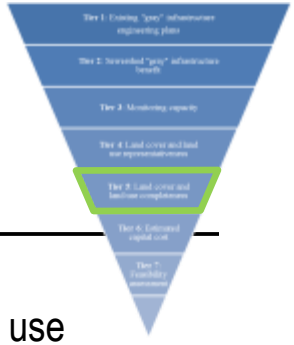
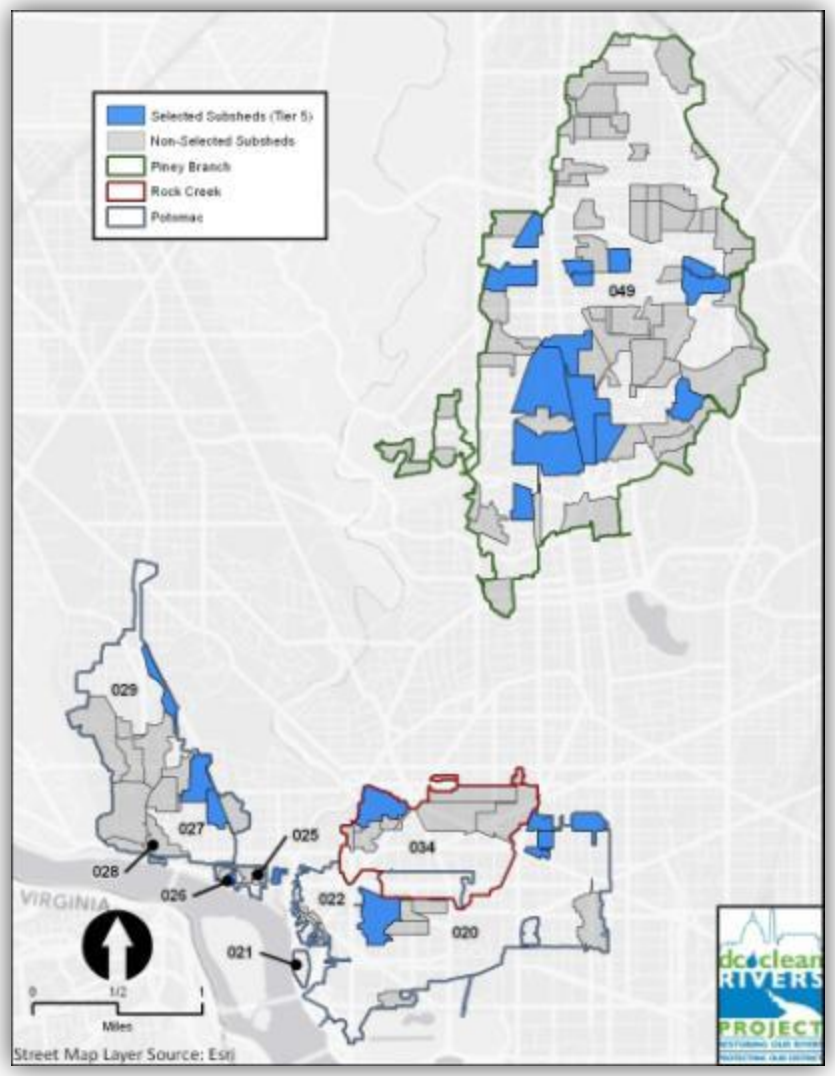
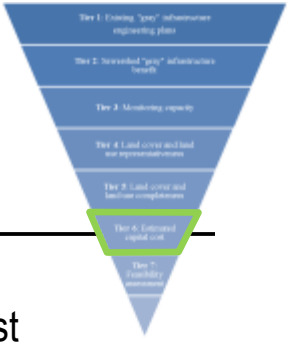
Site Selection Process – Tier 5

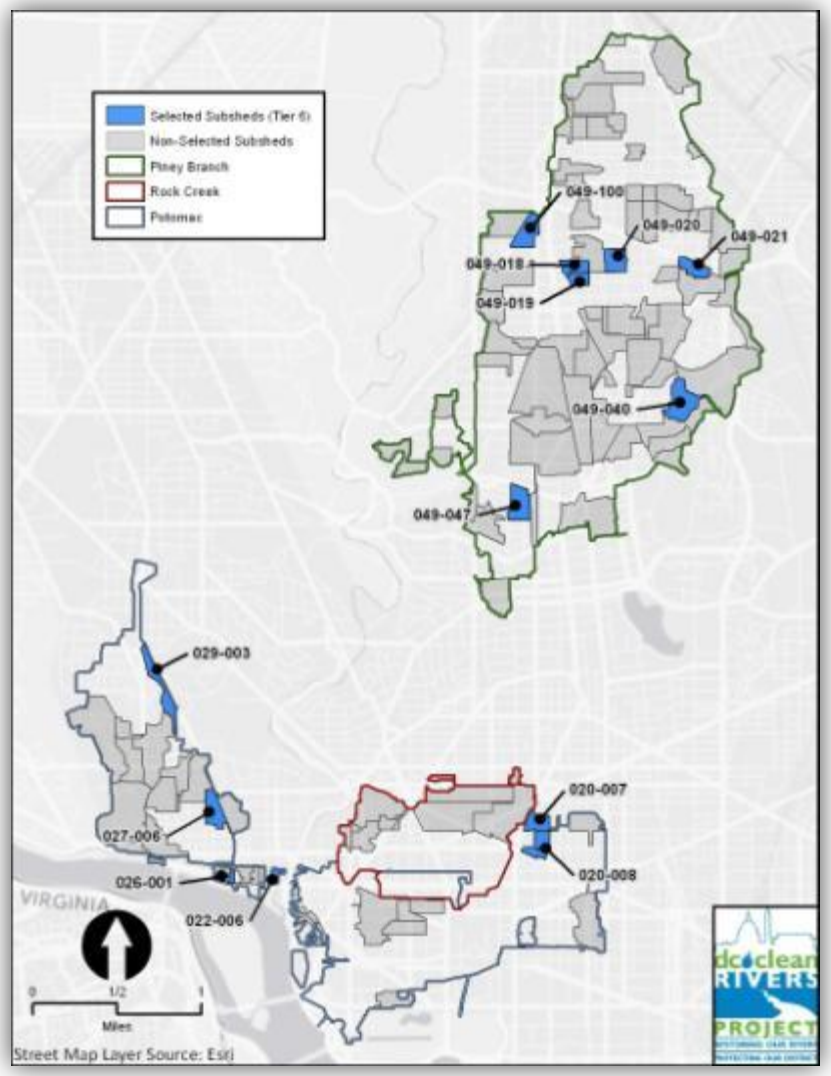




- Tier 5: Land cover and land use **completeness**
  - Eliminate subsheds that are not complete (at least 1%) in terms of:
    - Land cover (perviousness and imperviousness)
    - Land use (public, public/private, and private)
- Possible areas narrowed down to:
  - 24 subsheds

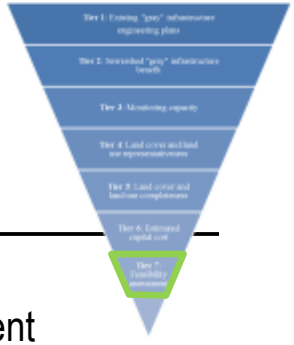
Site Selection Process – Tier 6

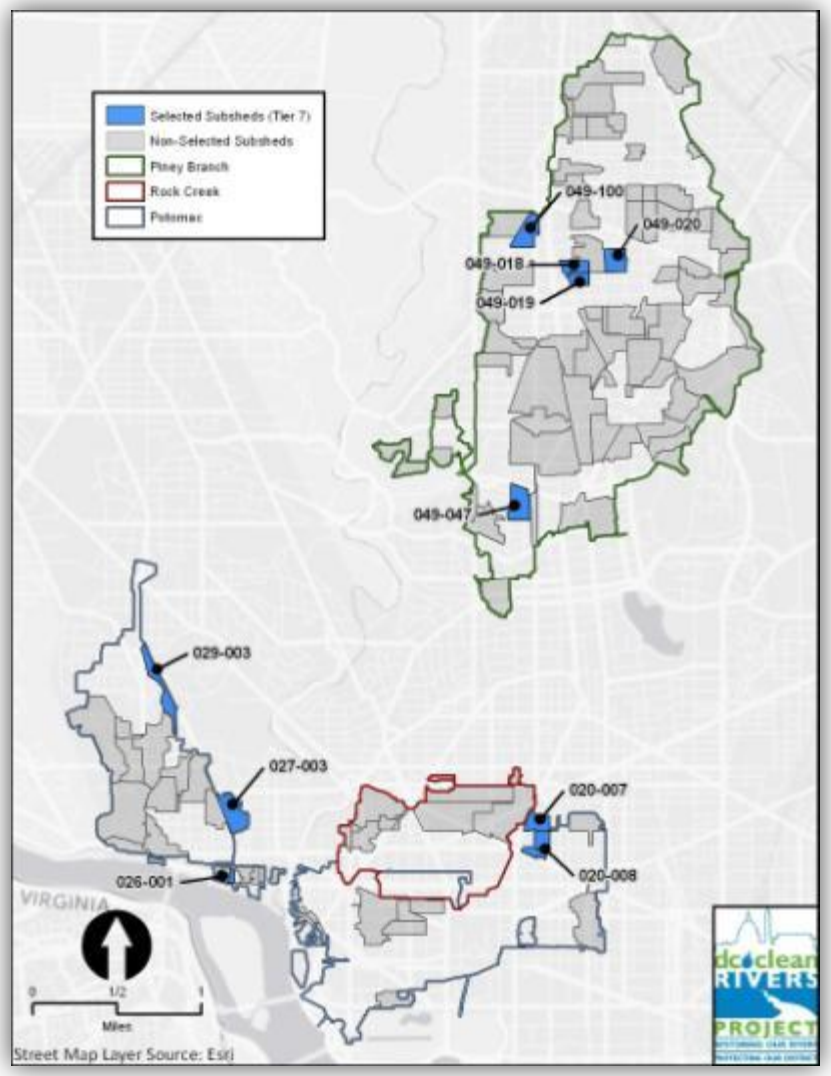




- Tier 6: Estimated capital cost
  - Eliminate subsheds whose gross estimated capital cost exceeds $11 million
- Possible areas narrowed down to:
  - 13 subsheds

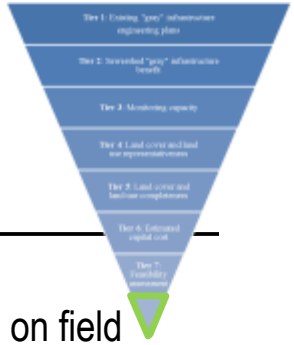
Site Selection Process – Tier 7

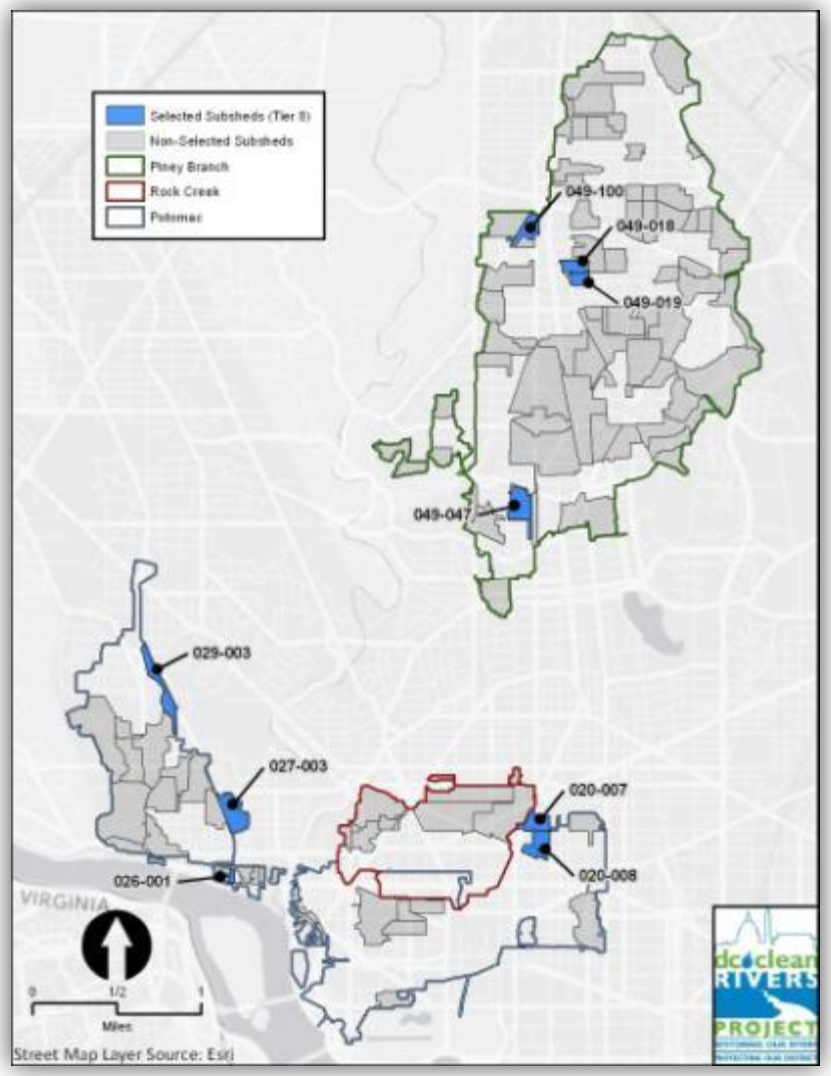




- Tier 7: Feasibility assessment
  - Eliminate subsheds in which field conditions indicated that monitoring would be prohibitively difficult
- Possible areas narrowed down to:
  - 10 subsheds

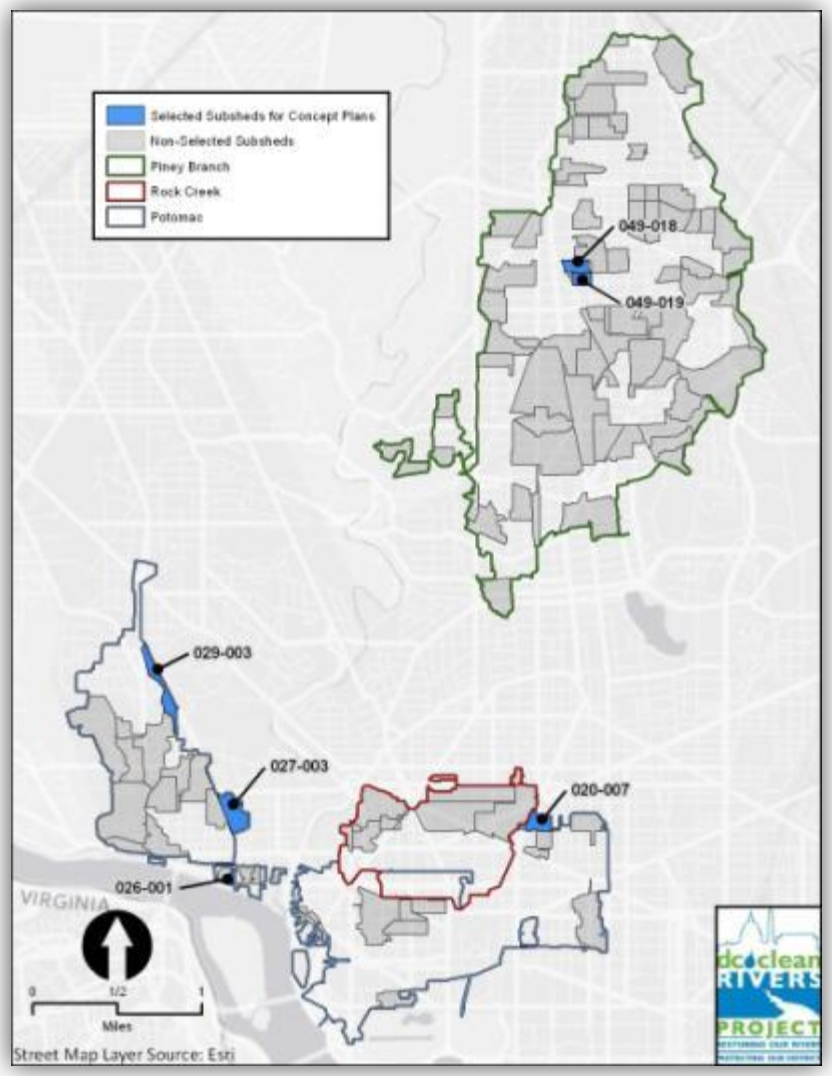
Site Selection Process – Tier 8





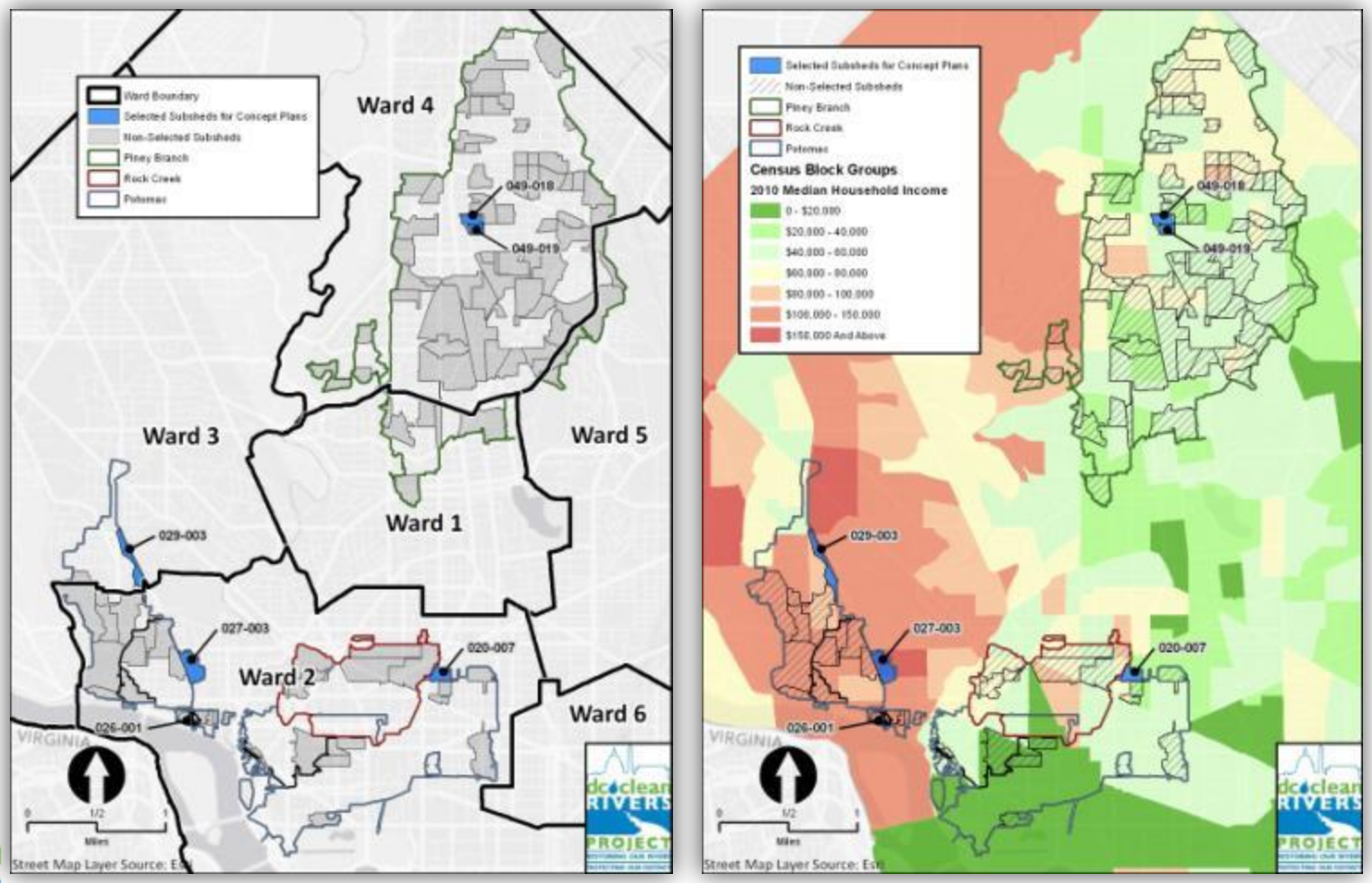
- Tier 8: Redelineation based on field conditions
  - Adjust the subshed boundaries based on field conditions (downspouts, flow direction, monitoring points, etc), and eliminate adjusted subsheds whose parameters fall outside of the Tier 1-6 selection criteria
- Possible areas narrowed down to:
  - 9 subsheds

Site Selection Process – Final Candidate Sites



- Select final concept plan sites based on:
  - Field knowledge of potential Green Infrastructure opportunities
  - Potential monitoring locations
  - Political representation (Wards 2, 3, and 4)
  - Demographic representation
- Total of 6 concept plan subsheds were selected

Site Selection Process – Final Candidate Sites

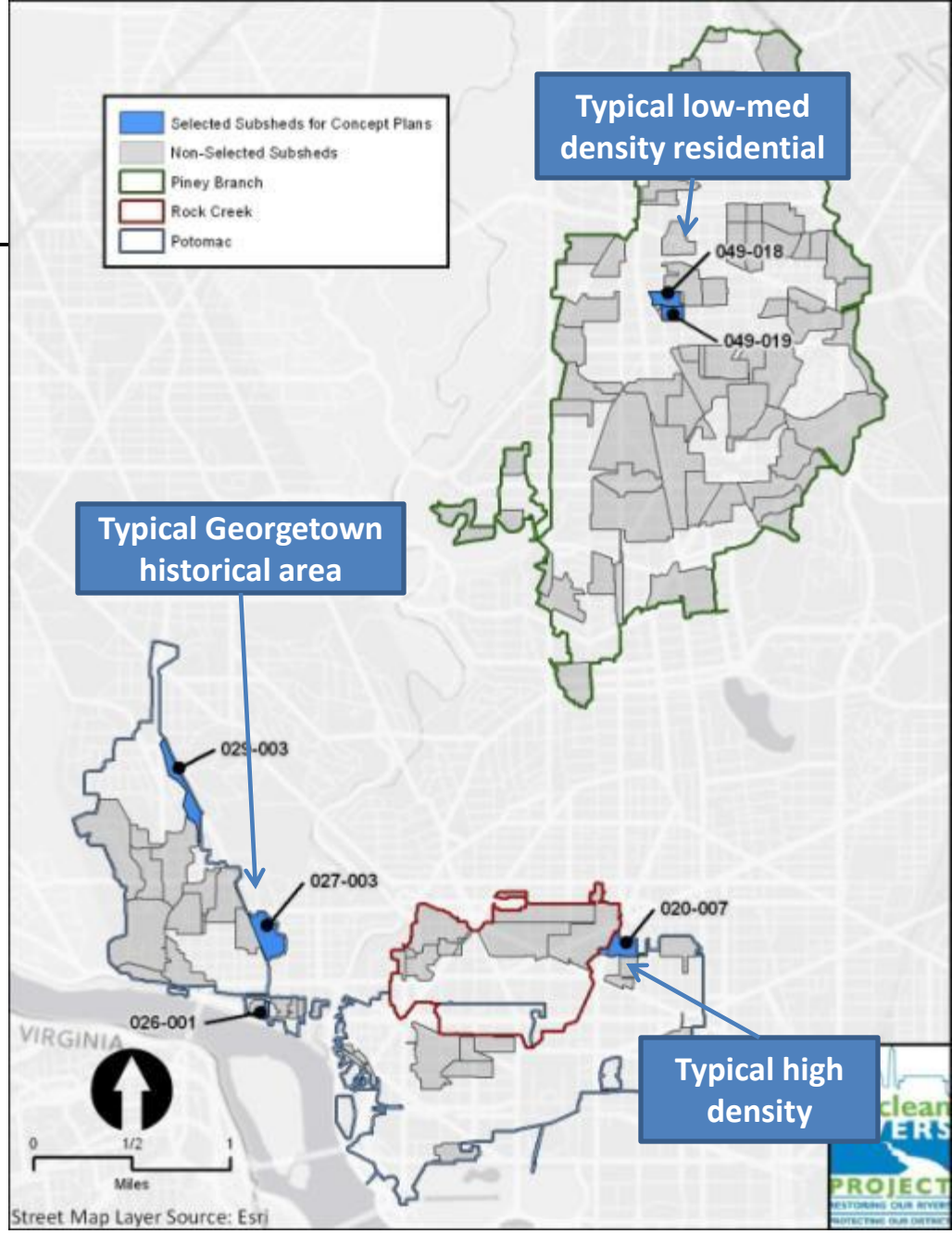


Demonstration Project

Proposed subsheds:

Rec. Water	Sub-shed	Total Acres	Imp. Acres	Description
Pot. River	020-007	10.0	8.1	High density "down town" land use
	026-001	1.8	1.6	High density Georgetown waterfront
	027-003	16.6	10.5	Georgetown historic area
	029-003	14.4	8.9	Medium density Georgetown commercial
Piney Branch (Rock Creek)	049-018	6.6	3.6	Low to medium density residential
	049-019	5.1	3.0	Low to medium density residential
		54.5	35.7	

Scope includes GI in public and private space



Concept Plan Approach

Green Infrastructure Practices

- Green Infrastructure practices were grouped into 4 categories:

BIORETENTION PRACTICES Bioretention cells Bioswales Vegetated filter strips Tree box filters		**ROOFTOP COLLECTION PRACTICES** Green roofs Blue roofs Downspout disconnections Rain barrels Cisterns	
PERMEABLE PAVEMENTS		**LARGE-VOLUME UNDERGROUND STORAGE**	

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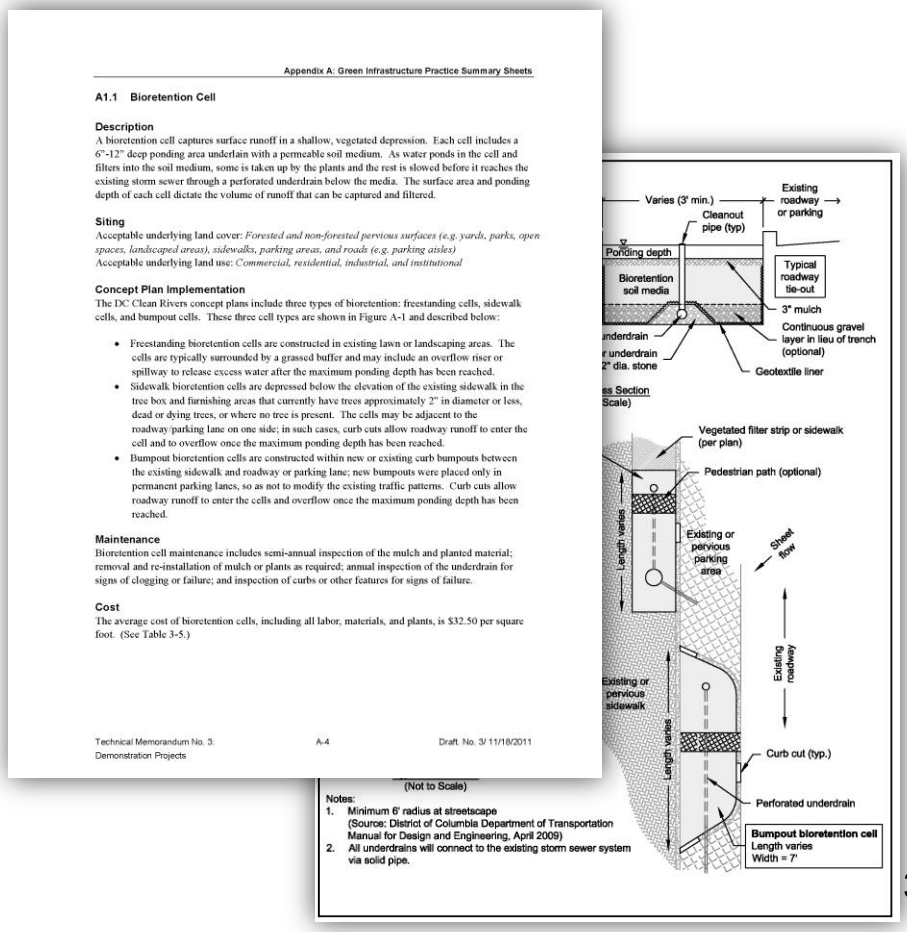
Concept Plan Approach

Green Infrastructure Practice Summary Sheets

- Green Infrastructure Practice Summary Sheets were developed for each practice
  - Siting (land uses and development types)
  - Maintenance considerations
  - Cost
  - Typical details
  - Photos



Appendix A: Green Infrastructure Practice Summary Sheets

A1.1 Bioretention Cell

Description
A bioretention cell captures surface runoff in a shallow, vegetated depression. Each cell includes a 6"-12" deep ponding area underlain with a permeable soil medium. As water ponds in the cell and filters into the soil medium, some is taken up by the plants and the rest is slowed before it reaches the existing storm sewer through a perforated underdrain below the media. The surface area and ponding depth of each cell dictate the volume of runoff that can be captured and filtered.

Siting
Acceptable underlying land cover: *Forested and non-forested pervious surfaces (e.g. yards, parks, open spaces, landscaped areas), sidewalks, parking areas, and roads (e.g. parking aisles)*
Acceptable underlying land use: *Commercial, residential, industrial, and institutional*

Concept Plan Implementation
The DC Clean Rivers concept plans include three types of bioretention: freestanding cells, sidewalk cells, and bumpout cells. These three cell types are shown in Figure A-1 and described below:

- Freestanding bioretention cells are constructed in existing lawn or landscaping areas. The cells are typically surrounded by a grassed buffer and may include an overflow riser or spillway to release excess water after the maximum ponding depth has been reached.
- Sidewalk bioretention cells are depressed below the elevation of the existing sidewalk in the tree box and furnishing areas that currently have trees approximately 2" in diameter or less, dead or dying trees, or where no tree is present. The cells may be adjacent to the roadway/parking lane on one side; in such cases, curb cuts allow roadway runoff to enter the cell and to overflow once the maximum ponding depth has been reached.
- Bumpout bioretention cells are constructed within new or existing curb bumpouts between the existing sidewalk and roadway or parking lane; new bumpouts were placed only in permanent parking lanes, so as not to modify the existing traffic patterns. Curb cuts allow roadway runoff to enter the cells and overflow once the maximum ponding depth has been reached.

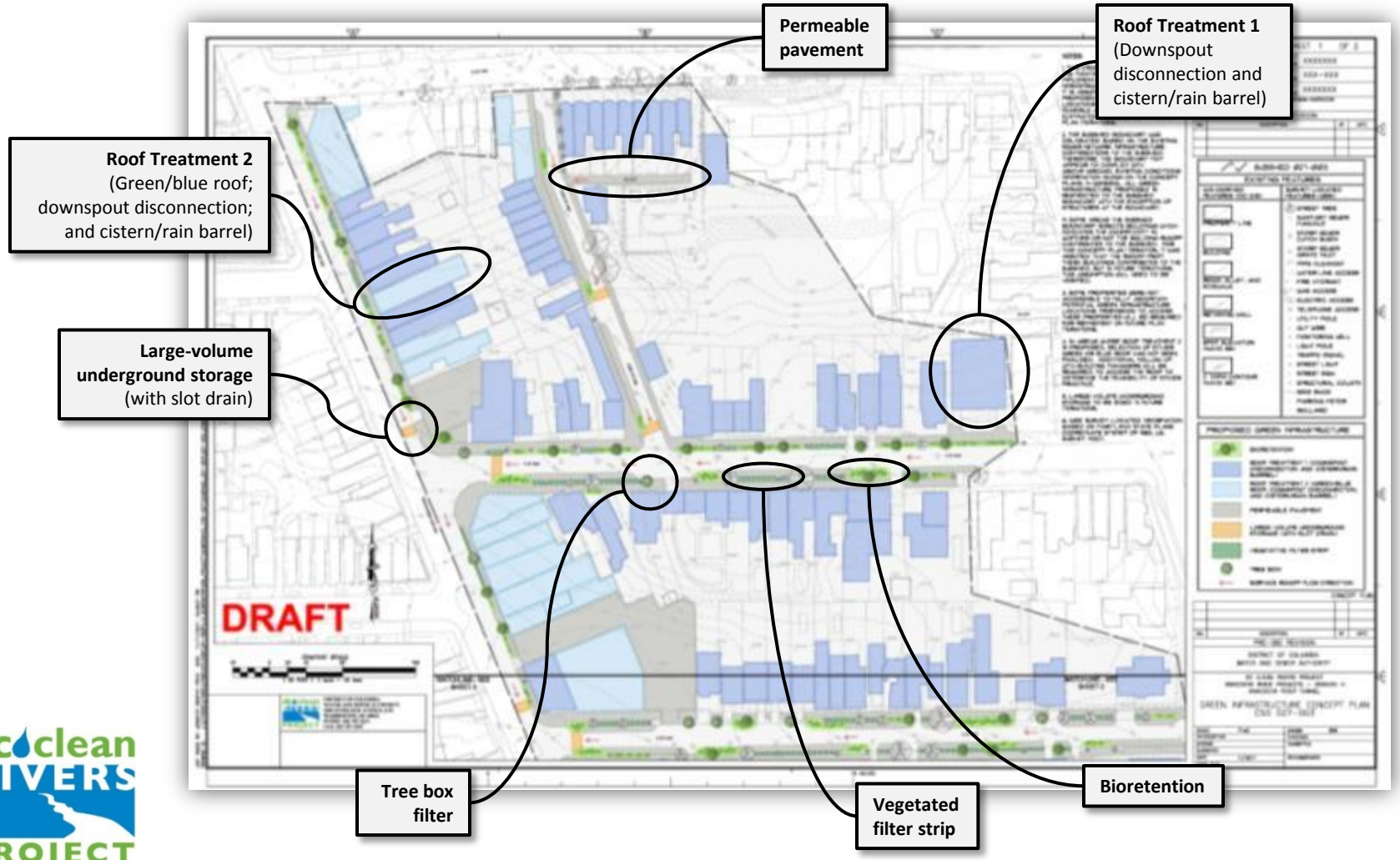
Maintenance
Bioretention cell maintenance includes semi-annual inspection of the mulch and planted material; removal and re-installation of mulch or plants as required; annual inspection of the underdrain for signs of clogging or failure; and inspection of curbs or other features for signs of failure.

Cost
The average cost of bioretention cells, including all labor, materials, and plants, is $32.50 per square foot. (See Table 3-5.)

Technical Memorandum No. 3: Demonstration Projects A-4 Draft. No. 3/ 11/18/2011

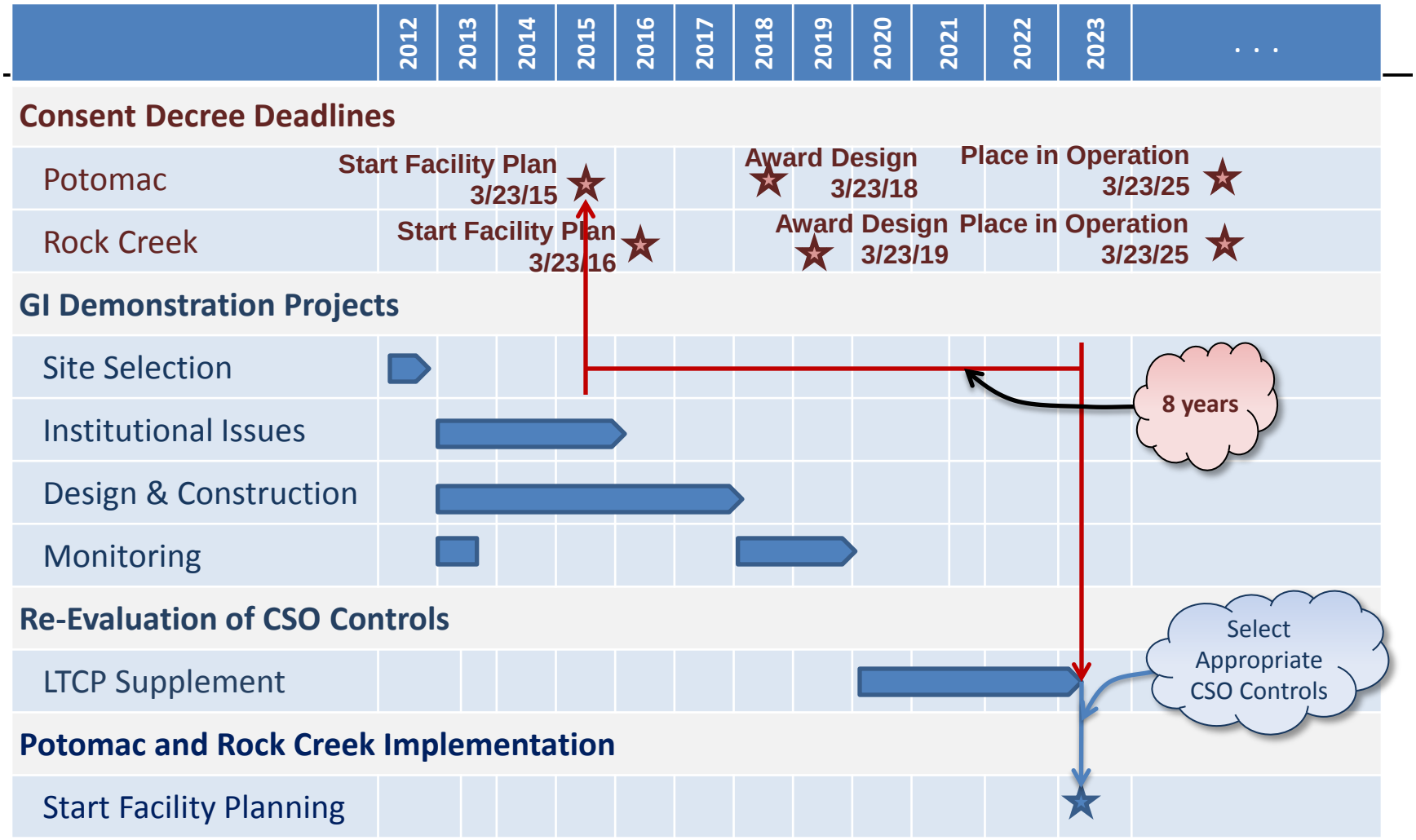
Concept Plan Approach

Typical Concept Plan



Concept Plan Approach

GI Project Schedule



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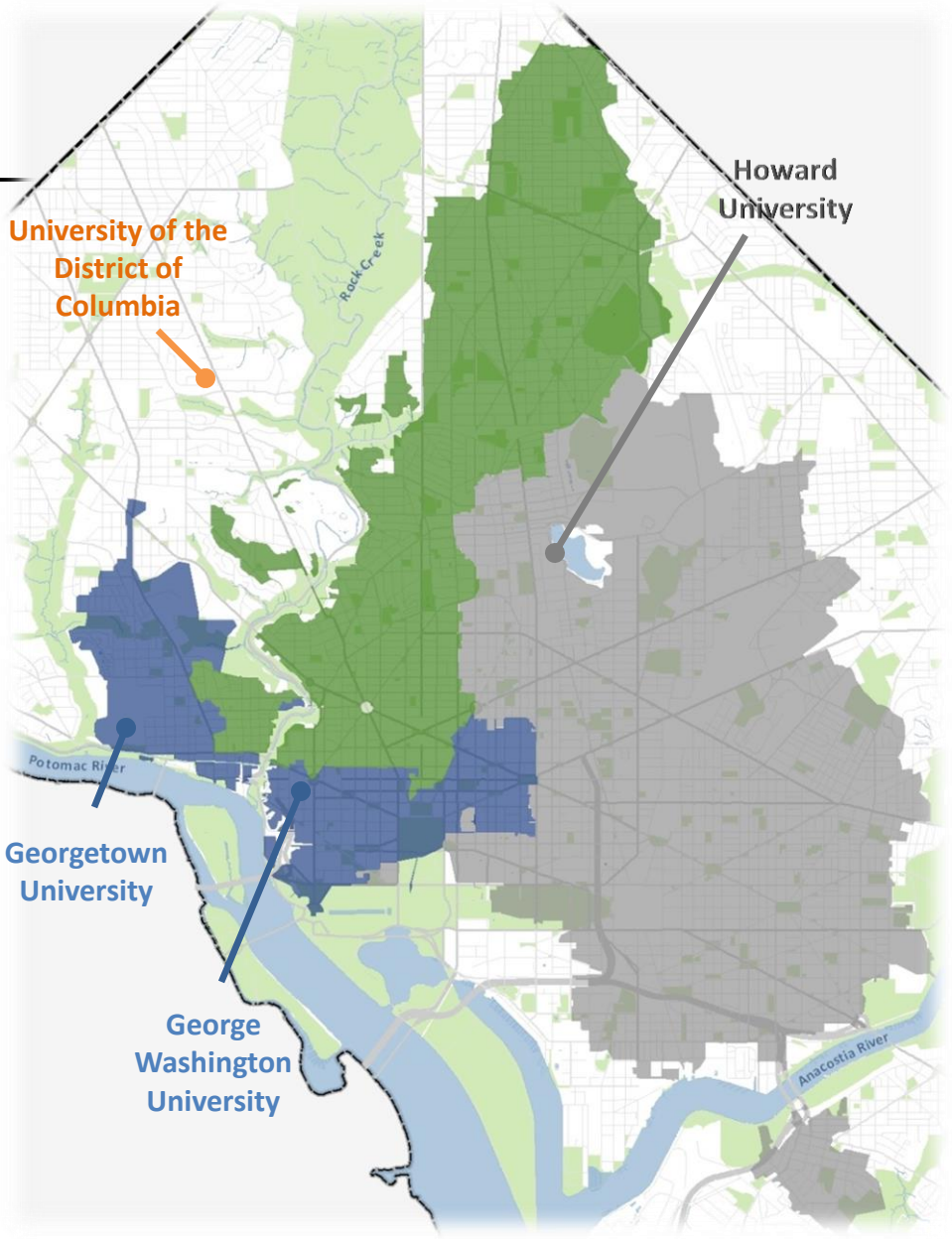
Clean Rivers, Green District

OPPORTUNITIES FOR COLLABORATION

Local Academic Institutions

Local Institution	Sewershed Location
Georgetown University	Potomac CSO
George Washington University	Potomac/Rock Creek CSO
Howard University	Anacostia CSO
University of the District of Columbia	Separate Sewer Area



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Opportunities for Collaboration

- Participate in Project Review Board
- Provide Staff for Monitoring
- Perform Private Property Outreach
- Study How to Assess Triple Bottom Line Benefits
- Implement Demonstration Projects on University Property

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Provide Staff for Monitoring

- Demonstration Project Pre and Post Construction Monitoring
  - Recommend monitoring locations
  - Recommend additional monitoring attributes (infiltration, soil moisture, etc)
  - Perform flow data tracking, analysis and summary

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Demonstration Project Monitoring

- Pre and Post Construction Monitoring

	Monitoring Goal	Data Needed	Potential University Role
1	Measure stormwater runoff reduction across each demonstration project site	Local precipitation, inflow to (if any) and outflow from the sewershed	Flow data tracking, analysis and summary.
2	Measure stormwater runoff reduction for each major GI type	Local precipitation, inflow to (if any) and outflow from selected representative practices	Recommend monitoring locations. Review and summarize data. Compare against other studies.
3	Measure other performance attributes of each major GI type	Soil moisture, evapotranspiration rates, infiltration/exfiltration rates, temperature outflow, water quality, pollutant storage in media	Recommend attributes and locations. Review and summamrize data. Support model inputs.

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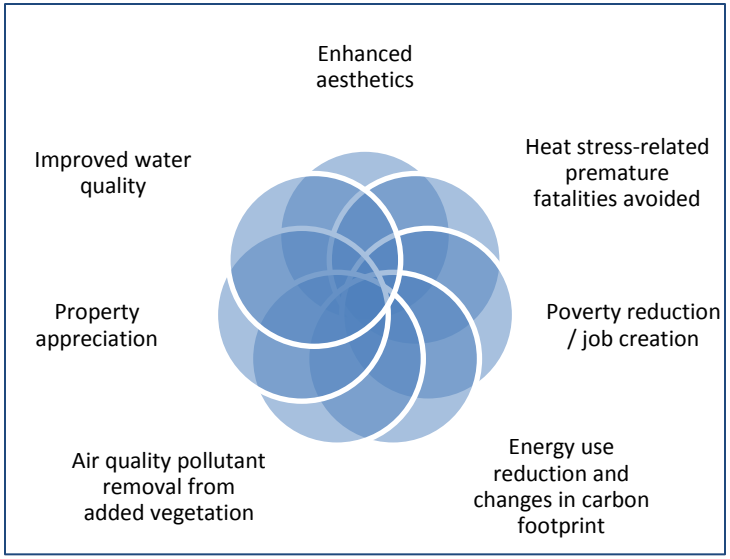
Studies to Assess Triple Bottom Line Benefits

- Establish property value baseline for demonstration areas
- Perform temperature studies for heat island (heat stress) reduction
- Measure changes in CO_2 emissions associated with energy use reductions
- Monitor air quality improvements related to health benefits



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Private Property Strategies

- Work with community organizations to establish outreach meetings
- Develop education programs
- Coordinate mailings and door-to-door outreach
- Support RiverSmart Homes

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Clean Rivers, Green District

PROPOSED CONSENT DECREE MODIFICATIONS

What Will DC Water's Proposed Consent Decree Modifications Include?

- Green Infrastructure
  - $10-$40M Demonstration Project
  - Extend Potomac and Rock Creek deadlines
  - Establish 0, 2, and 5-year decision points
  - 5 year decision point includes alternatives evaluation, site selection process and final review by public and regulatory agencies
  - Second CD Modification will be required if GI is proposed instead of tunnels or as part of a hybrid solution (will address controls and schedule)

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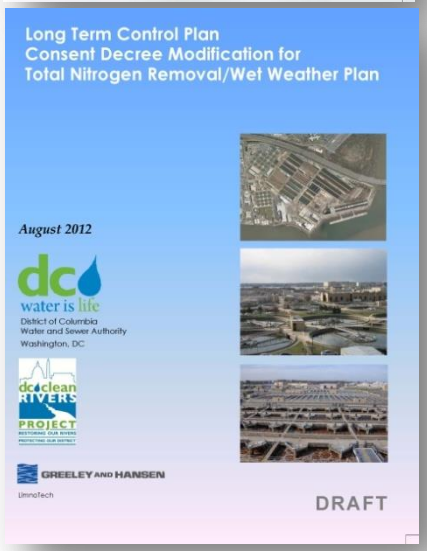
What Will DC Water's Proposed Consent Decree Modifications Include?

- Acceleration of Green Infrastructure Implementation
  - GI Proposal is not about avoiding costs or delayed compliance
  - DCW will reinvest any savings from the schedule extension to GI projects
  - For a hybrid or green approach, supplemental GI projects will permit early compliance with water quality goals.
  - For existing approach, supplemental GI projects will provide greater certainty on achieving water quality goals.



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