Ground Rules

- **Remember why you're here:**
  - Review and monitor the development of the Final Plan
  - Provide input and insight from your communities
  - Share progress with your communities
- Be respectful of others
- Be present and focused during meetings
- Be additive, not repetitive, during discussions
- Everyone should participate and no one should dominate
- Be clear when you're speaking if you're sharing your own thoughts or input provided by those you represent
- There are no stupid questions! Ask!
- Be open to new ideas
- Don't talk over people or interrupt
- Moderator will make note of group members who raise their hands to speak; or, wait to speak
- If there are 7 seconds of silence, we can move on from a discussion topic

Today's Agenda: Public Stakeholder Group Meeting #3

- Final Plan Timeline
- What We'll Address
- Developing Solutions
  - Methods and Technologies
  - Examples from Other CSS Communities
- Evaluating Options

The Process: Developing the Final Plan

WE ARE HERE

System Characterization and Options Identification

2020 | 2021 | 2022 | 2023 | 2024 | 2025 - 2035

SB1064 Passes into Law

Options Evaluation and Selection

Final Plan Due

THE CULMINATION OF OUR WORK

Design and Construction of Final Plan Projects

Richmond's Current Combined Sewer System

CSS Area: 19 square miles

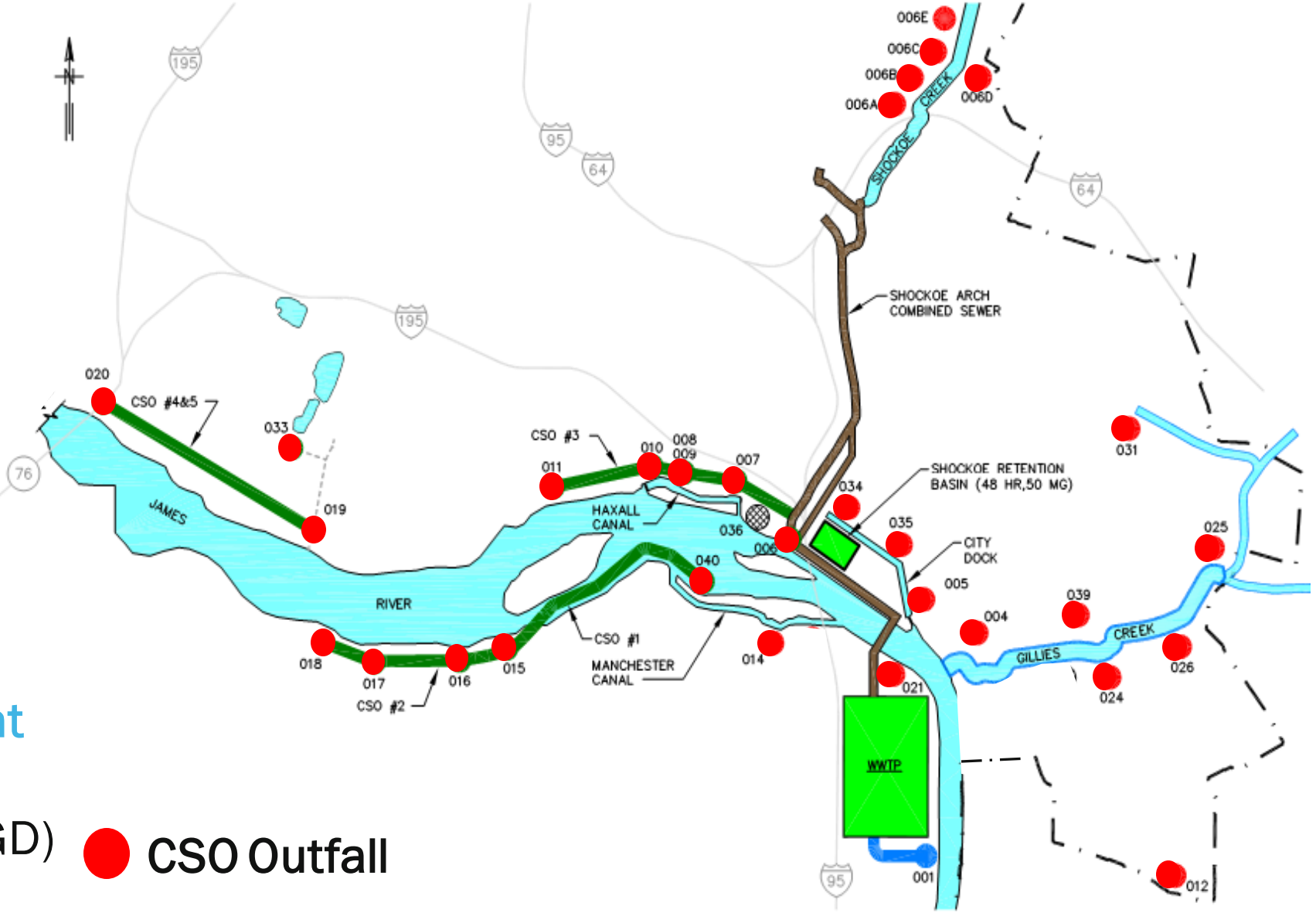
Annual Overflow Volume:
1.5 - 5 billion gallons

Remaining Outfalls: 25

Population: ~230,000

Storage: 57 million gallons (Shockoe Retention Basin and pipes & Hampton-McCloy Tunnel)

Wastewater Treatment Plant (WWTP) Capacity: 140 Million Gallons per Day (MGD)



CSO Outfall

Options

Methods for Controlling Combined Sewer Systems

1. Additional Pipes/Sewers
2. Storage
3. Upgrade Existing Wastewater Treatment Plant
4. Separate Wet Weather Treatment Facility
5. Sewer Separation
6. Green Infrastructure

Method: Additional Pipes/Sewers

Purpose

Carry flow to storage or treatment facility

Pros	Cons
• Effective for collecting flow from clusters of outfalls	• Would need additional storage or treatment facility
• Less disruptive construction methods available	• Construction can be very expensive or disruptive

CSO 03's 90" Diameter Pipe

Method: Storage

Purpose

- Store flow during storms
- Drain to treatment facility after event

Pros	Cons
• Very effective for remote or smaller outfalls • Construction is relatively inexpensive	• Requires more operation and maintenance than additional pipes do • Construction can be very disruptive

Shockoe Retention Basin

Method: Upgrade Existing Wastewater Treatment Plant

Purpose

Expand the treatment capacity at the existing Wastewater Treatment Plant

Pros	Cons
• Highest level of treatment	• Less cost efficient than building separate wet weather treatment facilities

Richmond's Wastewater Treatment Plant

Method: Separate Wet Weather Treatment Facility

Purpose

Treat additional combined flow during storm events

Pros	Cons
• Effective as a central facility for multiple outfalls	• Very expensive
• Reduces bacteria	• Requires significant operation and maintenance
• Some sediment removal	• May need one on each side of the James
	• No nutrient removal

Washington DC: High-Rate Treatment Facility

Method: Sewer Separation

Purpose

Build new sewers to separate stormwater and sanitary flow

Pros	Cons
• Eliminates stormwater from entering sewer system • Effective for small pipes	• Most expensive method • Construction is very disruptive (work needed in every street and at every property)

Sewer Separation Construction

Method: Green Infrastructure

Purpose

Reduce stormwater in combined sewer system

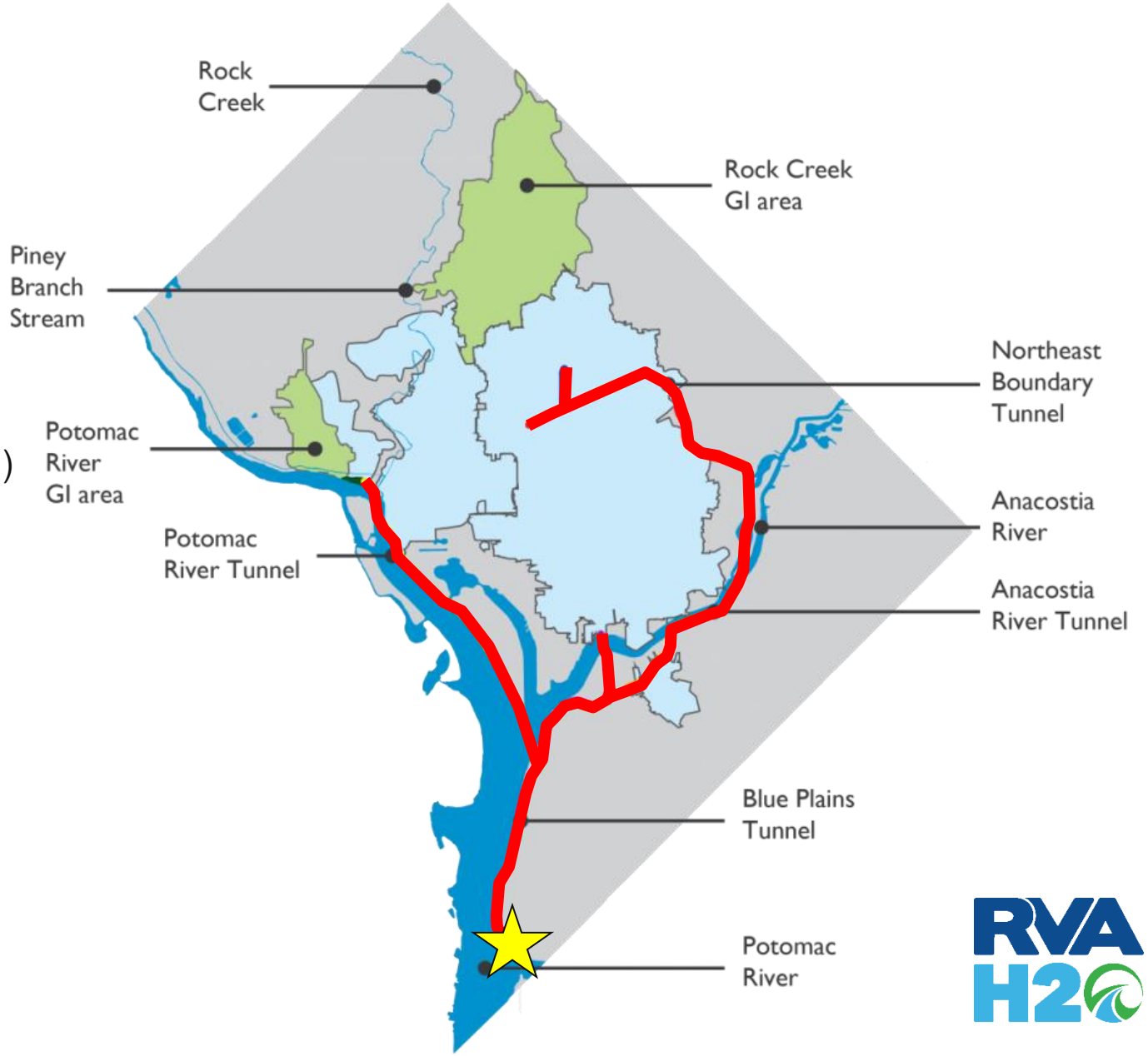
Pros	Cons
• Can be effective in very small areas (low flows)	• Not suited to remove significant volume
• Visible improvement	• Typically very expensive
	• Requires significant maintenance

Forest View Green Alley

What other communities are doing: Washington, DC

Estimated Cost: $2.7 billion
CSS Area: ~ 21 square miles
Population: ~700,000

- ☑ Additional Sewers/Storage
  - 18 miles of tunnels
- ☑ Treatment
  - Wastewater Treatment Plant Upgrades
    - >1,000 Million Gallons per Day (MGD)
  - 225 MGD High-Rate Treatment Facility
- ☑ Separation
- ☑ Green Infrastructure
  - ~3 million gallons of volume reduction



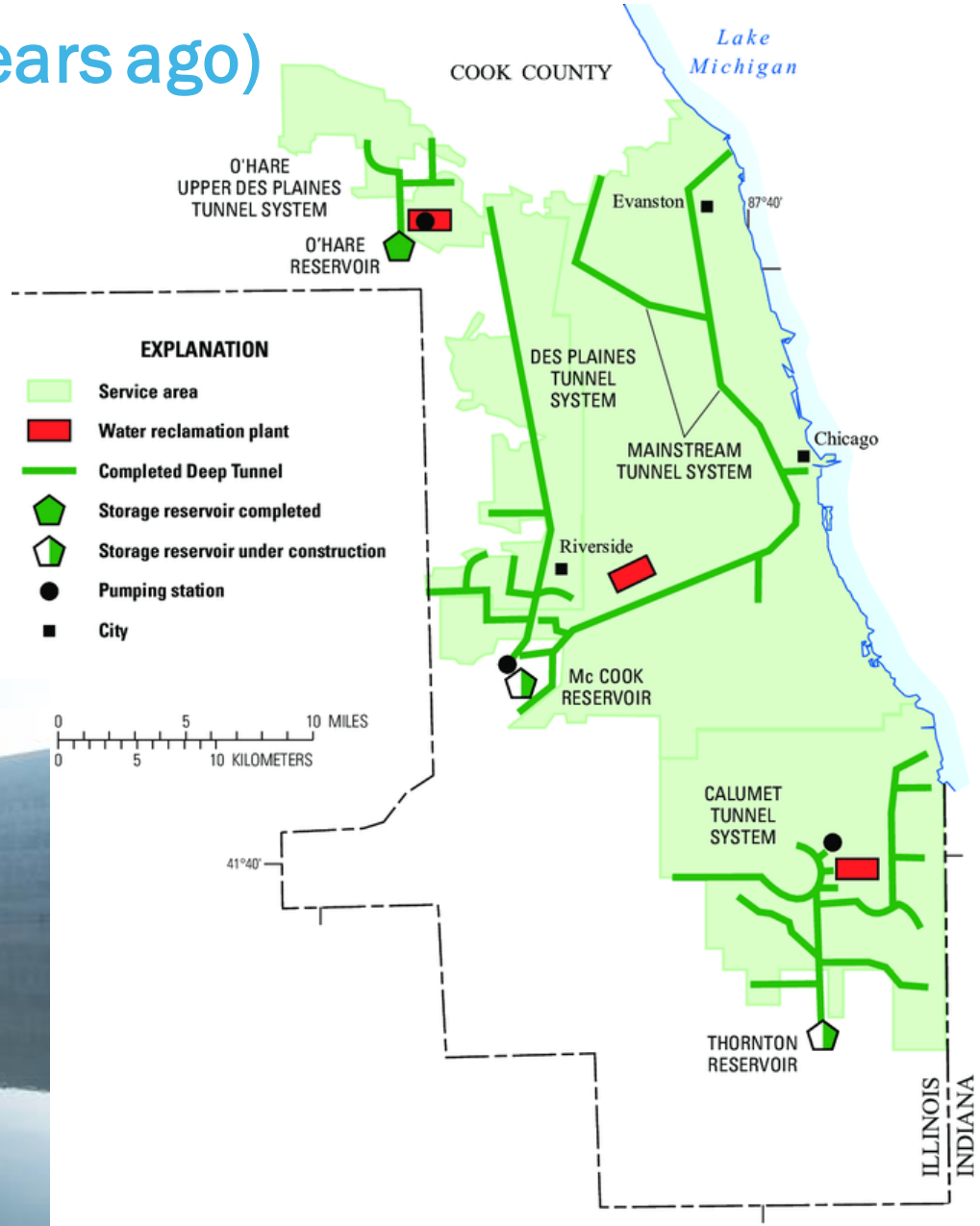
What other communities are doing: Chicago, Illinois

Estimated Cost: $4+++ billion (started 50 years ago)

CSS Area: ~ 375 square miles

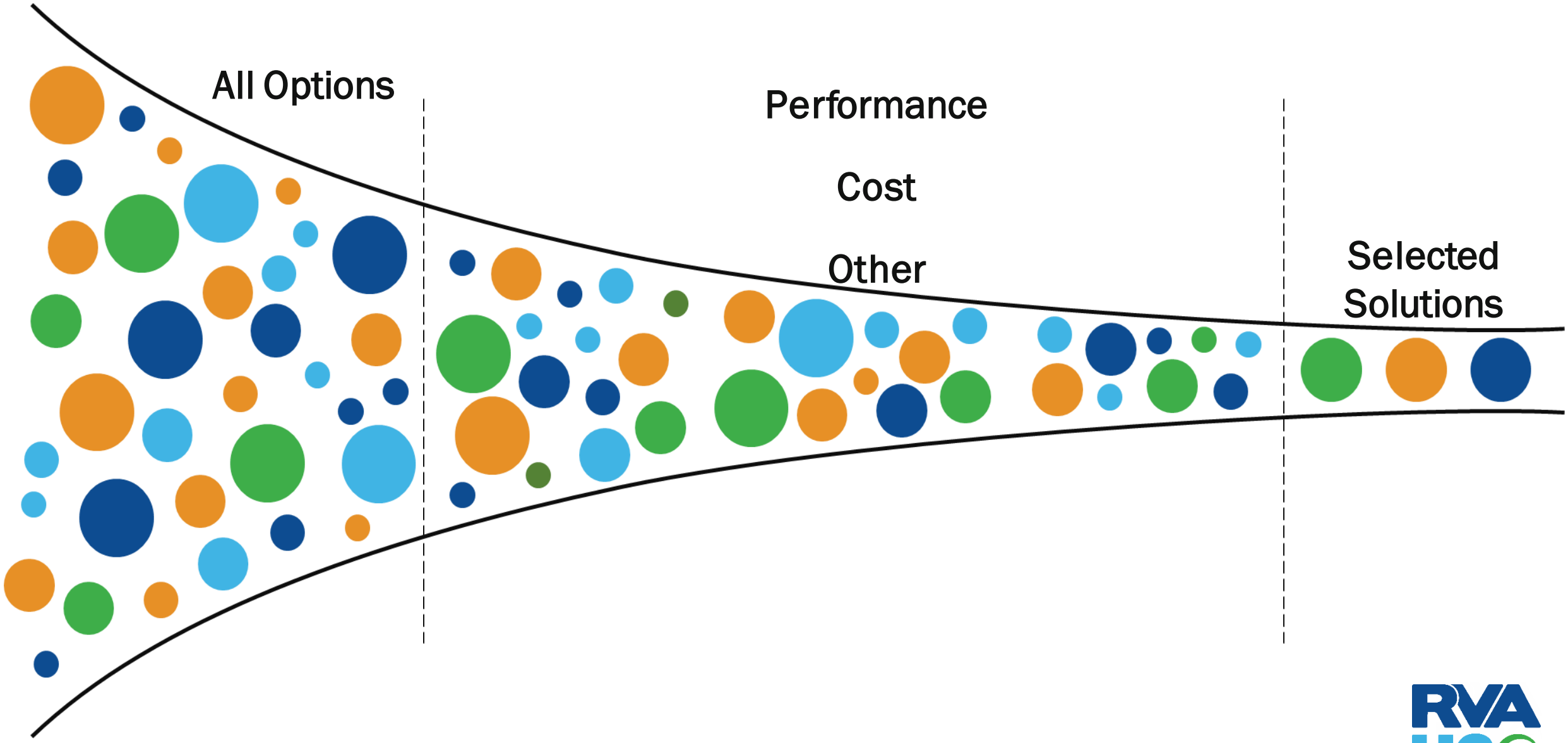
Population: ~2.7 million

- ☑ Additional Sewers
  - 109 miles of tunnels
- ☑ Storage
  - 3 Quarries/Reservoirs: 18.3 billion gallons
  - Tunnels: 2.3 billion gallons
- ☑ Treatment
  - Wastewater Treatment Plant Upgrades



Evaluating Options

Evaluation Criteria



Evaluation Criteria: Performance Criteria

- ❑ Reduce
  - Overflow Volume
  - Overflow Events
- ❑ Bacteria Reduction
- ❑ Regulatory Compliance
- ❑ Others?

Evaluation Criteria: Cost Criteria

- ❑ Construction
- ❑ Capital
- ❑ Operation and Maintenance
- ❑ Life-Cycle
- ❑ Others?

Evaluation Criteria: Other Criteria

- ❑ Constructability
- ❑ Operation and Maintenance Requirements
- ❑ Land Use and Permitting
- ❑ Community Benefits
- ❑ Community Impacts
- ❑ Others?

Scoring Options

Example: Should I buy paper towels in bulk?

Category	Criteria	Criteria Scoring		Criteria Weight	Score
Cost	Cost per roll of paper towels	Bulk rolls cost $0.75 per roll	2	5	10
		Single roll costs $1.25	1		5
Distance to Store	Distance from home (time, gas, mileage, traffic)	Less than a mile from home	2	3	6
		1 to 5 miles from home	1		3
		More than 10 miles from home	0		0
Storage Space	Space needed to store paper towels	Fits under sink or in pantry	2	2	4
		Need a shelf in the garage	1		2
		Will need a front-end loader	0		0

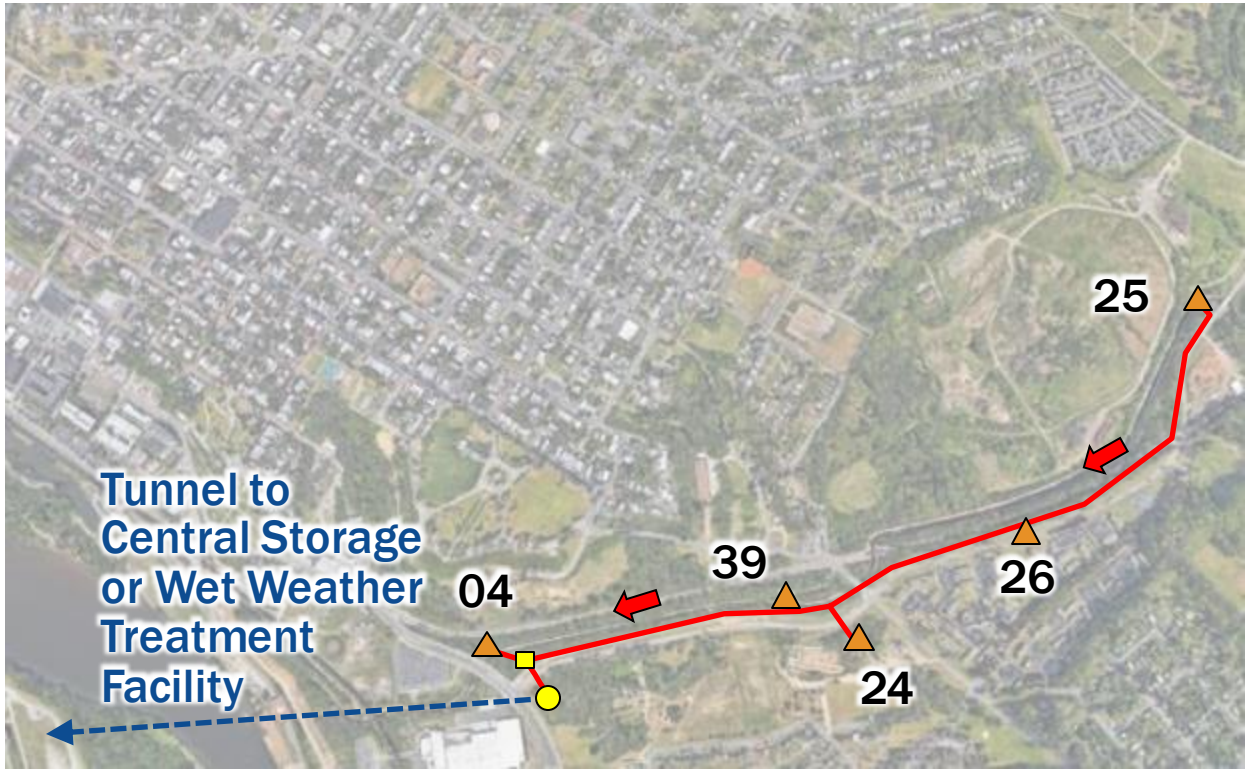
Scoring Options

Example: Should I buy paper towels in bulk?

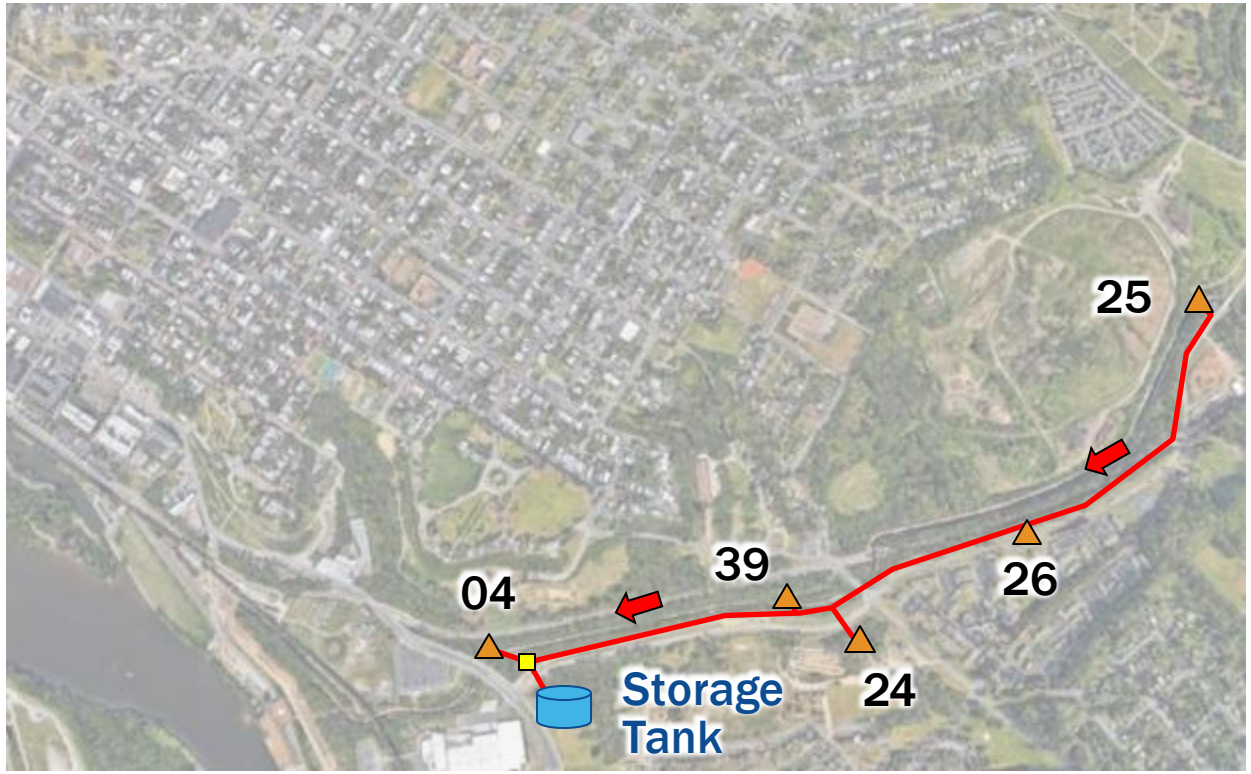
Category	Criteria	Criteria Scoring		Criteria Weight	Score	Highest Score
Cost	Cost per roll of paper towels	Bulk rolls cost $0.75 per roll	2	5	10	10
		Single roll costs $1.25	1		5	
Distance to Store	Distance from home (time, gas, mileage, traffic)	Less than a mile from home	2	3	6	6
		1 to 5 miles from home	1		3	
		More than 10 miles from home	0		0	
Storage Space	Space needed to store paper towels	Fits under sink or in pantry	2	2	4	4
		Need a shelf in the garage	1		2	
		Will need a front-end loader	0		0	

Potential Gillies Creek Options

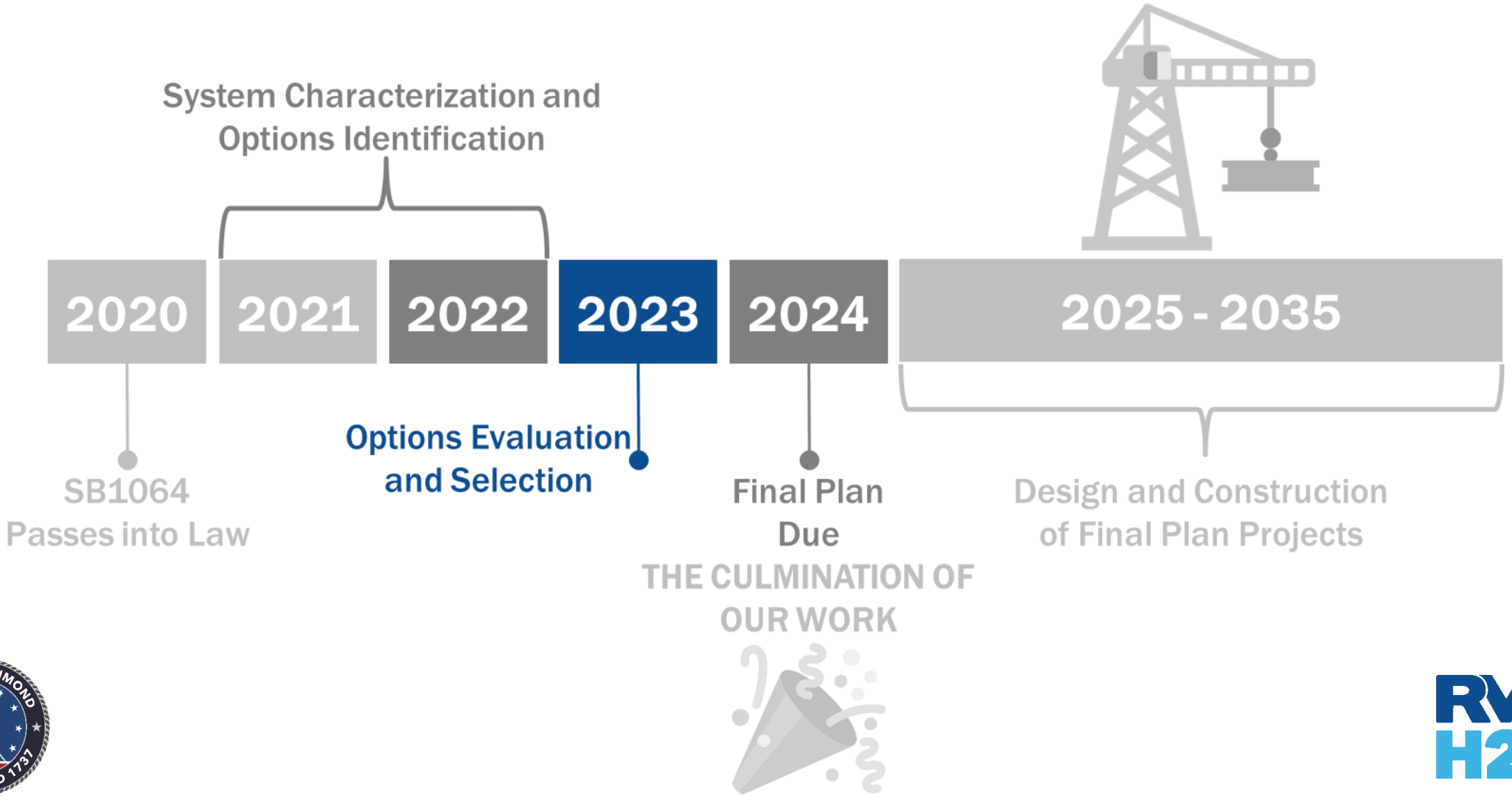
Option 1: Tunnel to Storage or Wet Weather Treatment Facility



Option 2: Remote Storage



What's Coming Next



Next Meeting: Winter 2023

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Photo Credit: Greg Velzy,

Friends of the James River Park, Chesterfield County, James River Outdoor Coalition, James River Advisory Council, Historic Falls of the James Scenic River Advisory Committee