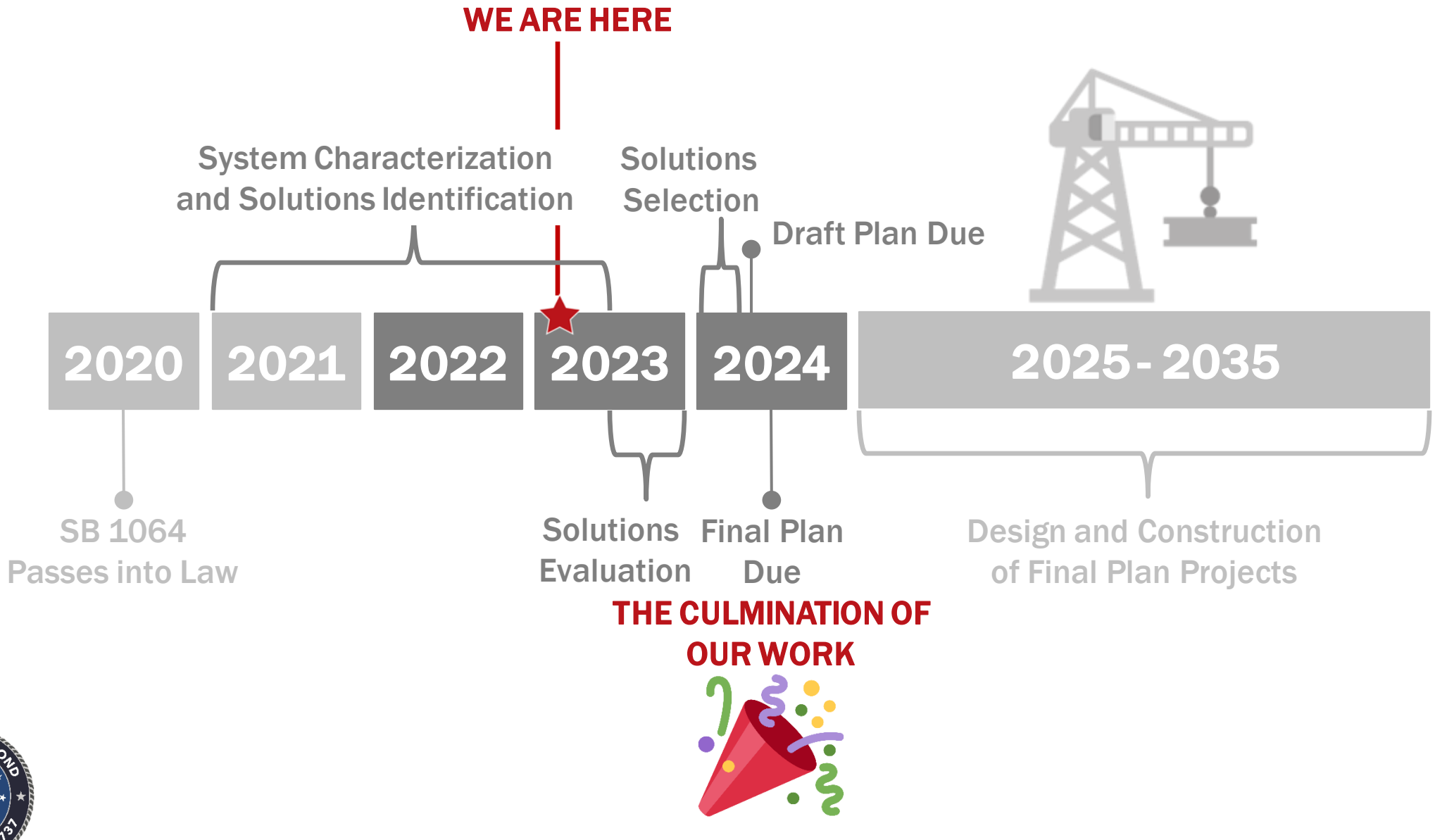
Ground Rules

- 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 #5

- Final Plan Timeline
- Green Infrastructure
- Solutions
  - Gillies Creek
  - North Side and Hampton-McCloy
- Next Meetings

The Process: Developing the Final Plan



Methods for Controlling Combined Sewer Systems

- Bigger Pipes
- Storage
- Treatment
- Separation
- Green Infrastructure

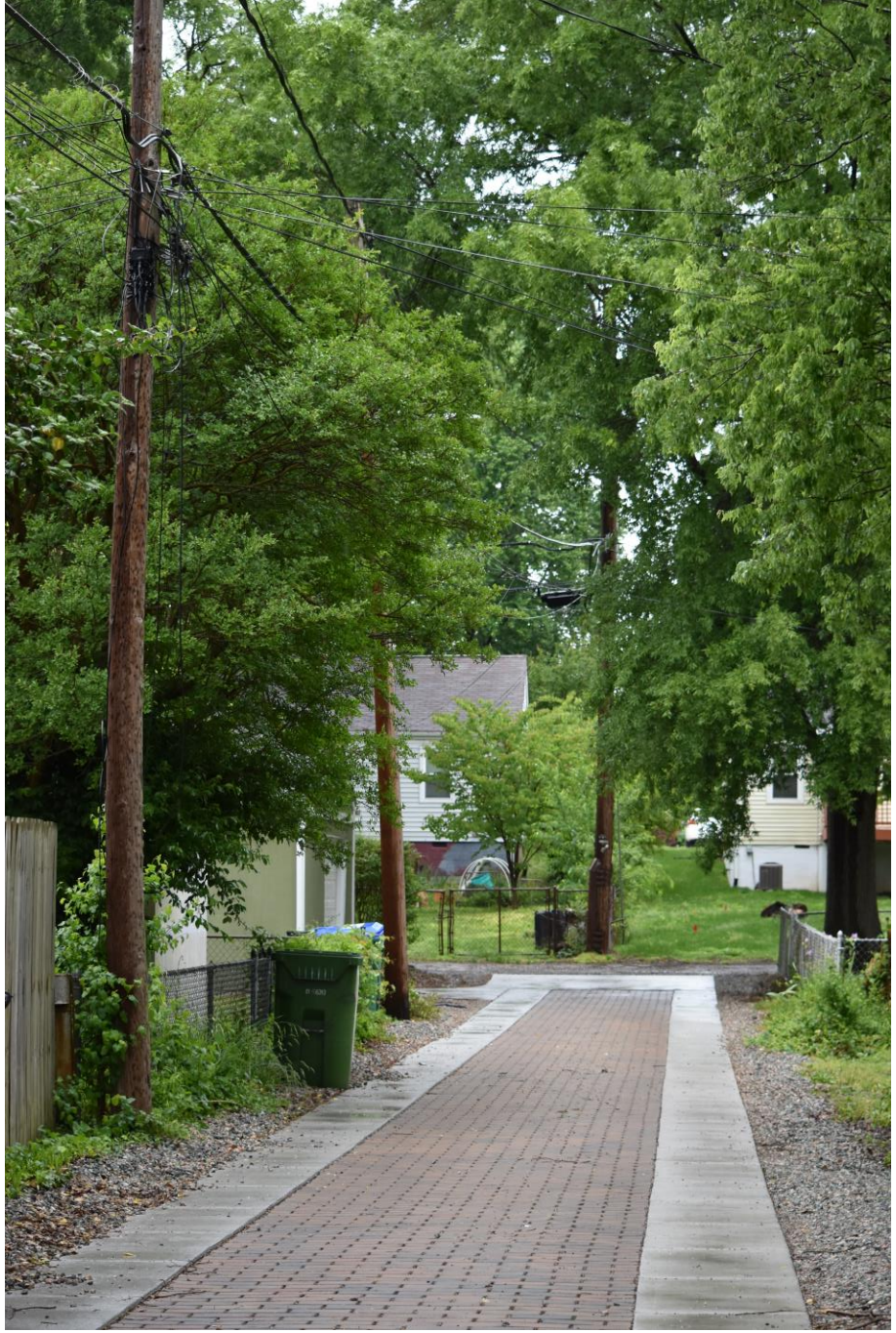
Low Line Green – 7th City Council District

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 – 4th City Council District

Green Infrastructure – Storage

Temporarily stores stormwater runoff that slowly drains

Common Practices:

- Pond
- Rain Barrels and Cisterns

Green Infrastructure – Pond

Cost	Medium
Performance	• Stores stormwater and then drains once the system has capacity • Only 0-15% Soaks In
Maintenance	Low
Limitations	• Lacks aesthetic appeal

Green Infrastructure – Rain Barrels and Cisterns

Cost	High
Performance	• Stores stormwater and then drains once the system has capacity
Maintenance	Low
Limitations	• Needs to be emptied before every rain event • Limited storage volume

Green Infrastructure – Soaking In

Holds smaller volumes of runoff and soaks into the ground

Additional rain (over 1-inch) flows into the combined sewer system

Common Practices:

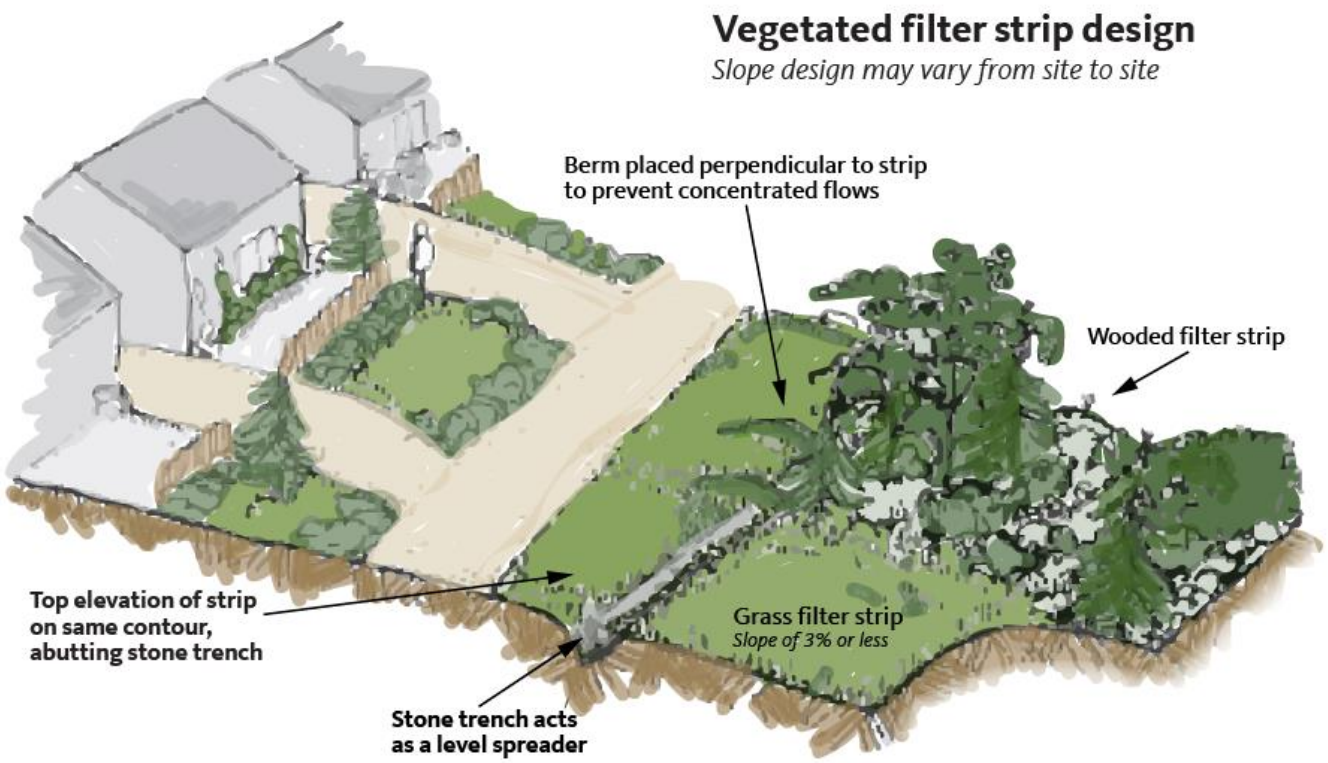
- Rain Gardens
- Open Space
- Permeable Pavers
- Ditches
- Trees

Green Infrastructure – Rain Gardens

Broad Rock Branch Library – 8th City Council District

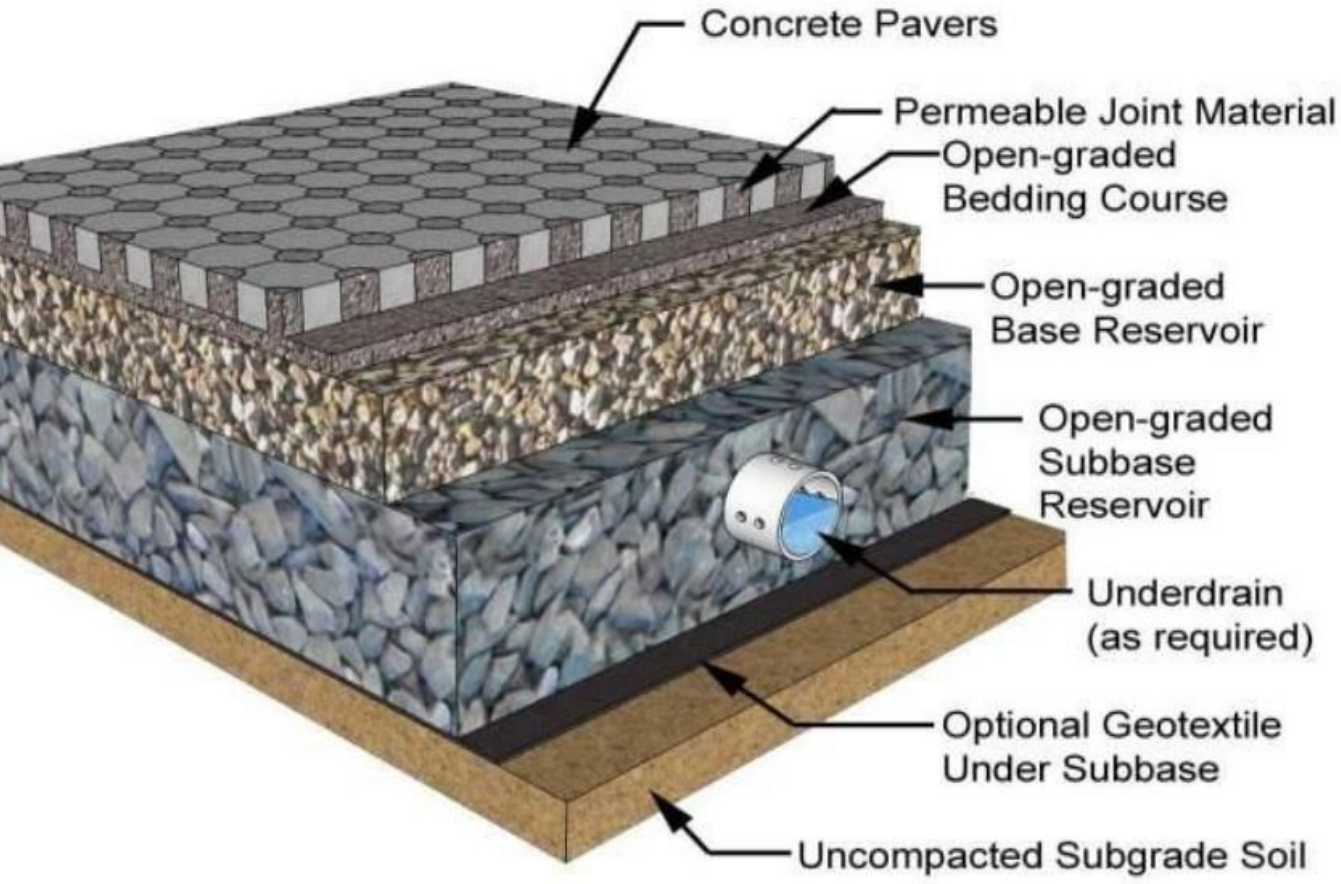
Cost	High
Performance	40-80% Soaks In
Maintenance	High
Limitations	• Possible soil amendment requirement • Requires specialized plant selection and maintenance • Maximum drainage area of 5 acres

Green Infrastructure – Open Space



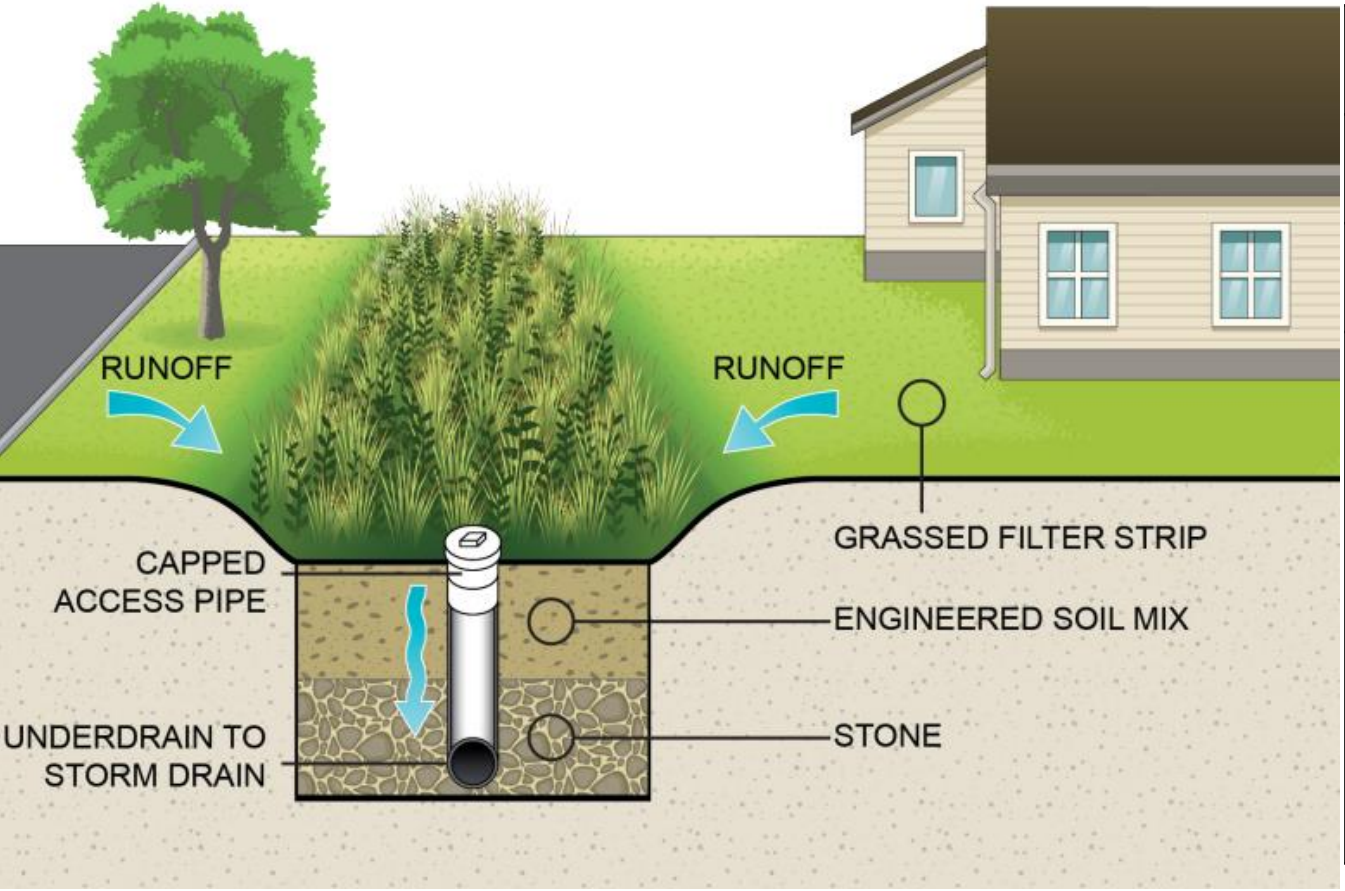
Cost	Medium
Performance	50-75% Soaks In
Maintenance	Low
Limitations	• Must be close to wetland/conserved open space • Possible soil amendment necessary

Green Infrastructure – Permeable Pavers



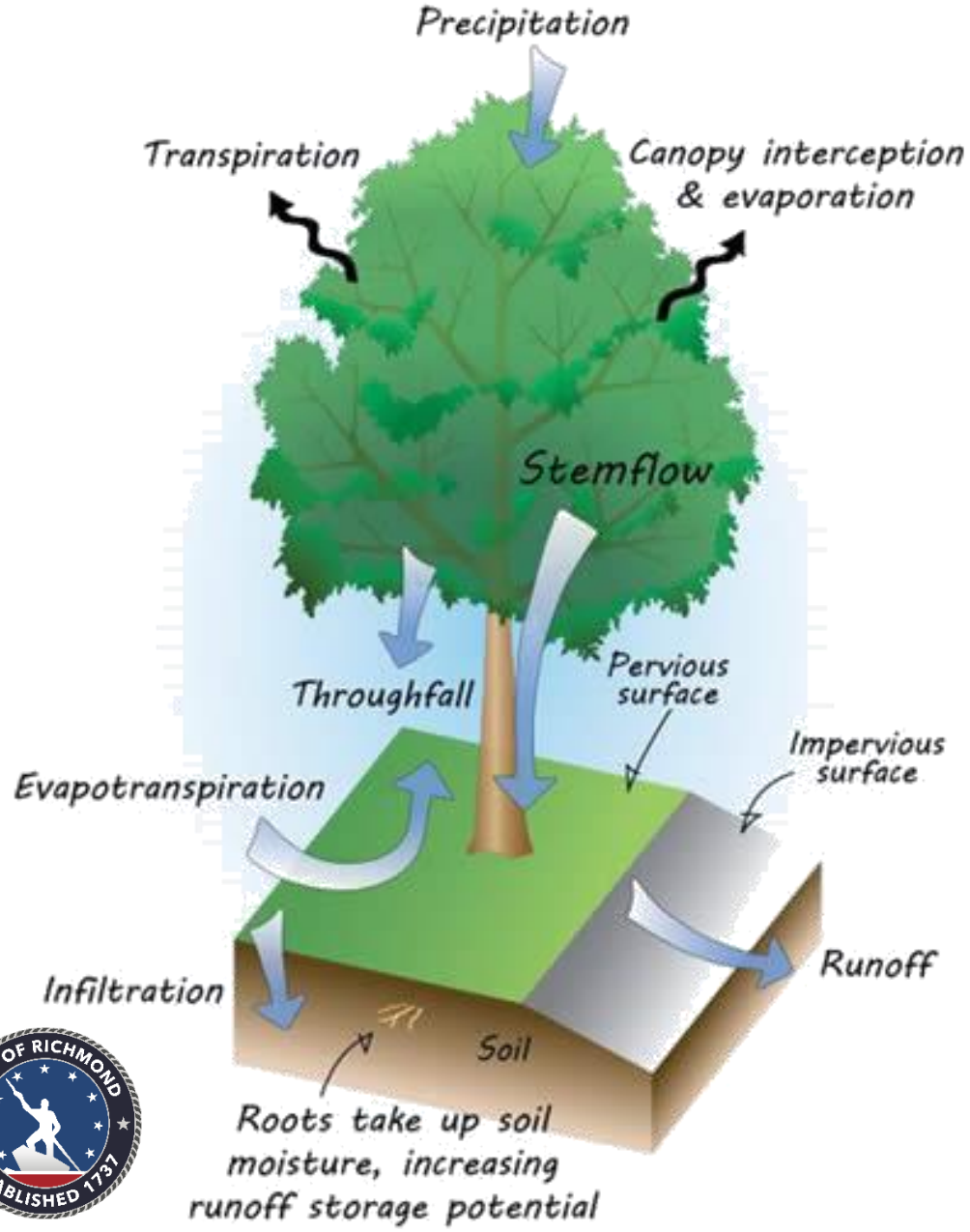
Cost	High
Performance	45-75% Soaks In
Maintenance	Medium
Limitations	• Can only treat impermeable surface • Extensive construction • Requires vacuum truck • Easily clogged

Green Infrastructure – Ditches



Cost	Medium
Performance	40-60% Soaks In
Maintenance	Medium
Limitations	• Max drainage area of 5 acres • Possible soil amendment necessary • Require specialized maintenance

Green Infrastructure – Trees



Cost	Low
Performance	0-5% Soaks In
Maintenance	Medium
Limitations	• Requires adequate space for tree canopy • Very limited runoff reduction and capture

Green Infrastructure – Summary

Engineered Solutions
There's no "one type fits all" solution

Performance

- Typically treat small rain events

Implementation

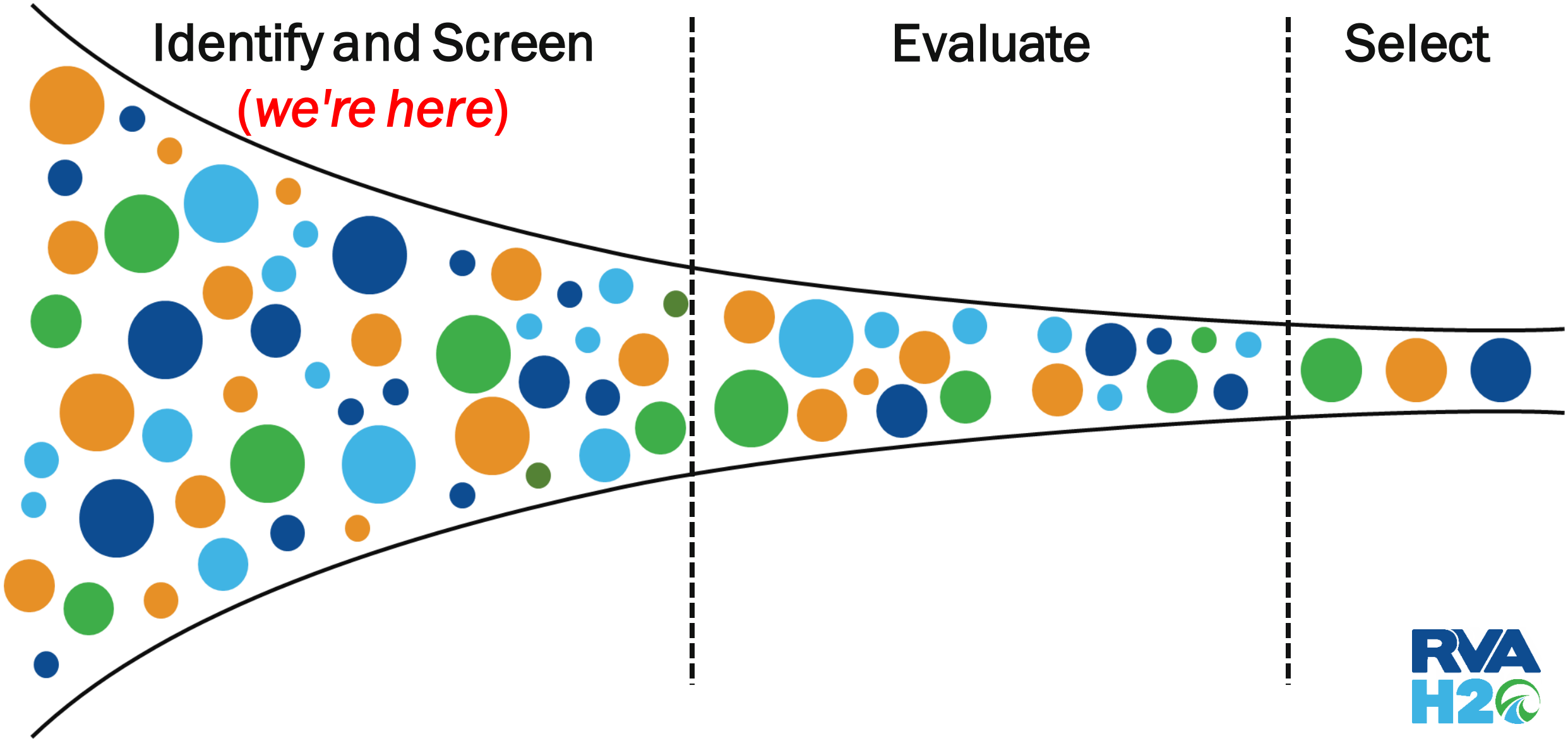
- Very challenging to implement in fully built out environments (downtown)

Maintenance

- Can completely lose their function if not regularly maintained

12th Street Green Alley – 6th City Council District

Solutions Discussion



A Review of Initial Evaluation Criteria

Identify good solutions to further evaluate (cost & performance)

❑ Technical Feasibility

- Can we build it?
- Will it work?

❑ Community Benefits/Impacts

- Will this impact daily activities of citizens?
- Can this be paired with a project to improve the community?

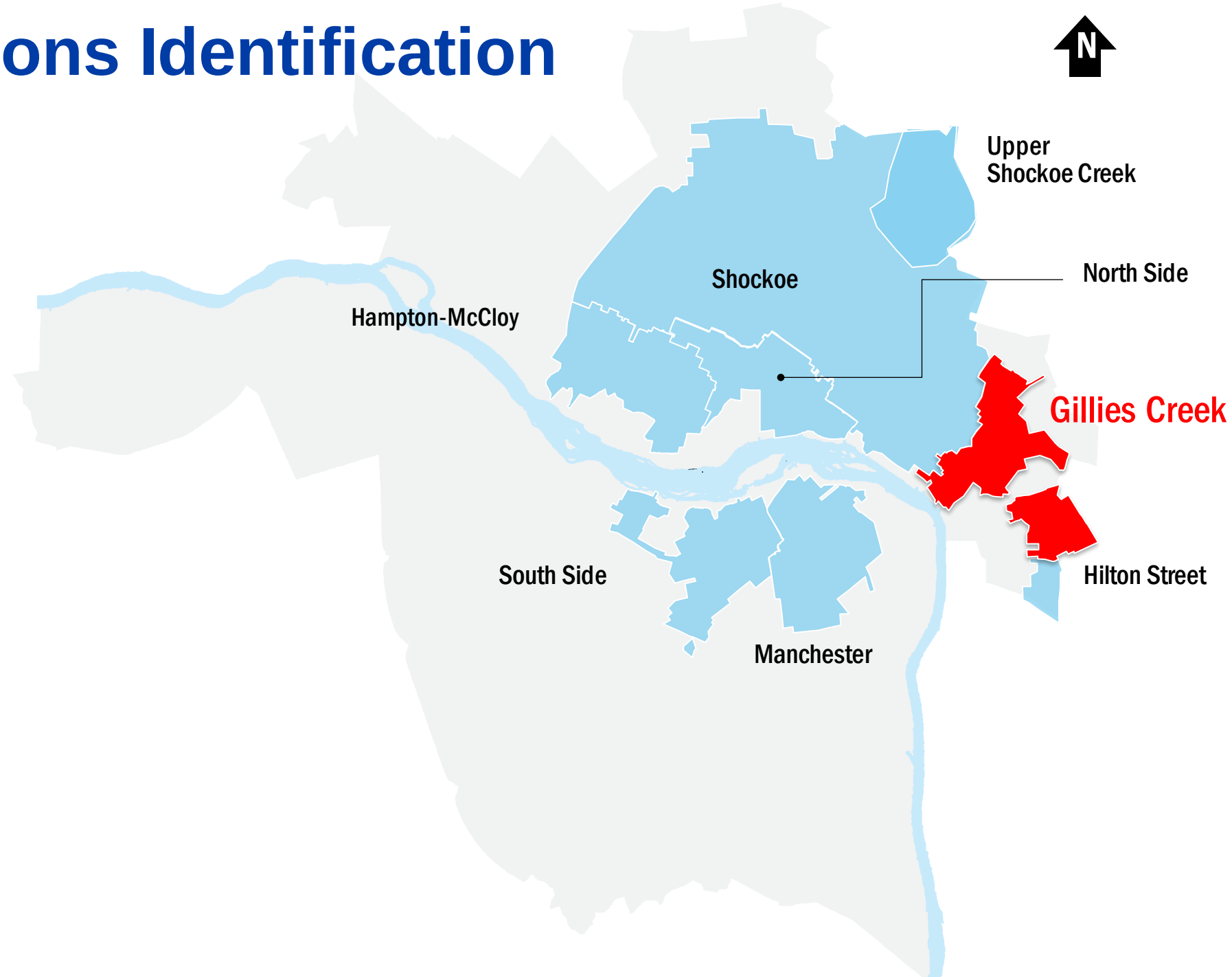
❑ Regulatory and 3rd Party Impacts

- Can the construction be permitted?
- Does land need to be bought?

❑ Operation and Maintenance Impacts

- Are additional equipment/employees needed to run and maintain the project?

Solutions Identification

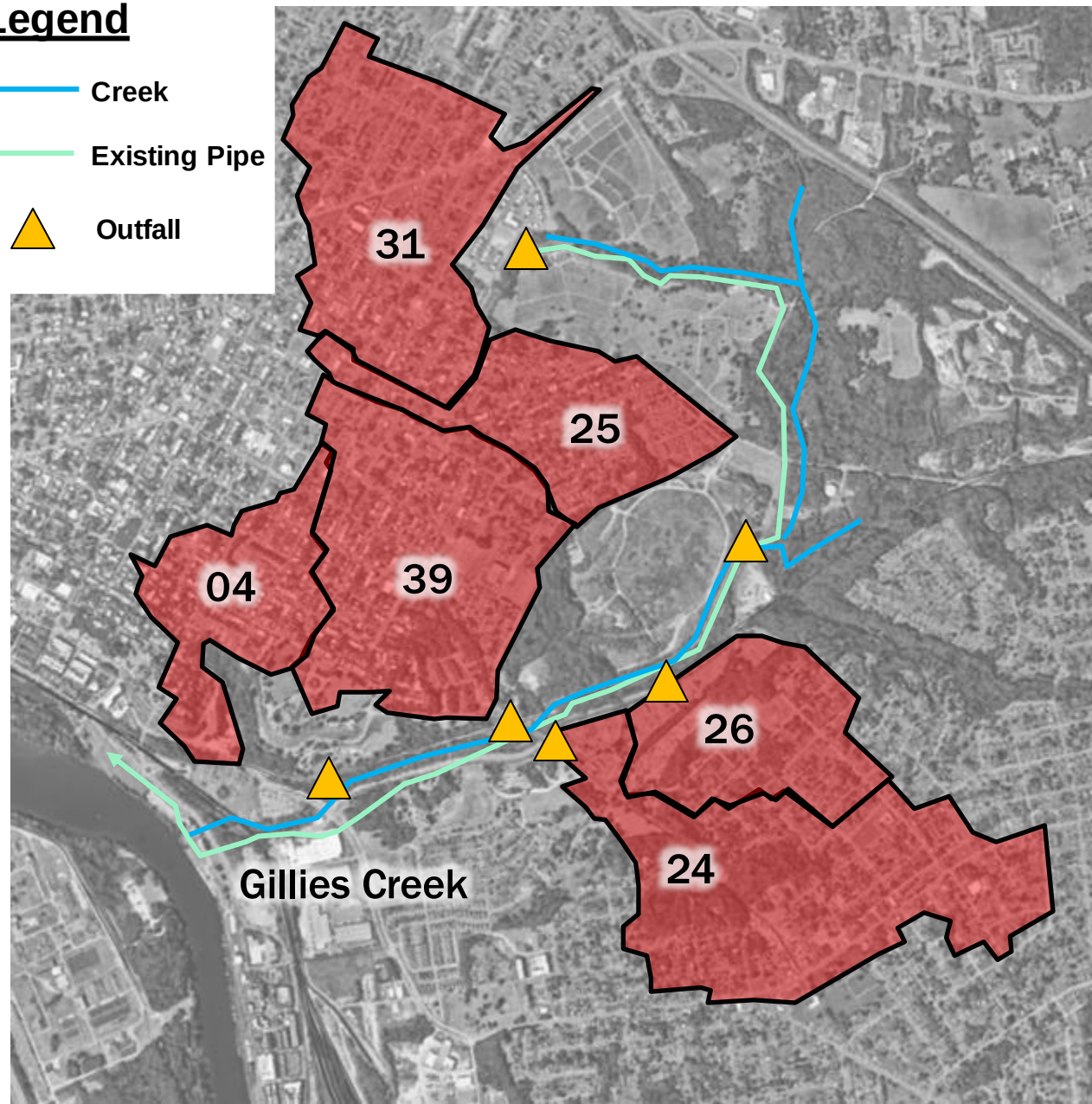


Setting the Stage: Gillies Creek

Events to Control: ~40 per year

Volume to Control: 40-70 MG/year

Criteria		CSS Outfall						
		4	39	24	26	25	31	Total
Drainage Area (acres)		80	160	120	80	60	170	670
2021	Overflow Volume (MG)	14	26	2	4	0.5	20	67
	Overflow Events (#)	38	40	7	11	3	15	
2022	Overflow Volume (MG)	9	13	0.1	1	0	13	36
	Overflow Events (#)	44	41	2	6	1	12	



Solutions in Our Toolbox

- Bigger Pipes
- Storage
- Treatment
- Separation
- Green Infrastructure

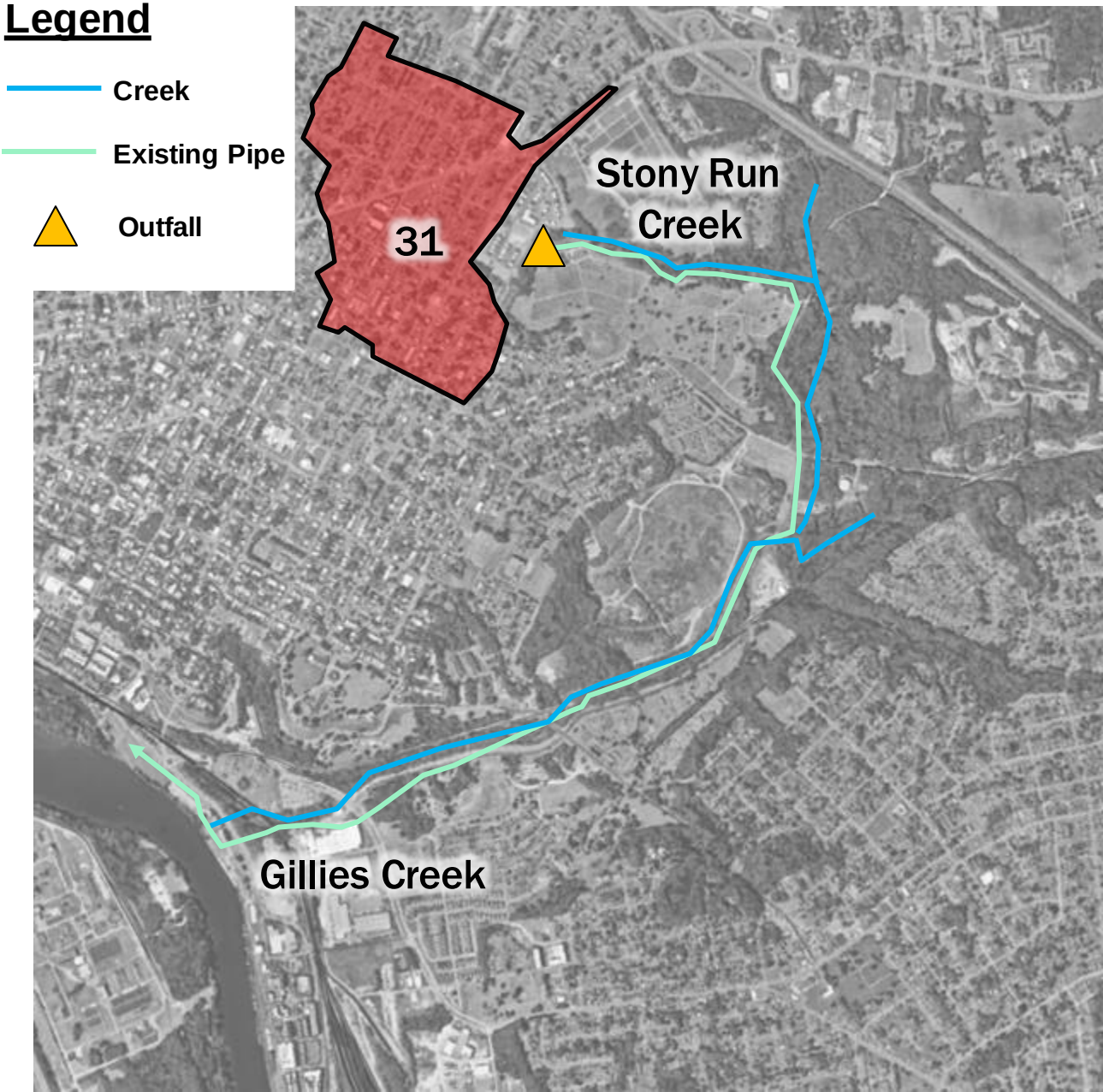
Outfall 03's 90" Diameter Pipe

Outfall 31

Events to Control: ~15 per year

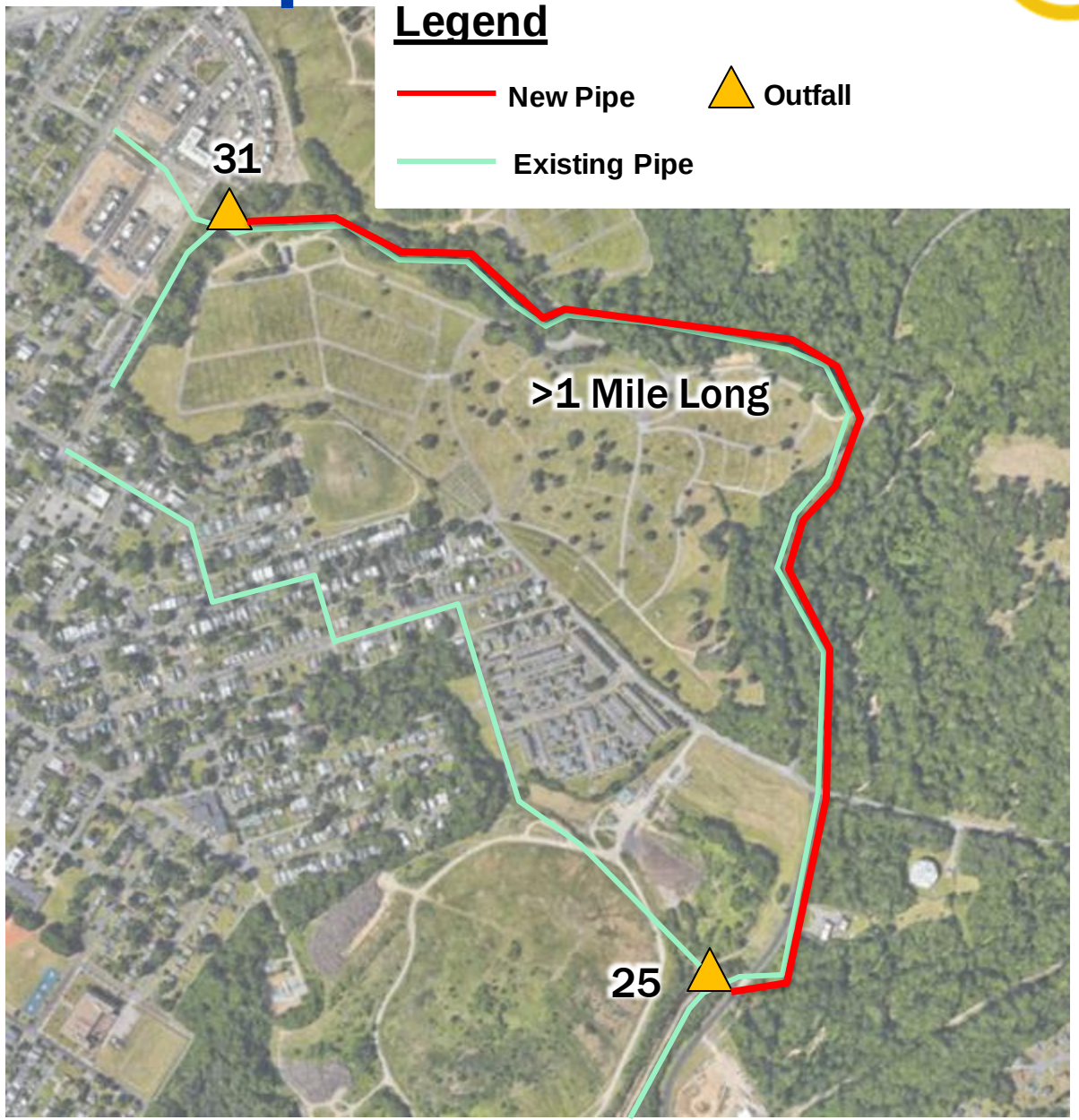
Volume to Control: 10-20 MG/year

Drainage Area (acres)		170
2021	Overflow Volume (MG)	20
	Overflow Events (#)	15
2022	Overflow Volume (MG)	13
	Overflow Events (#)	12



Outfall 31 - Bigger Sewer Pipe

- **Technical Feasibility**
  - Enough space for sufficiently-sized pipe to reduce overflow events to 0 – 6 per year
- **Community Benefits/Impacts**
  - Opportunity to install with pedestrian pathway to improve access to Stony Run Creek
- **Regulatory and 3rd Party Impacts**
  - Moderate Permitting
  - Minimal land and easement acquisition
- **Operation and Maintenance Impacts**
  - Minimal (maintenance of a new pipe)



Outfall 31 - Storage

❑ Technical Feasibility

- Enough space for sufficiently-sized tank to reduce overflow events to 0 – 6 per year

❑ Community Benefits & Impacts

- Minimal impacts to the public during construction
- Odor control will be required
- Opportunity to install with pedestrian pathway to improve access to Stony Run Creek

❑ Regulatory and 3rd Party Impacts

- Moderate permitting

❑ Operation and Maintenance Impacts

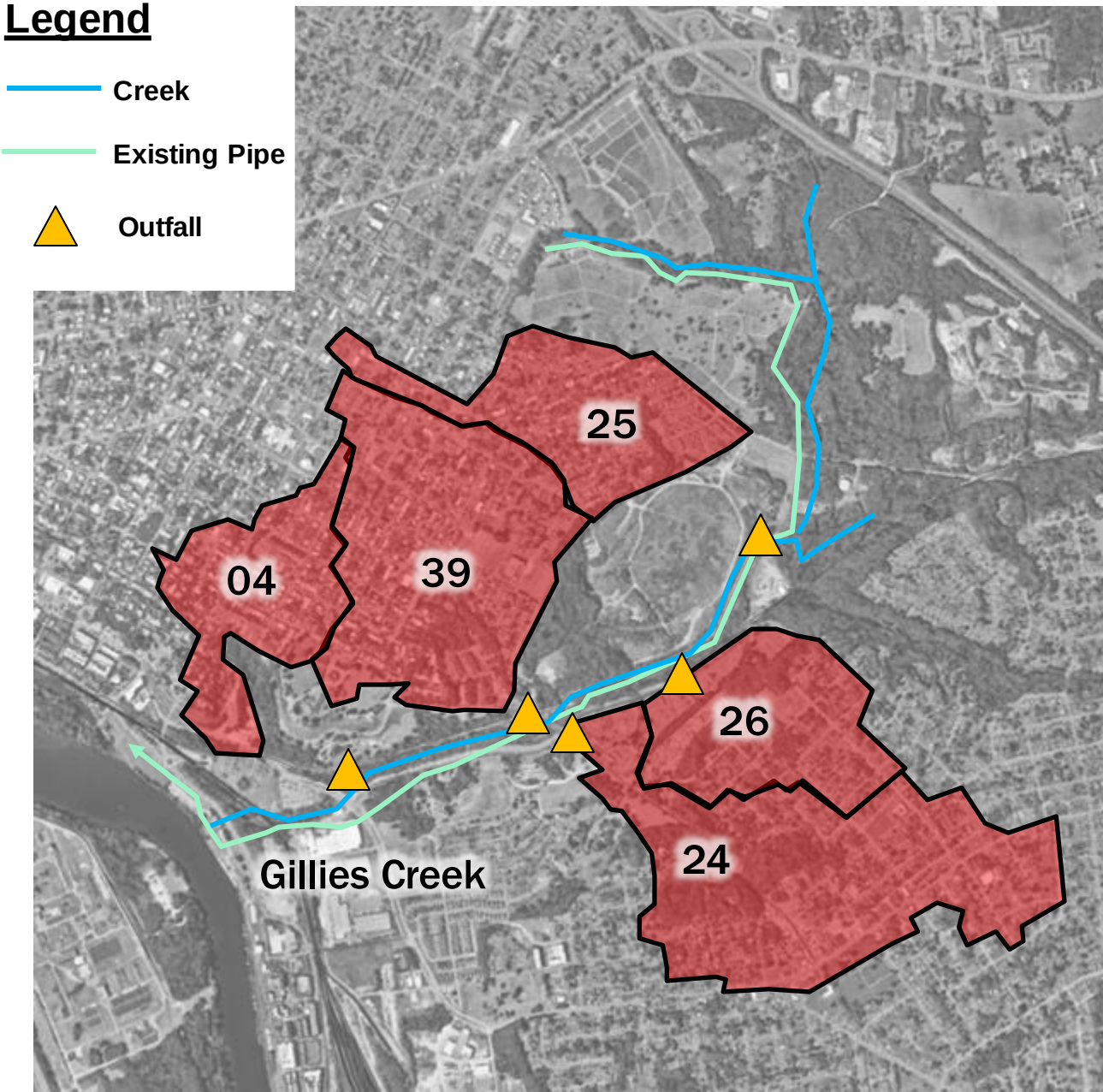
- Moderate (cleaning and maintenance of tank)

Others

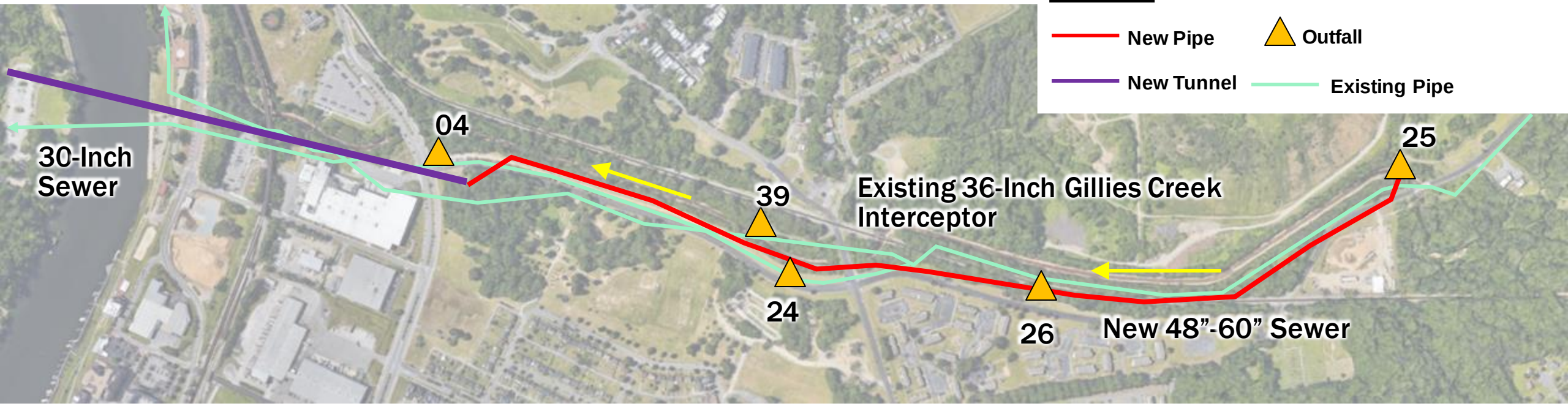
Events to Control: ~40 per year

Volume to Control: 35-50 MG/year

Criteria		CSO Outfall					
		4	39	24	26	25	Total
Drainage Area (acres)		80	160	120	80	60	670
2021	Overflow Volume (MG)	14	26	2	4	0.5	67
	Overflow Events (#)	38	40	7	11	3	
2022	Overflow Volume (MG)	9	13	0.1	1	0	36
	Overflow Events (#)	44	41	2	6	1	



Bigger Sewer Pipe



❑ Technical Feasibility

- Enough space for sufficiently-sized pipe to reduce overflow events to 0 – 6 per year

❑ Regulatory and 3rd Party Impacts

- Moderate permitting
- Minimal land and easement acquisition

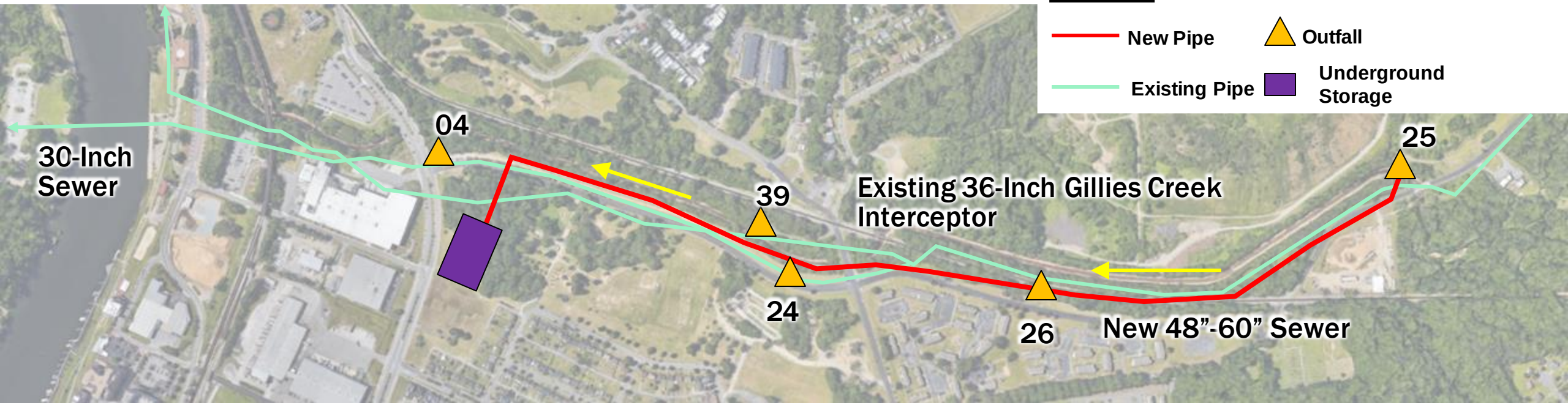
❑ Community Benefits/Impacts

- Opportunity to install with pedestrian pathway to improve access to Gillies Creek

❑ Operation and Maintenance Impacts

- Minimal (maintenance of a new pipe)

Storage



❑ Technical Feasibility

- Enough space for sufficiently-sized tank to reduce overflow events to 0 – 6 per year

❑ Community Benefits & Impacts

- Impacts to Gillies Creek Park during construction
- Odor control will be required
- Opportunity to install with pedestrian pathway to improve access to Gillies Creek

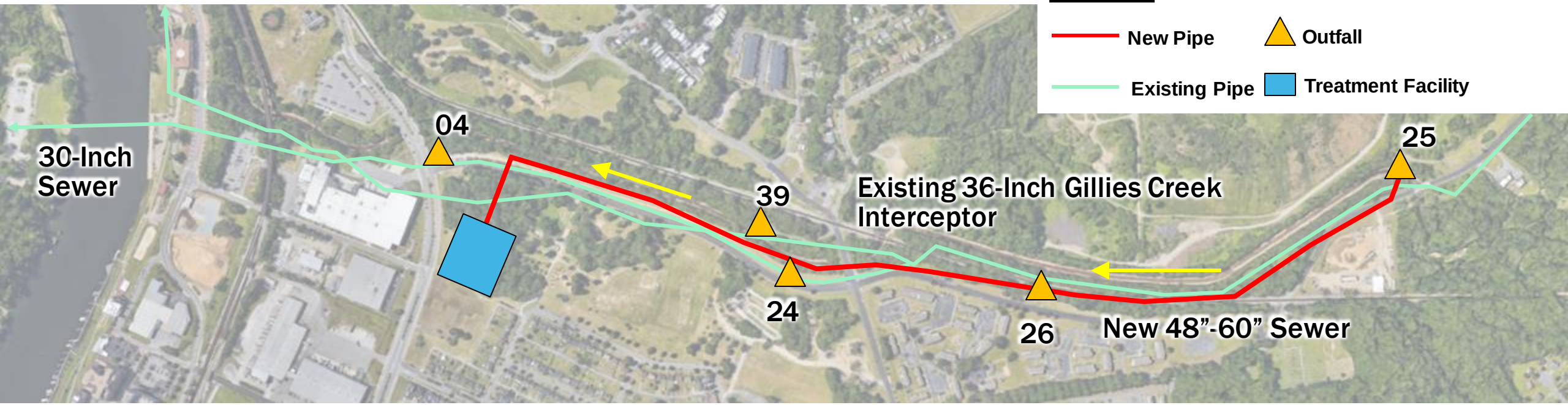
❑ Regulatory and 3rd Party Impacts

- Moderate permitting

❑ Operation and Maintenance Impacts

- Moderate (cleaning and maintenance of tank)

Treatment



❑ Technical Feasibility

- Enough space for sufficiently-sized treatment facility to reduce overflow events to 0 – 6 per year
- Result in higher discharged nutrients, solids, etc.

❑ Community Benefits & Impacts

- Impacts to Gillies Creek Park during construction
- Odor control will be required
- Opportunity to install with pedestrian pathway to improve access to Gillies Creek

❑ Regulatory and 3rd Party Impacts

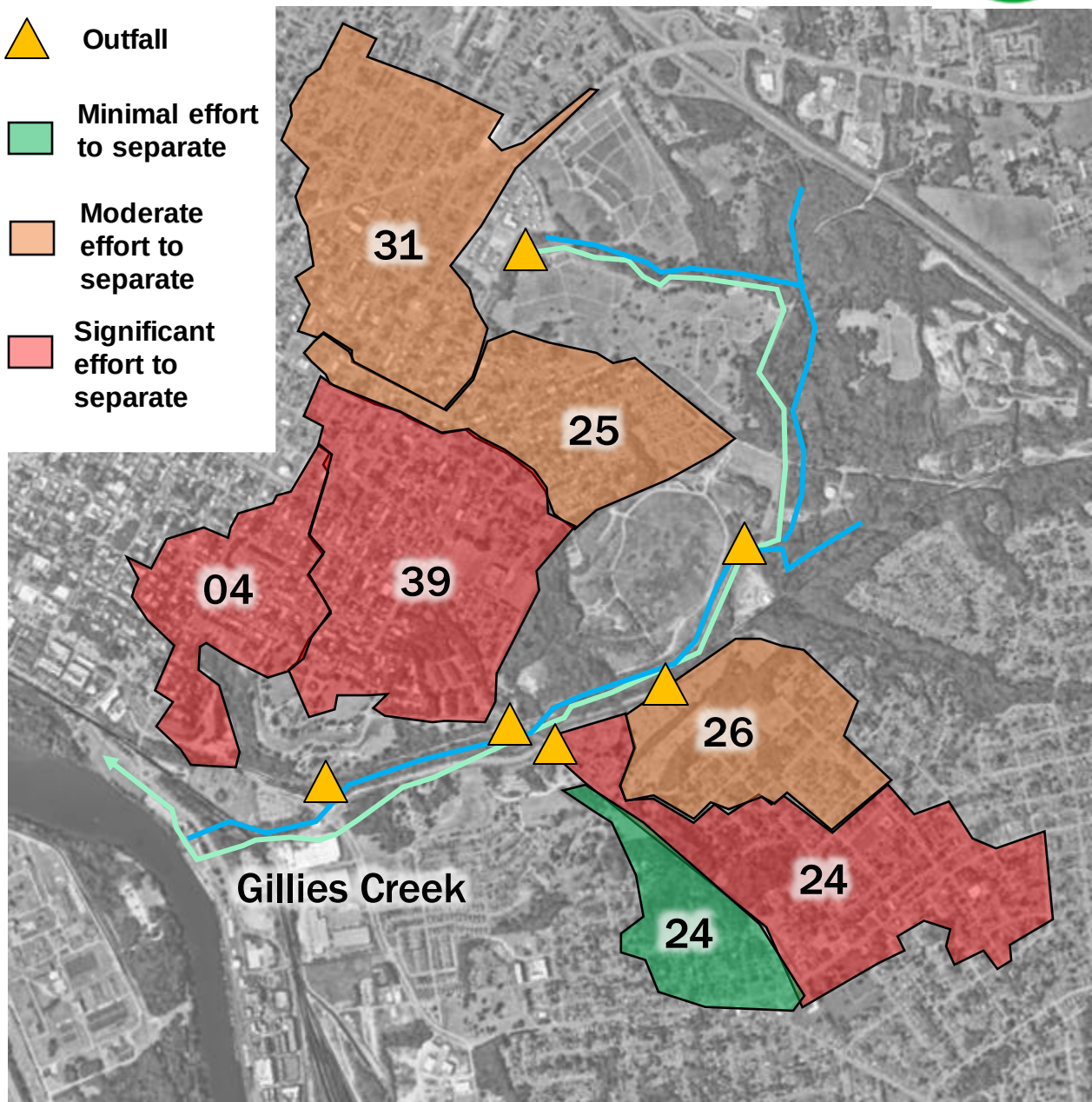
- Significant permitting

❑ Operation and Maintenance Impacts

- Very significant (operation of a treatment facility)

Separation

- **Technical Feasibility**
  - Very invasive construction would occur at every home and in every street
  - Construction could last approximately 5 years
- **Community Benefits & Impacts**
  - Noise and traffic impacts along all streets
- **Regulatory and 3rd Party Impacts**
  - Minimal permitting
  - Minimal land and easement acquisition
- **Operation and Maintenance Impacts**
  - Minimal (maintenance of new pipes)



Green Infrastructure

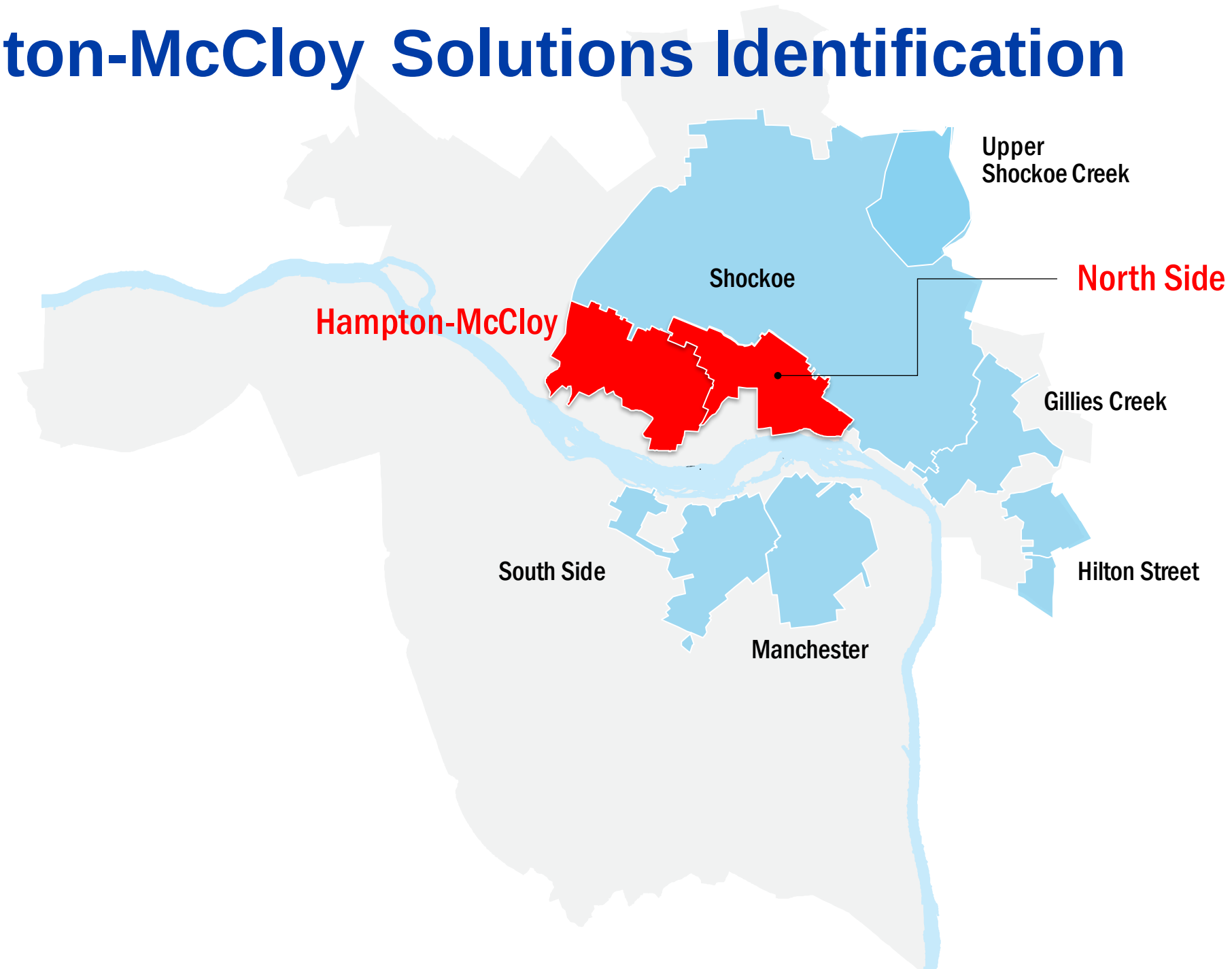
- **Technical Feasibility**
  - Would need 25 acres of permeable pavement for volume reduction (10 street miles, 20%)
- **Community Benefits/Impacts**
  - Beautification of the area
  - Provide additional greenspace
- **Regulatory and 3rd Party Impacts**
  - Minimal permitting
  - Minimal land/easement acquisition
- **Operation and Maintenance Impacts**
  - Moderate (regular maintenance is required for green infrastructure to continue to perform as intended)

West End Branch Library – 1st City Council District

Summary of Gillies Creek Solutions

- ✓ Bigger Pipes
- ✓ Storage
- ✗ ~~Treatment~~
- ✓ Separation
- ✓ Green Infrastructure

Hampton-McCloy Solutions Identification



Setting the Stage: North Side and Hampton-McCloy

Criteria		CSS Outfall				
		11	10	9	7	Total
Drainage Area (acres)		290	230	50	50	670
2021	Overflow Volume (MG)	31	0	0	1	32
	Overflow Events (#)	35	0	0	7	
2022	Overflow Volume (MG)	5	0	0	1	6
	Overflow Events (#)	18	0	0	9	

Criteria		CSS Outfall			
		19	20	33	Total
Drainage Area (acres)		400	320	60	670
2021	Overflow Volume (MG)	0	0.3	0	0.3
	Overflow Events (#)	0	2	0	
2022	Overflow Volume (MG)	0	0	0	0
	Overflow Events (#)	0	0	0	

Events to Control: ~20-35 per year

Volume to Control: 10-30 MG/year

Legend

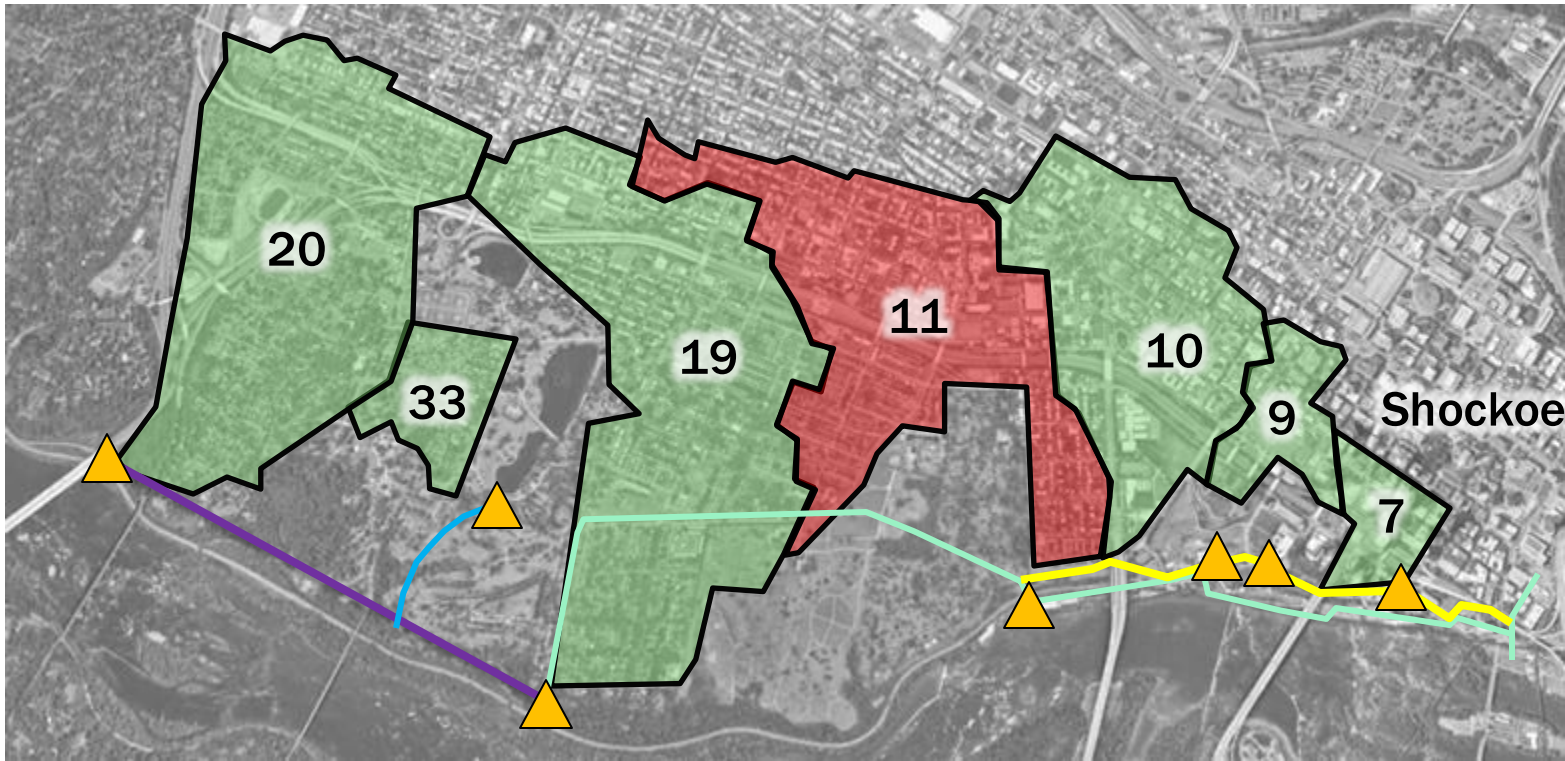
Creek

Existing Pipe

Outfall

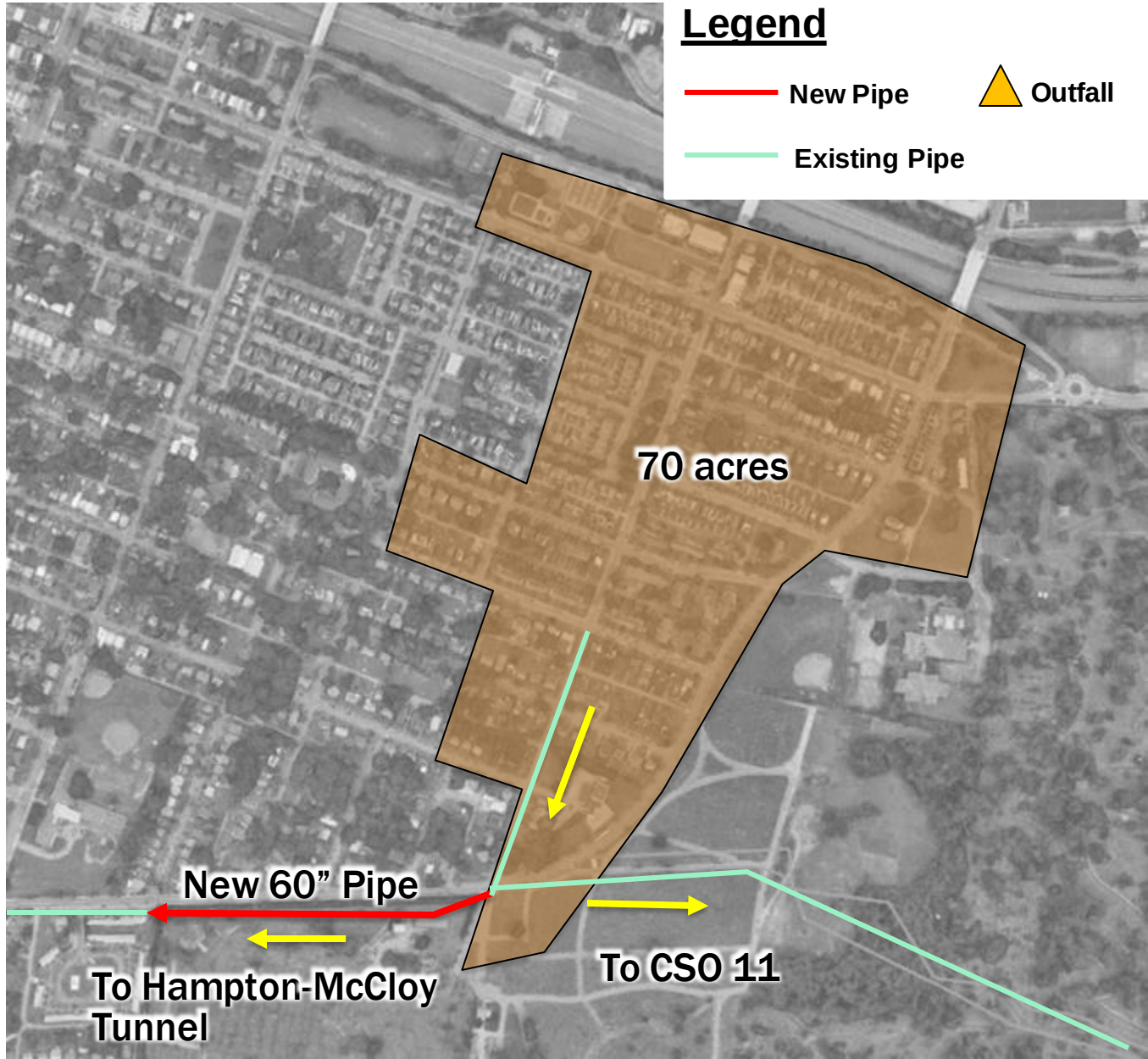
Hampton-McCloy Tunnel (7.2 MG of Storage)

Outfall 03 Sewer

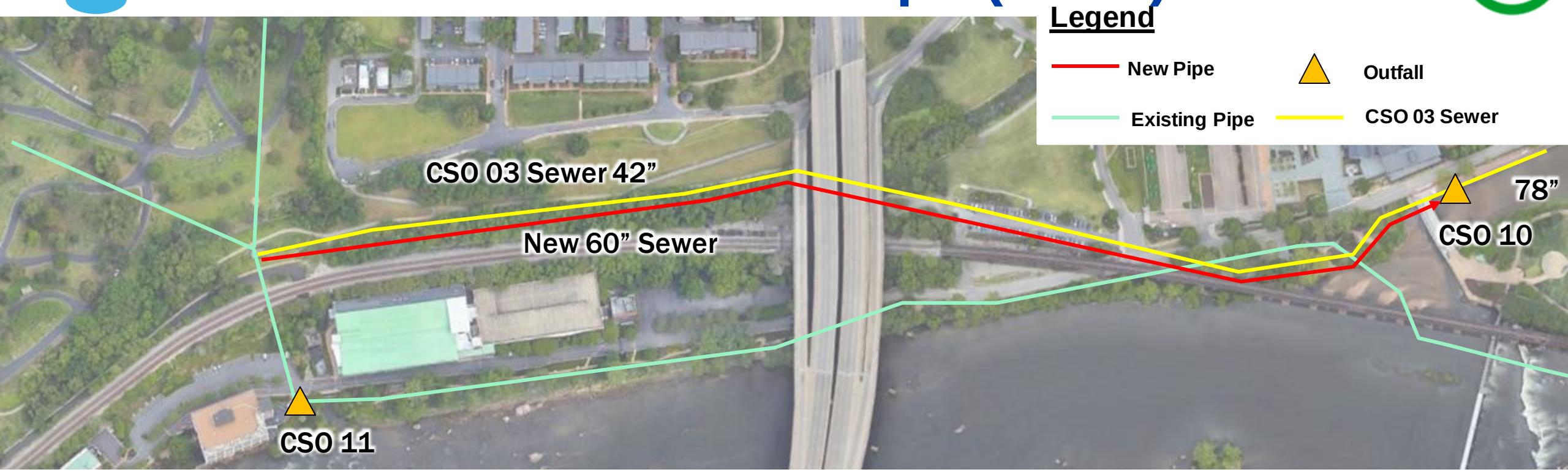


Outfall 11 - Bigger Sewer Pipe (Alt. 1)

- **Technical Feasibility**
  - Diverts 70 acres of drainage area to the Storage Tunnel
  - Reduces overflow events to 4 – 6 in an average year
- **Community Benefits/Impacts**
  - Construction on Colorado Avenue would have impacts on local residents
- **Regulatory and 3rd Party Impacts**
  - Minimal permitting
- **Operation and Maintenance Impacts**
  - Minimal (maintenance of a new pipe)



Outfall 11 – Add Sewer Pipe (Alt. 2)



❑ Technical Feasibility

- Enough space for sufficiently-size pipe to reduce overflow events to 4-6 per year

❑ Community Benefits & Impacts

- Impacts to the public during construction around Brown’s Island and on Tredegar Street

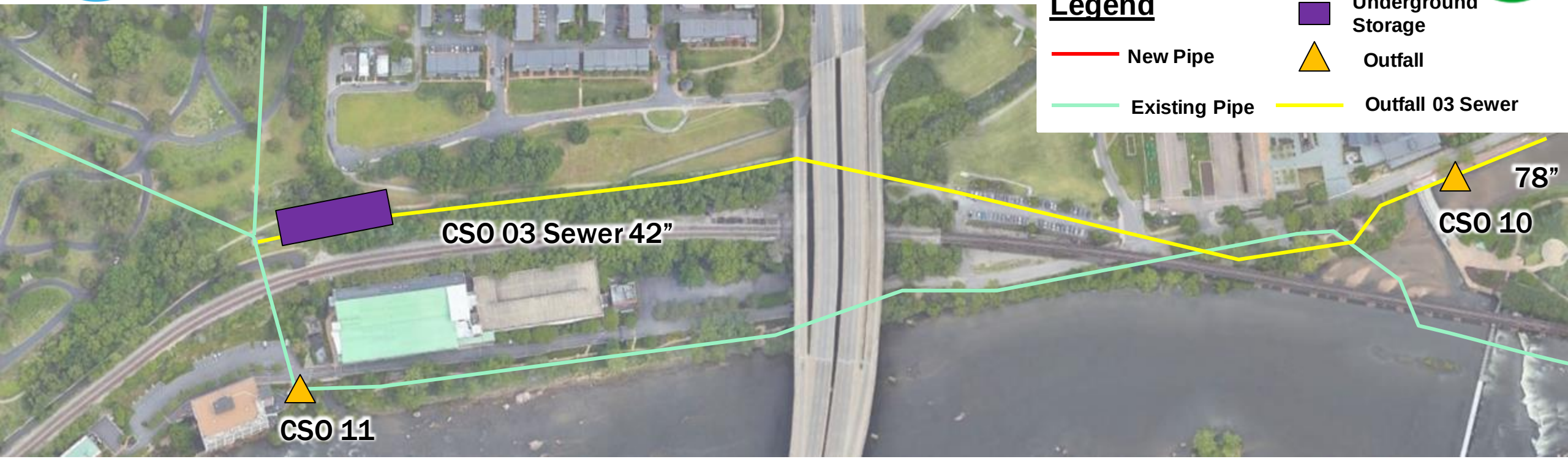
❑ Regulatory and 3rd Party Impacts

- Moderate permitting (work around railroads)

❑ Operation and Maintenance Impacts

- Minimal (maintenance of a new pipe)

Outfall 11 - Storage



❑ Technical Feasibility

- Enough space for sufficiently-size tank to reduce overflow events to 4 – 6 per year

❑ Community Benefits & Impacts

- Limited use of North Bank trail during construction
- Odor control will be required

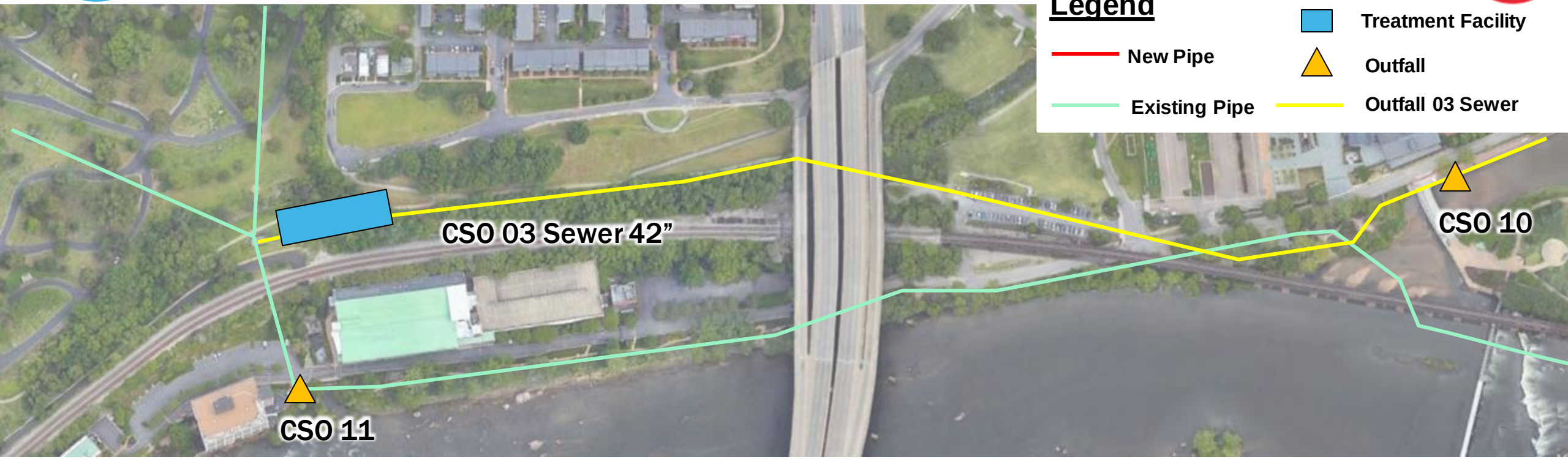
❑ Regulatory and 3rd Party Impacts

- Moderate permitting (work around railroads and canal)

❑ Operation and Maintenance Impacts

- Moderate (cleaning and maintenance of tank)

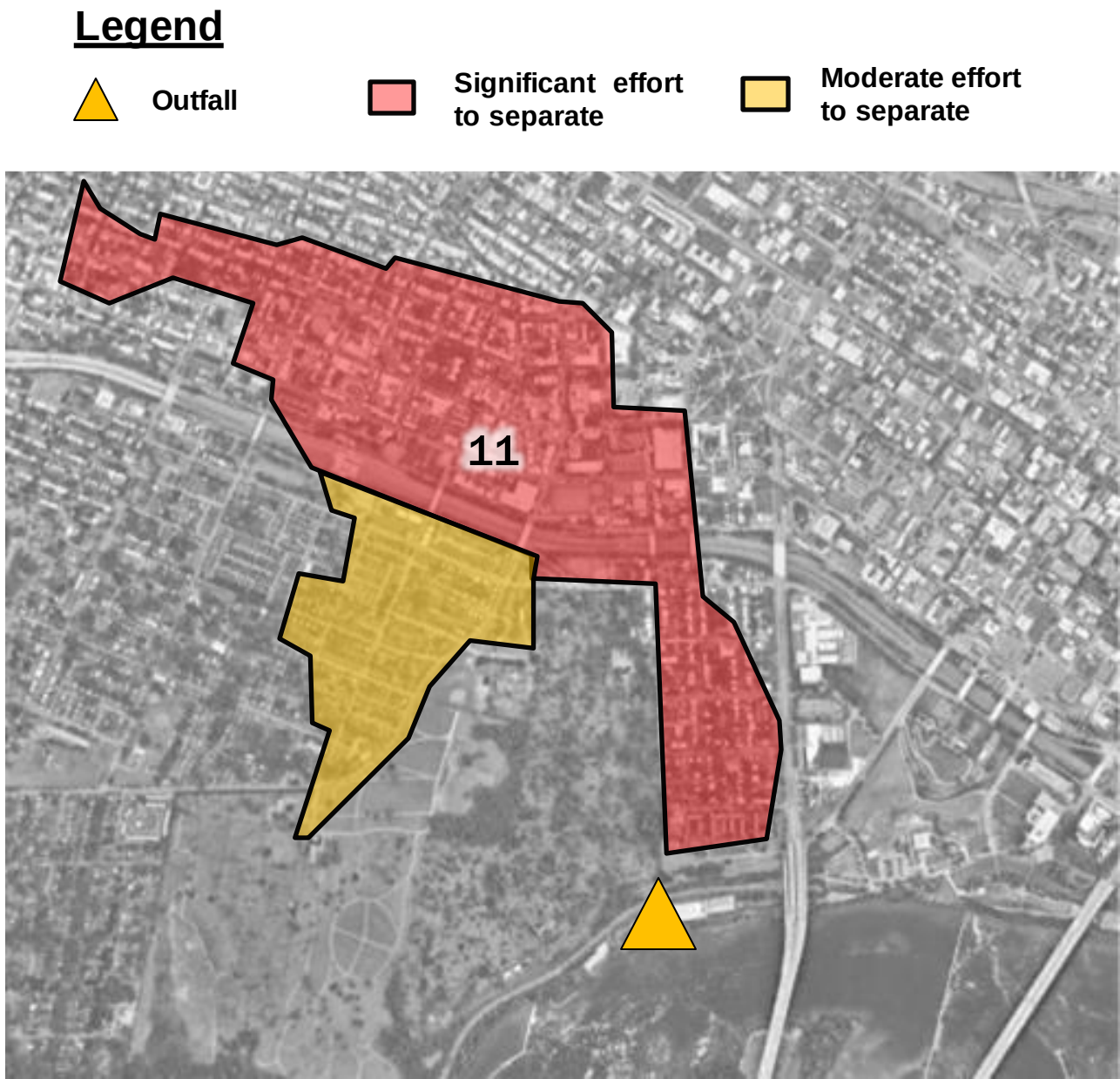
Outfall 11 - Treatment



- **Technical Feasibility**
  - Enough space for sufficiently-sized treatment facility to reduce overflow events to 4 – 6 per year
  - Result in higher discharged nutrients, solids, etc.
- **Community Benefits & Impacts**
  - Impacts to the park system during construction
  - Odor control will be required
- **Regulatory and 3rd Party Impacts**
  - Significant permitting
- **Operation and Maintenance Impacts**
  - Very significant (operation of a treatment facility)

Outfall 11 - Separation

- **Technical Feasibility**
  - Very invasive construction would occur at every home and in every street
  - Construction could last approximately 3 years
- **Community Benefits & Impacts**
  - Noise and traffic impacts along all streets
- **Regulatory and 3rd Party Impacts**
  - Minimal permitting
  - Minimal land and easement acquisition
- **Operation and Maintenance Impacts**
  - Minimal (maintenance of new pipes)



Outfall 11 - Green Infrastructure

- **Technical Feasibility**
  - Would need 5 acres of permeable pavement for volume reduction (2 street miles, 10%)

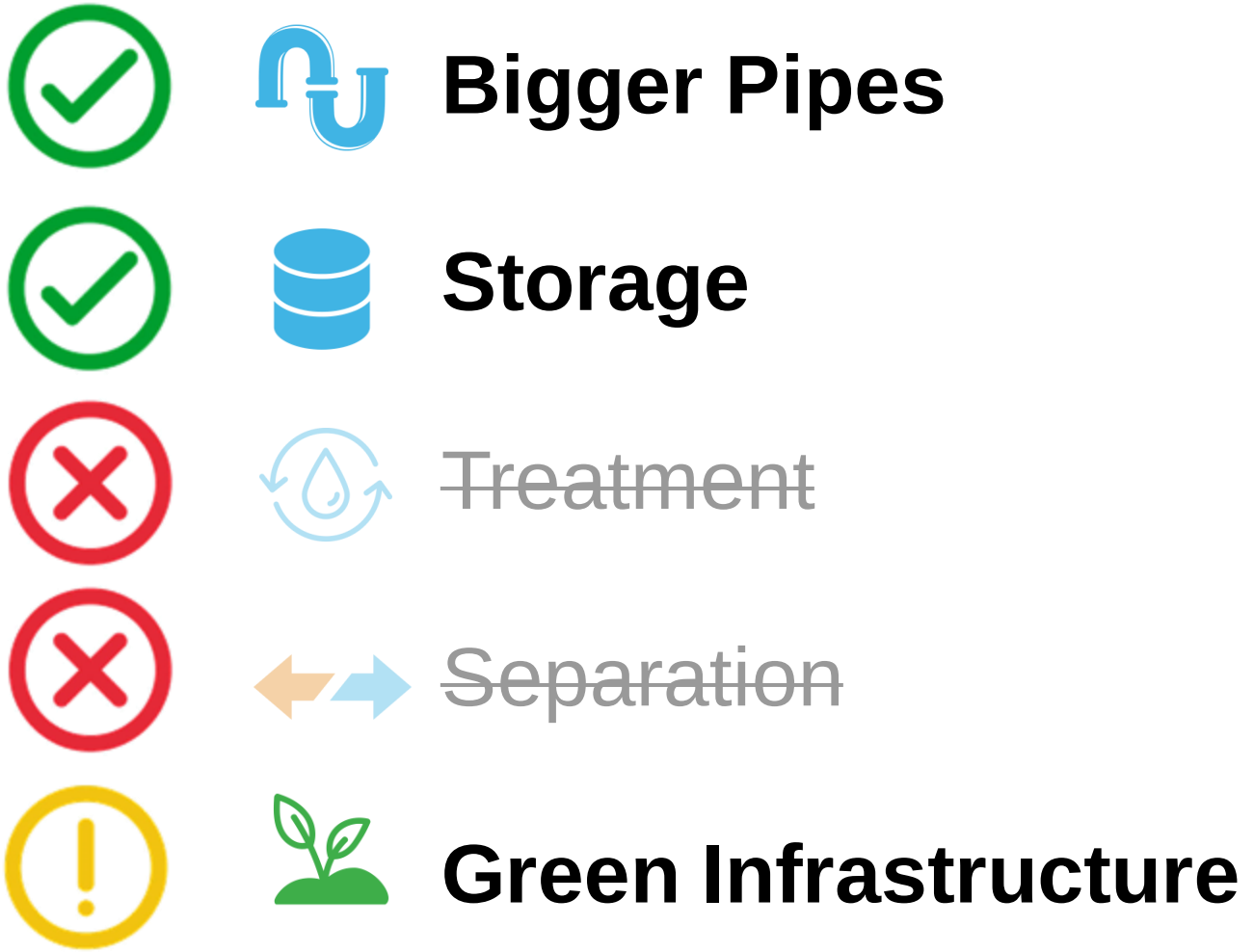
- **Community Benefits/Impacts**
  - Beautification of the area
  - Provide additional greenspace

- **Regulatory and 3rd Party Impacts**
  - Minimal permitting
  - Minimal land/easement acquisition

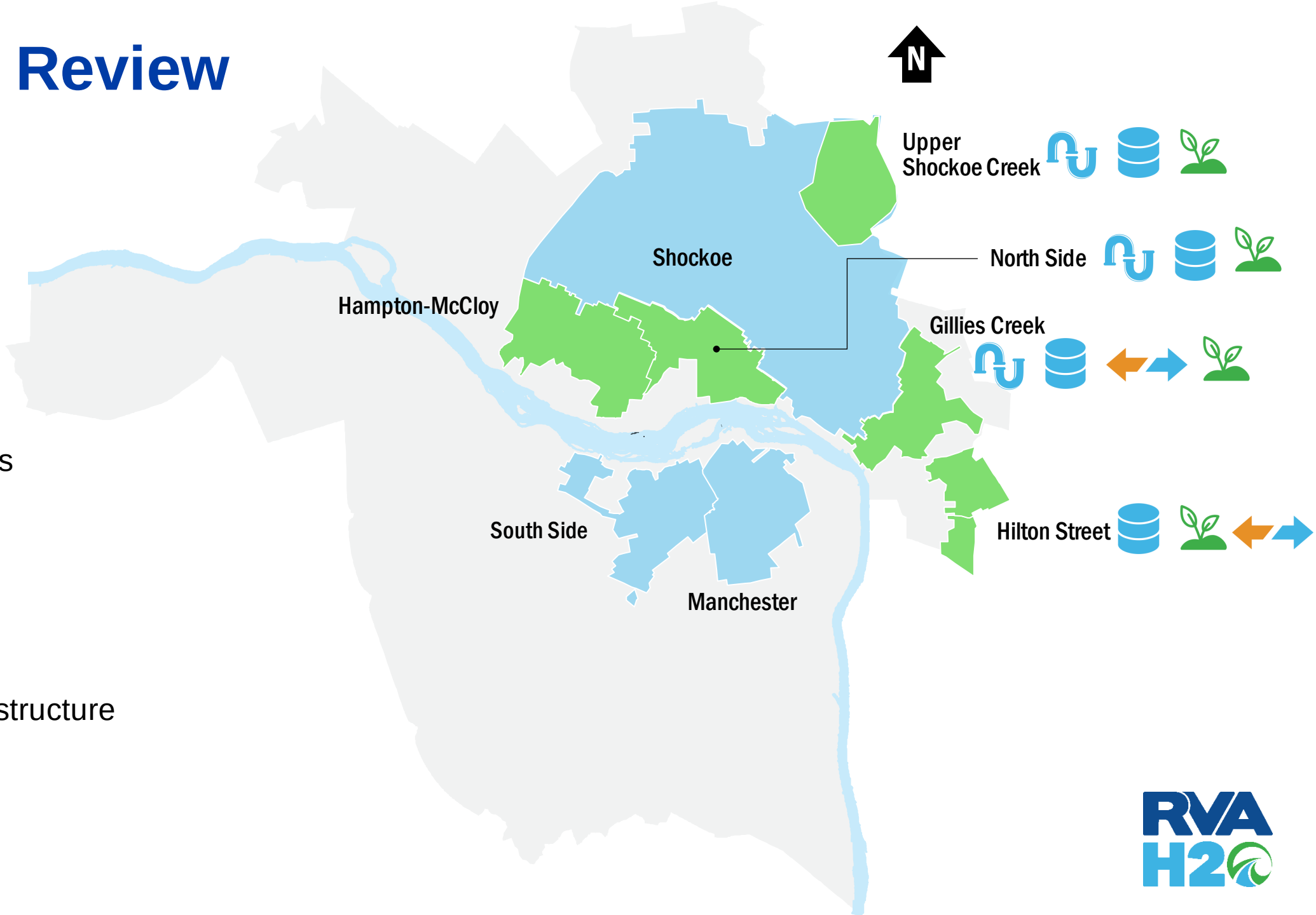
- **Operation and Maintenance Impacts**
  - Moderate (regular maintenance is required for green infrastructure to continue to perform as intended)

Stormwater Utility Permeable Paver Parking Lot – 6th District

Summary of North Side and Hampton-McCloy



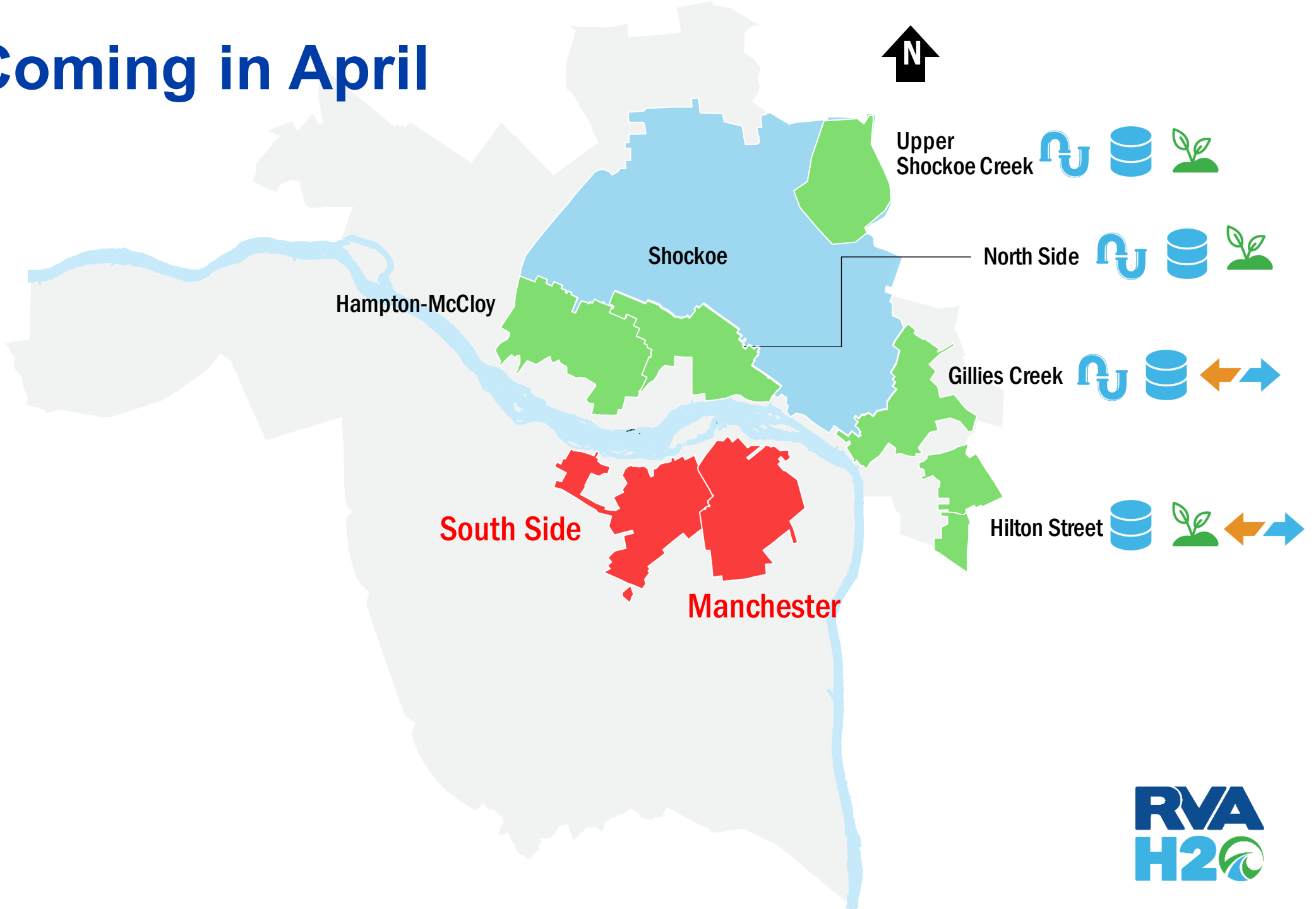
Solution Review



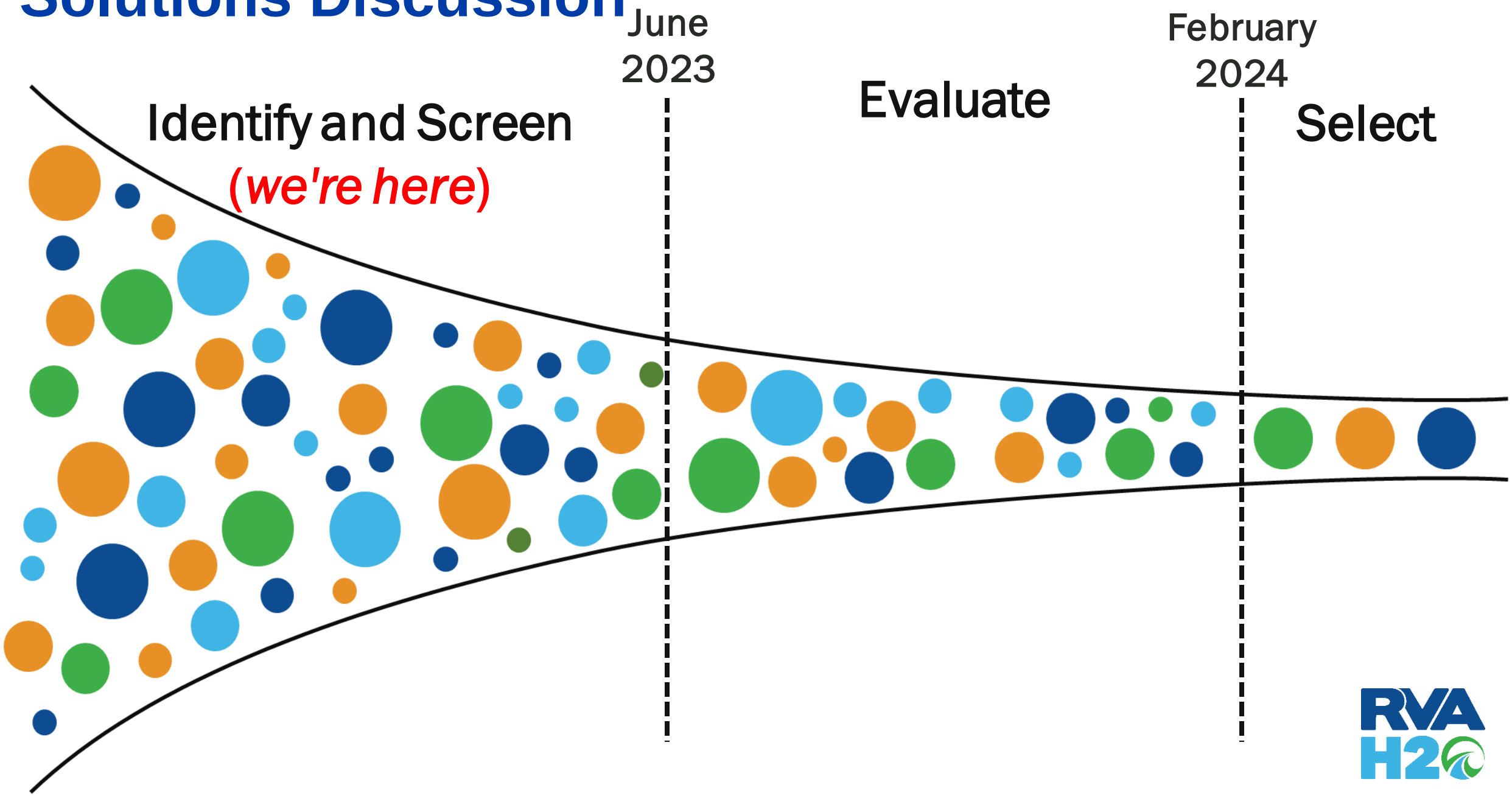
Legend

- Bigger Pipes
- Storage
- Treatment
- Separation
- Green Infrastructure

What's Coming in April



Solutions Discussion



Next Meeting: April 2023

Grace.LeRose@rva.gov

Outfall 03 Pipeline & Canal Walk Construction