Waterfront Commission
Flood Mitigation Subcommittee Presentation
June 7, 2021

Matthew Landes, PLA, ISA

Department of Project Implementation, Division Chief / Waterfront Program Manager

Meeting Objectives

- ✓ Review/Approval of Meeting Minutes
- ✓ Recap key messages from April 5 meeting
- ✓ Share *why* flooding is so complex
- ✓ Provide progress update from Owner's Advisor
- ✓ Facilitate discussion on design alternatives and priorities
- ✓ Establish next steps

Flood Characterization

Understanding *why* flooding is a complex problem

BACKFLOW
of River Outfalls

OVERTOPPING
of Bulkhead

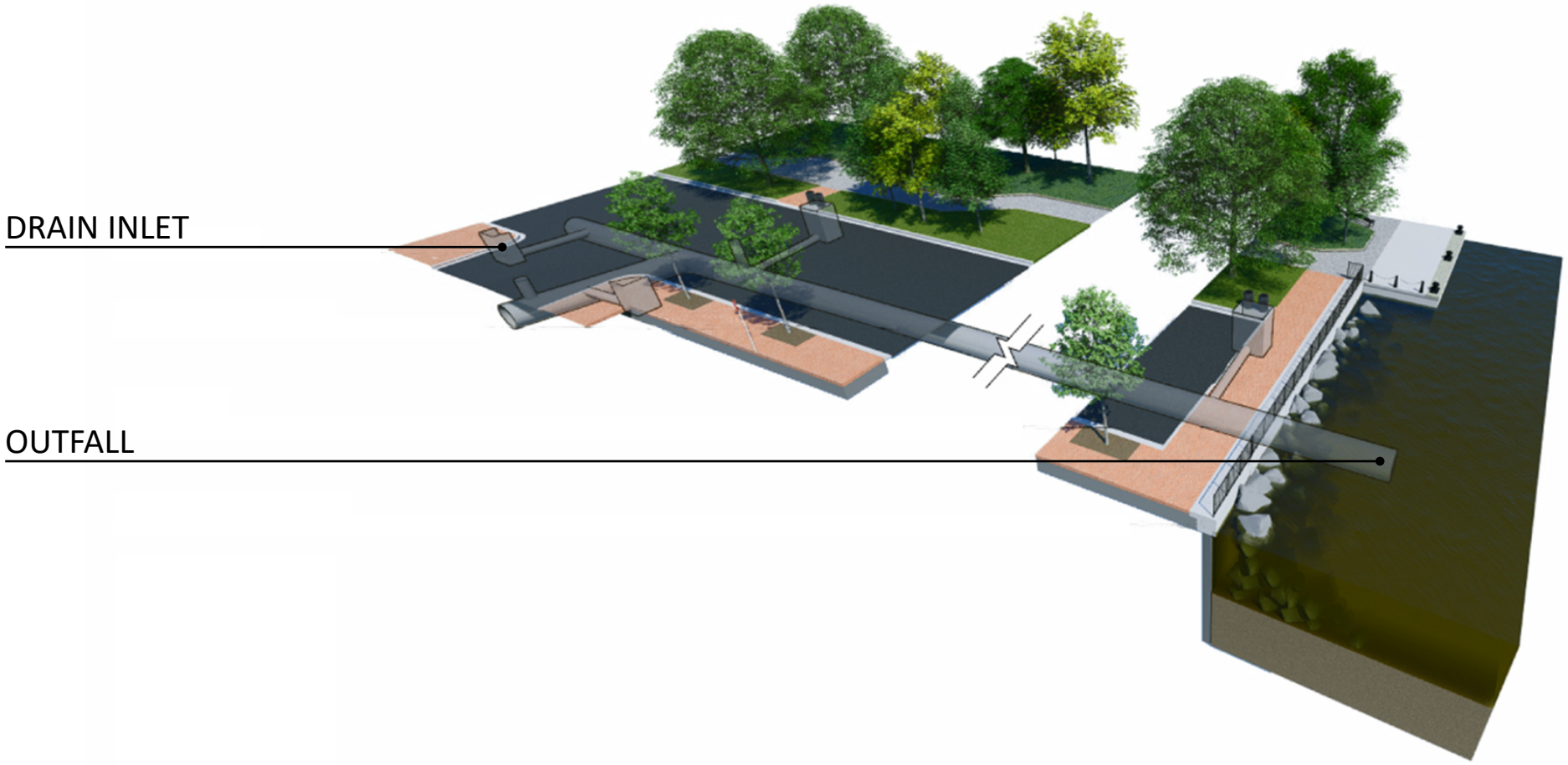
INUNDATION
of Storm Sewers

Flood Characterization along the Waterfront

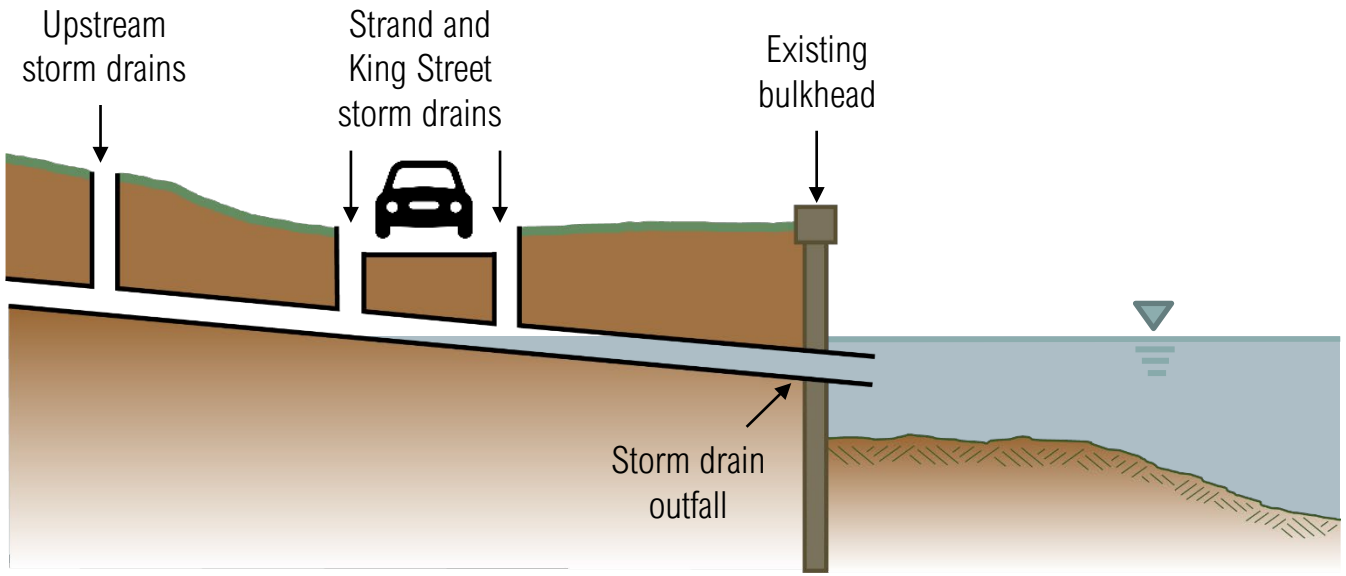
BACKFLOW
of River Outfalls

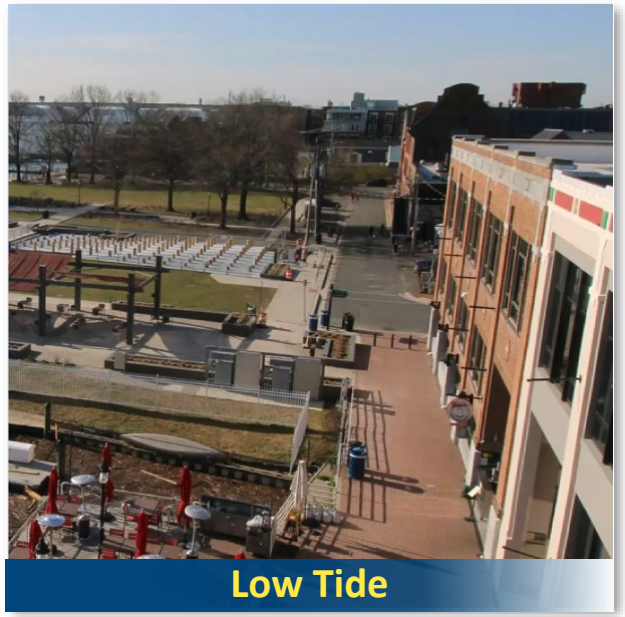
OVERTOPPING
of Bulkhead

INUNDATION
of Storm Sewers



Backflow occurs when the river level exceeds low-lying storm drain elevations.




Low Tide


High Tide

Backflow prevention valves can eliminate tidal back-up

Flood Characterization along the Waterfront

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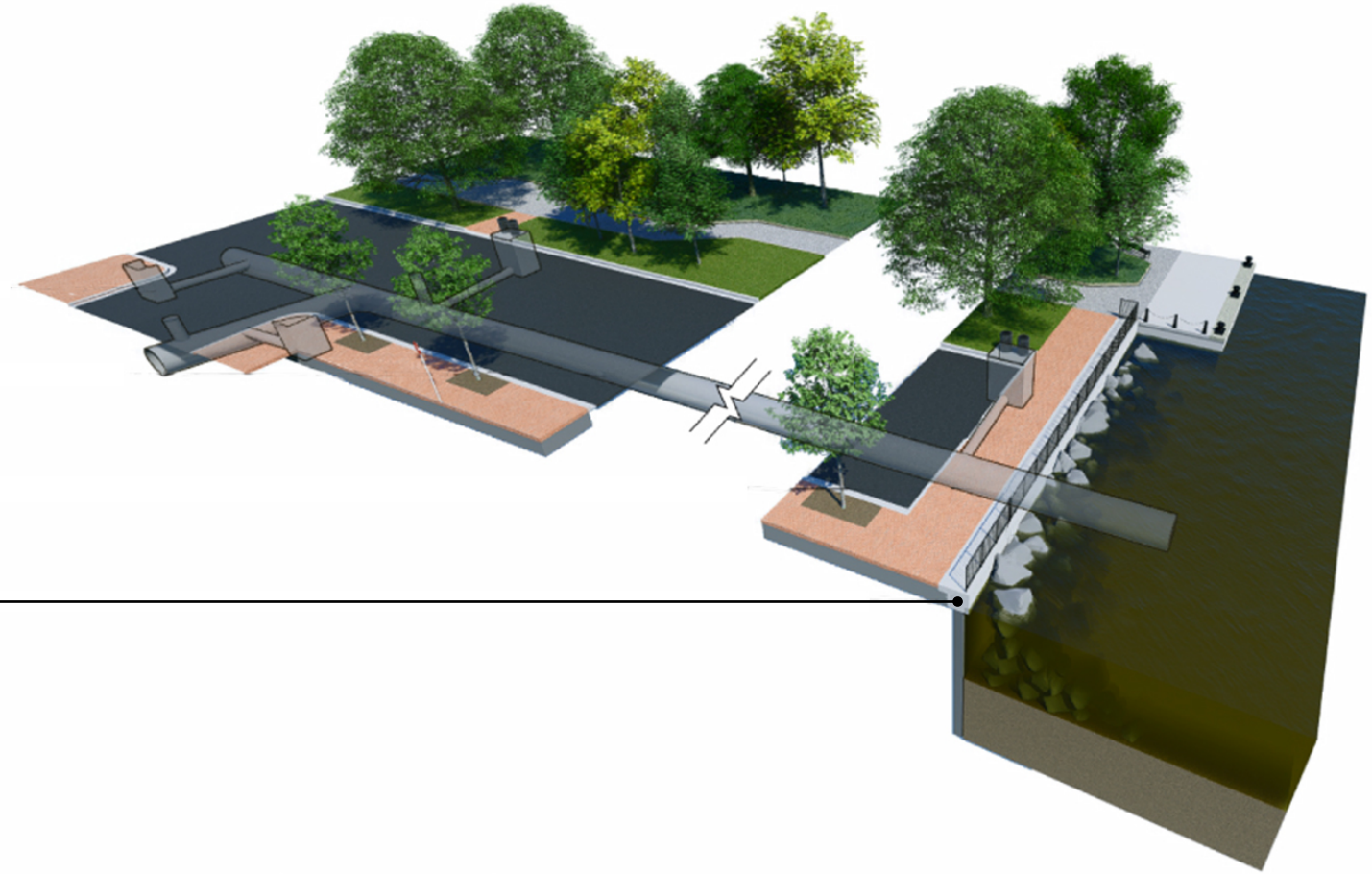
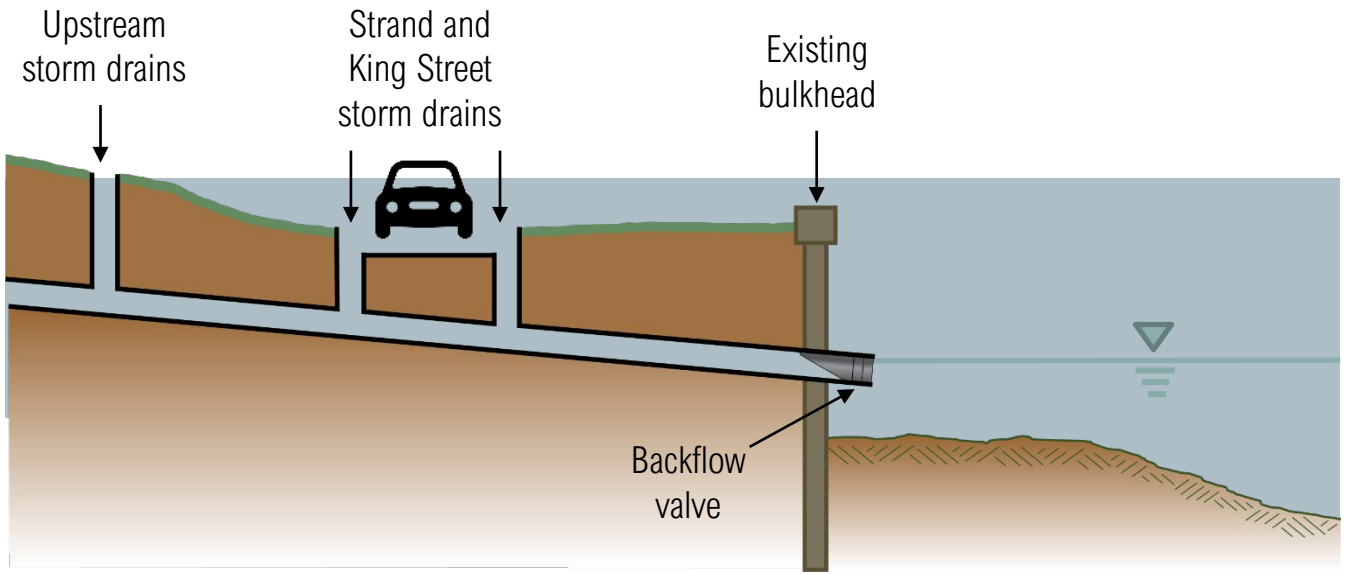
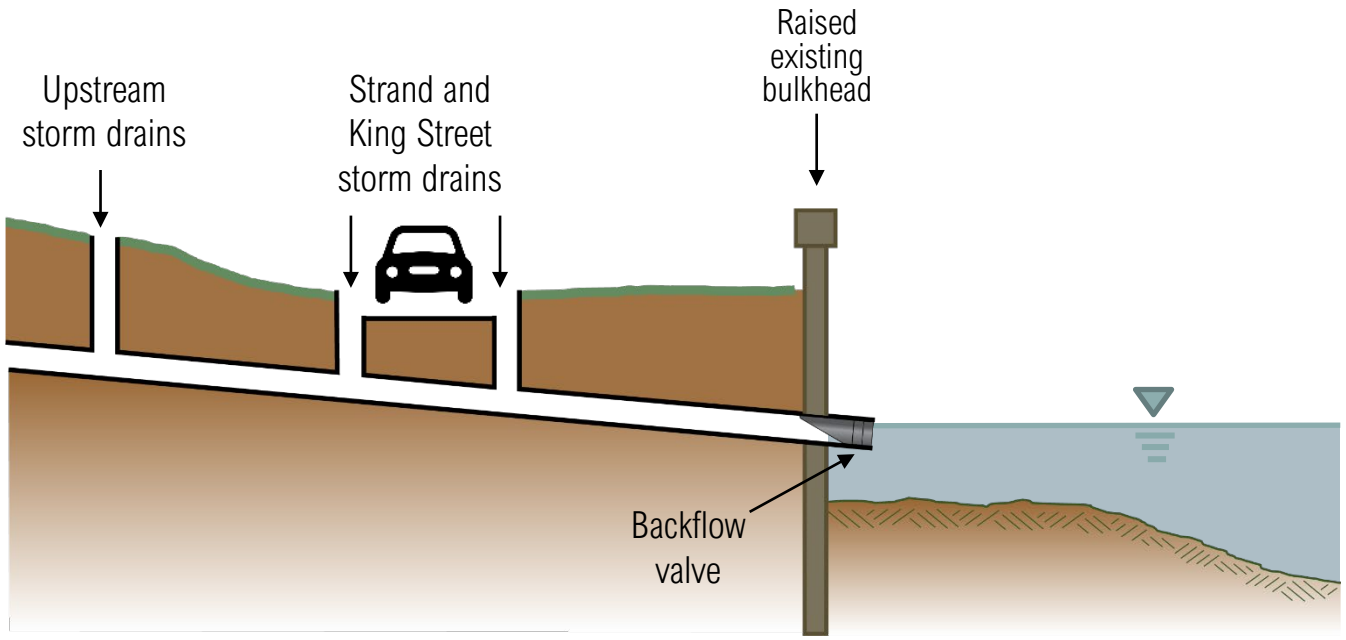


EXISTING BULKHEAD

Overtopping occurs when the river levels exceed the bulkhead



Mitigating backflow and Overtopping



Potential Solutions

- Repair and/or raise existing bulkhead
- Build new, higher bulkhead
- Construct flood barriers

Flood Characterization along the Waterfront

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of River Outfalls

OVERTOPPING
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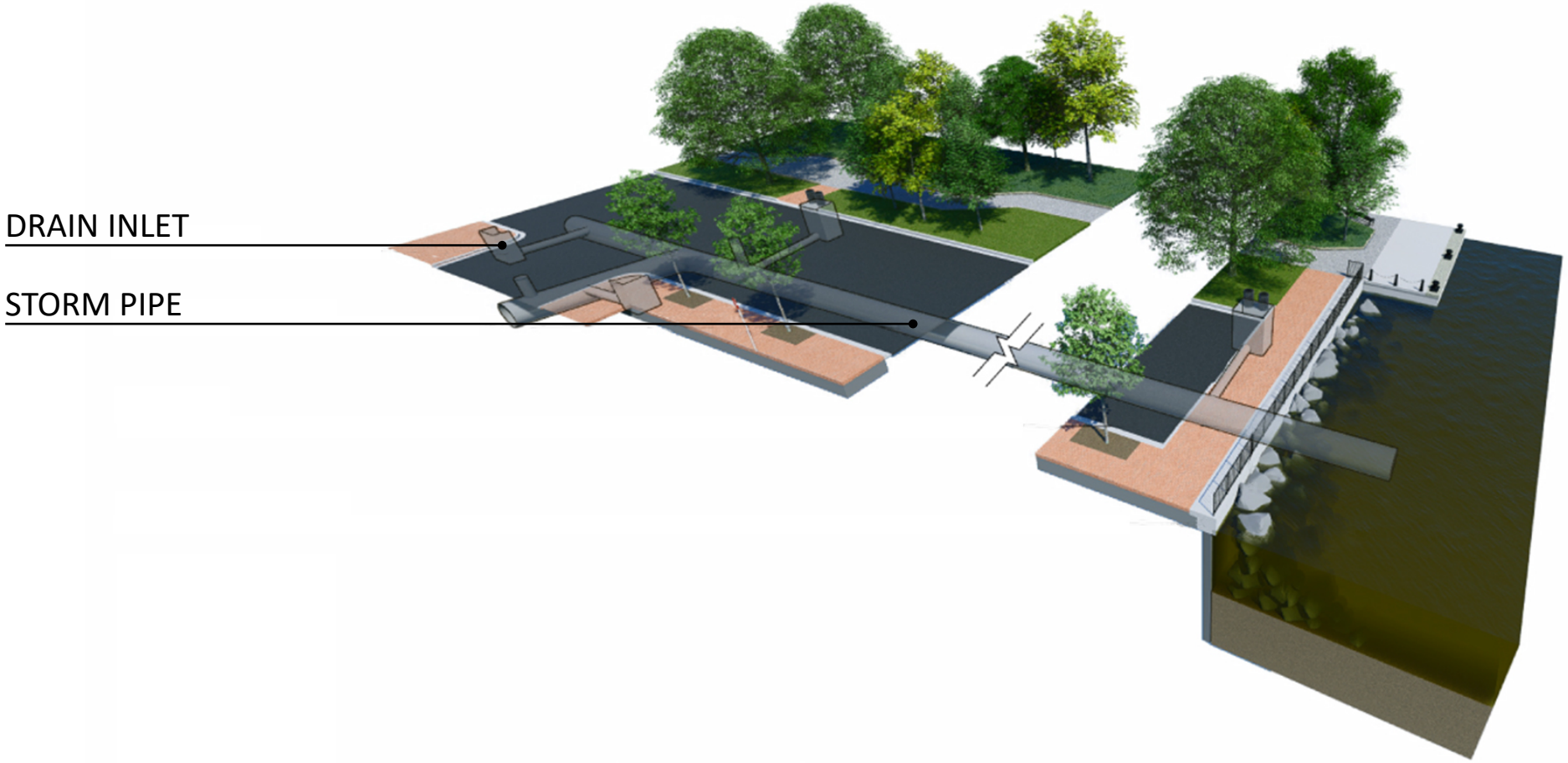
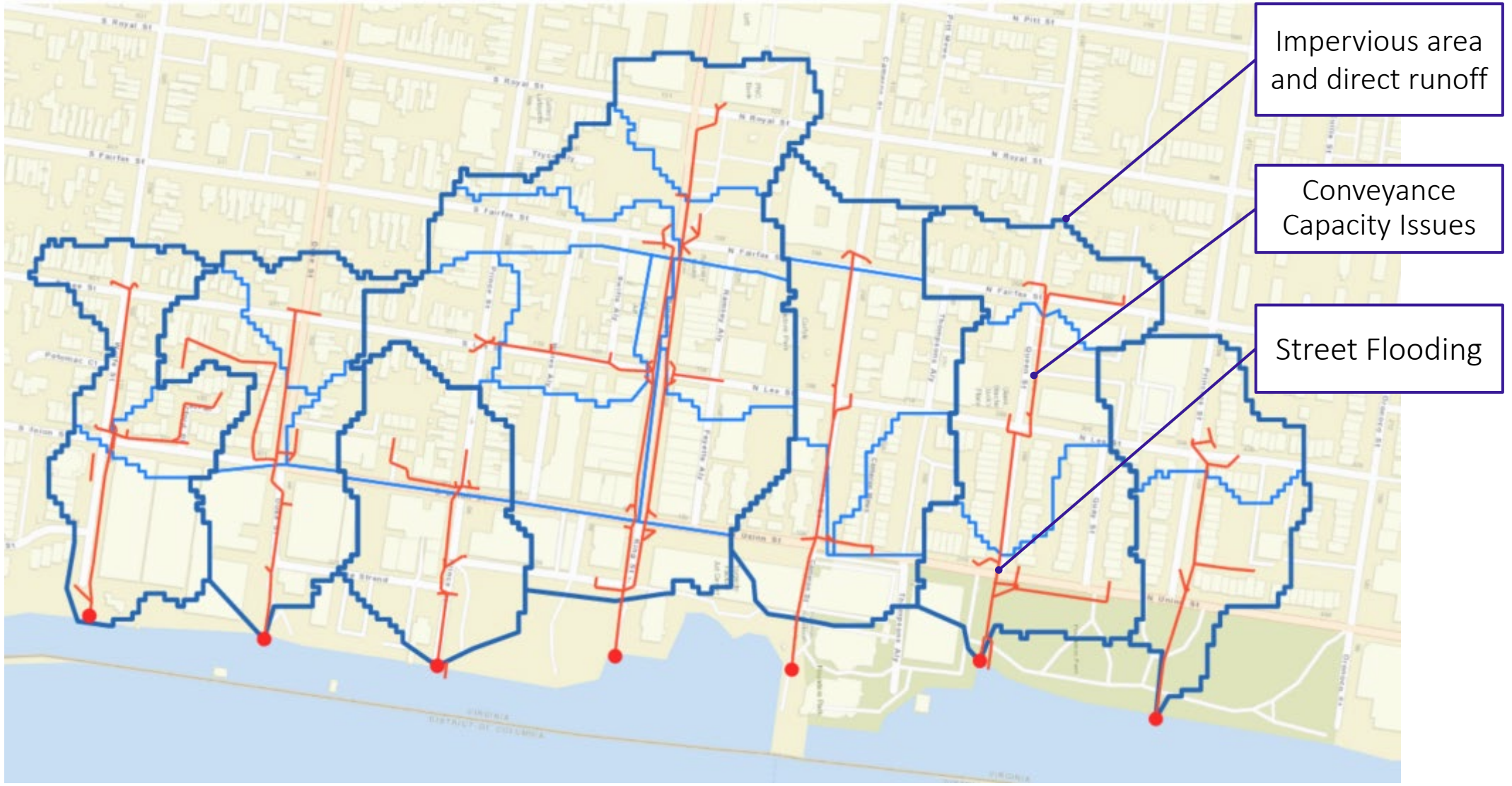


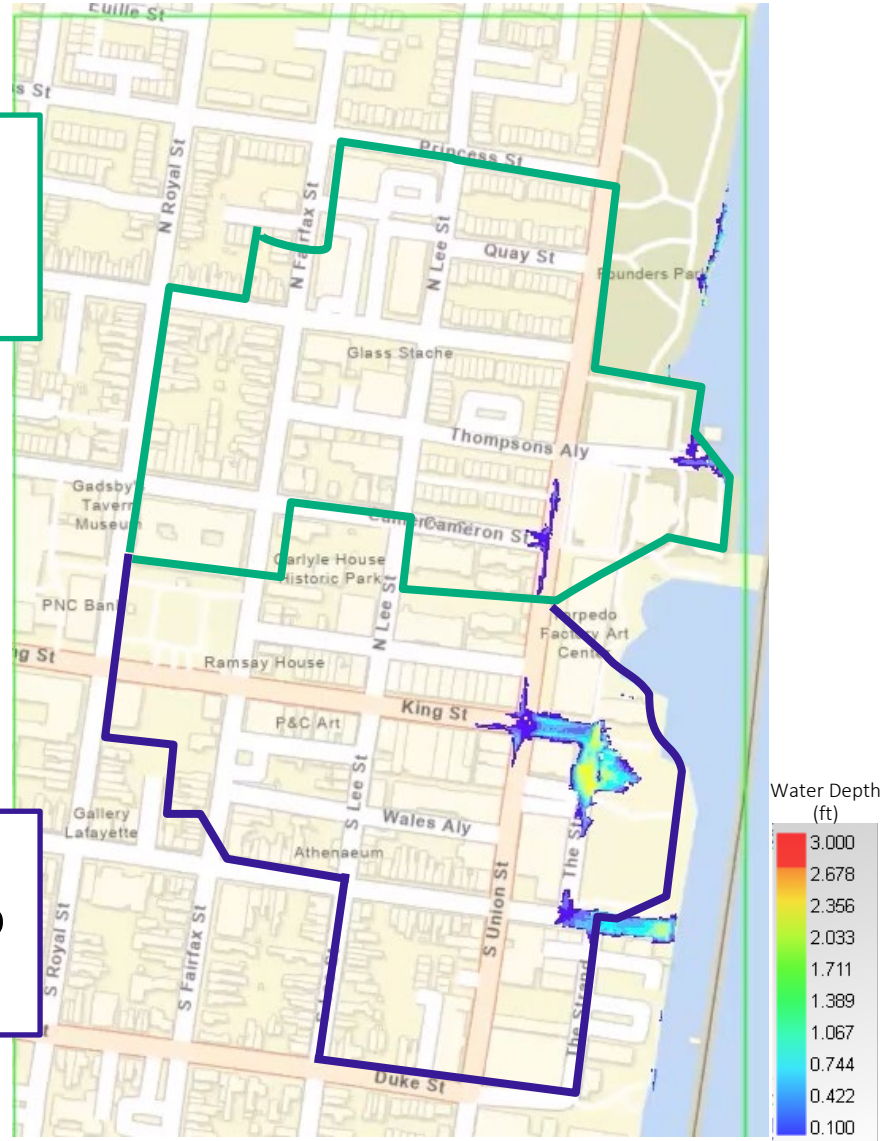
Flooding is a Watershed Issue!



Flooding is a Watershed Issue!

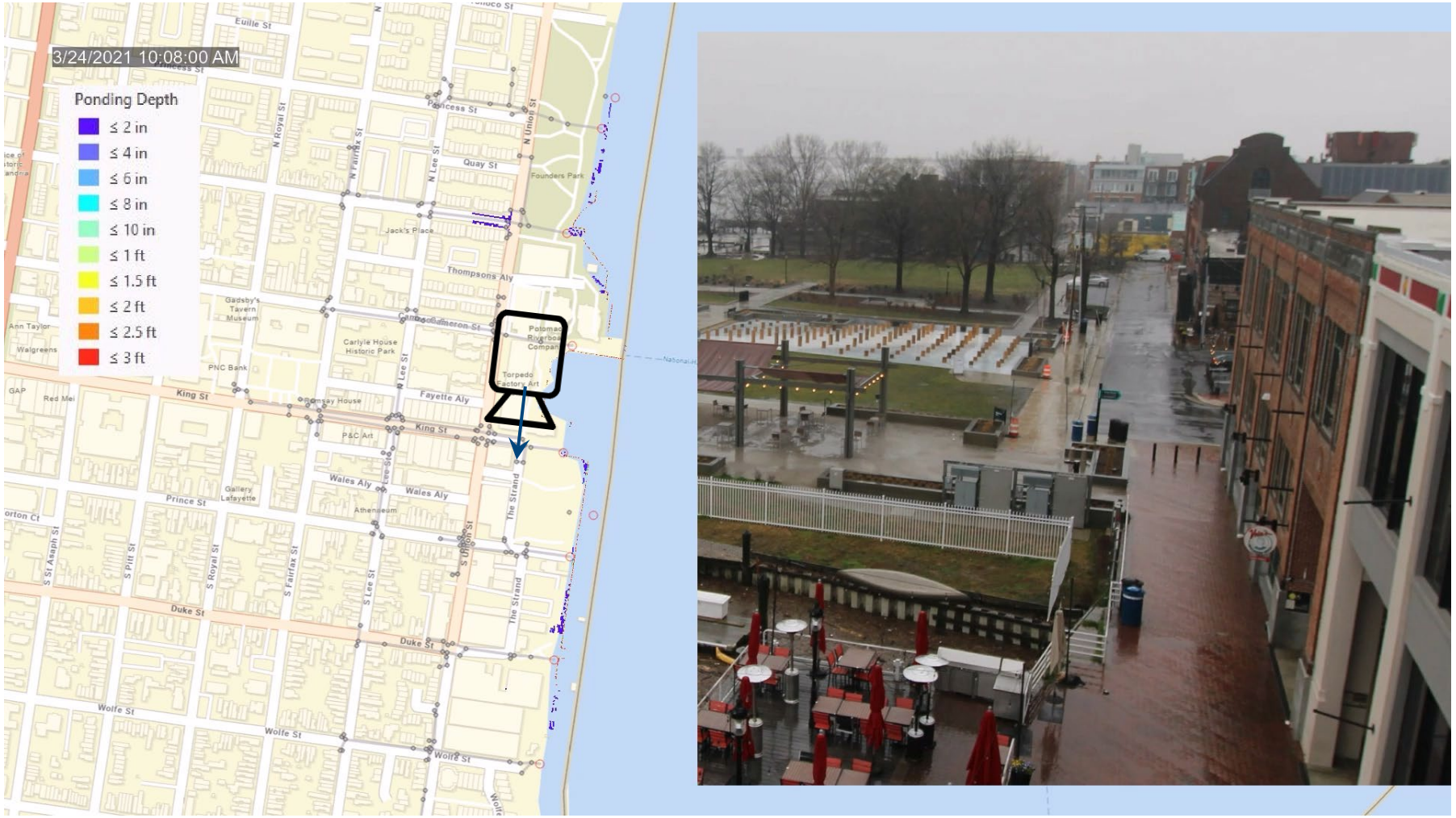
This area of flooding will be managed by Thompsons Alley Pump Station

This area of flooding will be managed by Waterfront Park Pump Station



STORM CONDITIONS: 10-year return period
City of Alexandria Intensity Duration Frequency Curve
Peak Rainfall Intensity = 5 inches/hour
Time of Concentration = 5 minutes
Total Storm Duration = 2 hours
Potomac River = El + 3.6-ft (constant)

Inundation occurs when stormwater is not fully captured and conveyed to Potomac River



Capture, Convey, and Pump

Step One
Water **enters** the system

Upsized and additional inlet structures

IMAGE SOURCES: Concrete Pipe & Precast Virginia (VDOT) Drainage Inlets
April 25, 2018. How a Stormwater Management Company Can Help you to Protect Your Bedford, NY, Landscape (Santucci Construction Corporation); Plastic Pipe Institute Storm Sewers
April 15, 2019. Alexandria Waterfront Pump House / Pavilion Development (Olin)

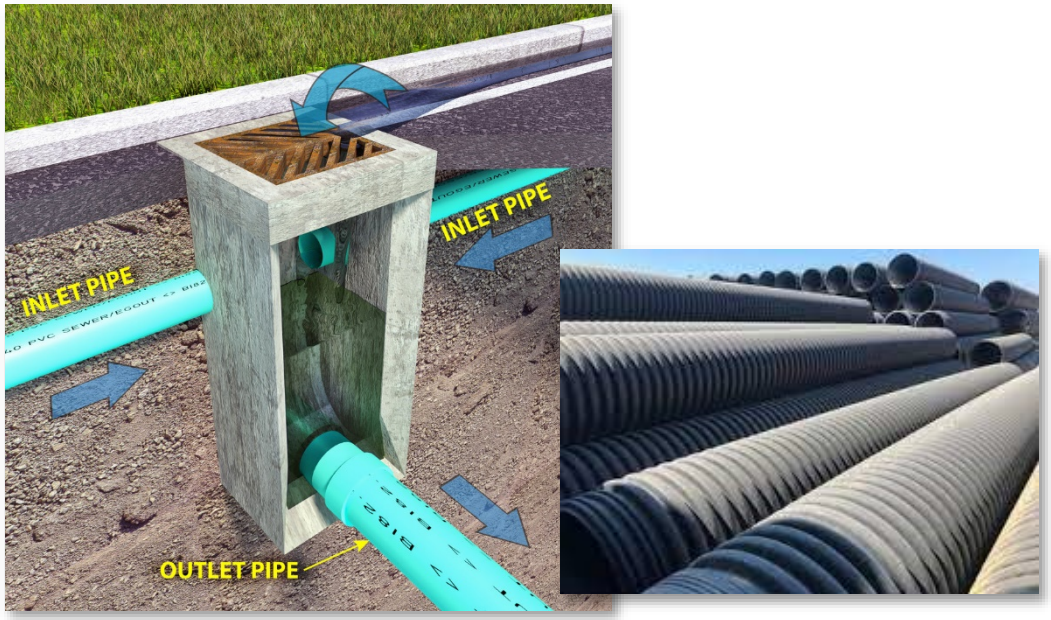
Capture, Convey, and Pump

Step One
Water **enters** the system

Step Two
Water is **conveyed** through the system

Upsized and additional inlet structures

Upsized and additional storm piping



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Capture, Convey, and Pump

Step One
Water **enters** the system

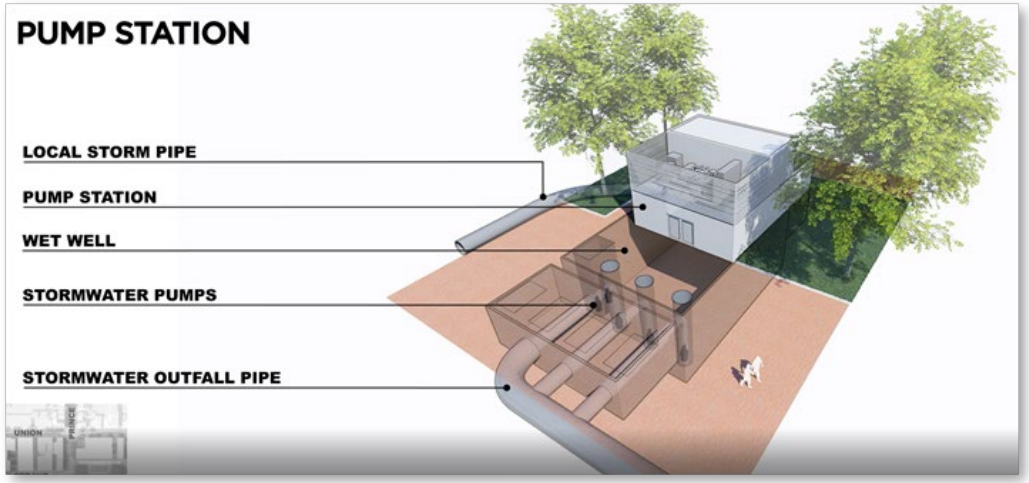
Step Two
Water is **conveyed** through the system

Step Three
Water is **evacuated**

Upsized and additional inlet structures

Upsized and additional storm piping

New stormwater pumping stations



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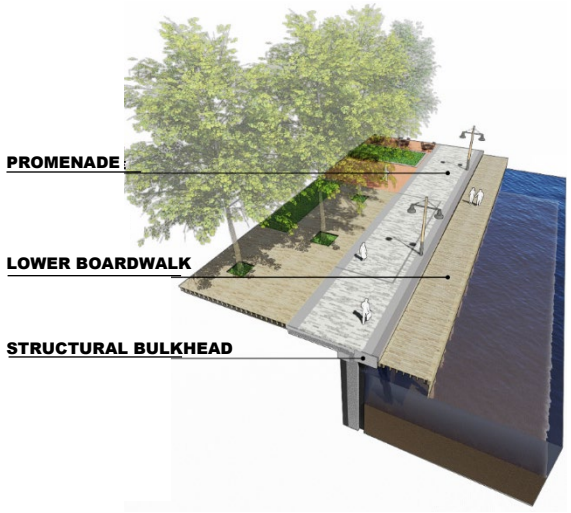
Complex flooding requires an integrated solution.

BACKFLOW
of River Outfalls

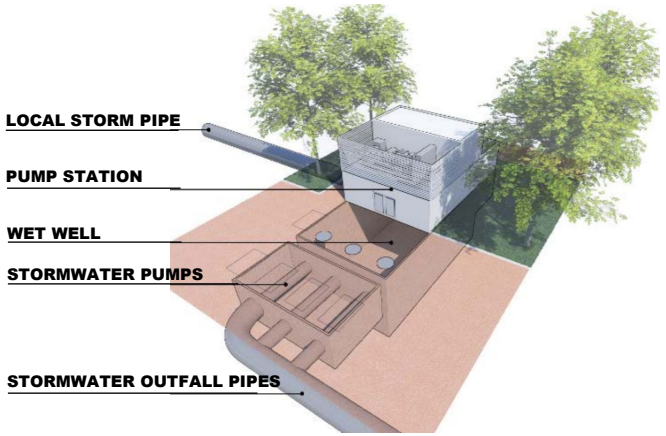
Requires **backflow prevention** on outfalls

OVERTOPPING
of Bulkhead



Requires a higher-elevation **flood barrier**

INUNDATION
of Storm Sewers



Requires new/larger inlet structures, new/larger storm sewer pipes, and **pumping**

Limitations of the “Baseline Project”

- Concepts developed a decade ago and rely on “grey” infrastructure
  - Best practices in resiliency have changed
  - Climate change is now better defined
- Approach costly
  - Exceeds current City budget of $102 million

Asked our Owner's Advisor how we might…

MODERNIZE AND ADAPT

to today's best practices

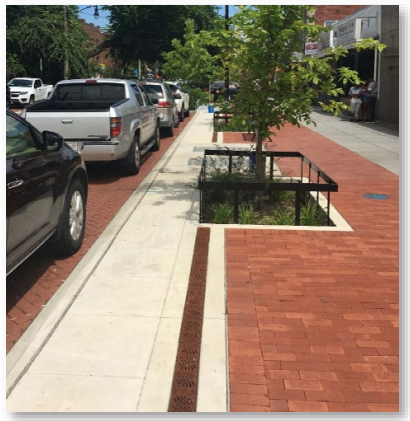
Take a view that is

GREENER AND MORE SUSTAINABLE

Without adding
(and potentially reducing)

COST

We showed you some concepts from other delta cities.



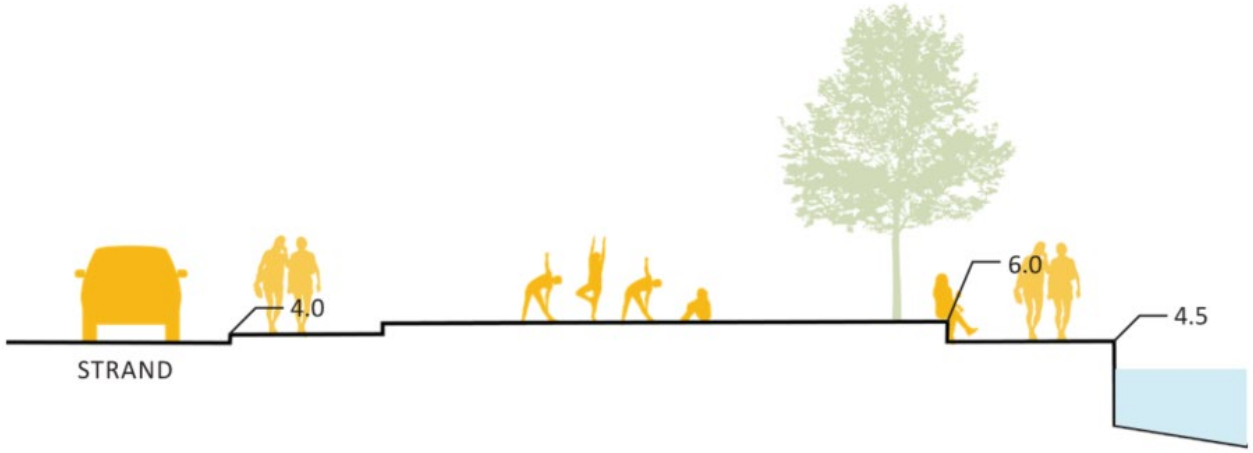
SOURCES: 2014. "Resist, Delay, Store, and Discharge: A Comprehensive Urban Water Strategy" (OMA)
Image provided by ADS StormTech
"Tanner Springs Park, Portland, Oregon, US" (Urban Green-Blue Cities)
April 15, 2021. "Rock Creek Project Green Infrastructure Virtual Tour" (DC Clean Rivers Project)

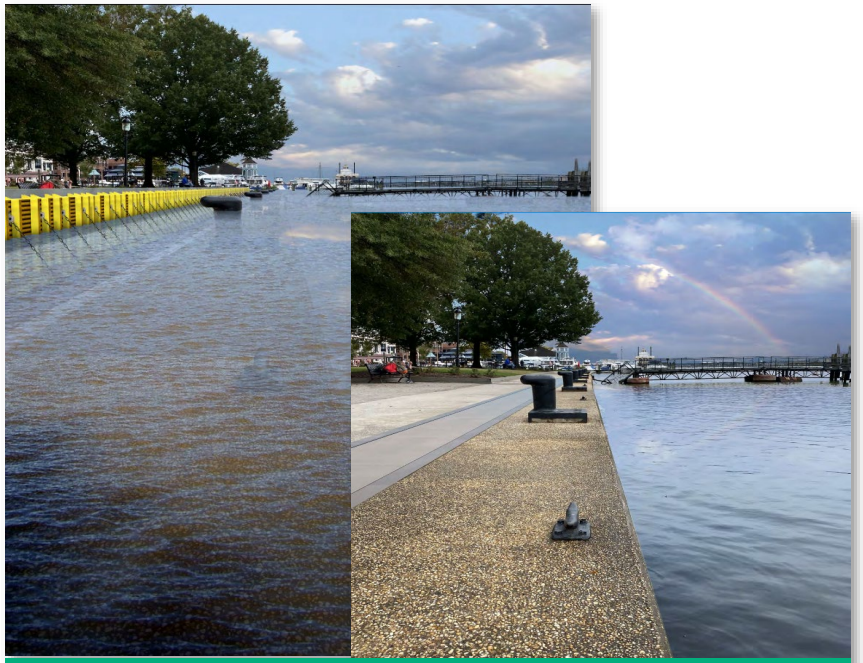
Facilitated Discussion

Alternative Flood Barrier Solutions

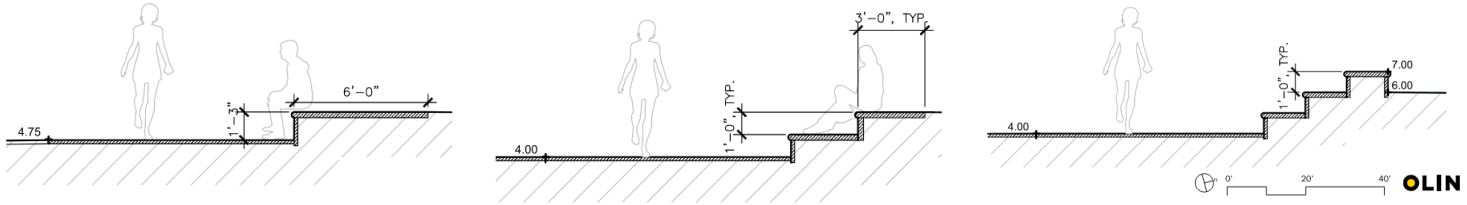
- Deployable products and technologies
- Fixed features (do not require activation/deployment)
- Alignment preferences

Continued development of alternative flood barrier solutions





New Walkway with Deployable Flood Gate

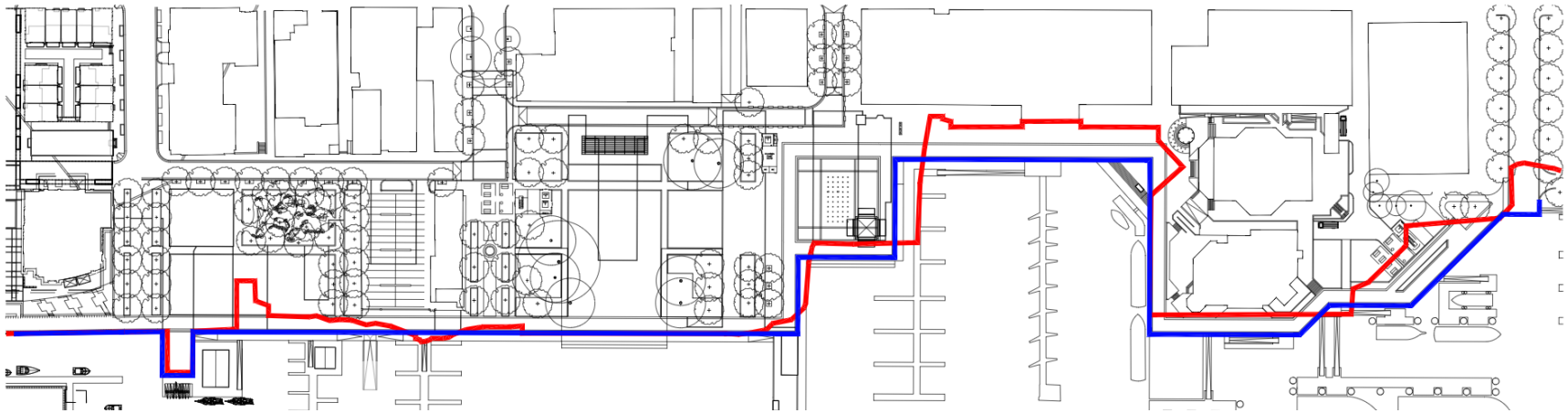


Ha-Ha Wall or Landscape Site Wall with Various Seating Configurations

Floodproof Glass with Handrail at Piers

SOURCE: February 3, 2021. Alexandria Waterfront Alternatives Analysis Section Studies (Olin) // Renderings provided by FloodBreak and Fenex.

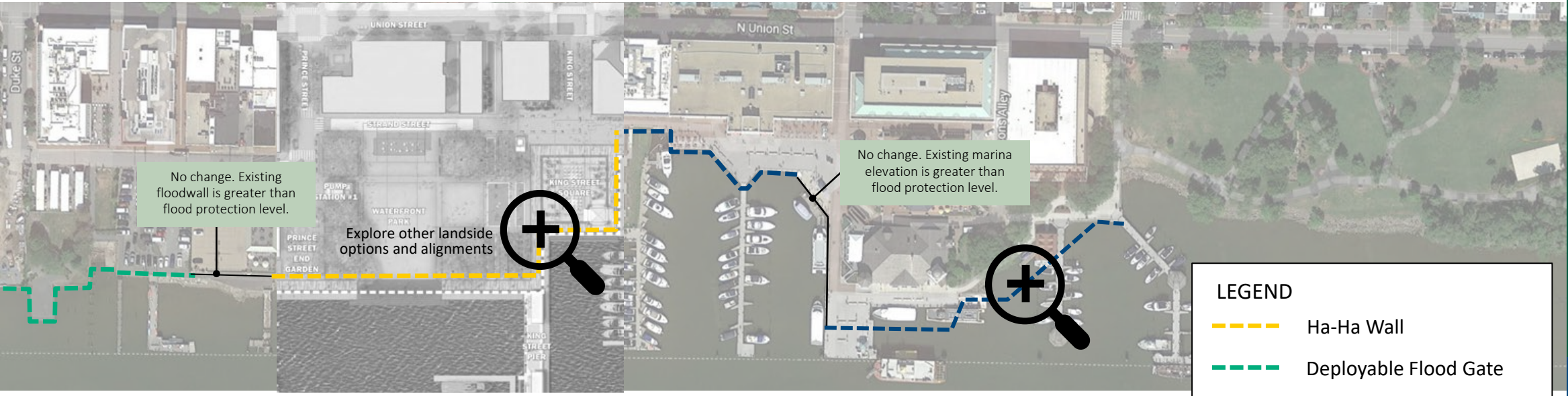
Alternative solutions and alignment may reduce costs.



LEGEND

Existing Shoreline

Proposed Alignment



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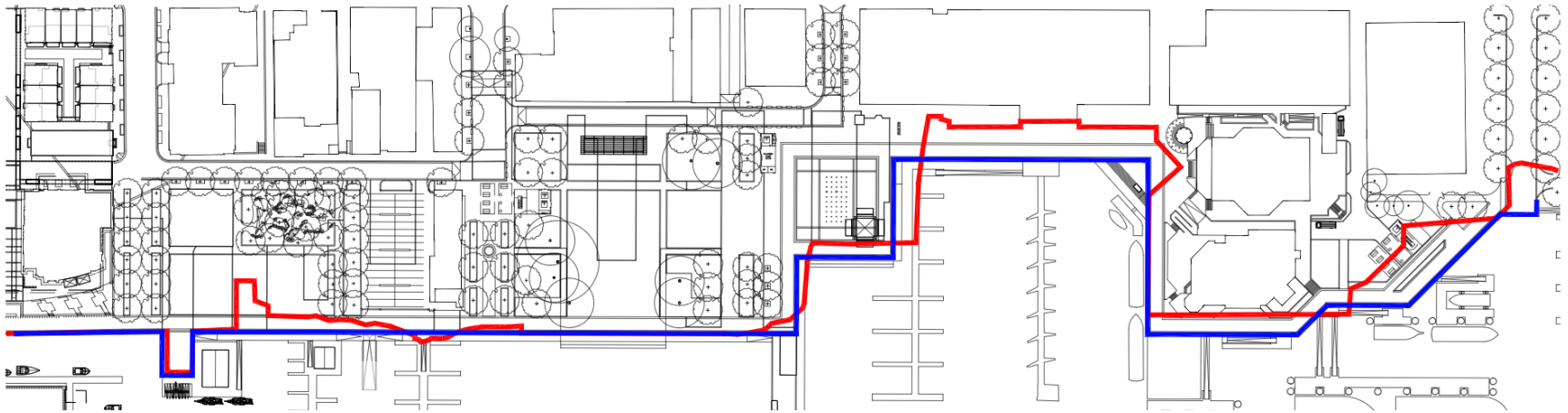

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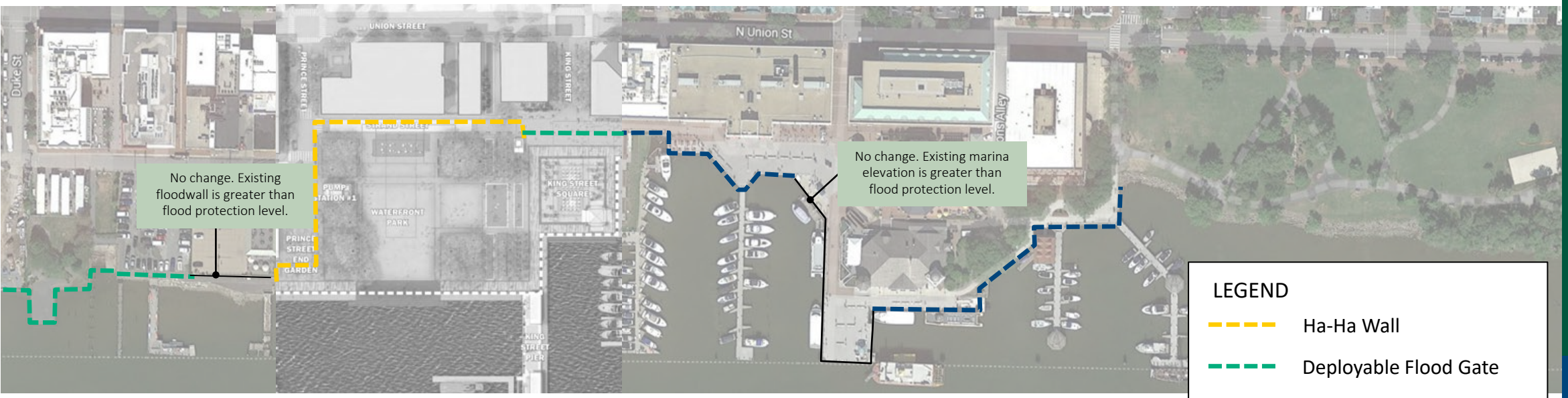


LEGEND

Ha-Ha Wall

Deployable Flood Gate

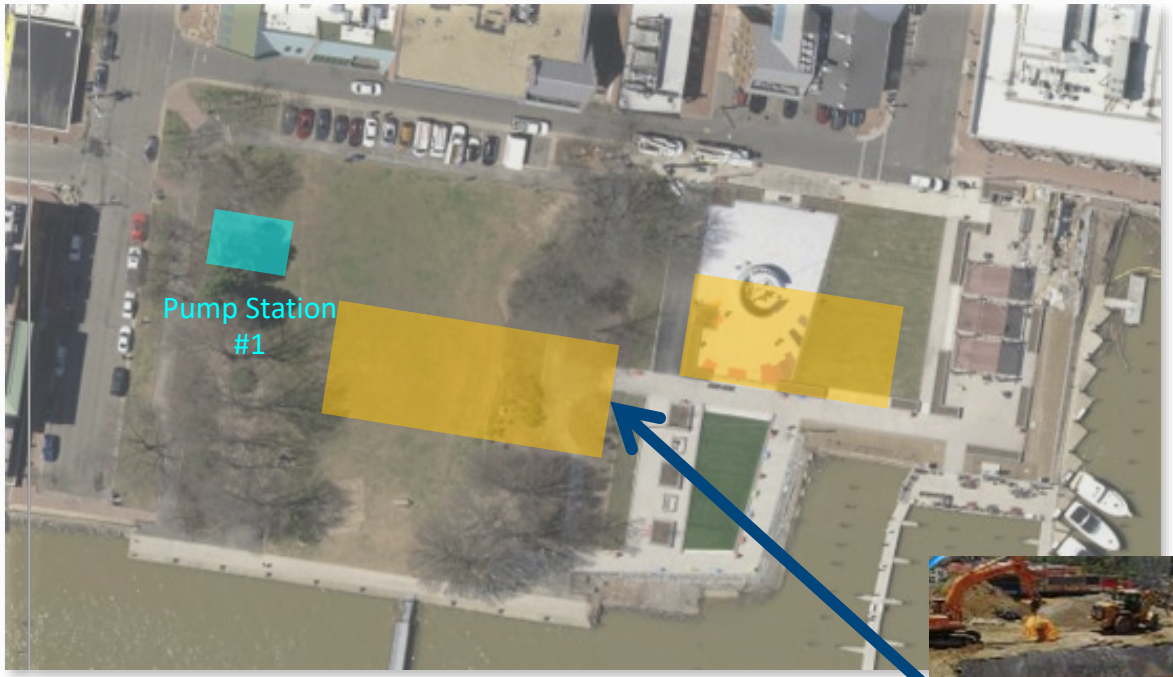
Floodproof Glass

Facilitated Discussion

Underground Stormwater Detention and Bioretention

- Underground stormwater detention at Waterfront Park and/or Founders Park
- Above-ground bioretention at Founders Park
- Pervious pavement and/or infiltration basins along roads and sidewalks

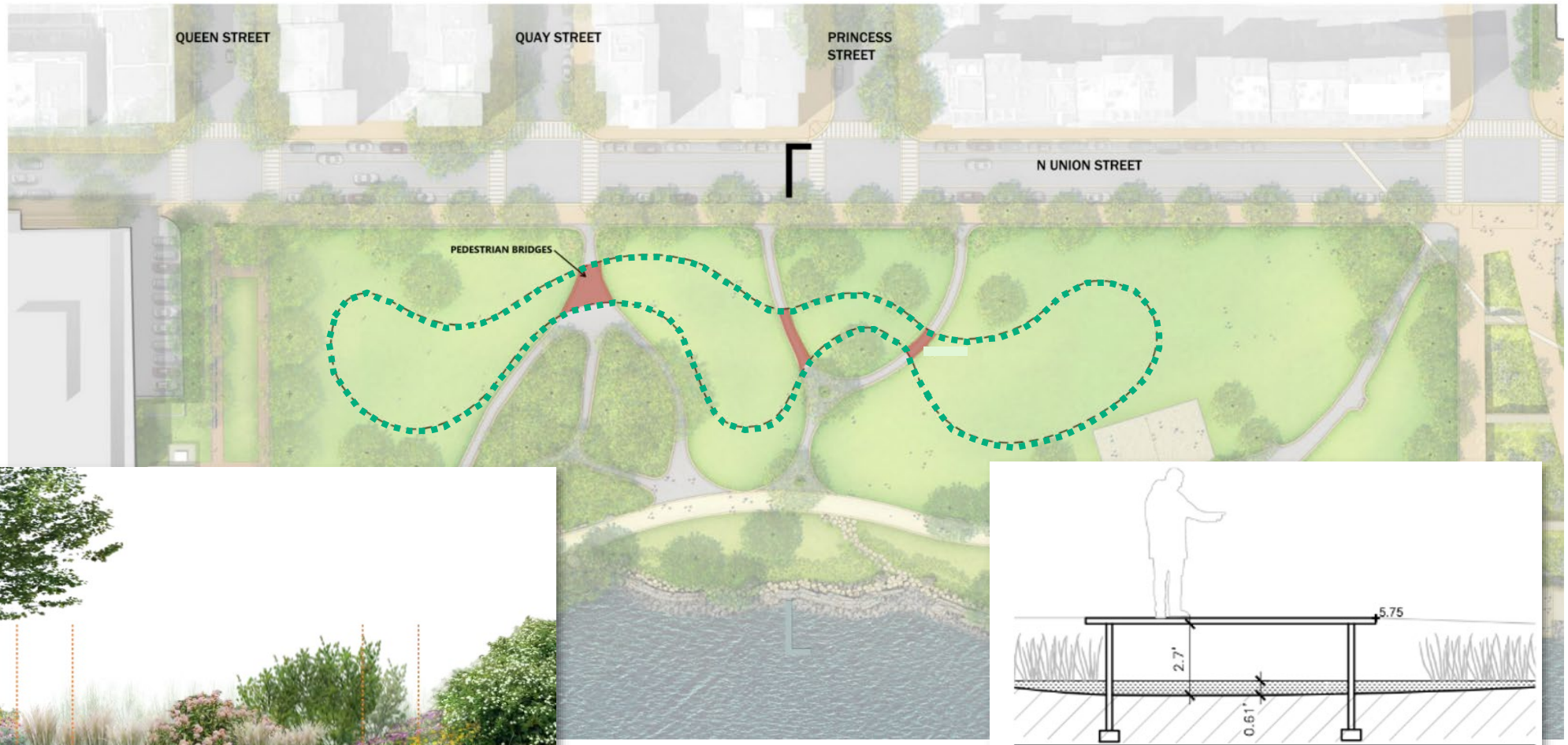
Design analysis shows underground stormwater detention provides more time to pump the same amount of water and therefore reduces the pump size and flow capacity required.



Up to **47% Pump Capacity Reduction** at Waterfront Park

Up to **95% Pump Capacity Reduction** at Founders Park

Bioretention has other benefits but **does not** make a sizable impact on pump station sizing.



ENLARGEMENT AT THE BIORETENTION

SOURCES: February 12, 2021. Alexandria Waterfront Floodproofing Alternatives Analysis (Olin) // Image provided by Philadelphia Water Department

Feedback from Founders Park Community Association

- FPCA wants to be good citizens of both Founders Park and of the broader community and environment
- Several members have ongoing questions related to why and how Founders Park is part of the solution
  - Flooding not perceived to be a problem in immediate area of the park
  - Shared that Founders Park can be part of the solution for the watershed based on where the stormwater infrastructure and outfalls are located
- Several members stated that underground stormwater detention preferred over above-ground bioretention
  - Concerns included safety, maintenance, pests, and interference with park programming and patterns of current use (against reducing open space)

Next Steps/Schedule

- Refinement of alternatives based on:
  - Field investigations (geotechnical and survey)
  - Cost-benefit analysis
  - Coordination with AlexRenew
- Vetting of long-term maintenance requirements
- Plans for next Subcommittee Meeting
  - Refined schematics/renderings
  - Preliminary cost estimates