CITY OF ALEXANDRIA
Project Implementation

Waterfront Flood Mitigation Project Discussion

September 4, 2025

Draft, Deliberative, Pre-Decisional

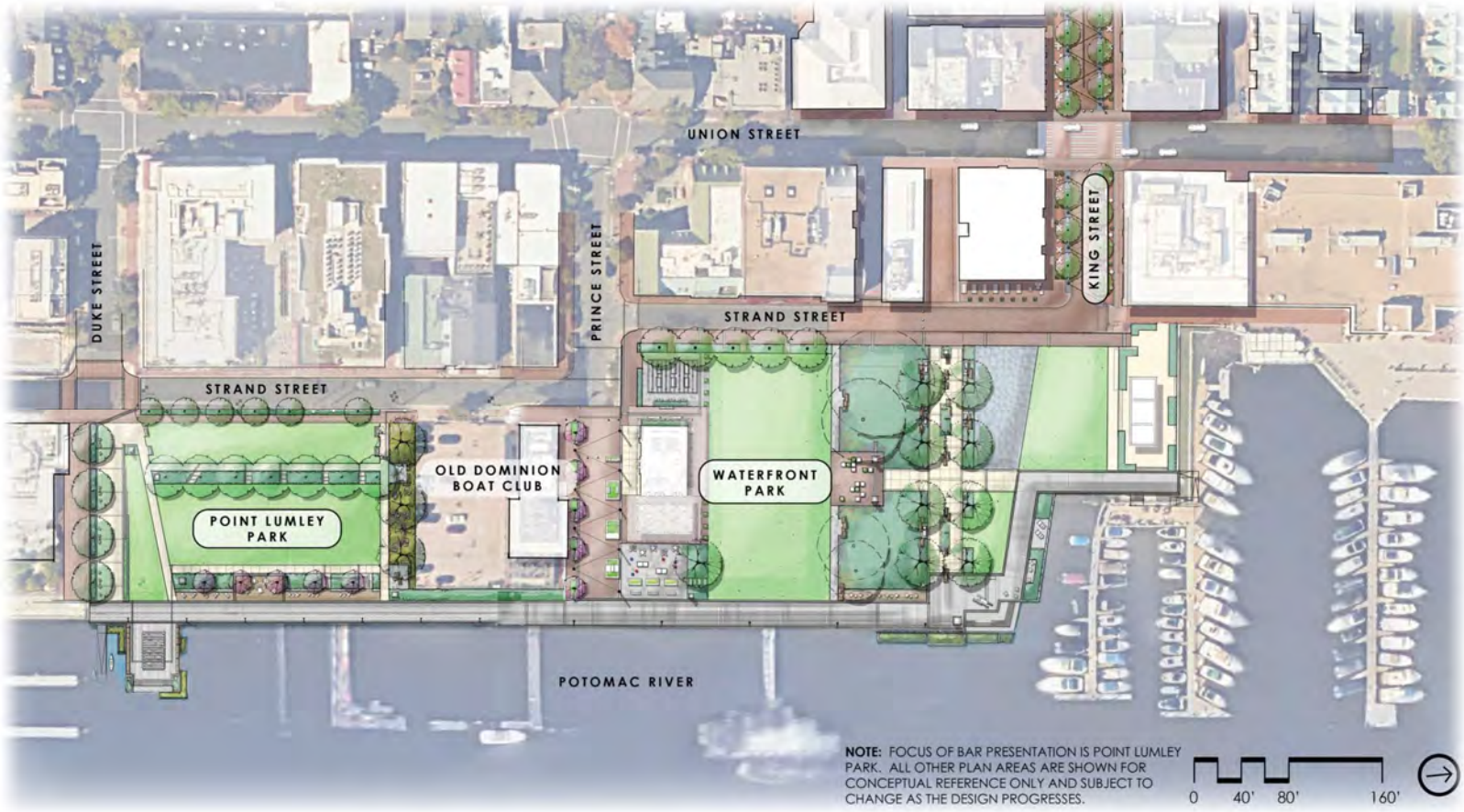
Why are we here?

- Outreach Update
- Project Goals & Objectives
- Project Design Updates & Response to Feedback to Date
- Constructive Feedback Requested:
  - Specific Landscape Features
  - Pump Station Design & Materials
- Consideration During Construction
  - Avoidance, Minimization, and Mitigation
- Share your Questions and Concerns!

Outreach Opportunities

- **Outreach Events – September**
  - Old Dominion Boat Club
  - Alexandria Waterfront Alliance
  - Old Town Civic
  - Waterfront/Parks and Recreation Commissions
  - Individual Stakeholders
- **Outreach Events – October**
  - Waterfront/Parks and Recreation Commissions
  - Stakeholder Groups
  - Individual Stakeholders
- **Door-to-Door Outreach and Survey (Business/Residential)**
- **Business/General Stakeholder Newsletters**
- **Public Event Pop-Ups – Fall**
  - Old Town Farmers Markets
  - Arts Festival
- **Construction Impact Mitigation Meetings – October/November**
  - Average Duration of Construction Phases / Closures
  - Maintenance of Access
  - Potential for Trolley and Bus Routing to Strand Street / Businesses
  - Activation of Spaces

Public Space and Amenities



Flooding Sources & City Impacts

OVERTOPPING
of Bulkhead

Ranges of Cost*/City Impacts:

***$20,000 - $50,000 annually for major debris**

***~$300k-500k – sandbag mobilization (annual)**

***$500k-$1M – Inlet & Street Cleanup (annual)**

***Events and Festivals Impacted = Lost Revenue**

***Tourism Impacted**

Solution:

Raised bulkhead/flood barrier(s) & pump station.

BACKFLOW
into River Outfalls

Ranges of Cost*/City Impacts:

***Increased sewer inspection required**

***$500k-$1M/yr river sediments removal**

***Street Closures**

***Pedestrian safety/closed crosswalks**

***Businesses impacted = lost revenue**

Solution:

New outfall structure and pump station.

INUNDATION
of Storm Sewers

Ranges of Cost*/City Impacts:

***~$300k-$500k – sandbag mobilization (annual)**

***$100K-$250K– Street Cleanup (annual)**

Solution:

Replace aging (50+ years old) and undersized storm pipes.

*Costs vary year to year & figures and ranges are estimated averages. Figures do not include secondary/unquantified costs of impacts, negative PR, cancelled events, etc., lost sales, etc.

Riverine Overtopping & Flooding

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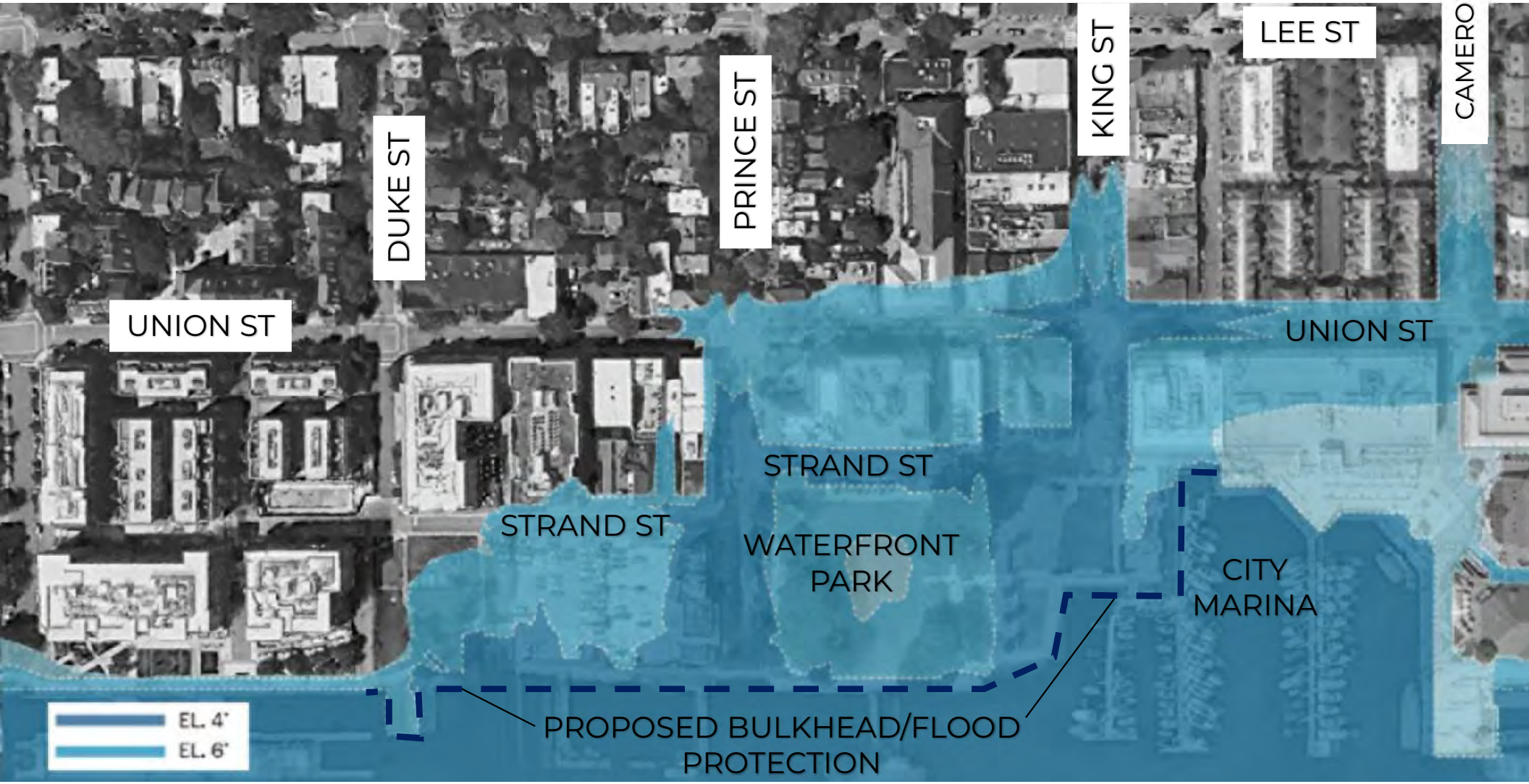
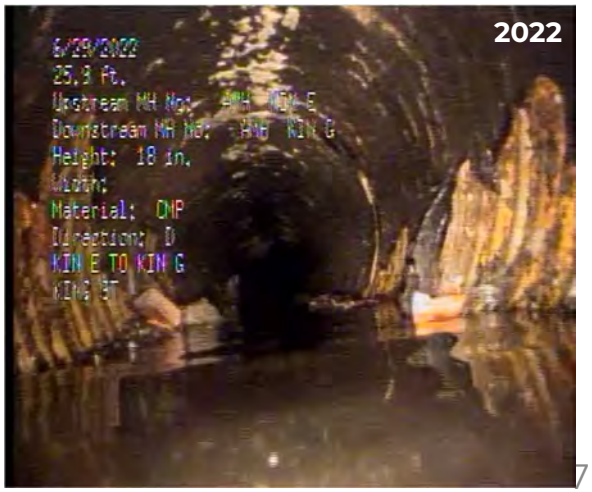


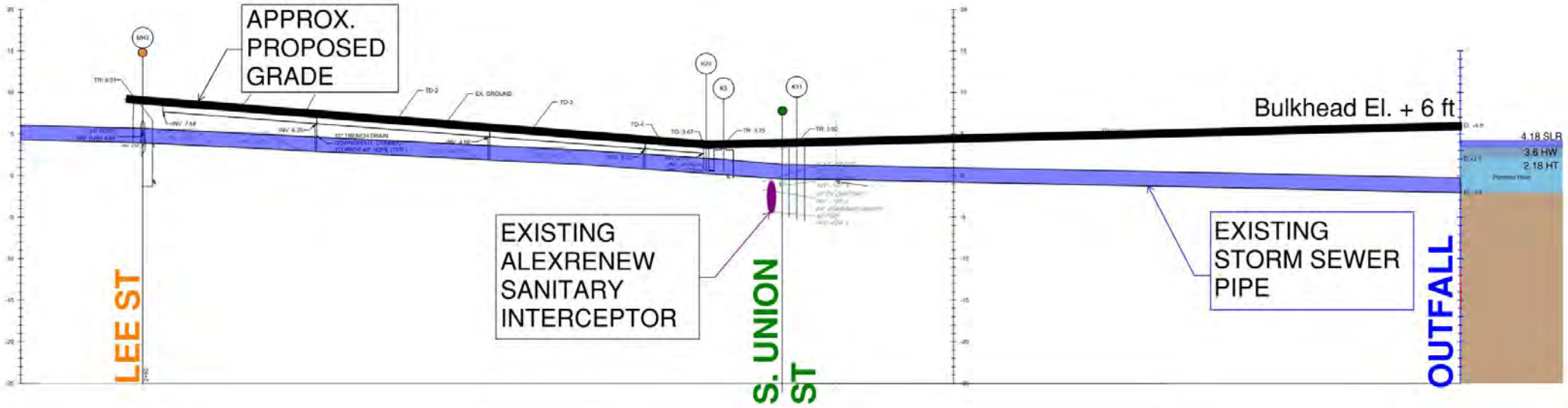
Aging & Failing Infrastructure



Problem Solving

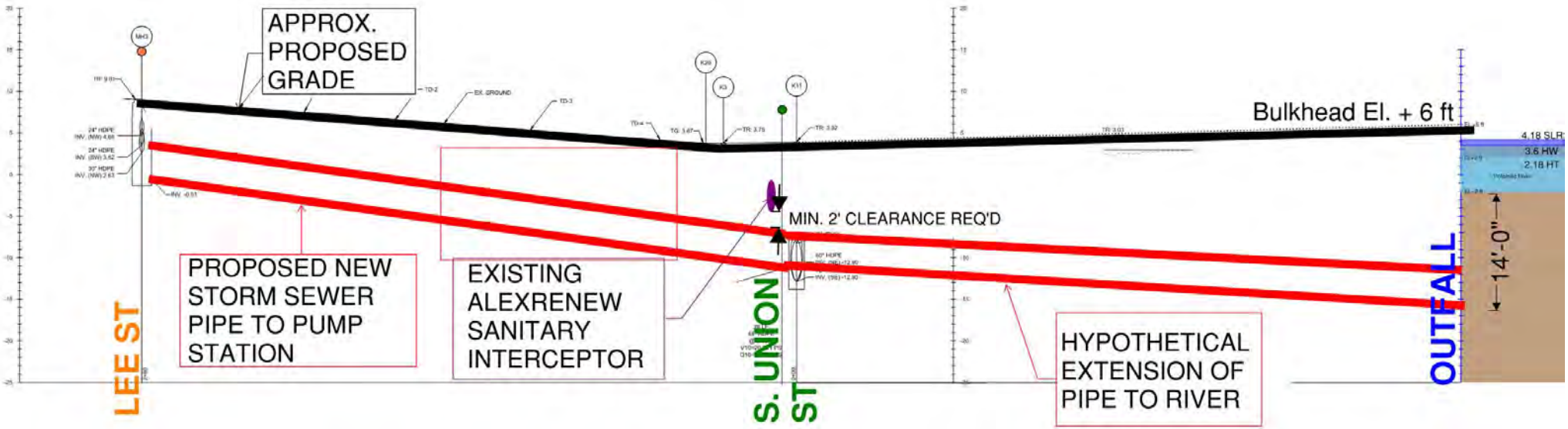
- Our failing infrastructure needs replacement.
- Responsibility to manage the floods & storms of today and tomorrow.
- On the waterfront, the Potomac River (and mudline) act like a plug and stop the water from draining.
- A pump station allows the floodwaters to be removed regardless of tidal conditions, and pedestrian and vehicular traffic is maintained.

Existing Storm Sewer on King St



- The *existing* Storm Sewer Pipe is tidally influenced and undersized for today's storms.
- The AlexRenew Sanitary Interceptor prevents us from upsizing the current storm sewer pipe due to available cover over the pipe and separation between the pipes.

The “Bypass” Alternative



- The *proposed* Storm Sewer Pipe would require further evaluation to determine size and capacity for today’s storms under a gravity-only or bypass scenario.
- Pipe is “plugged” due to tidal conditions & mudline.
- The *proposed* Storm Sewer Pipe must be below the AlexRenew Sanitary Interceptor to maintain proper cover over the pipe and separation between the pipes.

Pump Station Design Progression:

Initial Concept of Single Station:
(Presented in summary/fall 2024)

Revised Concept:
(Presented spring 2025):

- Smaller footprint, elevated design & increased public amenities

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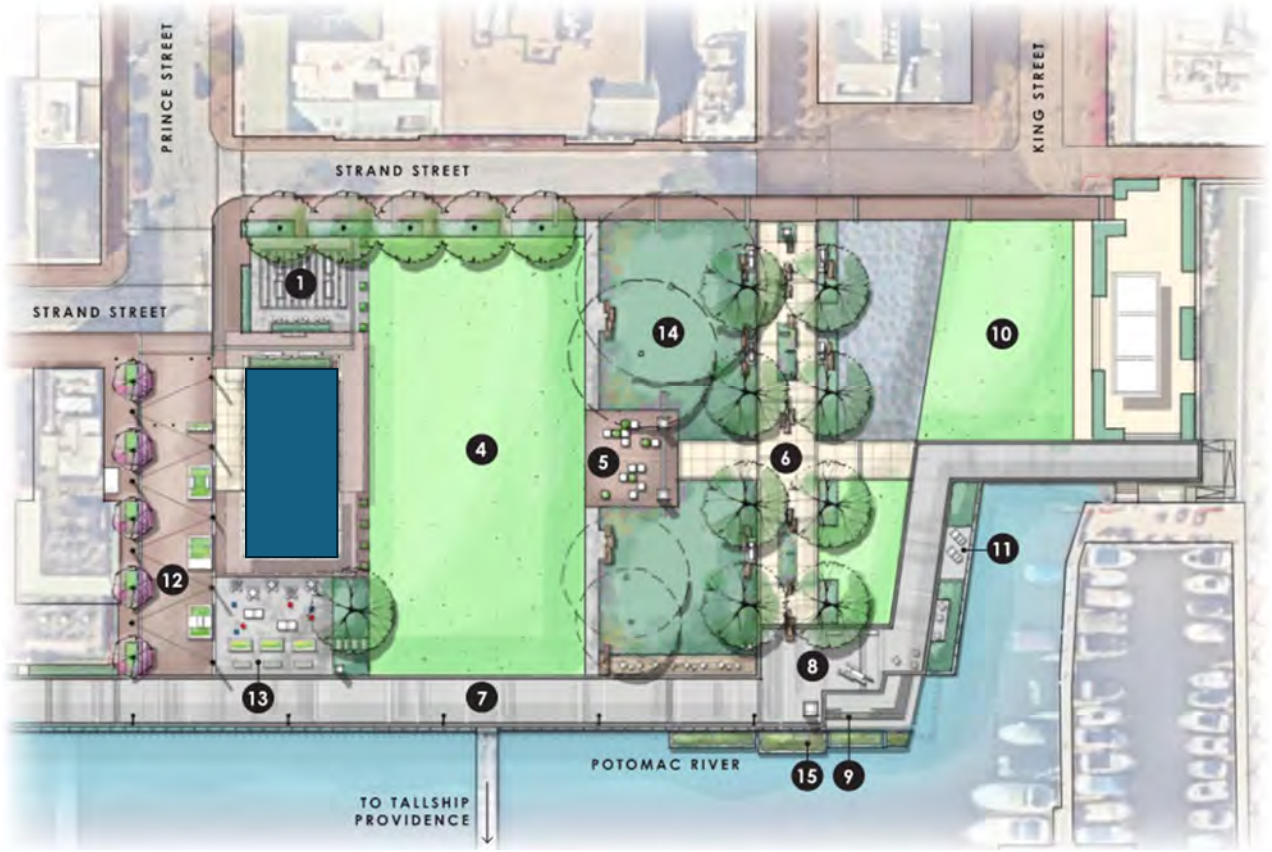
Site Plan: Prior Building Footprint

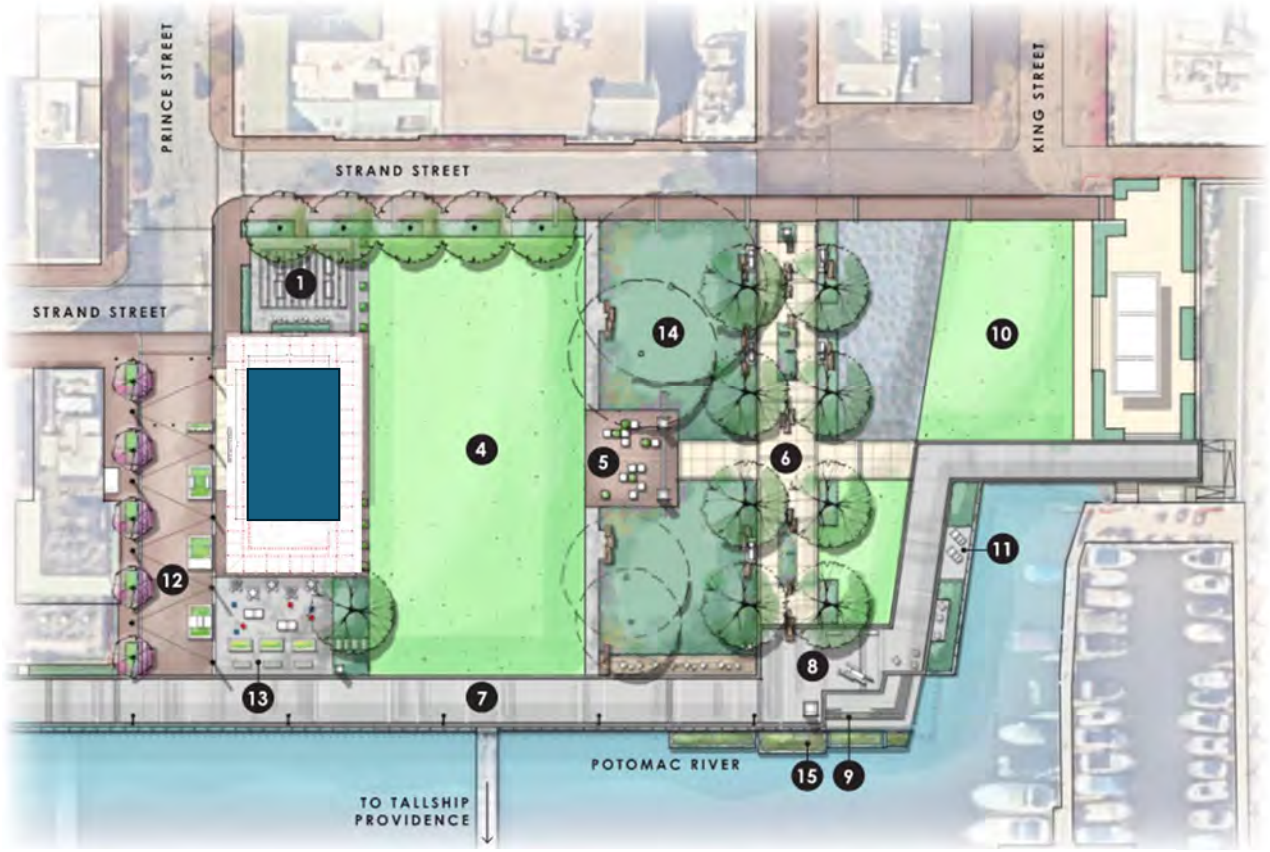


The proposed site plan uses a rectilinear framework as an homage to the historic wharfs and 1845 shoreline layout. This simple framework also aims to maximize programmable space, integrate the existing context, and create direct connections to the Potomac River that engage the waterfront and reinforce views.

LEGEND:

1. Trellis structure with picnic tables and catenary lighting
2. Pump station
3. Covered plaza / venue space
4. Multi-use lawn
5. Arrival plaza with crate-inspired seating
6. Wales Alley River Gateway
7. Promenade
8. Promenade plaza with seating / art / signage
9. Waterfront steps / seat wall
10. N. Waterfront area - to be replaced in kind
11. Boatyard overlook
12. Pedestrianized Prince Street / plaza with catenary lighting
13. Flexible game / waterfront seating space
14. Preserved existing trees (understory to be determined with arborist)
15. Floating wetlands attached to bulkhead

Site Plan: Reduced Station Size



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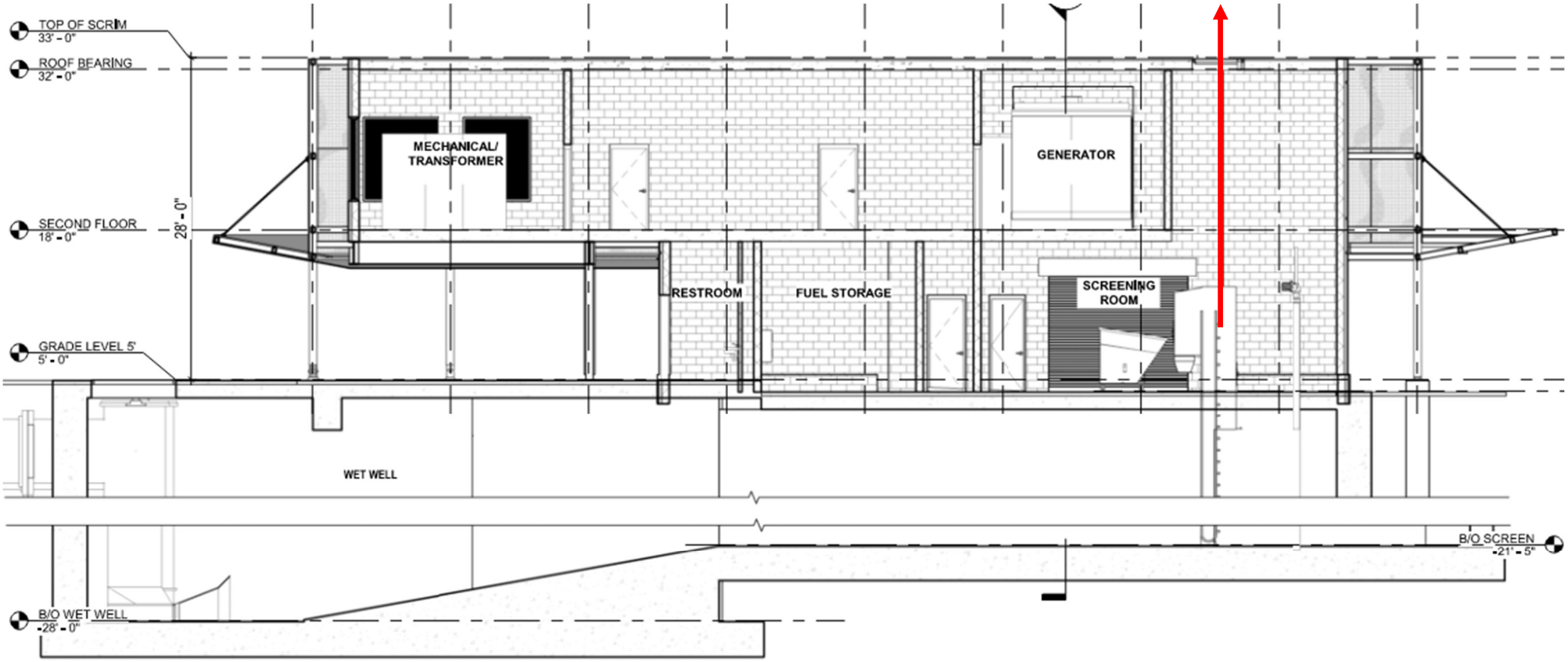
(Building length reduced 18-22’ (55’ total if canopy eliminated)

Prior Pump Station Cross Section



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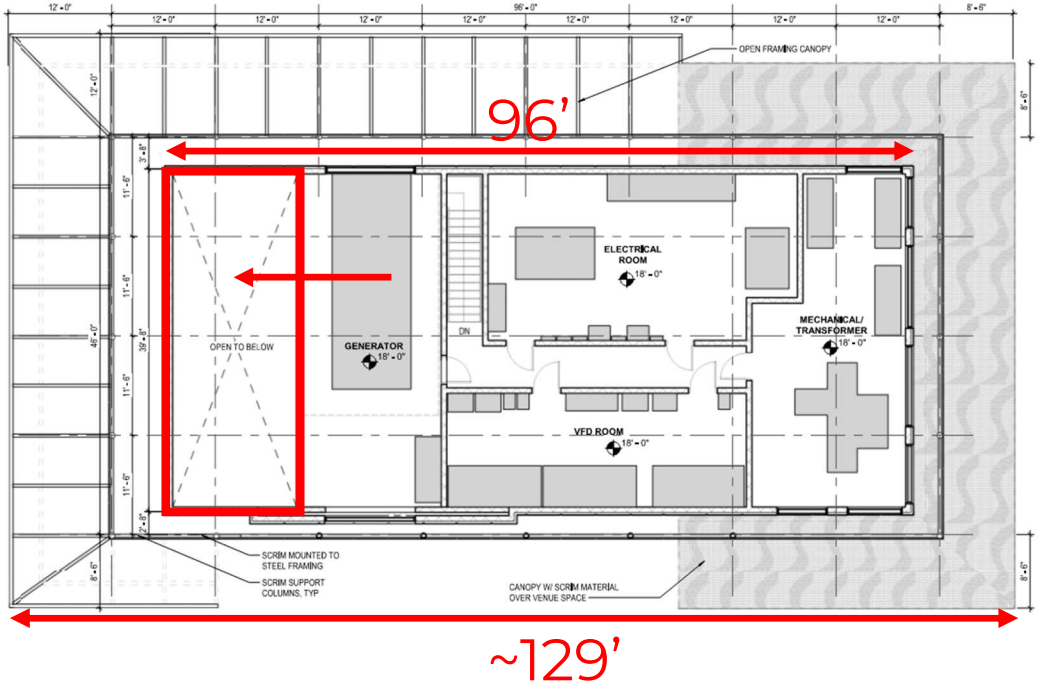
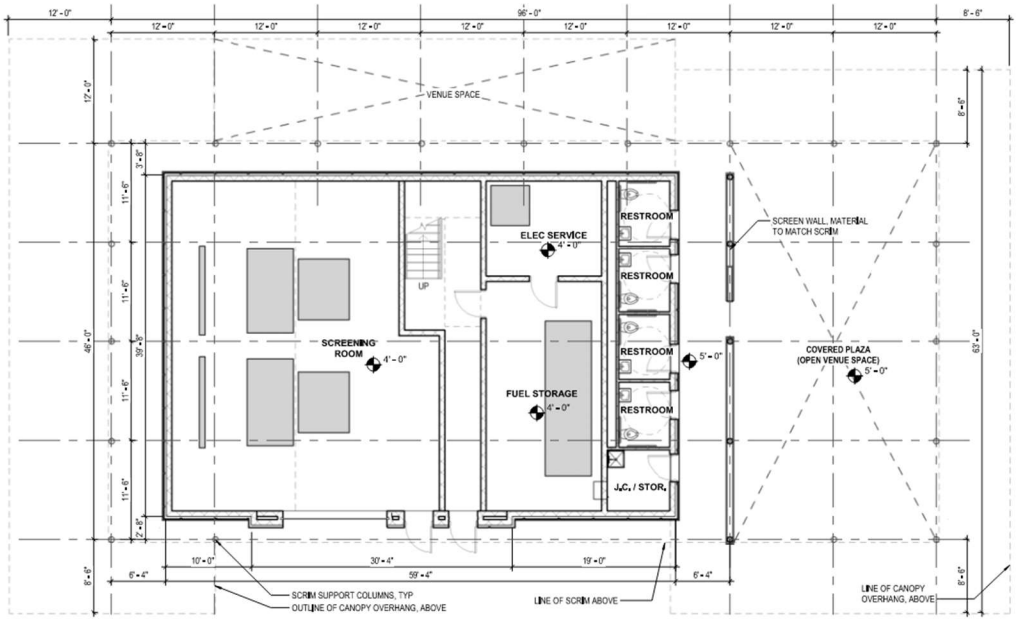
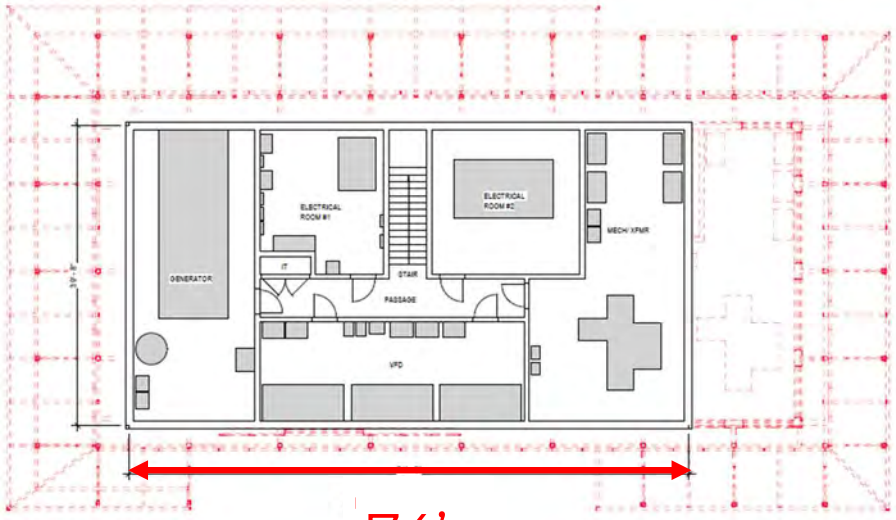
Prior Pump Station Floor Plan

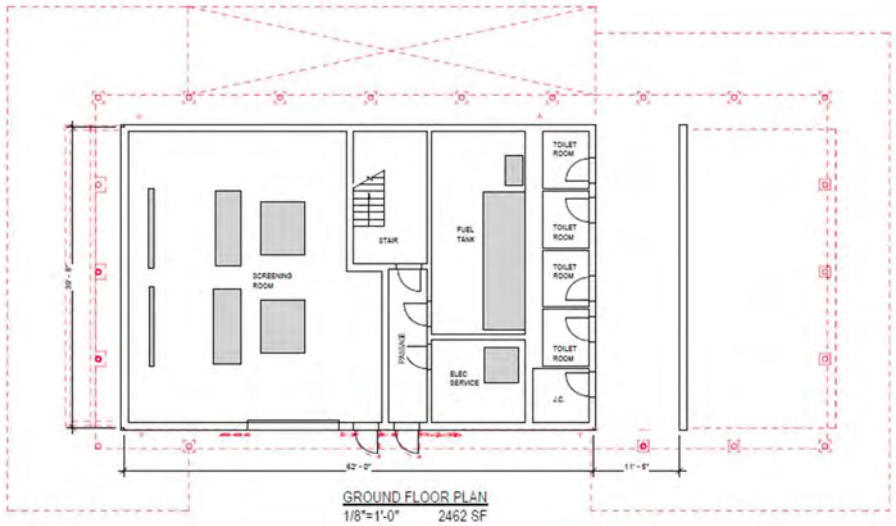




Pump Station Floorplan Reduced



74’



Building length reduced ~18-22’
(~55’ total if canopy eliminated)

Pump Station Prior Design

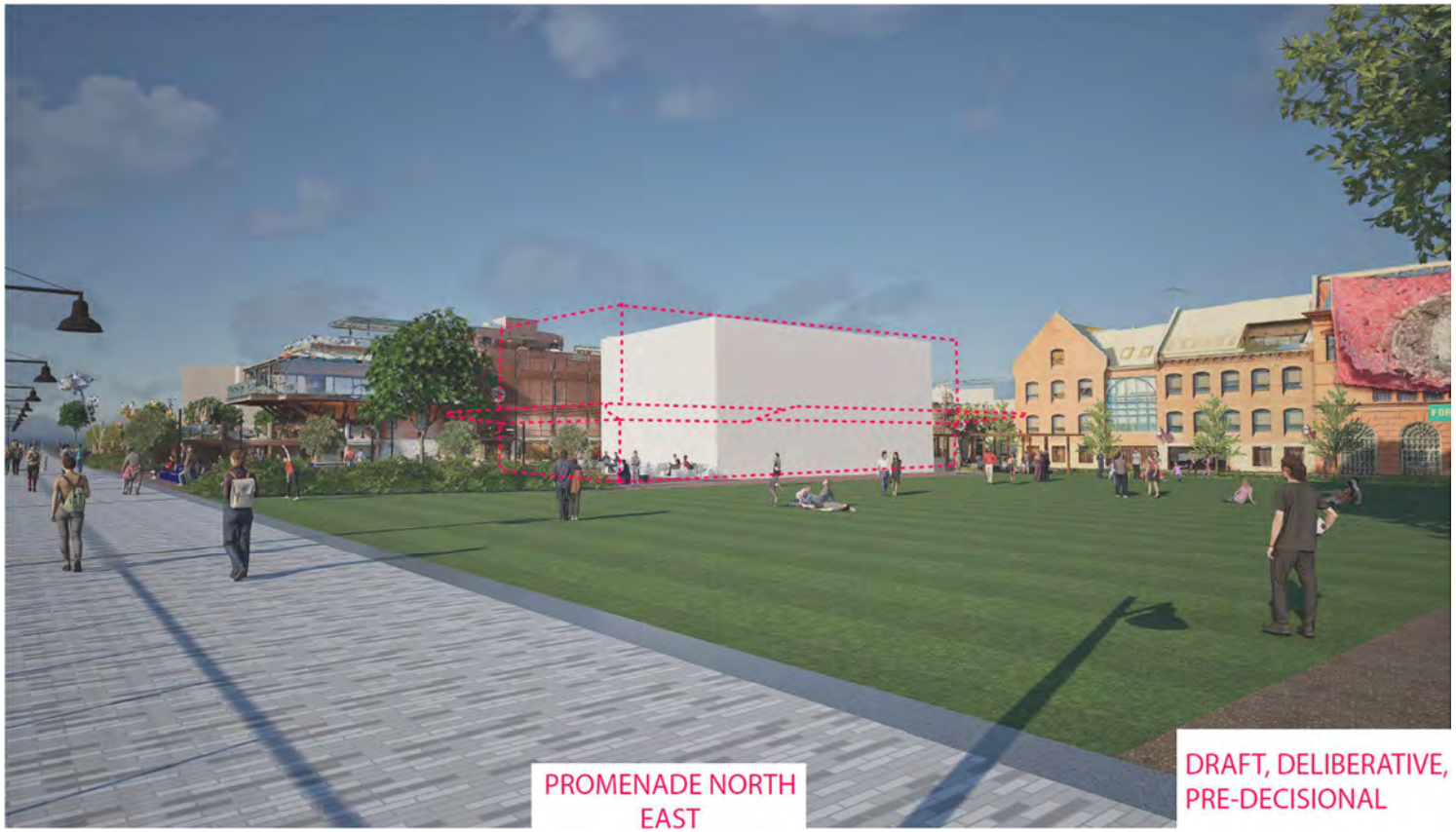
Pump Station Reduced

Pump Station Prior Design

Pump Station Reduced

Pump Station Prior Design

Pump Station Reduced



Current Pump Station Materials

COLUMNS AS A DEVICE TO REPRESENT NAUTICAL SURROUNDS

STRUCTURAL TECHTONICS AND RELATIONSHIP TO SAIL BOATS

VIEW FROM BASE OF KING STREET

SCRIM MATERIAL INSPIRATION

BOARD-FORMED CONCRETE PANEL TO REFERENCE HISTORIC CRIBBING

Open to Revisit Architecture

Green Walls

Adjacent trees and sky are reflected in the scrim to blend building and environment.

Green walls integrate planting into the facade, softening building massing while offering environmental benefits such as insulation, air filtration, and stormwater management. They can be adapted to complement both modern and historic architectural contexts.

Alternative to planter walls, a reflective material can be used to create a 'green' facade reflecting the adjacent canopy trees. (Image #2)

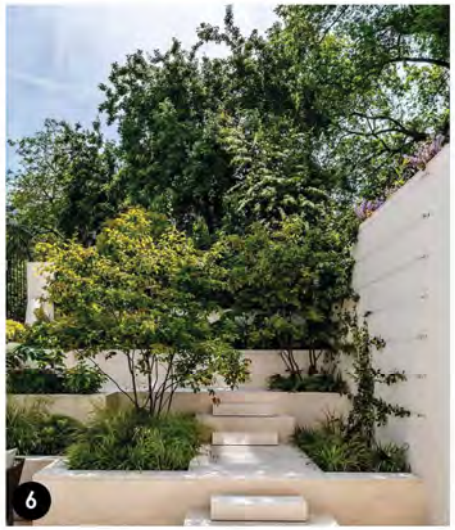
1. **Vertical Living Gallery** | Bangkok, Thailand
2. **Hayes Primary School** | Kenley, UK
3. **17 Glen Avenue** | Cape Town, South Africa
4. **Musée du Quai Branly** | Paris, France
5. **Park Plaza** | Santa Fe, Mexico City
6. **New Street Square** | London, UK
7. **Ion Orchard Residences** | Singapore

Vines

Vine-covered trellises add texture and seasonal interest to building walls, reducing visual impact and increasing air filtration and shade as a flexible, low-profile green infrastructure strategy.

1. **MFO Park** | Zürich, Switzerland
2. **Swiss RE Headquarters** | Munich, Germany
3. **Tan's Garden Villa** | Singapore
4. **The Base** | Bangkok, Thailand
5. **Biomedical Research Center** | Granada, Spain
6. **Freiburg Office Complex** | Munich, Germany

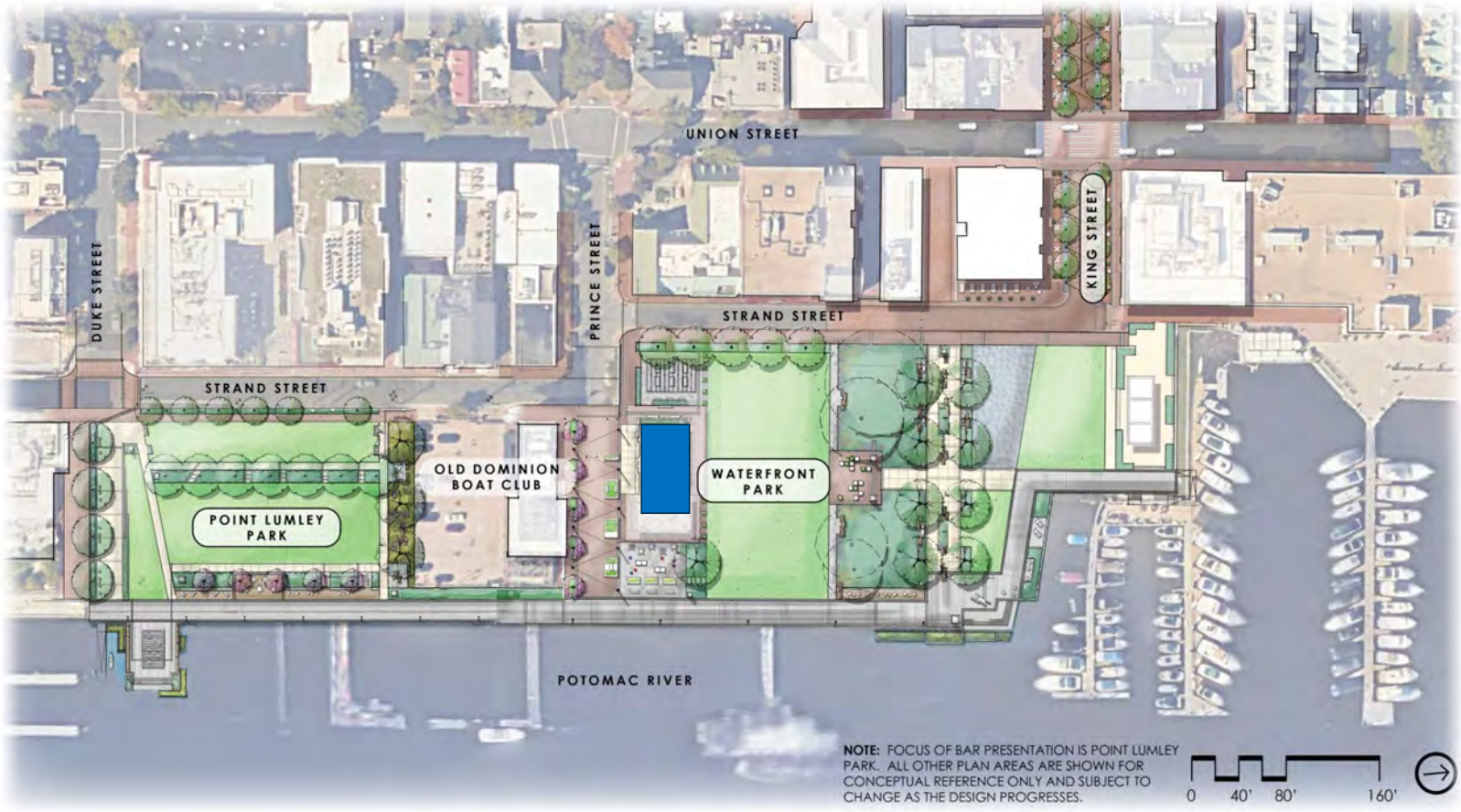
Integral Planters



Integral planters can enhance architectural storytelling, incorporate seating, and offer environmental benefits such as rainwater collection, conveyance, and filtration opportunities.

1. **Coulée verte René-Dumont** | Paris, France
2. **The Highline Spur** | New York, NY
3. **Ecological Living Module** | New York City
4. **Hooper Street** | San Francisco, CA
5. **Hilgard Garden** | Berkley, CA
6. **Townhouse** | West London, UK

Site Plan: Feedback Requested



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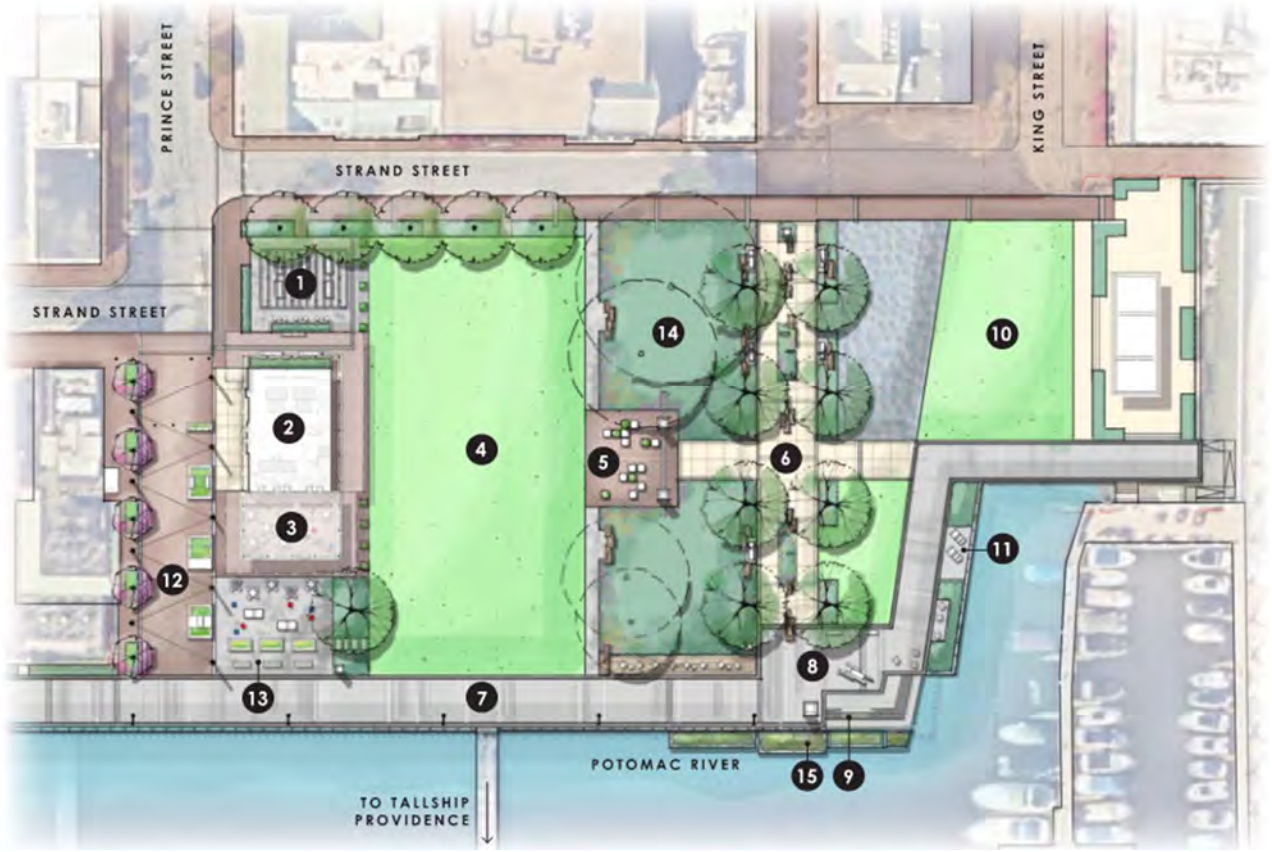

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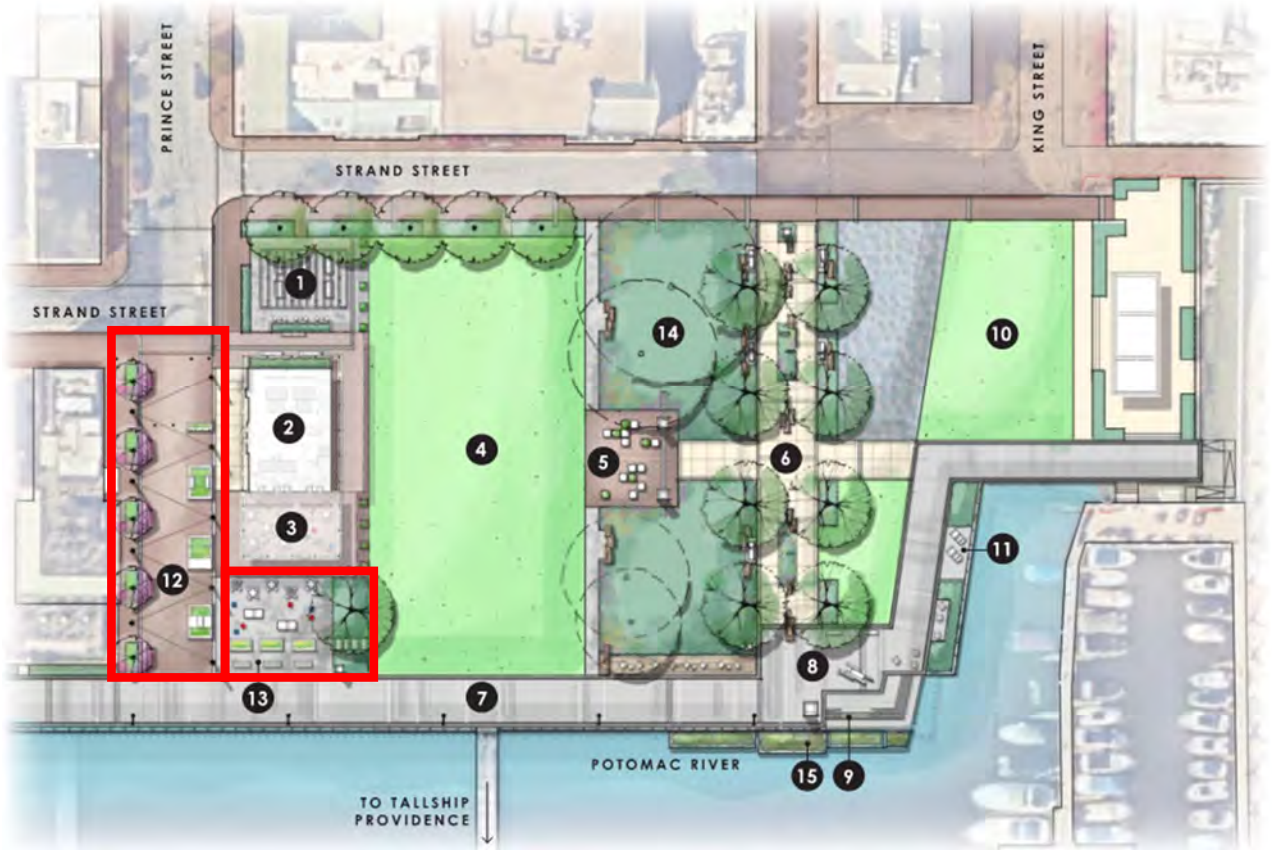

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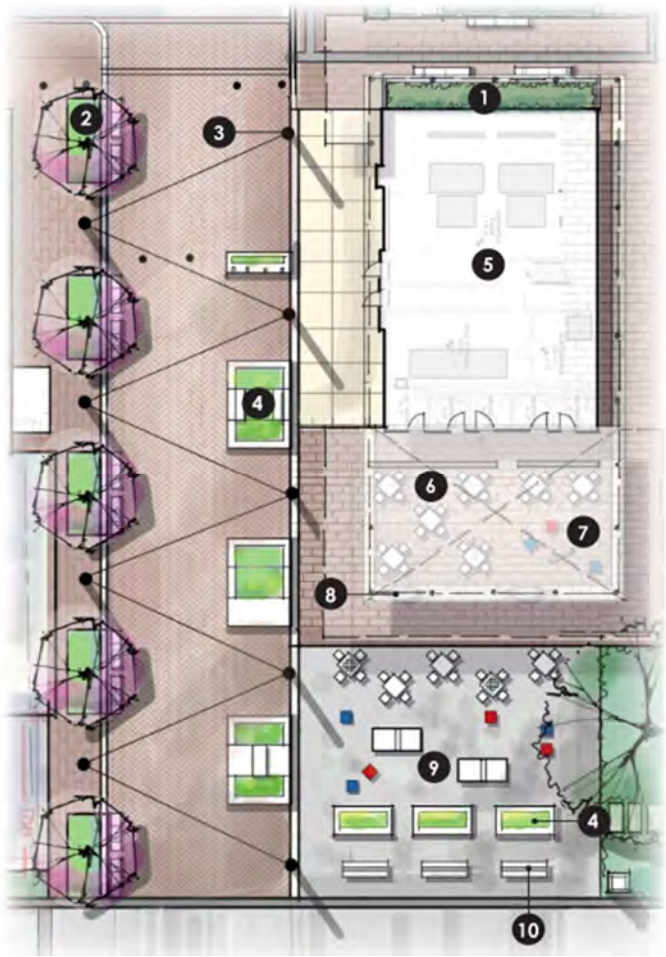
Prince Street and East Plaza



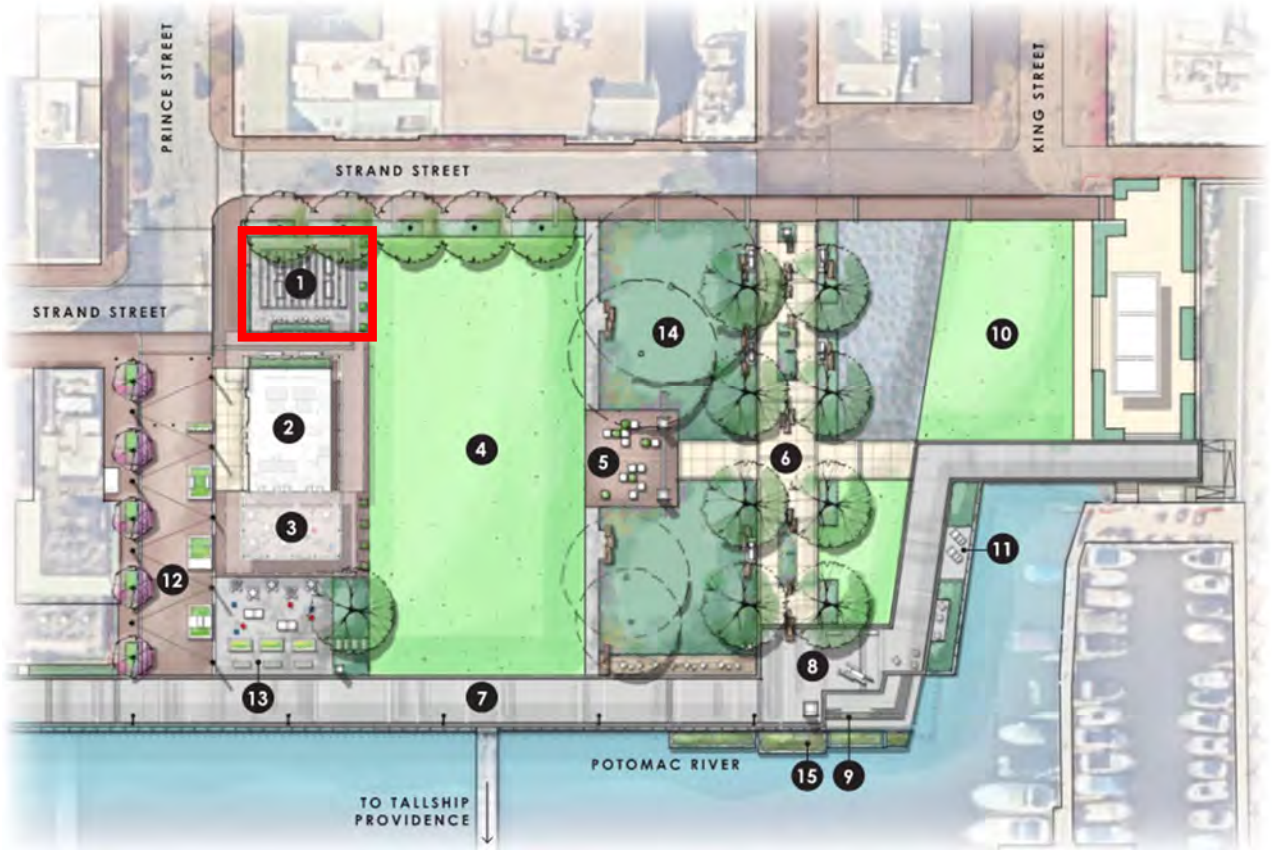
LEGEND:

1. Raised bioretention planter
2. In-ground planters + benches
3. Poles with catenary lighting
4. Movable planters with seating
5. Pump Station
6. Covered plaza / venue space with movable tables and chairs
7. Movable Connect Four game or similar with movable cube seating
8. Hammocks / swing attached to canopy (removable for events)
9. Ping pong tables
10. Specialty double-sided promenade seating






Site Plan: Feedback Requested



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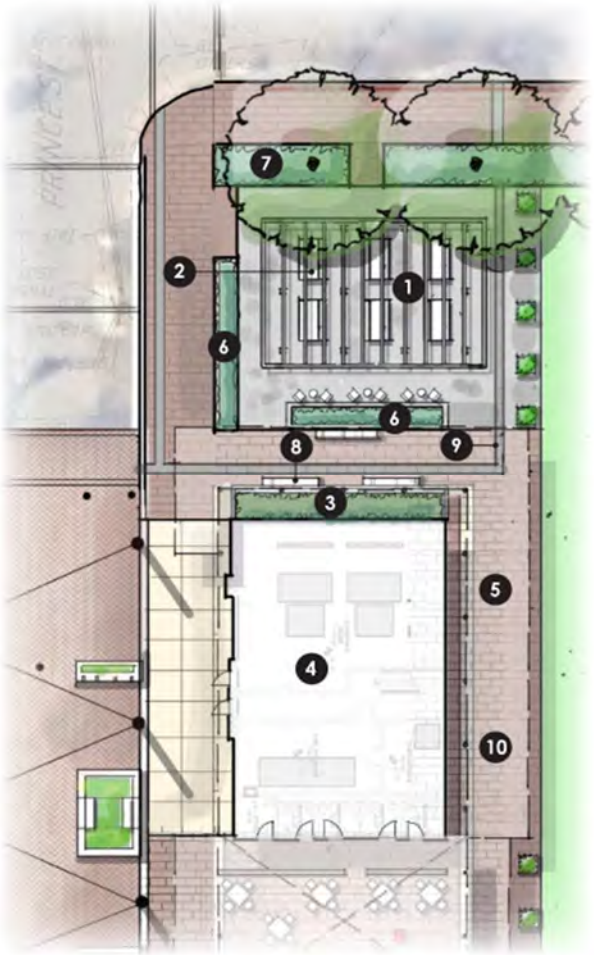
Strand Street West Plaza



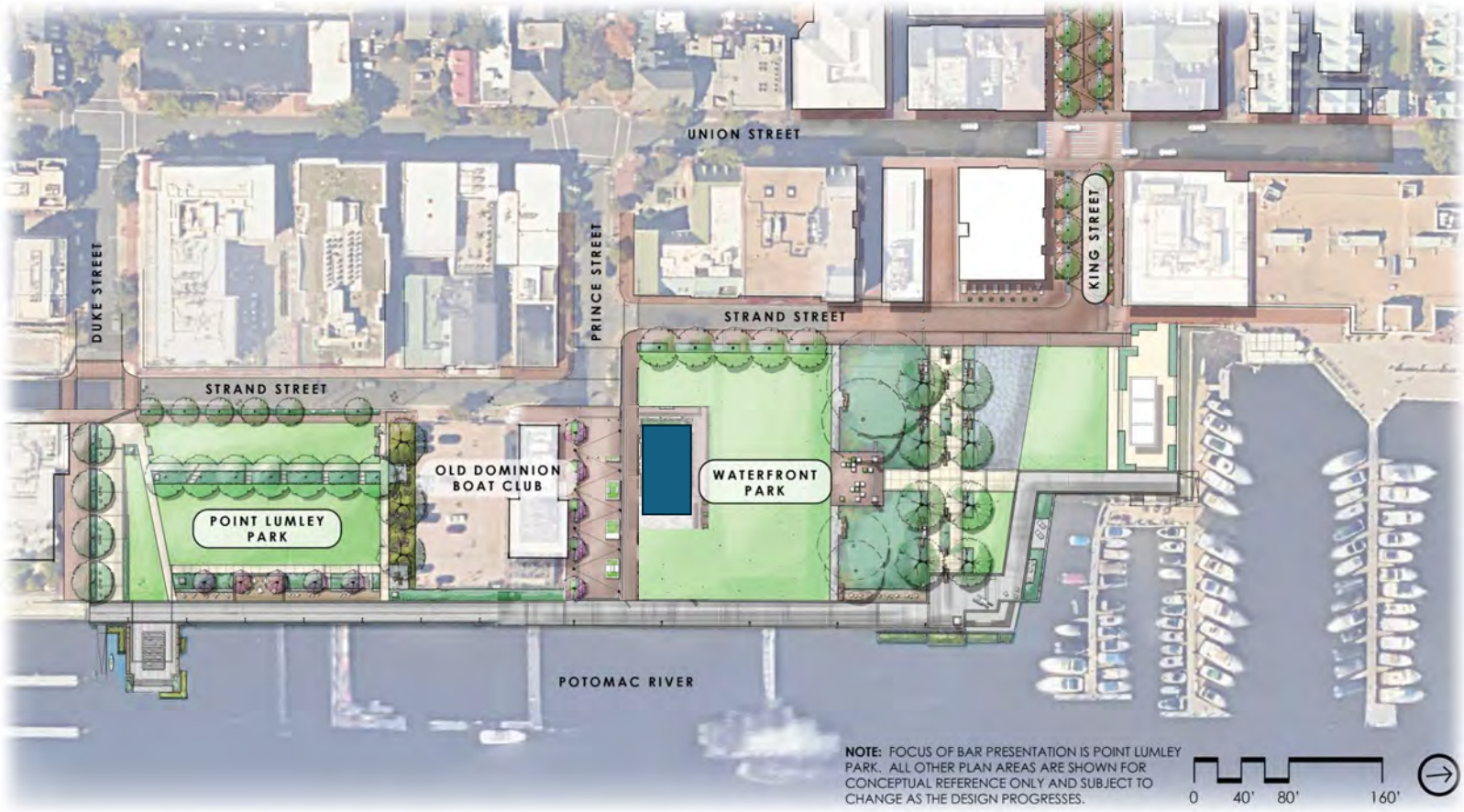
LEGEND:

1. Trellis with catenary lighting; columns to align with pump station building canopy grid
2. Picnic tables
3. Raised bioretention planter
4. Pump station
5. Pump station canopy
6. Raised planting areas
7. Planting areas at grade
8. Seating along planter walls
9. Historic 1845 shoreline banding
10. Stage / performance area






Revisit Concept Plan?



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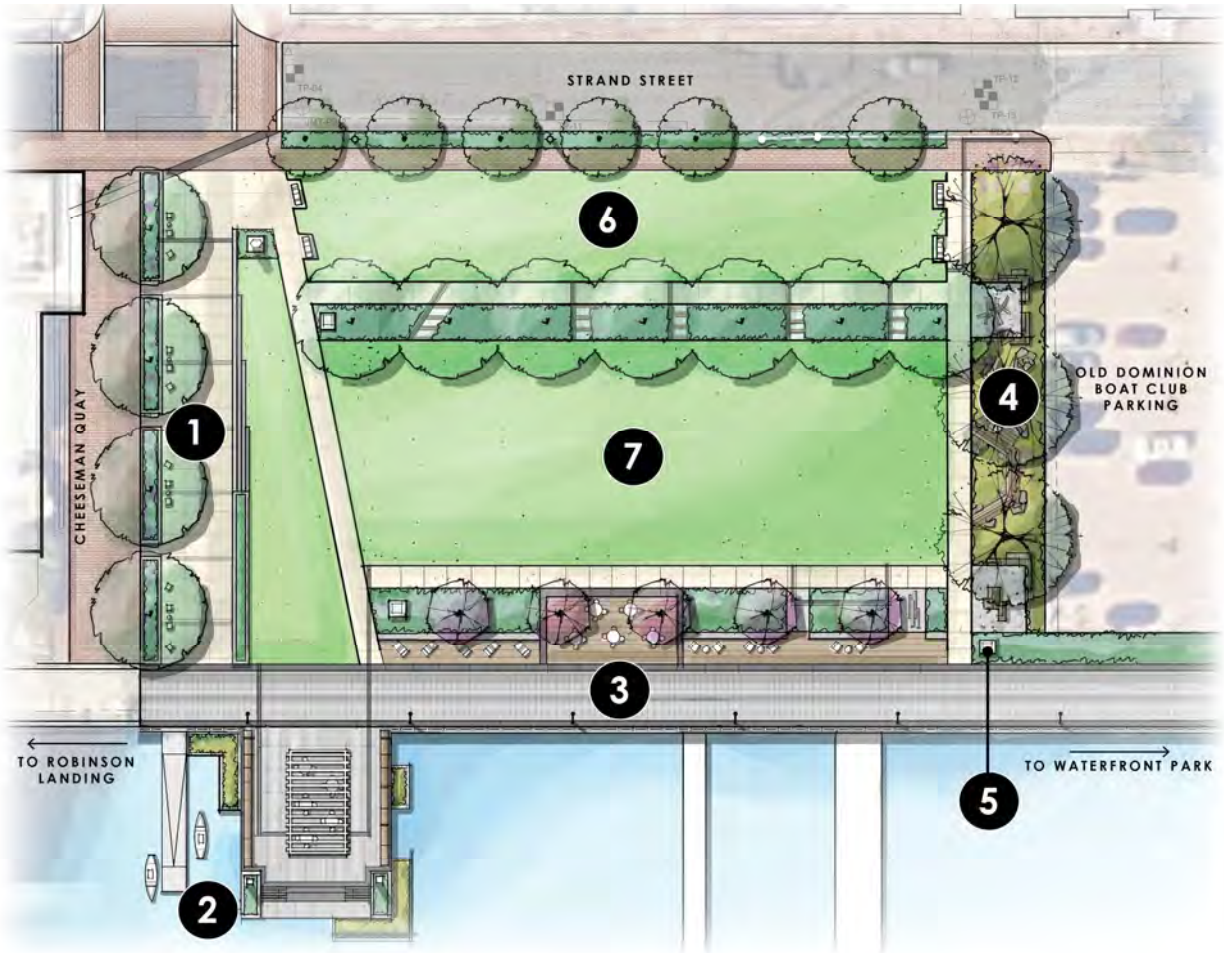


In keeping with the **Alexandria Small Area Waterfront Plan**, art, history, and storytelling will be woven throughout the park's function zones to create **unique and memorable experiences unique to Alexandria, Virginia.**

LEGEND:

1. **Shipbuilding/River Gateway walk** and lawn with feature stairs and relocated Shipbuilder statue
2. **Wharf** with signature shade structure, waterfront steps, floating wetlands, and kayak launch
3. **20' Promenade** with seating and plaza
4. **Bioretention** with boardwalk and children's play/learning nodes
5. **African American Heritage Trail** signage
6. Future **Rosenbaum bequest garden** location
7. Grand event lawn

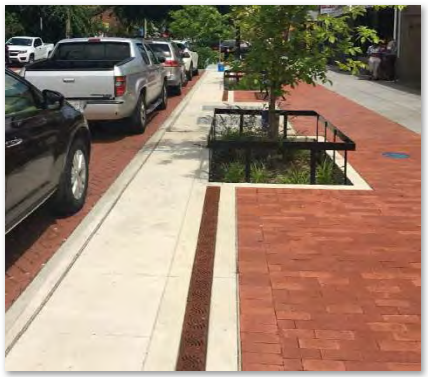
0 15' 30' 60'

Construction Considerations and Planning

- Avoid & Minimize Impacts (where feasible)
  - Sidewalks remain open
  - Thoughtful phasing of work
  - Maximum Pedestrian & Delivery Access
  - Parking Mitigation
  - Reduce construction duration (multi-shift work)
- Direct Collaboration & Communication:
  - Business-Focused Stakeholder Group
  - Business Survey and Data Collection
  - Direct outreach to individual businesses
  - Clear communication as planning continues
- Options for potential phased park closure/opening
- Transit Planning/Rerouting Options

Other ideas considered?

- Green Infrastructure
- Pervious Pavement (brick pavers – streets and sidewalks)
- Bioretention & Raingardens
- Stormwater Ponds in Parks
- Underground Storage (stormwater)
- Multiple pump stations
- Allow parks & streets to flood / Floodproof Buildings
- Deep dredging of Potomac River
- Flood barriers without a pump station
- Levee system (Army Corps)

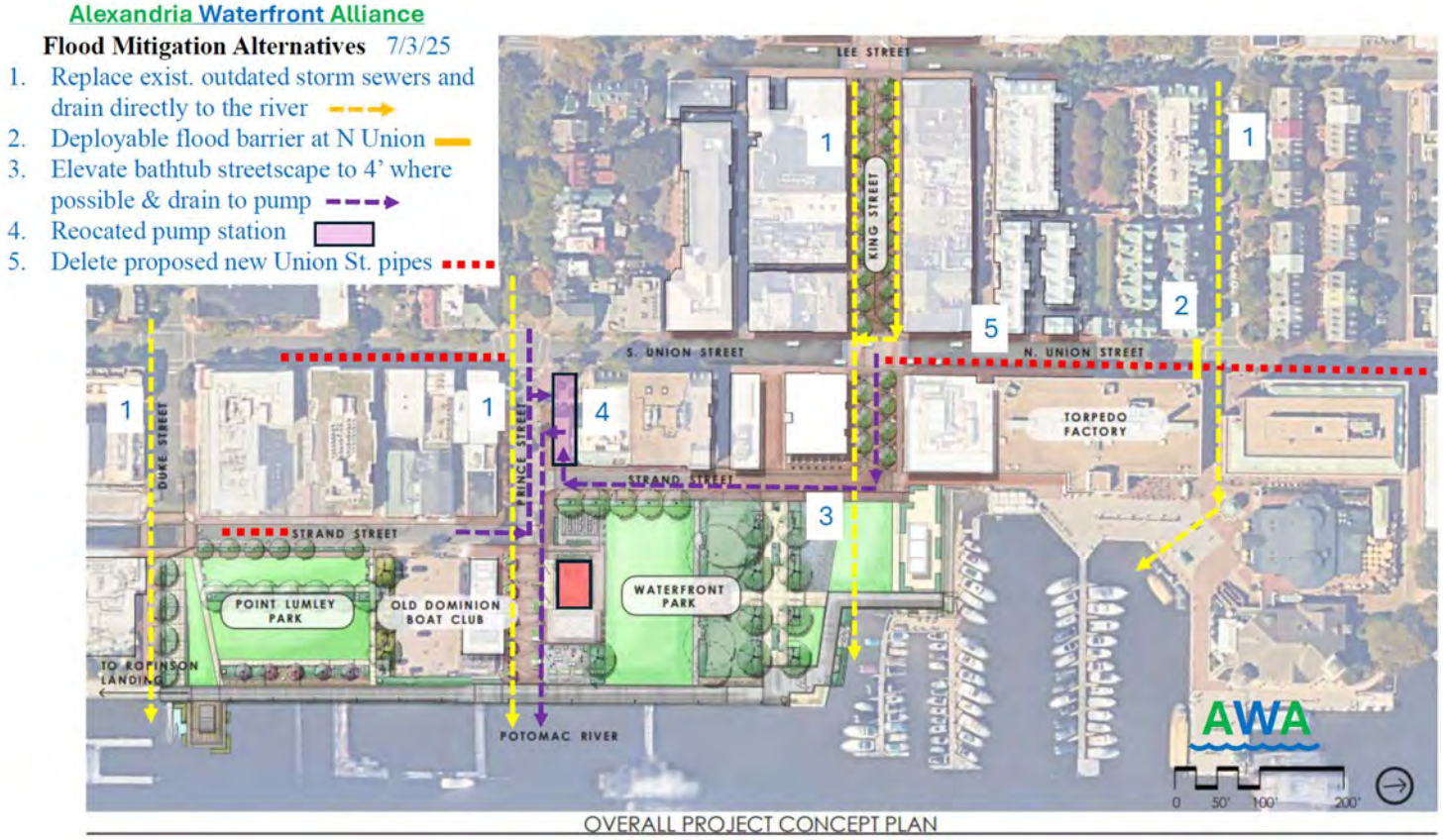


AWA Alternative Concept:

Stated Objectives

1) Reduce the size & footprint of the pump station

2) Reduce community impacts

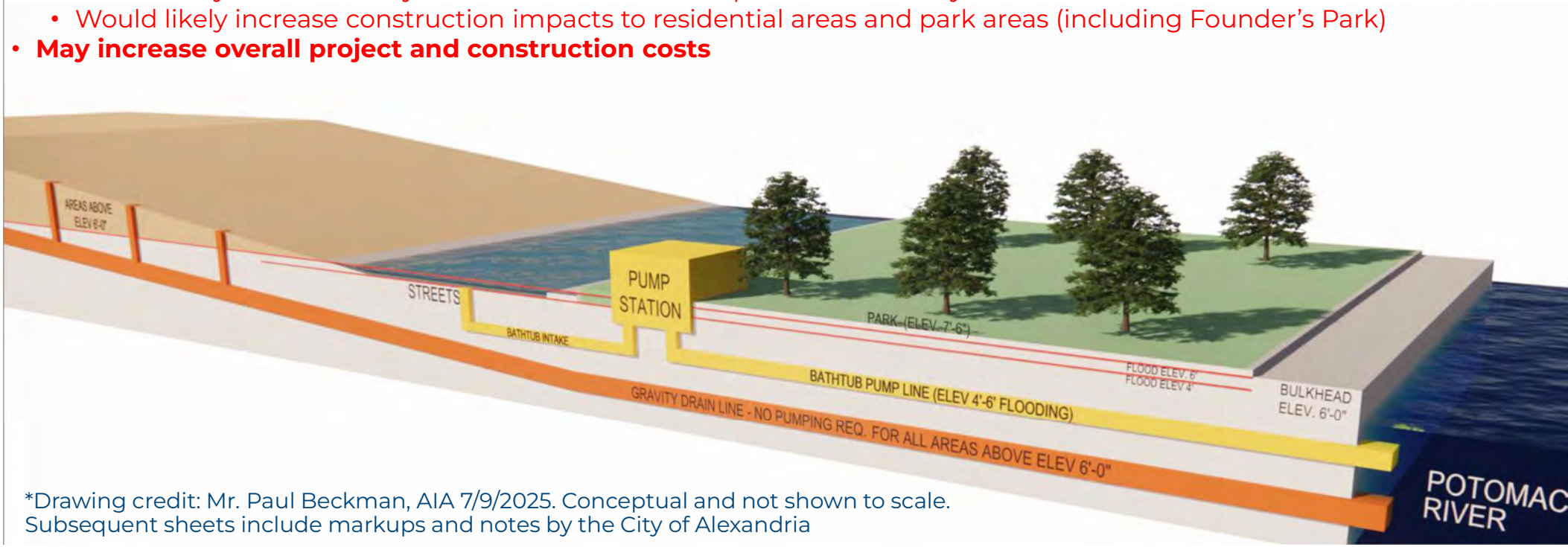


* Conceptual Drawing credit: Mr. Al Cox, AIA 7/3/2025. Subsequent sheets include markups and notes by the City of Alexandria

AWA Alternative Concept

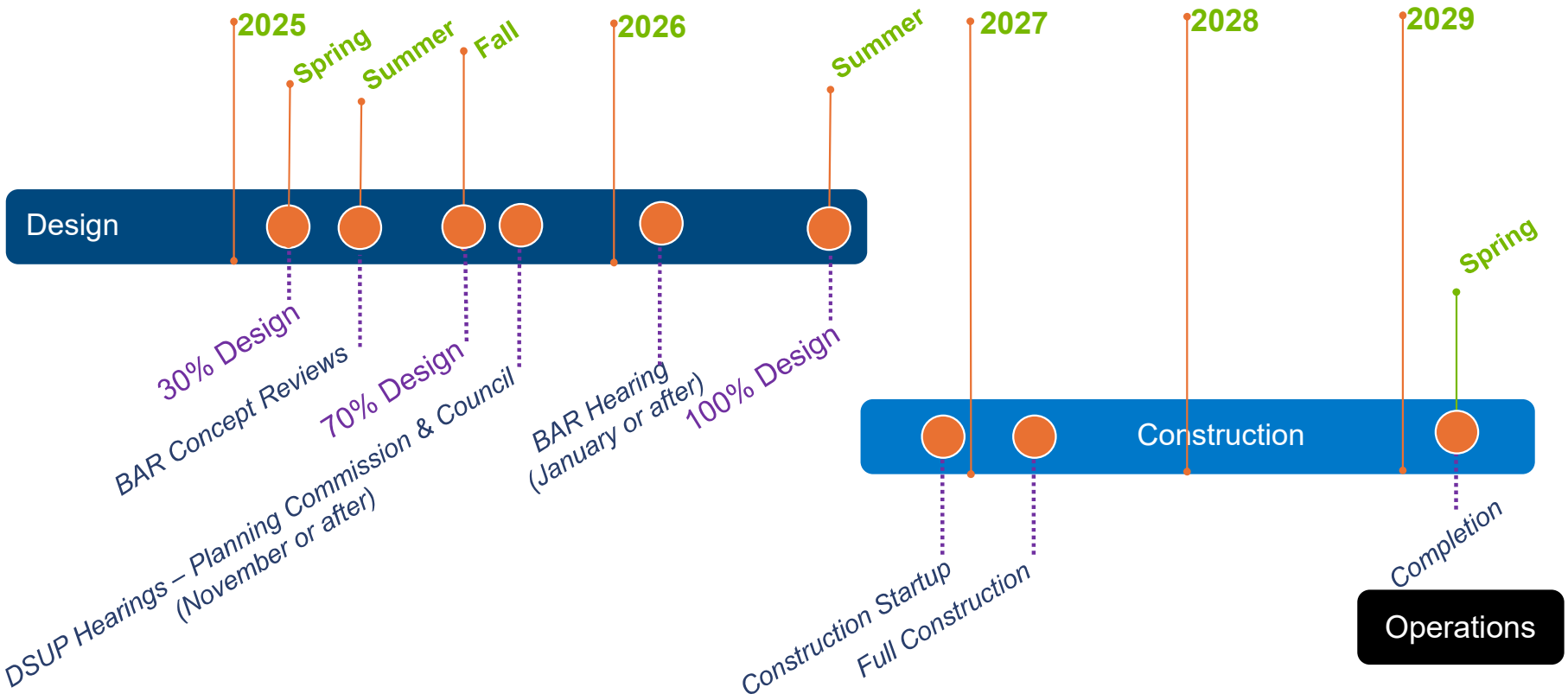
This theoretical concept proposes a dual stormwater system which, after evaluation by engineering analysis and modeling:

- **Does not substantially reduce the footprint/size of the pump station**
- **Increases construction impacts as compared to the City's current proposal:**
  - Would require deep excavations and deeper outfall structures than is feasible/sustainable
  - Would still require phased street closures and significant pipe replacement/installation
  - Would likely increase utility conflicts and street disruption due to utility relocations
  - Would likely increase construction impacts to residential areas and park areas (including Founder's Park)
- **May increase overall project and construction costs**



*Drawing credit: Mr. Paul Beckman, AIA 7/9/2025. Conceptual and not shown to scale.
Subsequent sheets include markups and notes by the City of Alexandria

Anticipated Schedule



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CITY OF ALEXANDRIA

Discussion:

- How can we be successful together?
- What ways can we best communicate, collaborate, and share info?
- What concerns haven't we heard or addressed yet?

Project Information & Updates

- Participate in upcoming Business-Owner Stakeholder Meetings
- https://www.alexandriava.gov/Waterfront
- Email Project Manager: Matthew.Landes@AlexandriaVA.gov

- Signup for Updates and Newsletter:

- Signup for Alexandria eNews:
  - Go To Planning & Zoning category
  - Select “Waterfront Planning”

Reference

The Number of Overtopping Events Continues to Increase

Potomac River Surface Elevation Flooding Analysis Over Time At Prince Street/Waterfront	Prince Street-End (Elev. 2.4)	Bulkhead at Waterfront (Elev. 3.0)
In the Last 20 Years, we've seen an average of	145 events/yr	37 events/yr
In the Last 5 Years, we've seen an average of	185 events/yr	48 events/yr
In the Last 2 Years, we've seen an average of	194 events/yr	54 events/yr
In the Last 1 Year, we've seen...	227 events/yr	93 events/yr
By Year 2100, we anticipate...	353 events/yr	341 events/yr

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Alternative Pump Station Location Evaluation

1. **110 S Union**
2. **1 Prince Street**
3. **2&6 Prince Street**
4. **Point Lumley Park**
5. **Foot of Prince Street**

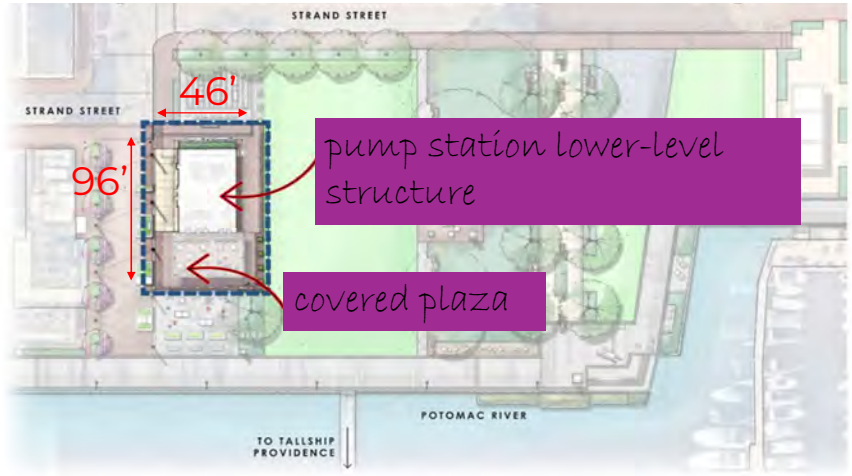
(locations suggested for evaluation by stakeholders)

AWA Alternative Concept:

Pump Station Size Constraints

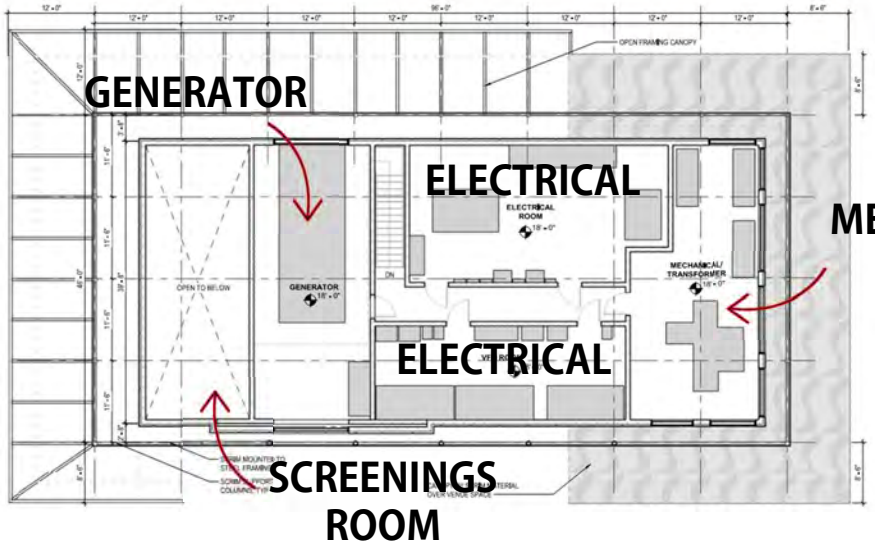
Waterfront Park Pump Station

Explaining the Numbers



The Pump Station footprint is approx. 96' x 46' (4,420 SF).

On the lower level, the footprint includes a covered plaza supporting a portion of the second story.



MECHANICAL/HVAC

The second floor sets the building footprint.

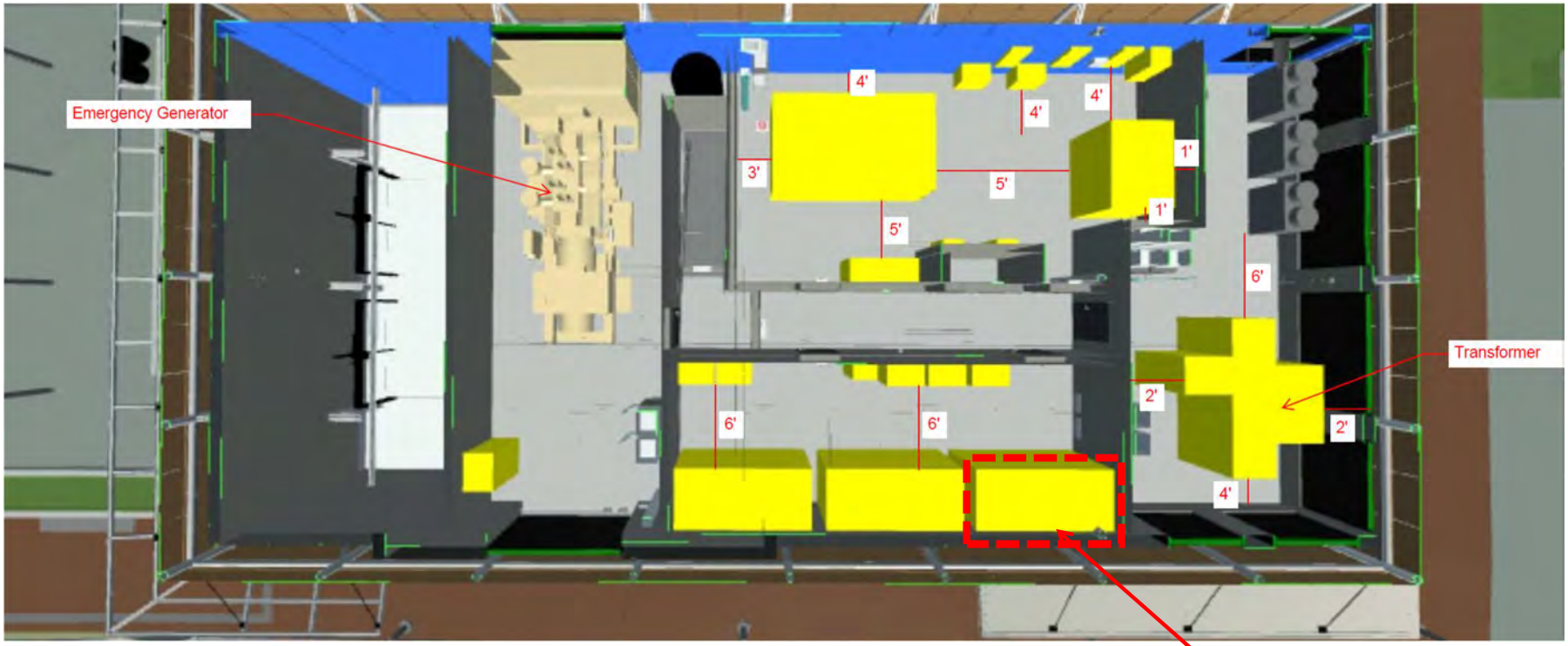
These rooms are fundamental to the operation of any pump station, regardless of flow/capacity.

AWA Alternative Concept:

Pump Station Size Constraints

Minimum Clearance Requirements per NEC and/or Equipment Manufacturer

Meeting the requirements prevents the 2nd floor from being reduced, even with the elimination of a VFD Pump Controller.

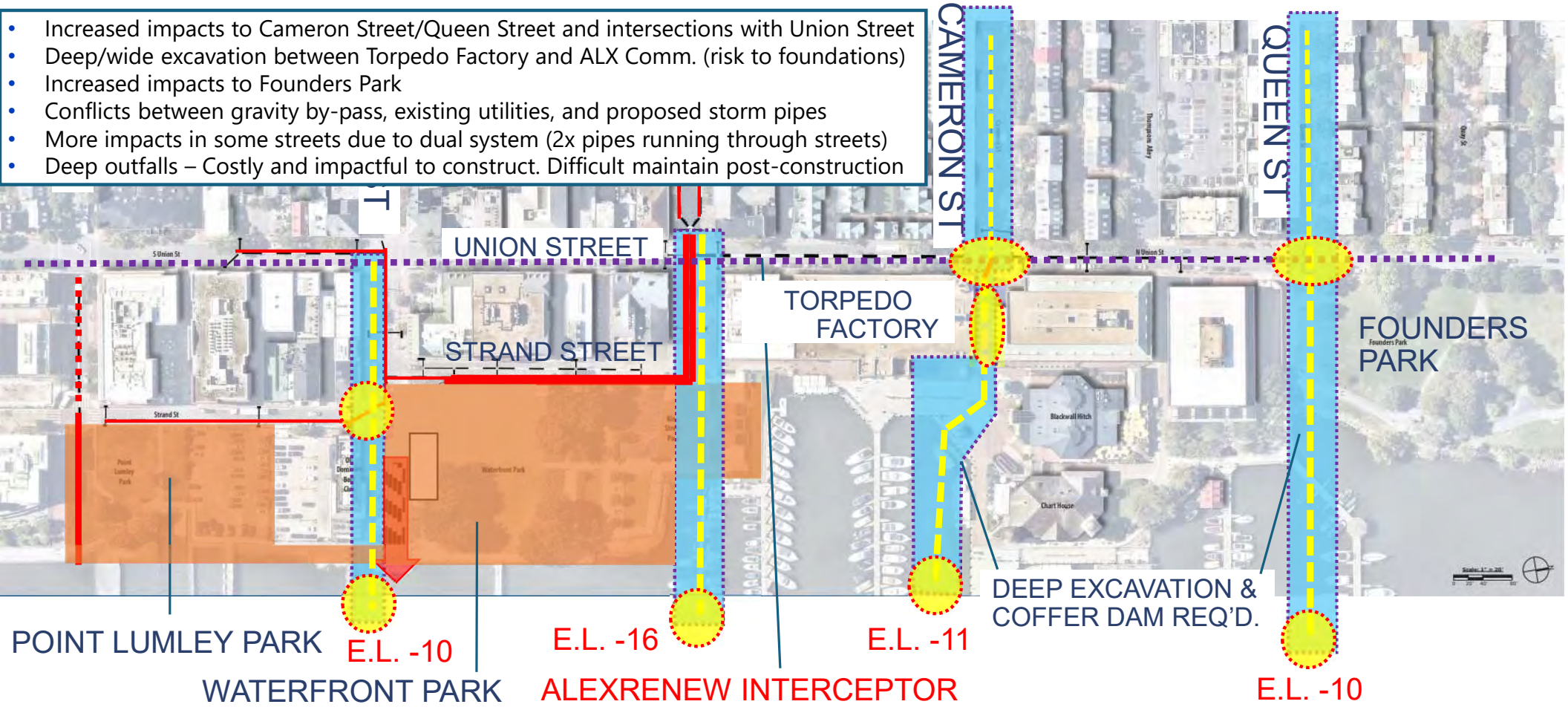


Even if we could reduce pump station pumping capacity by 50% (to ~ 115 MGD) - only one Pump/**VFD Pump Controller** would be eliminated.
This will not substantially reduce the size of the pump station as suggested by AWA.

Impacts of AWA Alternate Concept

This approach would be more impactful than the City's proposal.
Would still require deep excavation, long-term street closures, and additional impacts to street ends and park areas (including Founder's Park)

- Increased impacts to Cameron Street/Queen Street and intersections with Union Street
- Deep/wide excavation between Torpedo Factory and ALX Comm. (risk to foundations)
- Increased impacts to Founders Park
- Conflicts between gravity by-pass, existing utilities, and proposed storm pipes
- More impacts in some streets due to dual system (2x pipes running through streets)
- Deep outfalls – Costly and impactful to construct. Difficult maintain post-construction

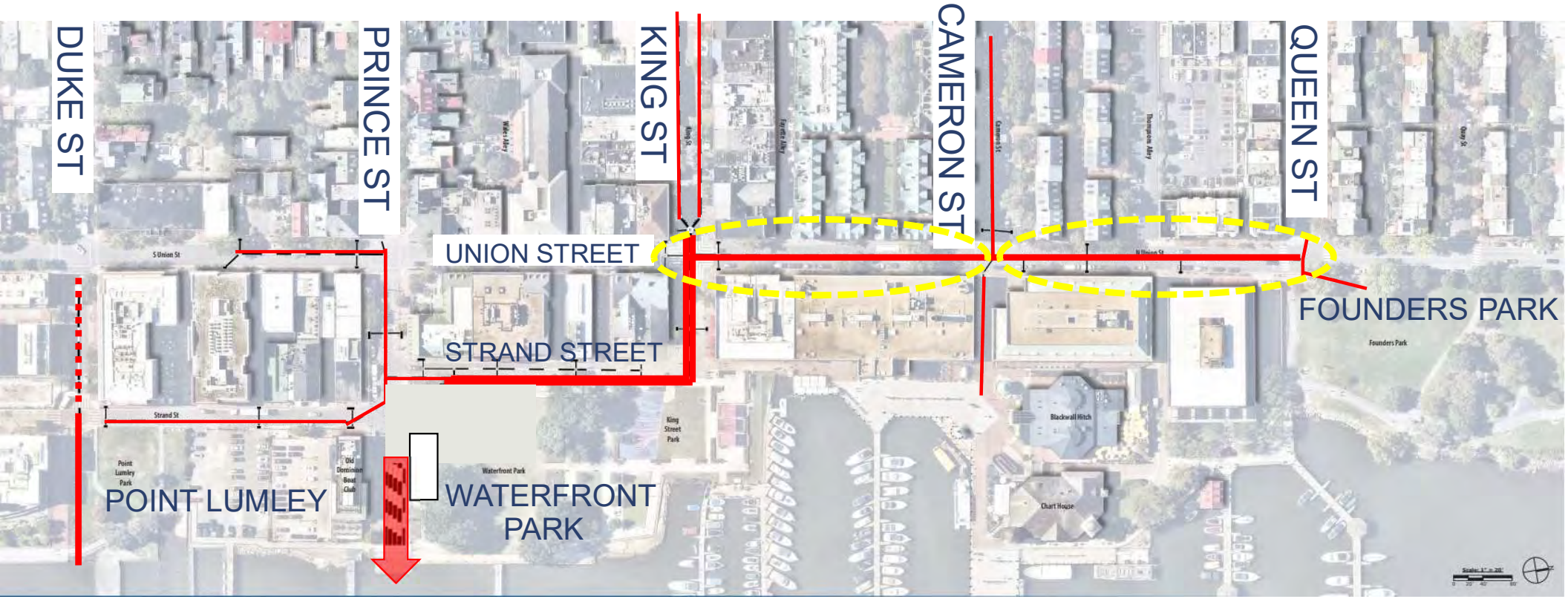


Impacts of AWA Alternate Concept: Deep Excavation and Coffer Dam (example)

***The required trench would be narrower than the example shown as only one pipe segment would be required.**

Draft, Deliberative, Pre-Decisional

Stormwater Infrastructure Plan



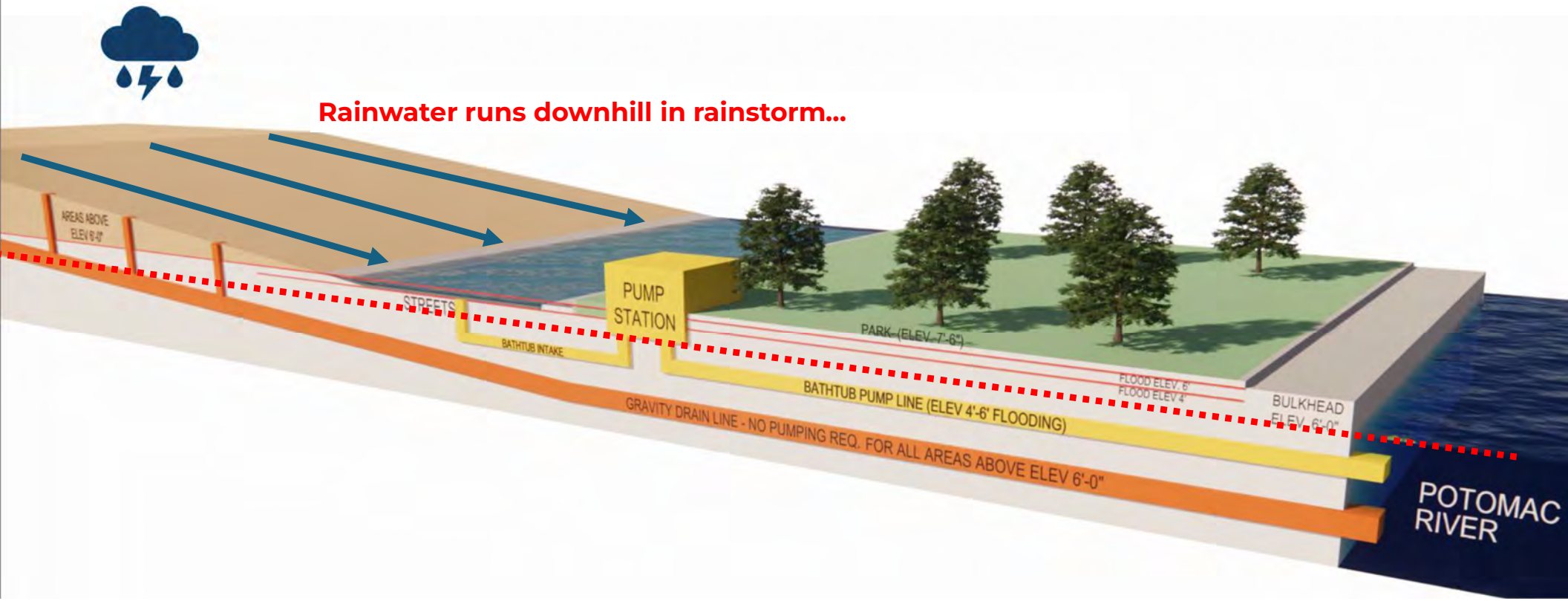
Avoidance, Minimization, & Mitigation Ideas

- Avoid & Minimize Impacts (where feasible)
- Thoughtful phasing of work
- Maximum Pedestrian & Delivery Access
- Parking Mitigation
- Potential phased park closure/opening
- Evaluate financial mitigation
- Transit Planning/Rerouting
- Reduce construction duration (multi-shift work)
- City Purchasing Partnerships
- Public Art, Special Events and Festivals

- Direct Collaboration & Communication:
  - Business-Focused Stakeholder Group
  - Business Survey and Data Collection
  - Direct outreach to individual businesses
  - Clear communication as planning continues

AWA Alternative Concept:

Capacity Constraints



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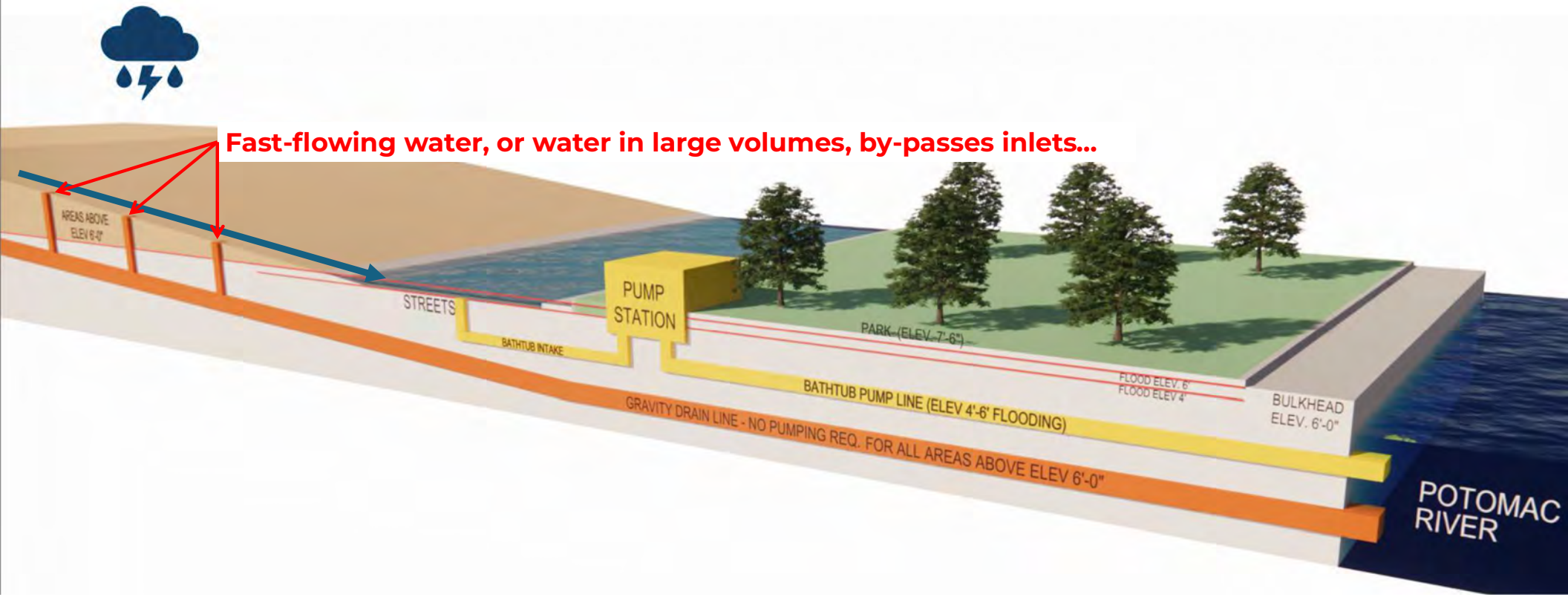
Capacity Constraints



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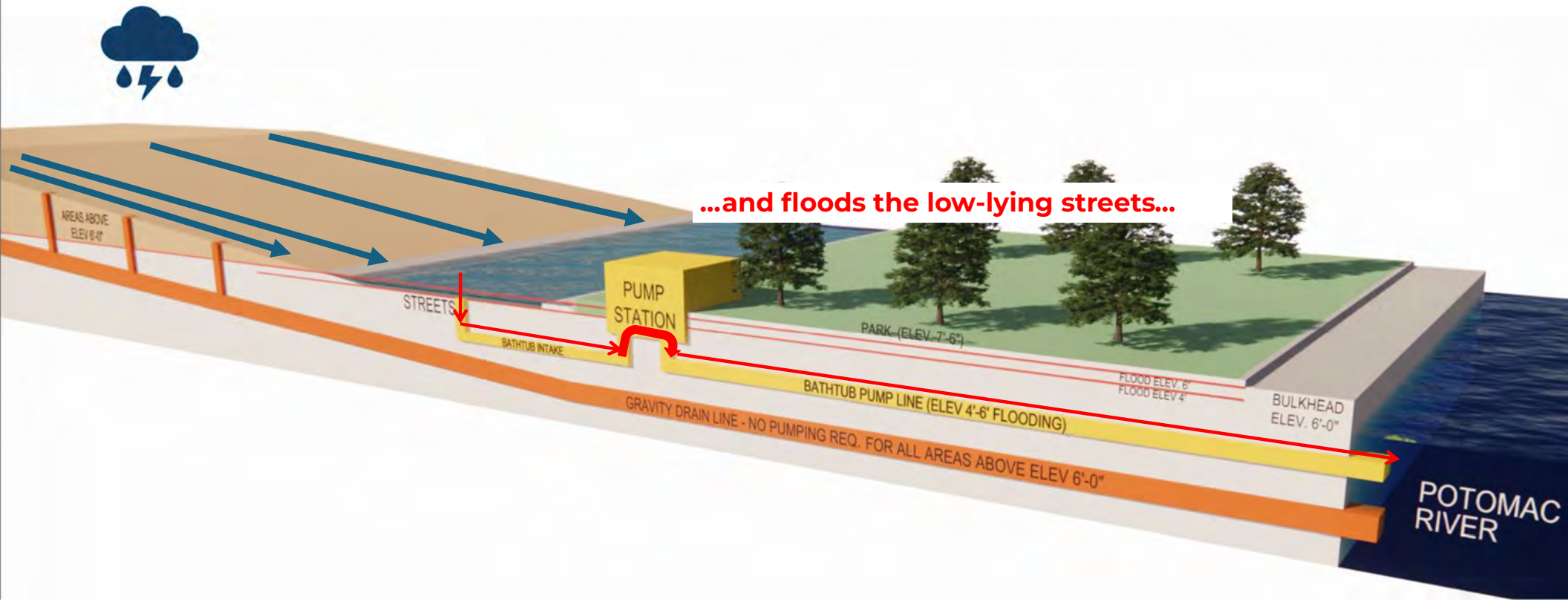

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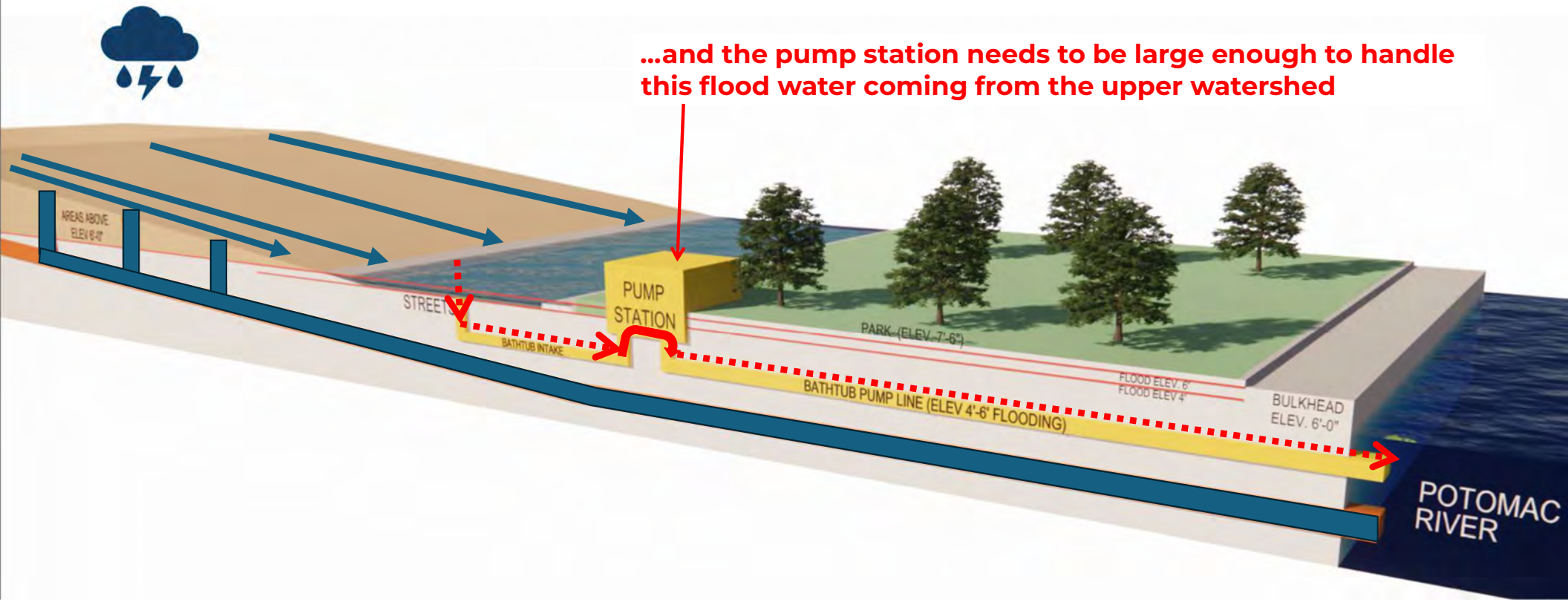
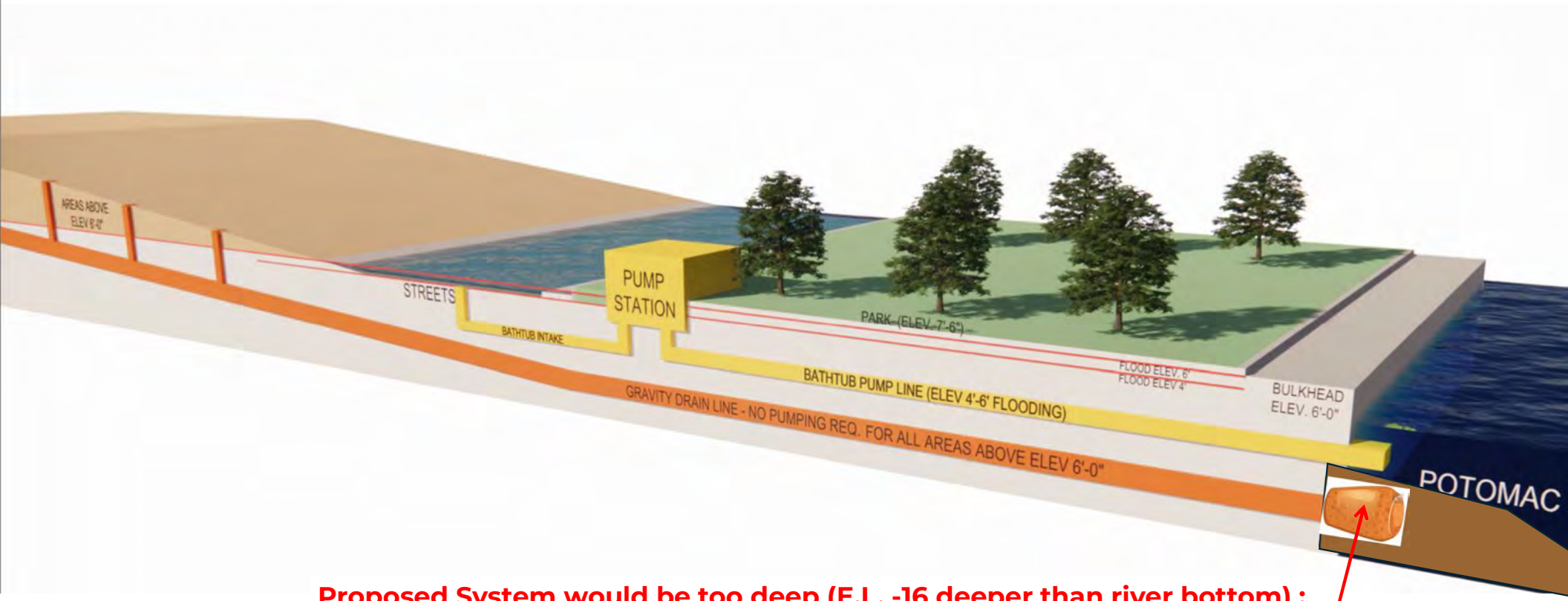


AWA Alternative Concept:

Gravity System & Tailwater Constraints



Proposed System would be too deep (E.L. -16 deeper than river bottom) :
Force of Potomac River and mudline will act like a giant drain plug

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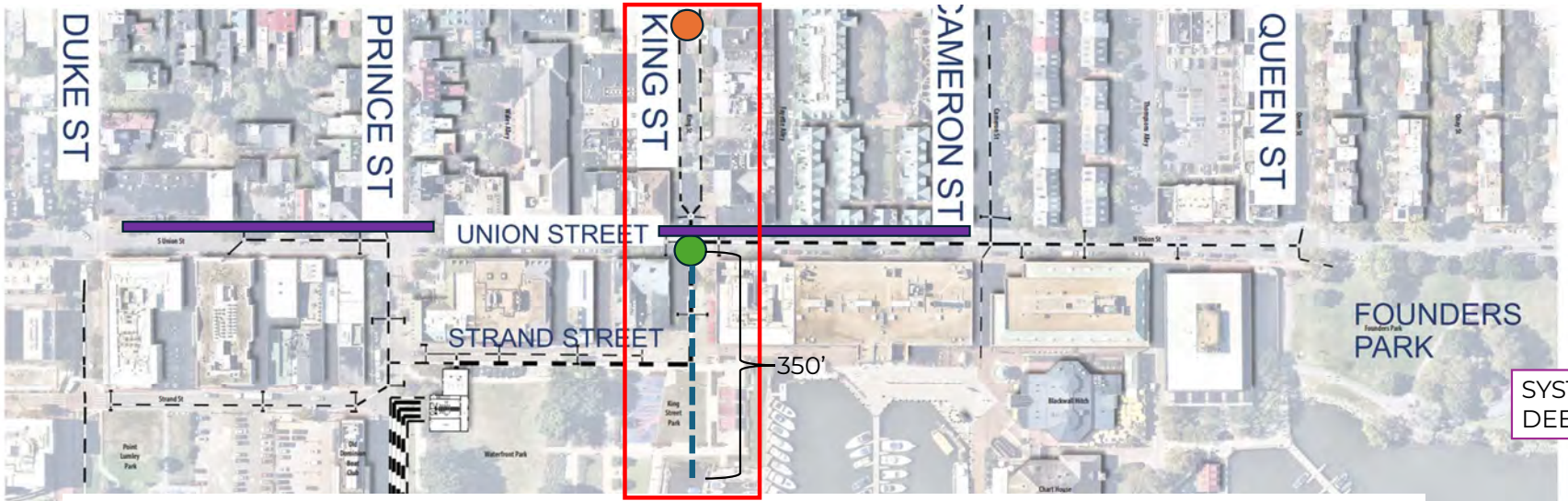


SYSTEM WOULD BE TOO DEEP TO DRAIN

EXISTING ALEXRENEW SANITARY INTERCEPTOR

Potomac River

BULKHEAD El. +6 FT

TOP OF WATER El. +2 FT

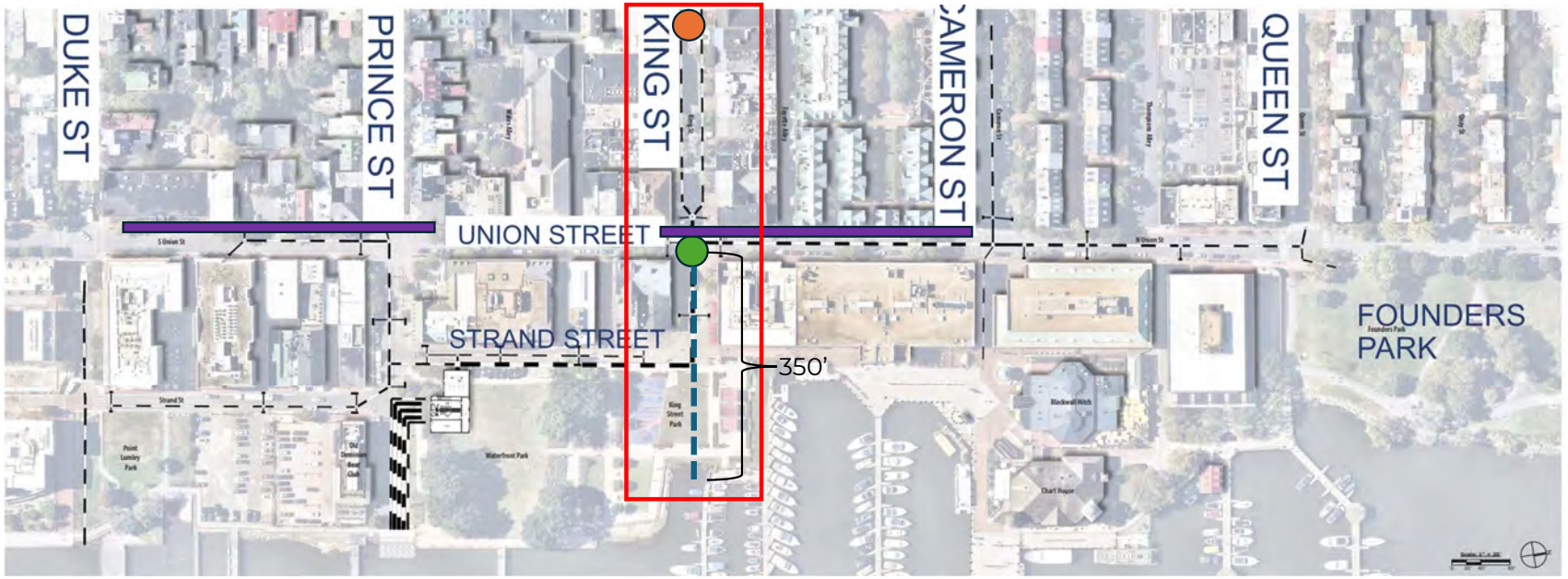
RIVERBOTTOM El. -2 FT

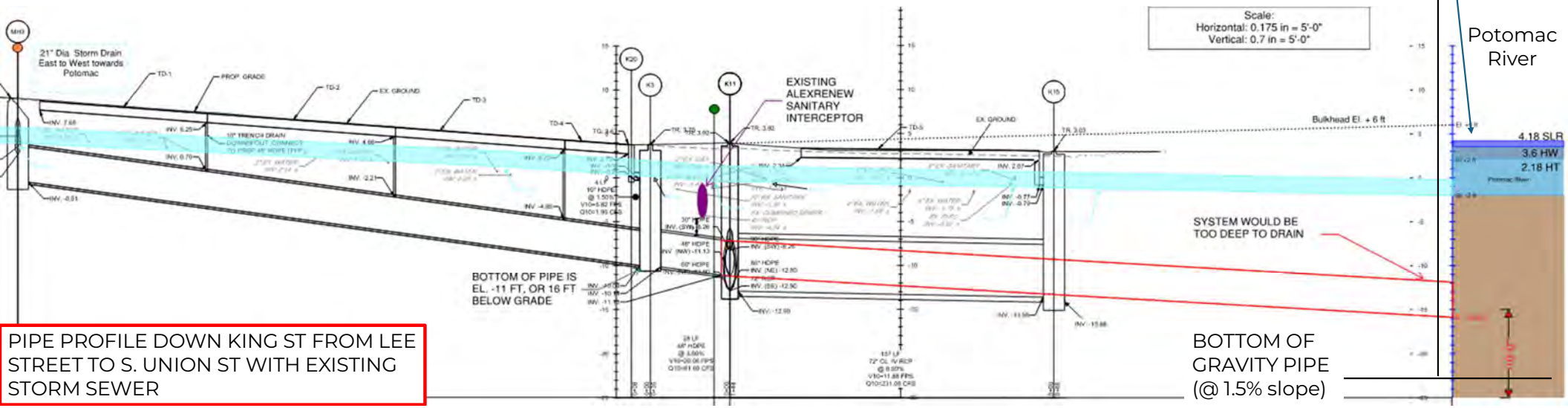
El. -16 FT

BOTTOM OF GRAVITY PIPE (@ 1.5% slope)

BOTTOM OF PIPE IS EL. -11 FT, OR 16 FT BELOW GRADE

PIPE PROFILE DOWN KING ST FROM LEE STREET TO S. UNION ST





Current Average High Tide (HT), High Water (HW), and Sea Level Rise (SLR)

Potomac River

PIPE PROFILE DOWN KING ST FROM LEE STREET TO S. UNION ST WITH EXISTING STORM SEWER

BOTTOM OF GRAVITY PIPE (@ 1.5% slope)

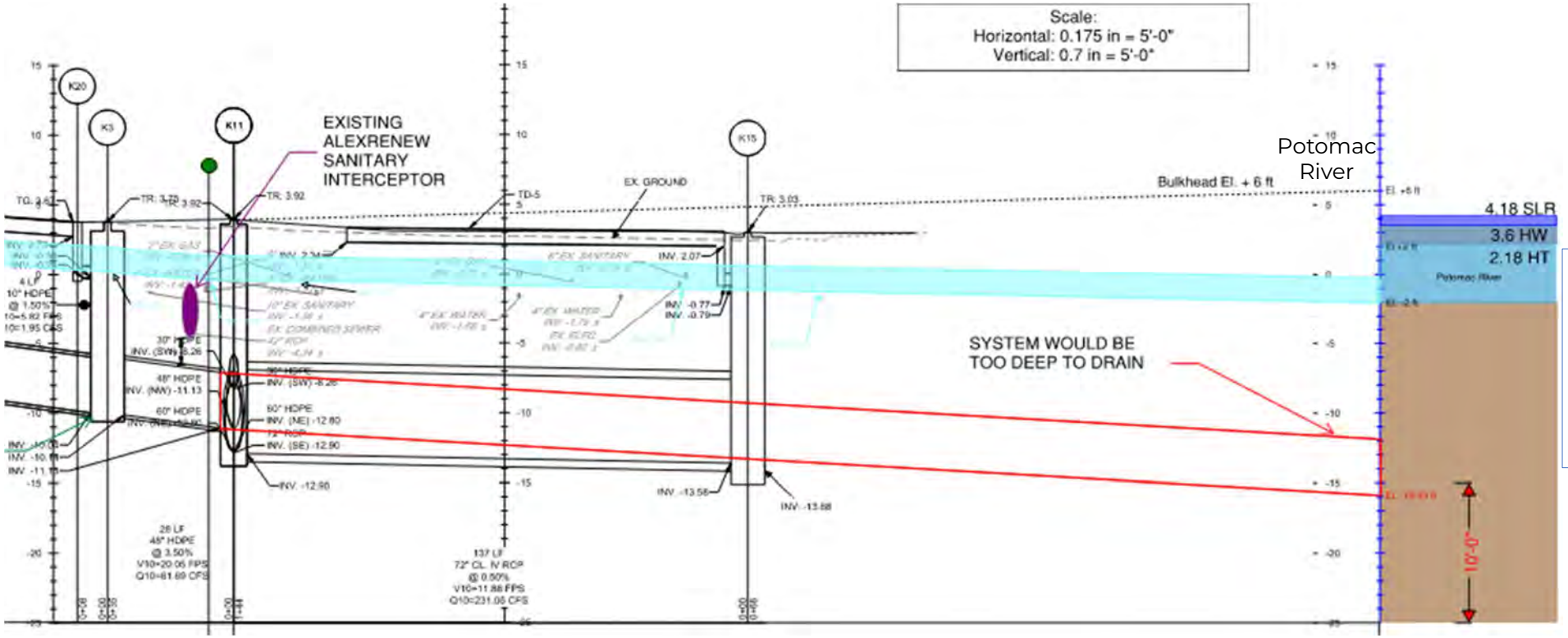
Challenges with replacing existing storm sewer in-kind

Capacity of existing storm sewer was not designed for current City design standards and is undersized.

Replacing in-kind with same size storm sewer will not alleviate current flooding issues.

A larger storm sewer will not be able to be routed over the AlexRenew combined sewer.

Significant dredging would be required to install a larger storm sewer and outfall at depths below the AlexRenew combined sewer.



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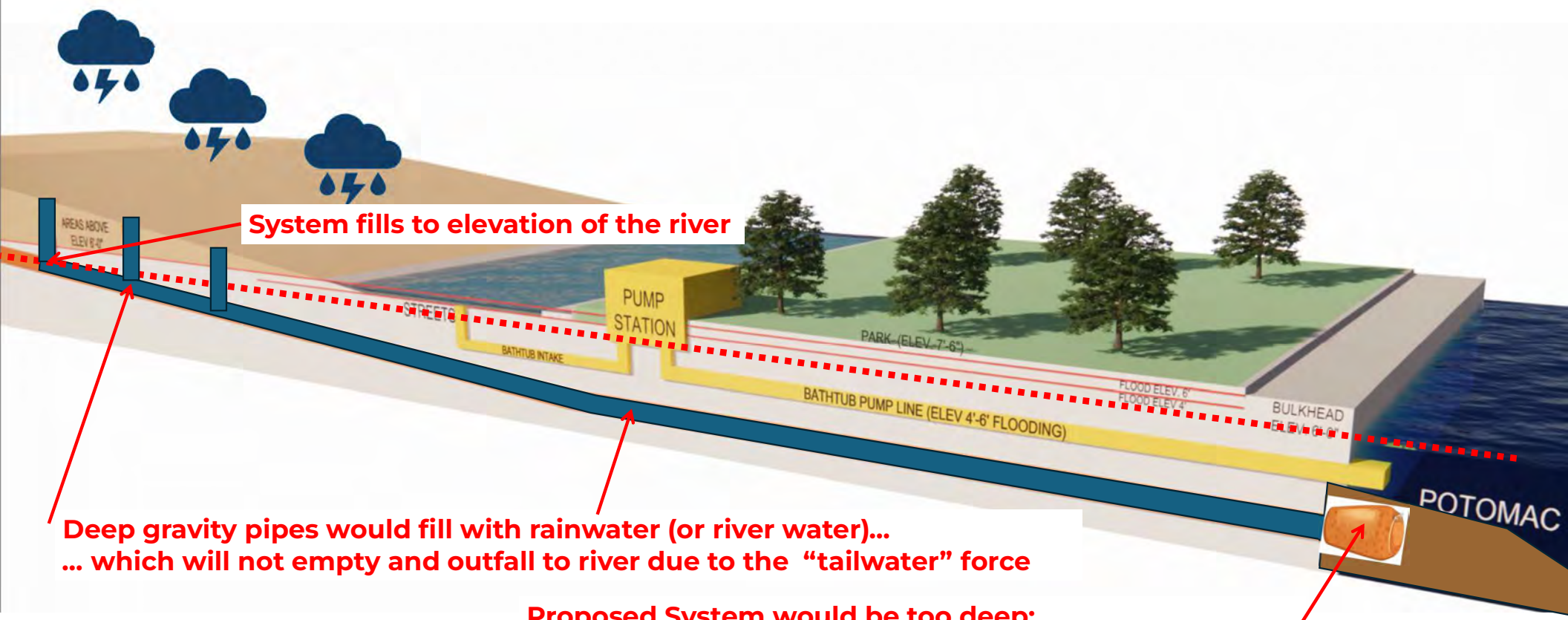
Gravity System & Tailwater Constraints



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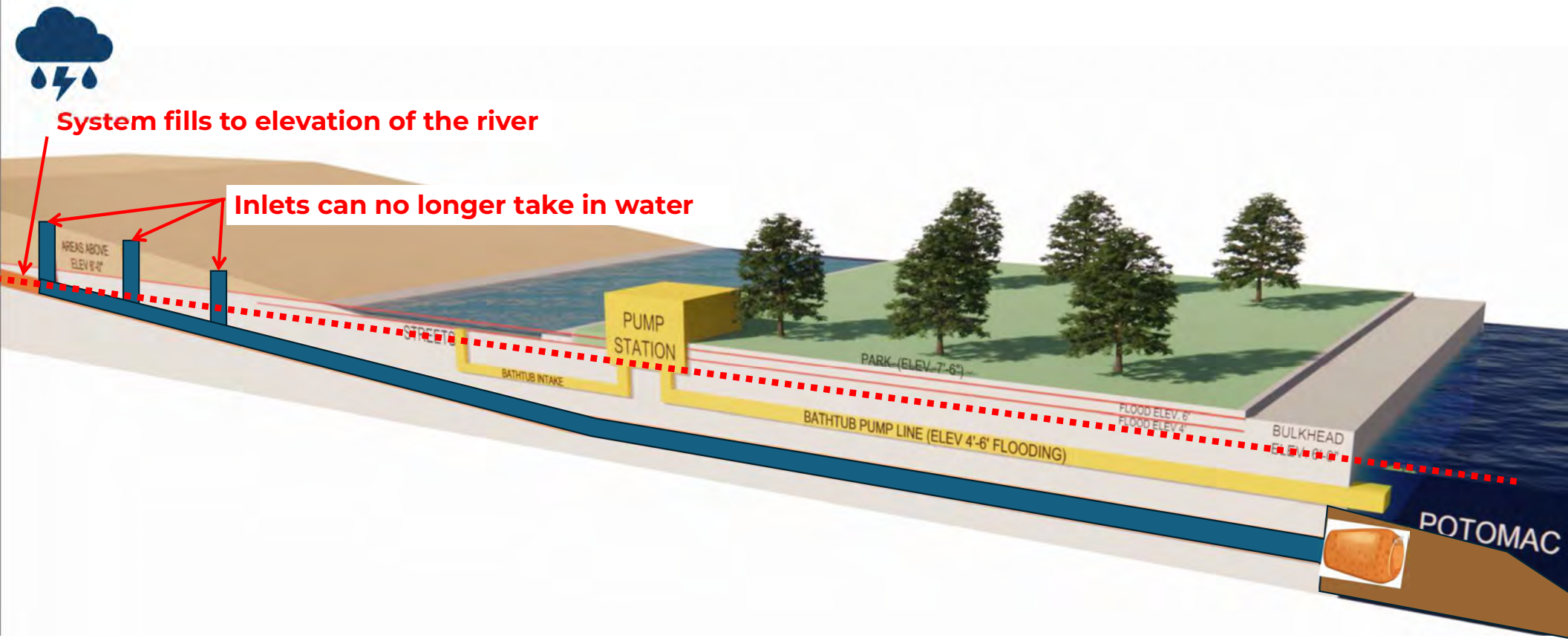

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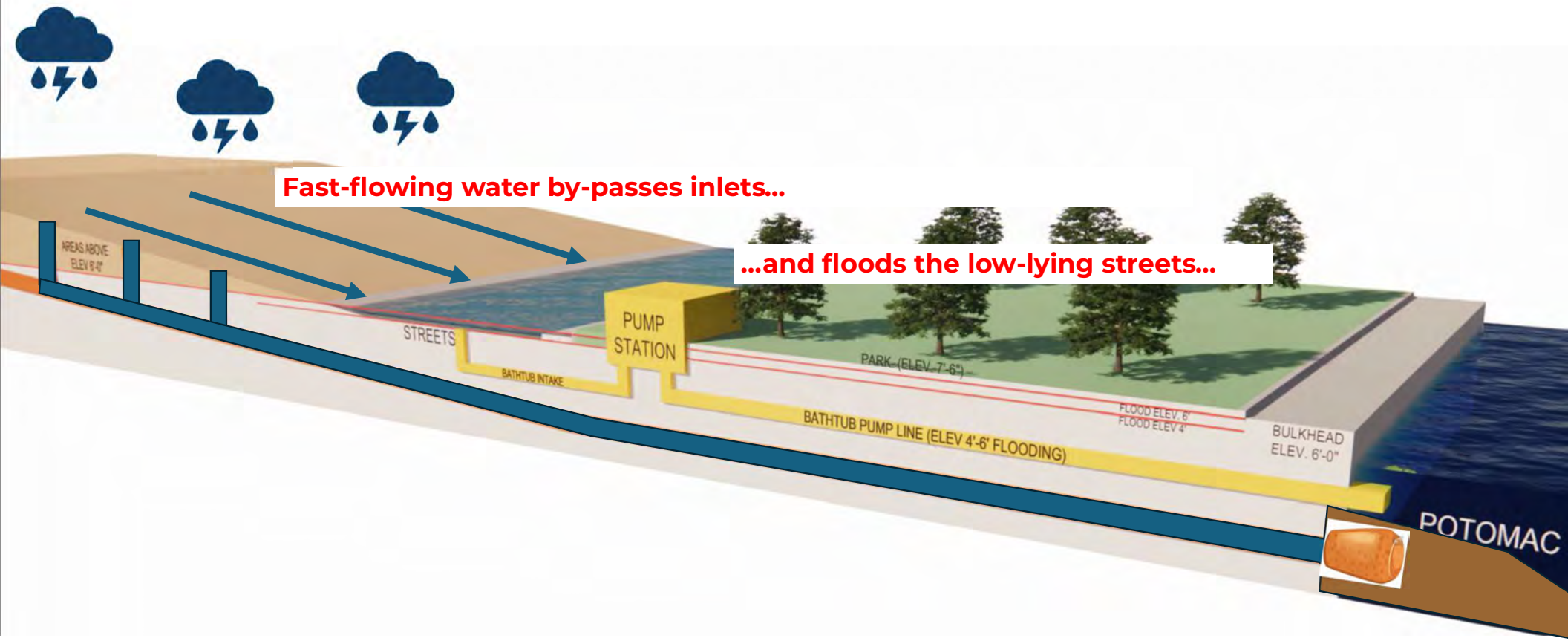

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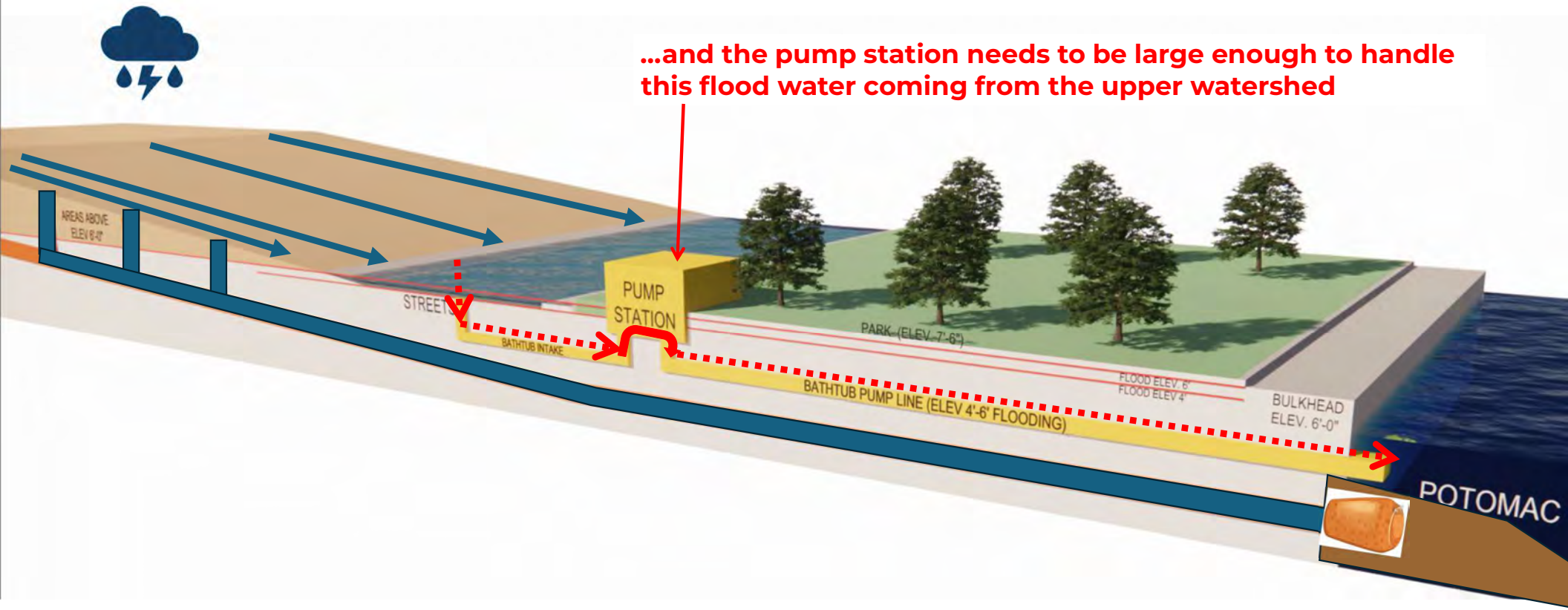

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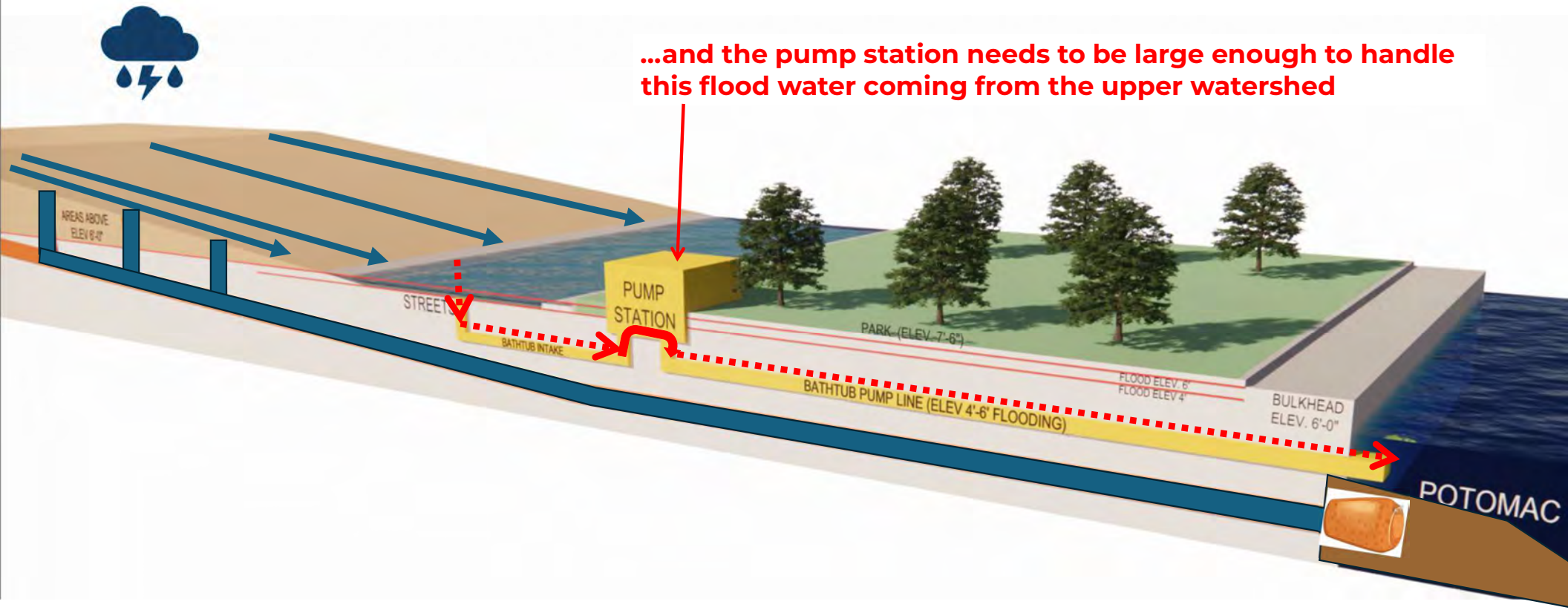

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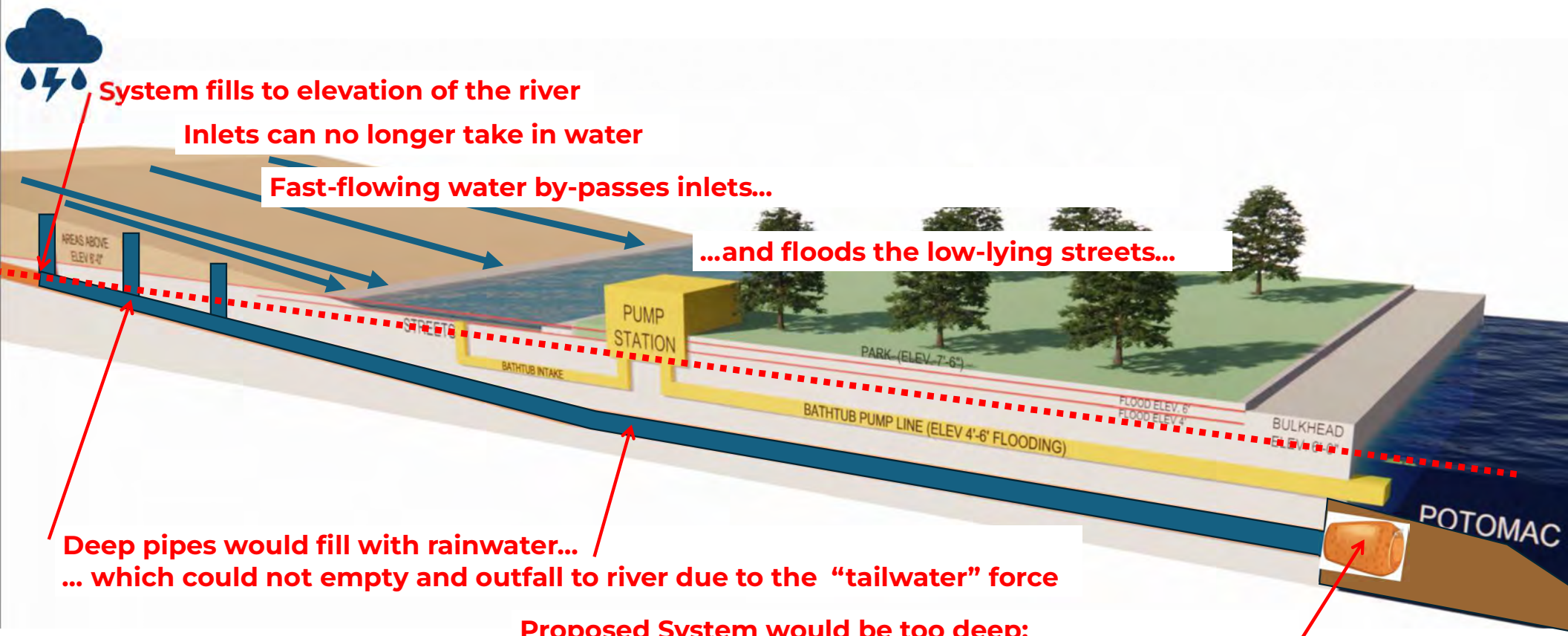

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Stormwater Modeling Results: “85% Solution” Concept

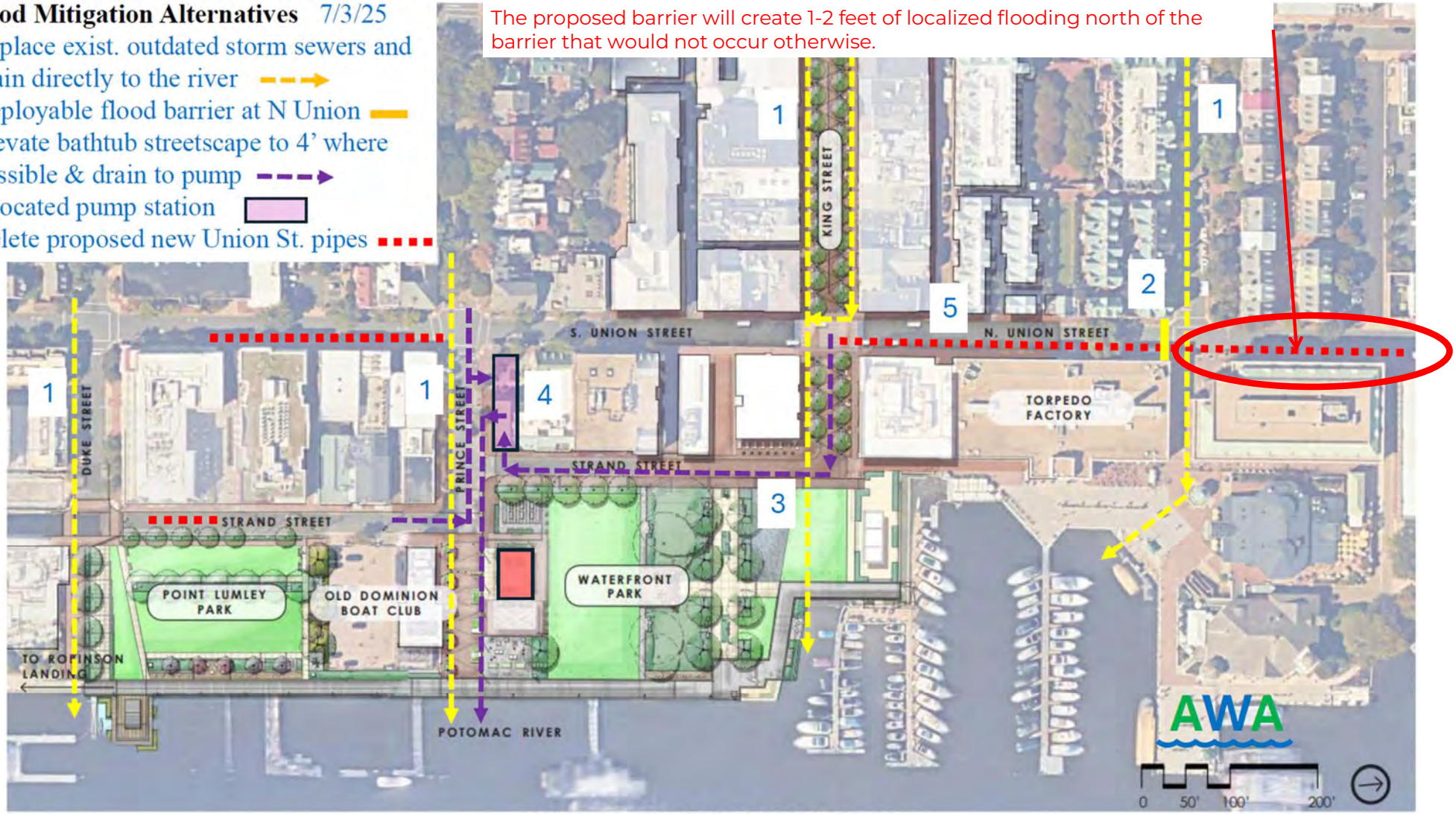
Gravity Stormwater System, Backflow Prevention & Capacity Improvements North of King St

Alexandria Waterfront Alliance

Flood Mitigation Alternatives 7/3/25

1. Replace exist. outdated storm sewers and drain directly to the river
2. Deployable flood barrier at N Union
3. Elevate bathtub streetscape to 4' where possible & drain to pump
4. Reocated pump station
5. Delete proposed new Union St. pipes

The proposed barrier will create 1-2 feet of localized flooding north of the barrier that would not occur otherwise.



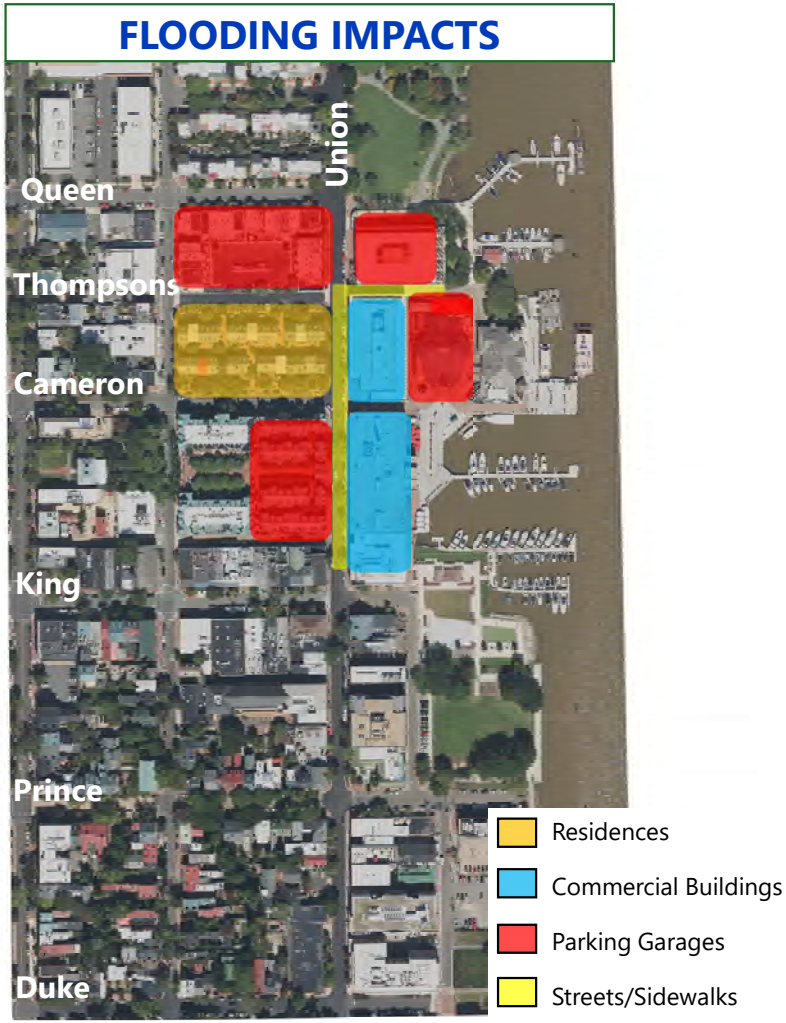
OVERALL PROJECT CONCEPT PLAN

AWA Concept - Flooding at the Storm Peak

This concept fails to prevent 1 - 1.5 feet of flooding

STREET FLOODING

FLOODING IMPACTS



Key Results

- Potential damage to buildings and cars, including parking garages, residences, and businesses.
  - N Union from Thompsons Alley to Cameron Street
  - Unit Block of Thompsons Alley
- Impacts may include the basement, first floor, or building access.
- Sidewalks and roadways are passible and drivable in less than 30 minutes.

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A deployable pump can be further evaluated for this location; however, it won't reduce the pump station size.

Potential that manhole at Cameron/Union intersection could be used as a point for bypass pumping.

Would require further analysis of capacity of a trailer-mounted bypass pump on Union St. Potential route for discharge hose to the Potomac River shown.

The bypass pump would need to be sized to handle the floodwater that accumulates behind any the deployable barrier.

OVERALL PROJECT CONCEPT PLAN

Challenges with elevating streets and disconnecting northern catchment basin

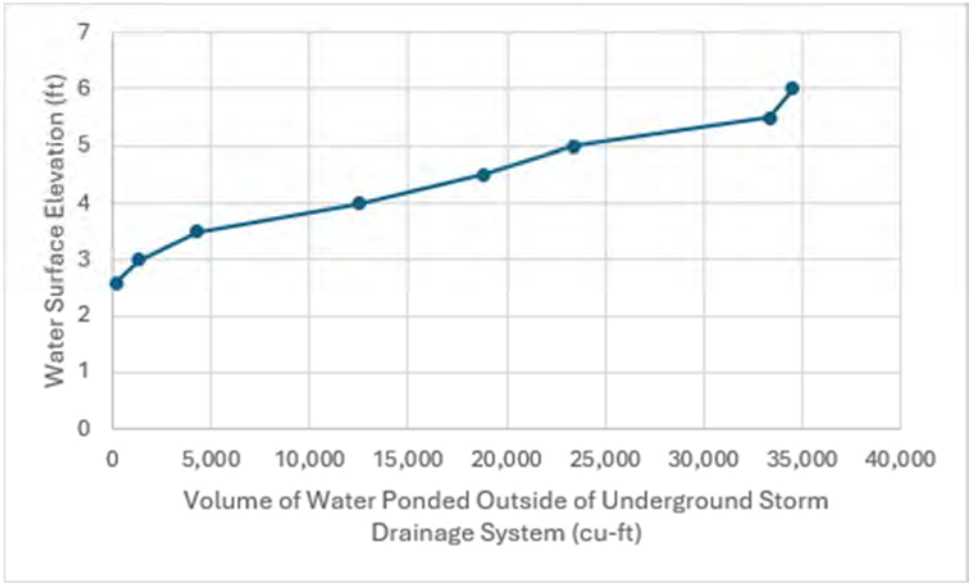
If northern catchment basin infrastructure is not enlarged, existing storm sewer network quickly fills up and the excess runoff/ponding fills the bathtub.

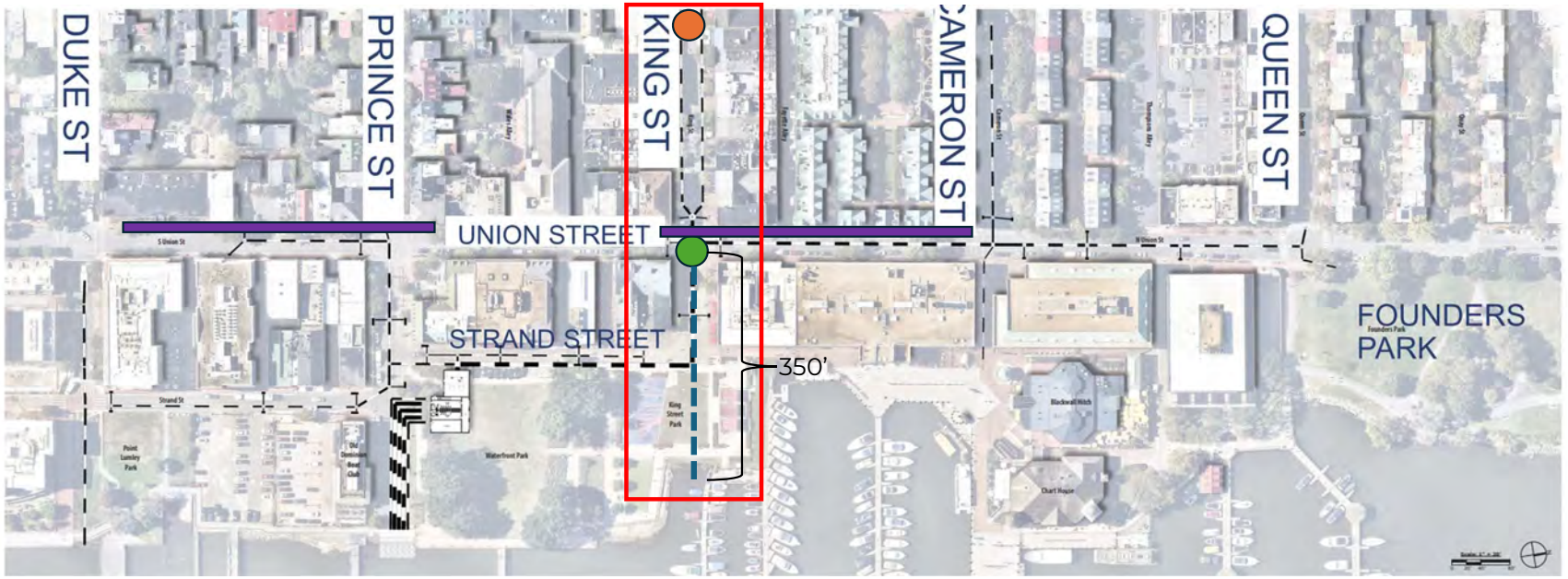
Approximately 260,000 gallons of water is in the bathtub during the design storm after the underground storm drainage system is full.

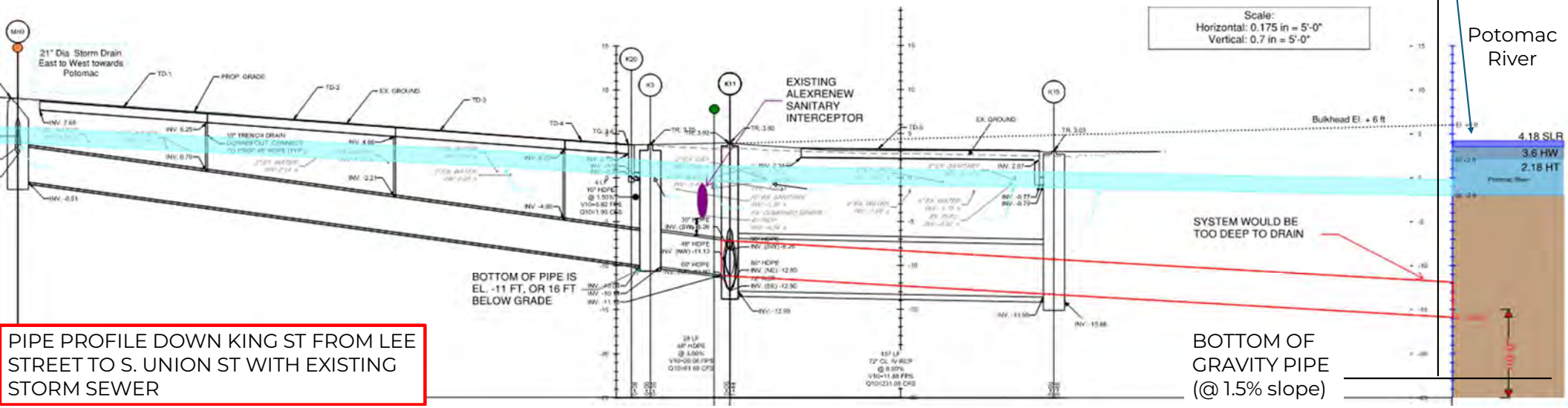
Raising the grade will spread out this volume of water to a wider footprint and will not reduce the capacity requirements of the pump station.

Additional storm sewer improvements, outside the proposed project area, will be required to collect this water.

Raising the grade across a large area will require significant building/home access improvements along with challenges in meeting ADA requirements for sidewalks, crosswalks, etc.







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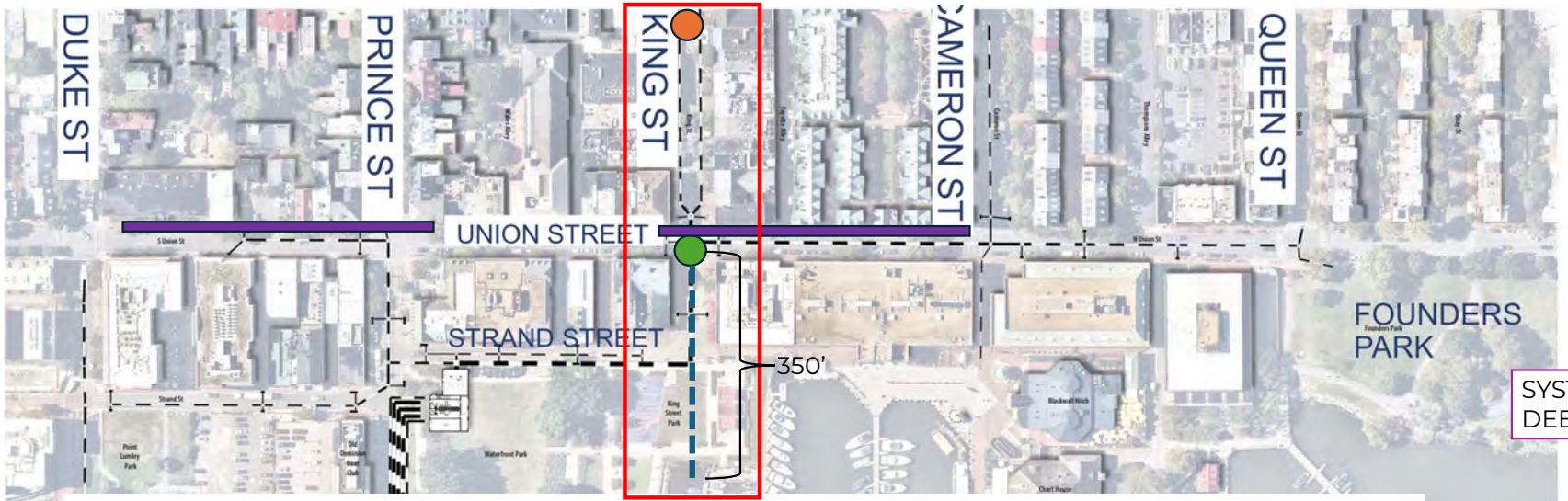

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