# Lower Manhattan Coastal Resiliency Briefing

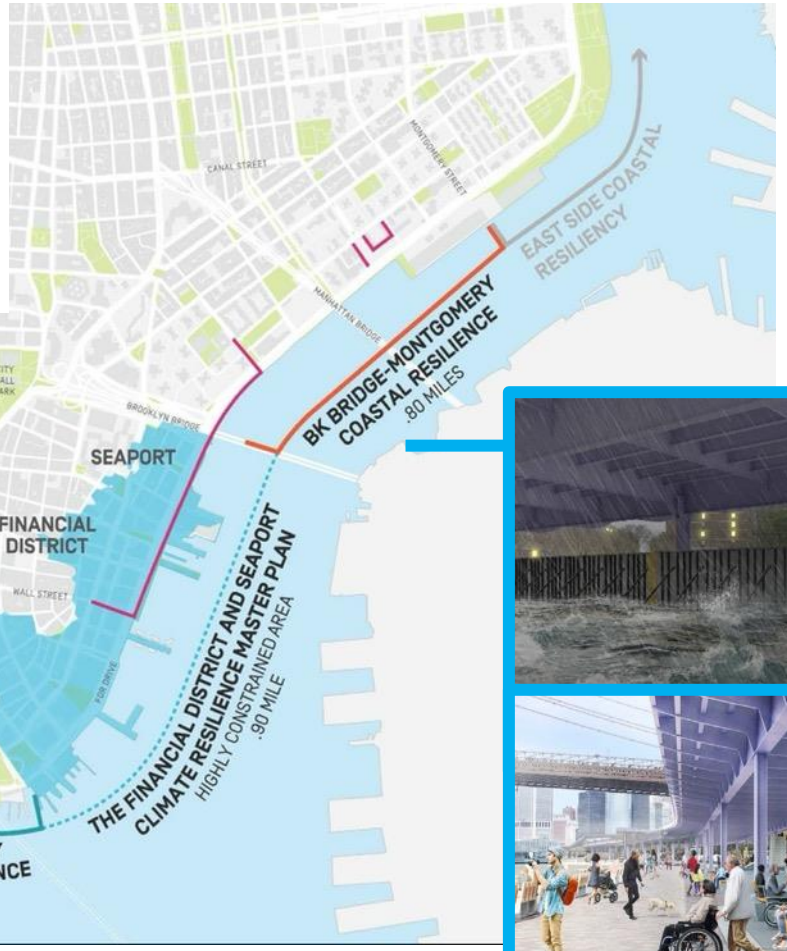
LMCR Quarterly June 21st 2021

NYC EDC

NYC Mayor's Office of Climate Resiliency

# Tremendous Momentum on LMCR Projects

- In 2019, Mayor De Blasio announced resiliency plan to protect Lower Manhattan, with over $500M in investment
- BMCR fully funded, Battery and BPCA projects advancing, FiDi-Seaport design progressing

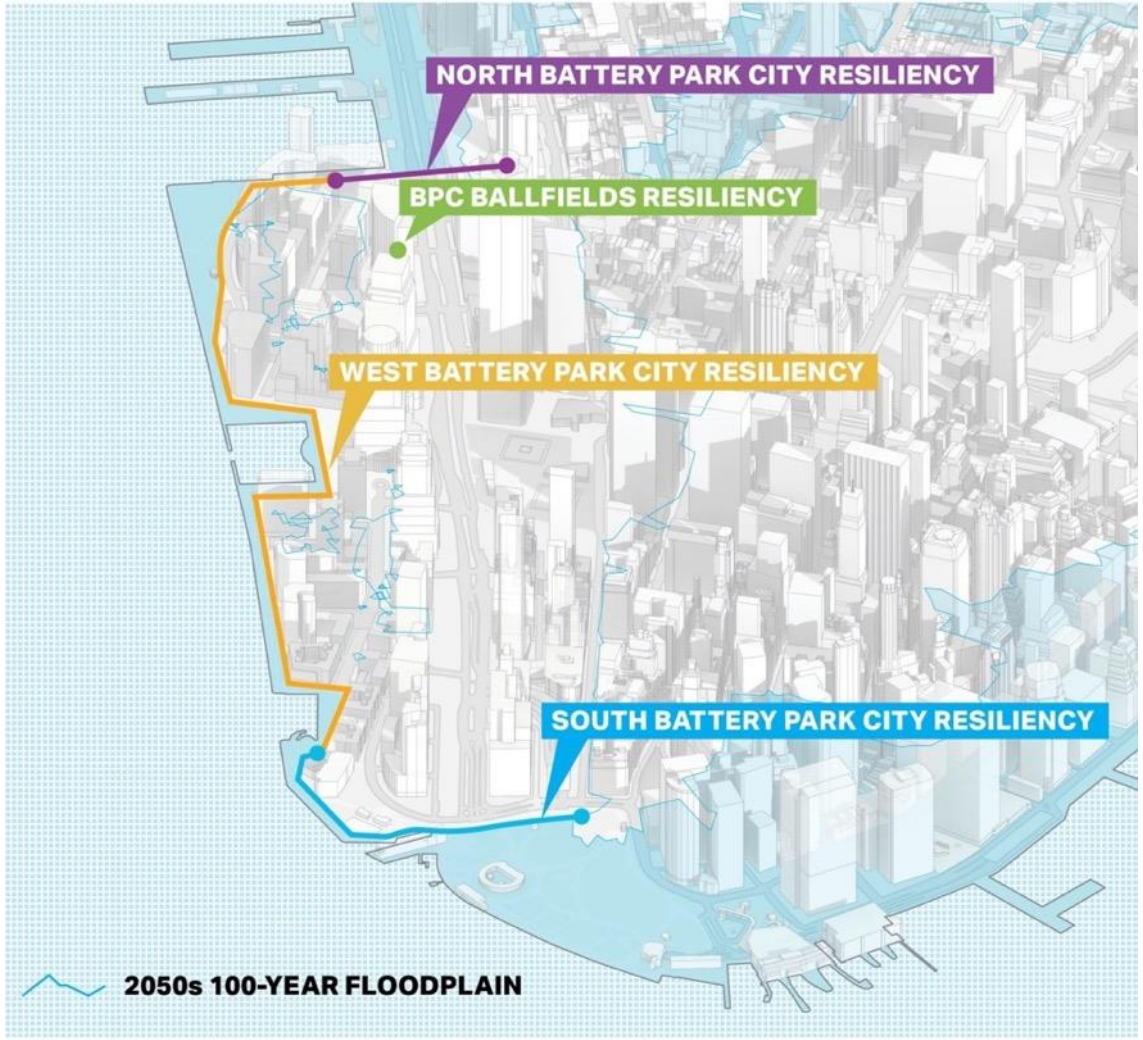



# Battery Park City Update

- **<u>BPC Ballfields Resiliency</u>**
  - Construction Commenced: June 2021
  - Projected Completion: October 2021

- **<u>South BPC Resiliency</u>**
  - DEIS underway
    - Public Scoping: Fall 2021
  - 75% design Pier A Plaza/Battery; 95% design Wagner Park/MJH
  - Construction Start: Early 2022

- **<u>North/West BPC Resiliency</u>**
  - Consulting Engineer Project Definition Underway
  - Progressive Design-Build Contractor Selection: Early 2022




NYC/EDC

# Battery Park City Update

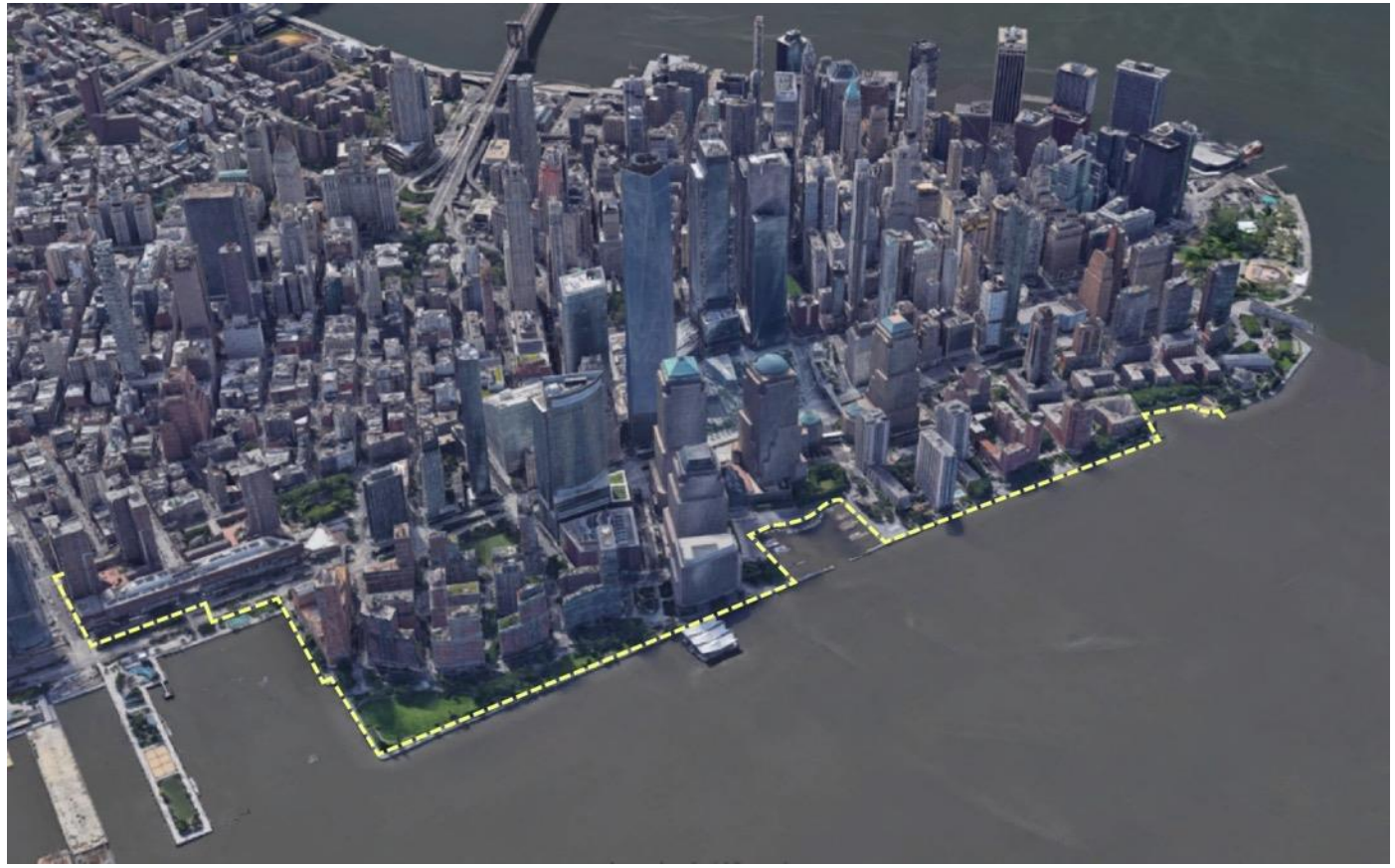
## *Ballfields/Community Center Resiliency*

- **Construction Commenced:** June 2021
- **Ongoing Ballfield Use Accommodated**
- **Construction Completion:** October 2021


# Battery Park City Update

## *North/West Battery Park City Resiliency*

- **Project Kickoff: June 2021**
- **Consulting Engineer Project Definition Underway (Including Public Meeting): Summer 2021**
- **PDB RFQ Issuance: Late Summer 2021**
- **PDB RFP Issuance: Late Fall 2021**
- **PDB Contractor Selection: Early 2022**

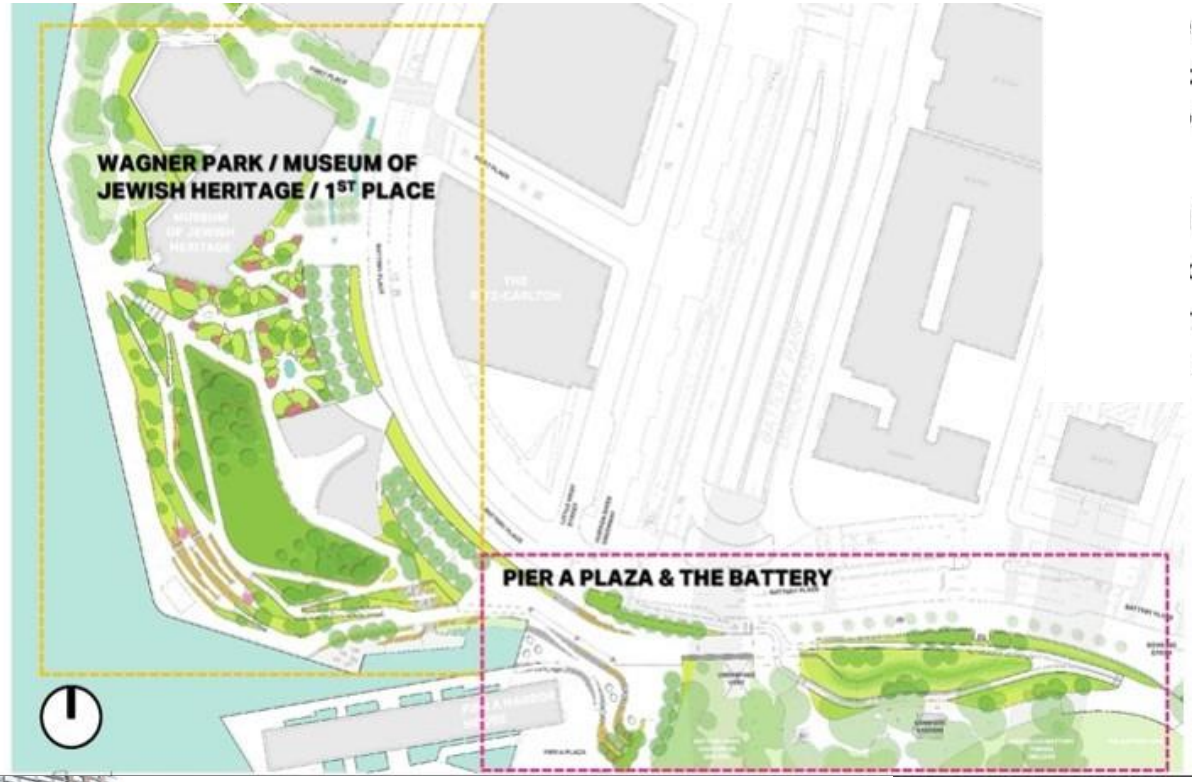


NYC EDC

# Battery Park City Update

## *South Battery Park City Resiliency*

- DEIS in progress.
  - Public Scoping – Fall 2021
- Construction Start:  Spring 2022
  - 75% design Pier A Plaza & Battery
  - 95% design Wagner Park & MJH
- Ongoing Coordination with NYCDEP Regarding Interior Drainage Design
- Final PDC Approval: Summer 2021

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# Wagner Park Pavilion Service Entrances

# BATTERY PLACE DESIGN– Presented to CB 1 February 2021

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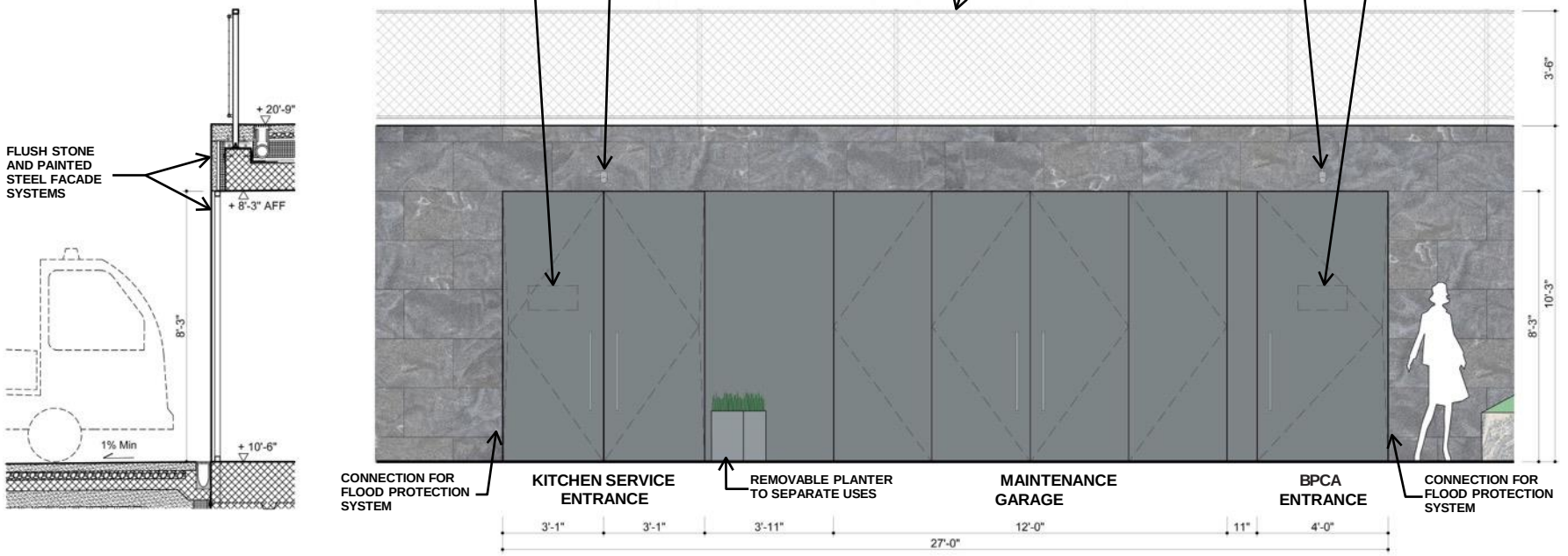


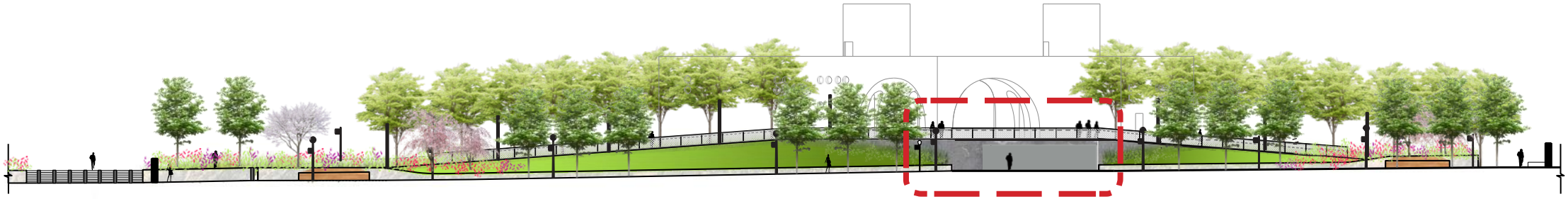

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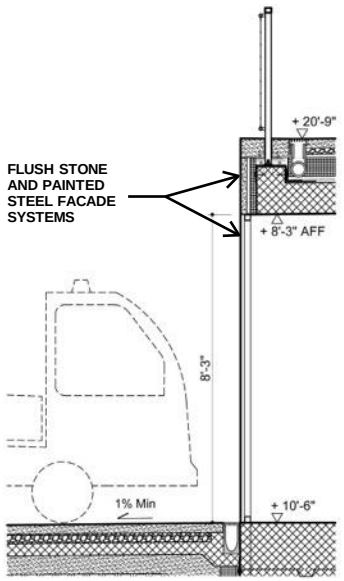
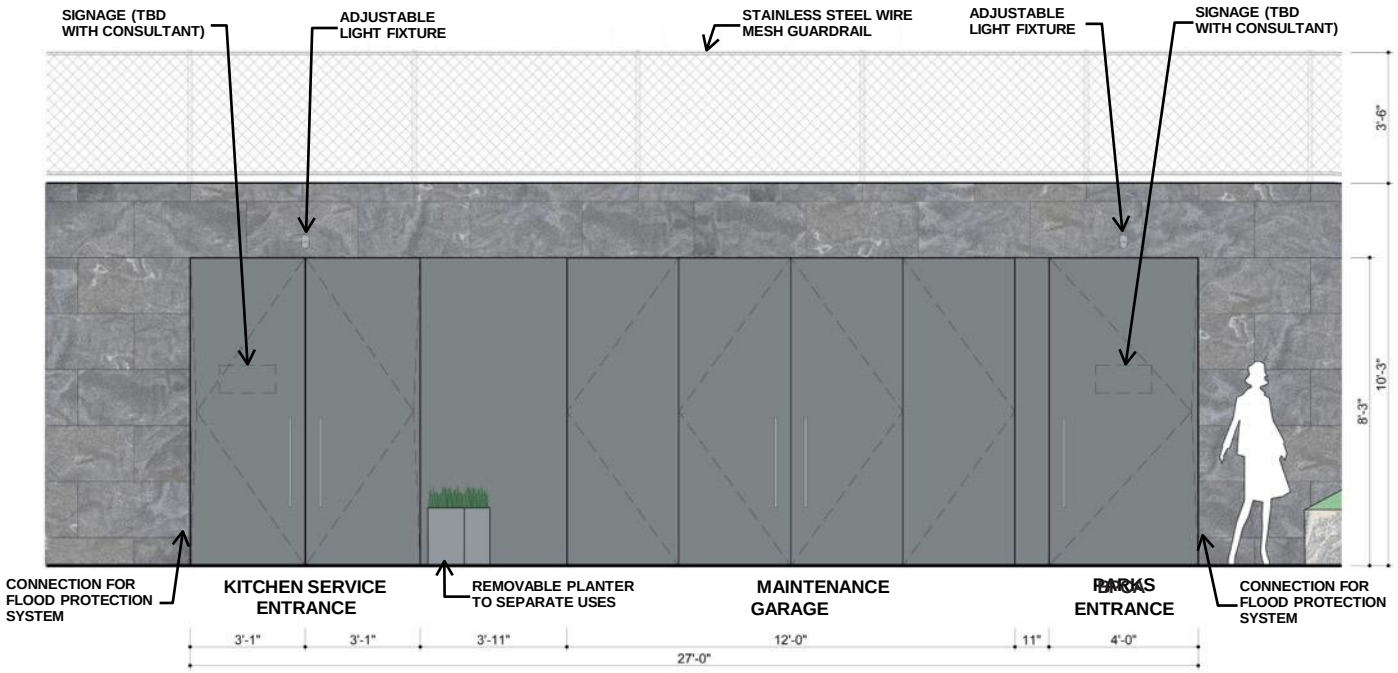



JET MIST GRANITE


RAL 7011 PAINTED STEEL WITH SIGNAGE (TBD)

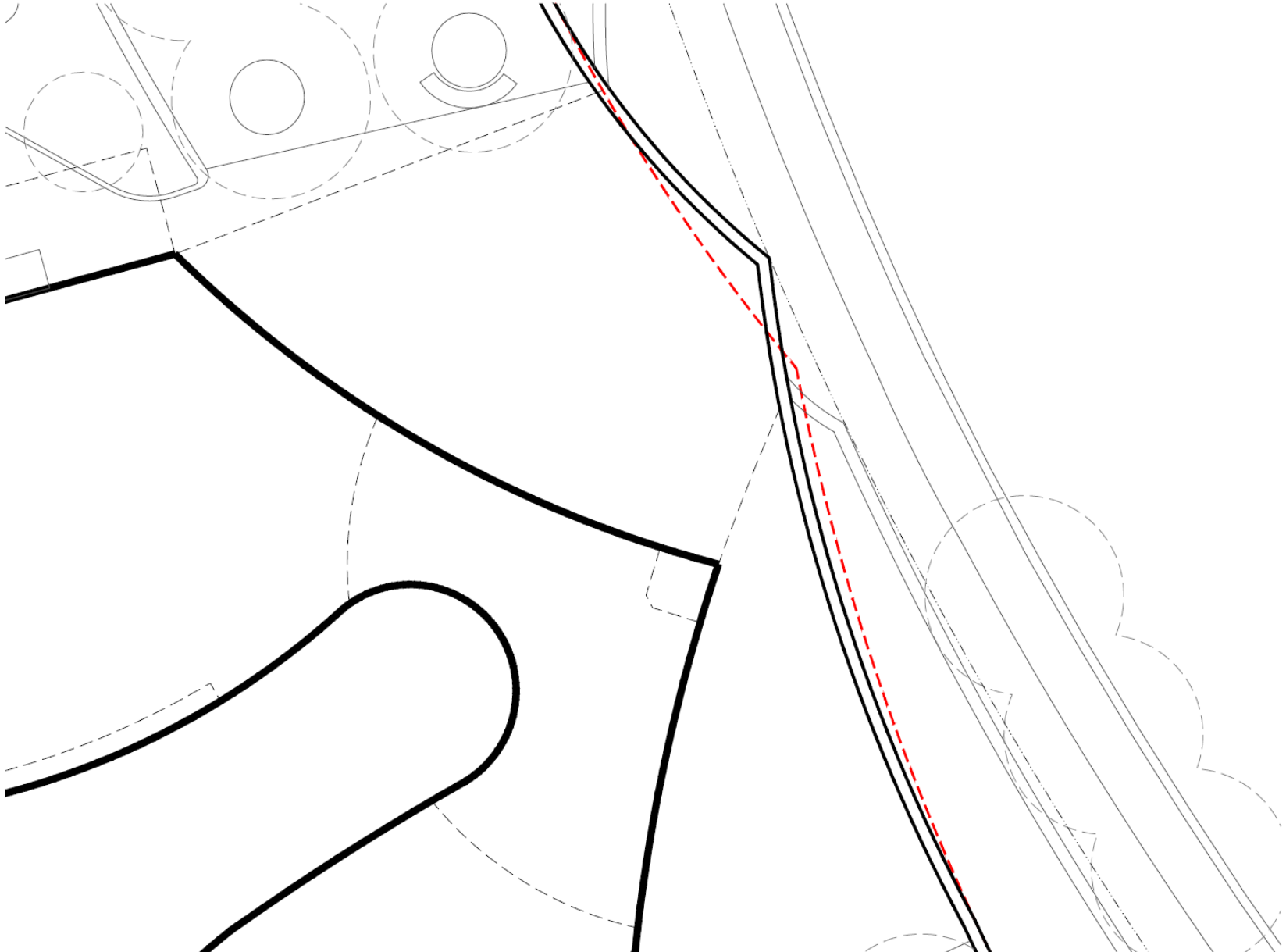
DEPLOYABLE FLOOD PROTECTION SYSTEM

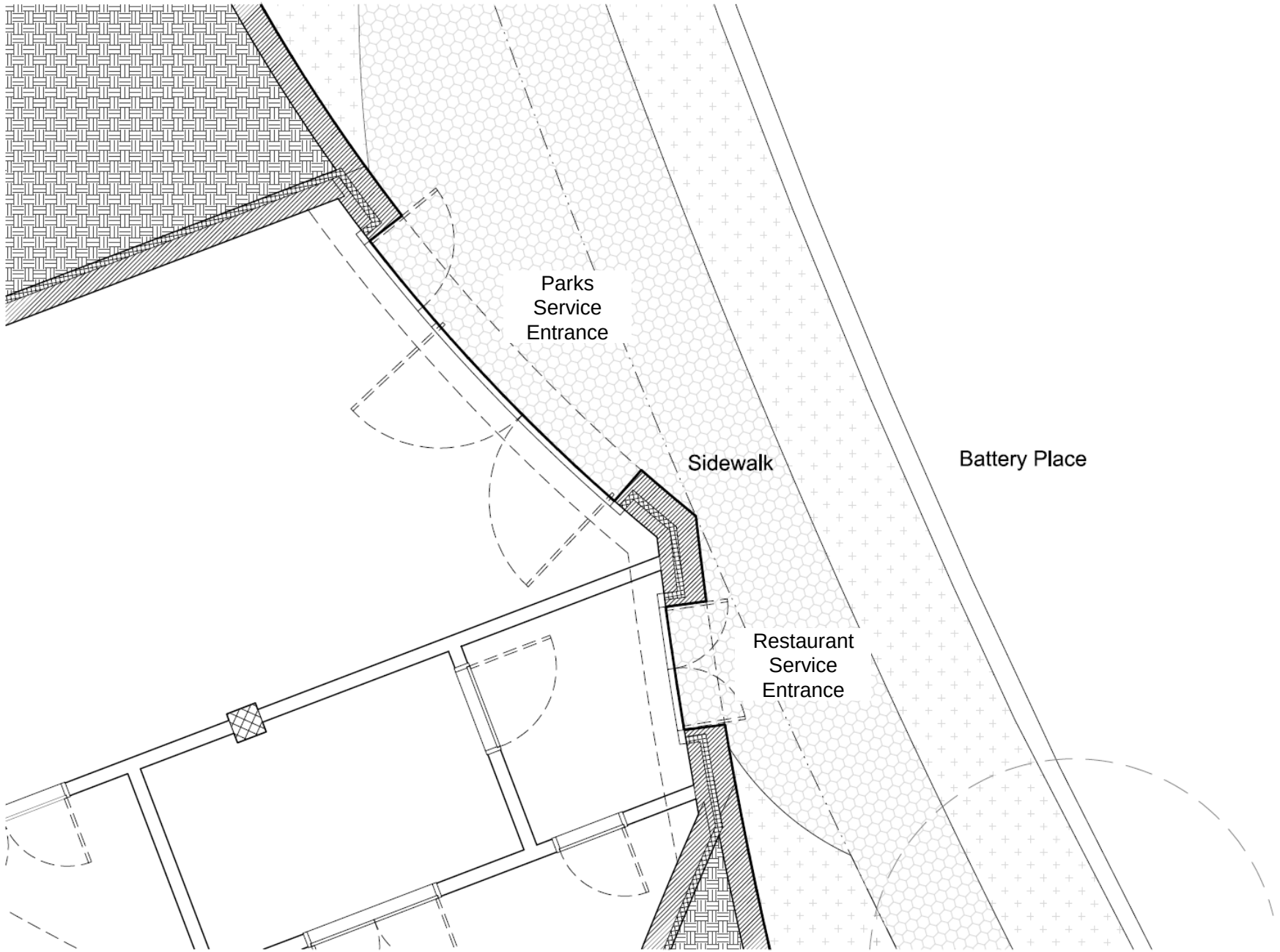
ADJUSTABLE LIGHT FIXTURES

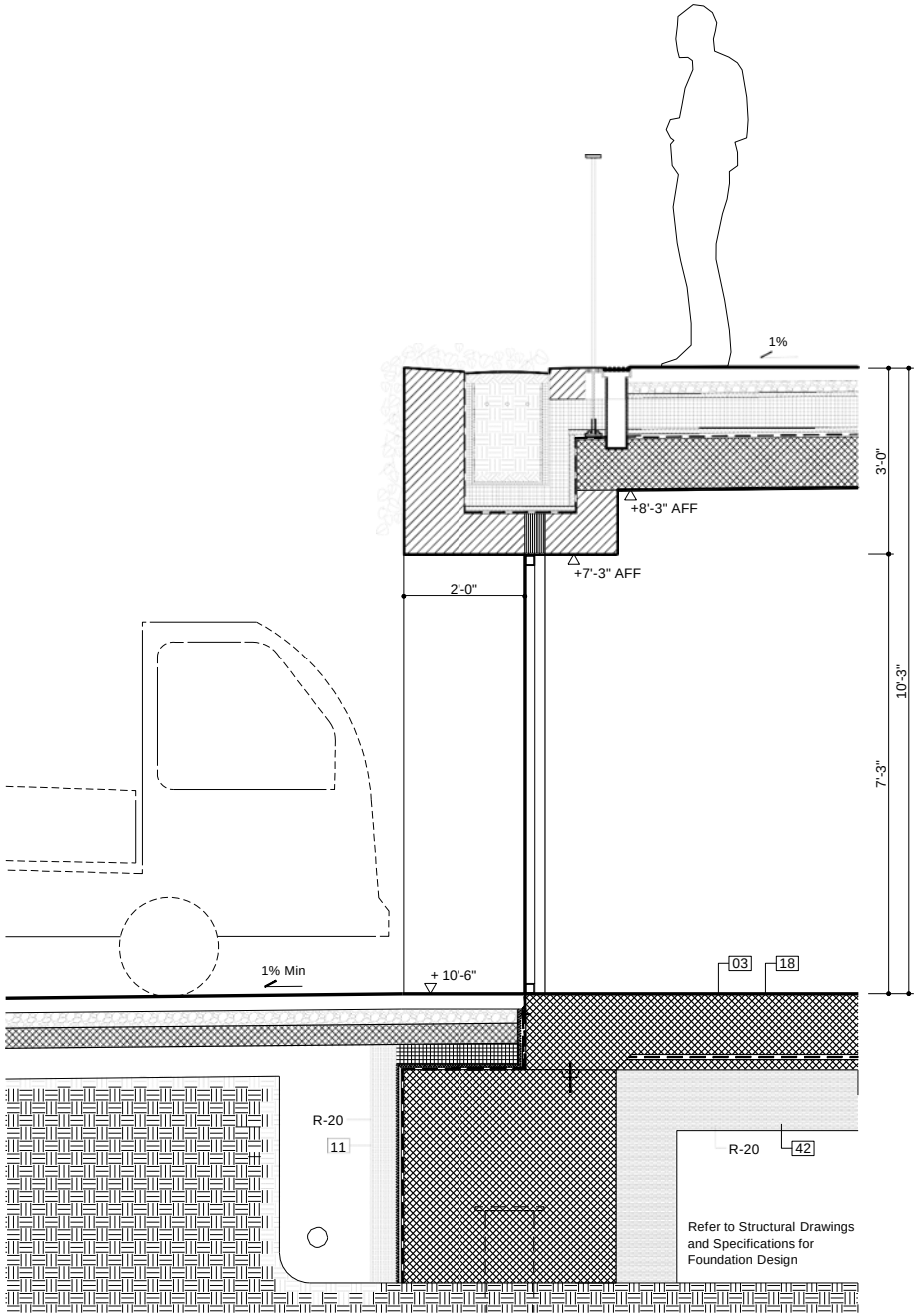
STAINLESS STEEL WIRE DOOR PULLS

TOURNESOL RECTANGULAR PLANTERS

# BATTERY PLACE DESIGN REFINEMENT– New Design Approach




Parks
Service
Entrance
Sidewalk
Battery Place
Restaurant
Service
Entrance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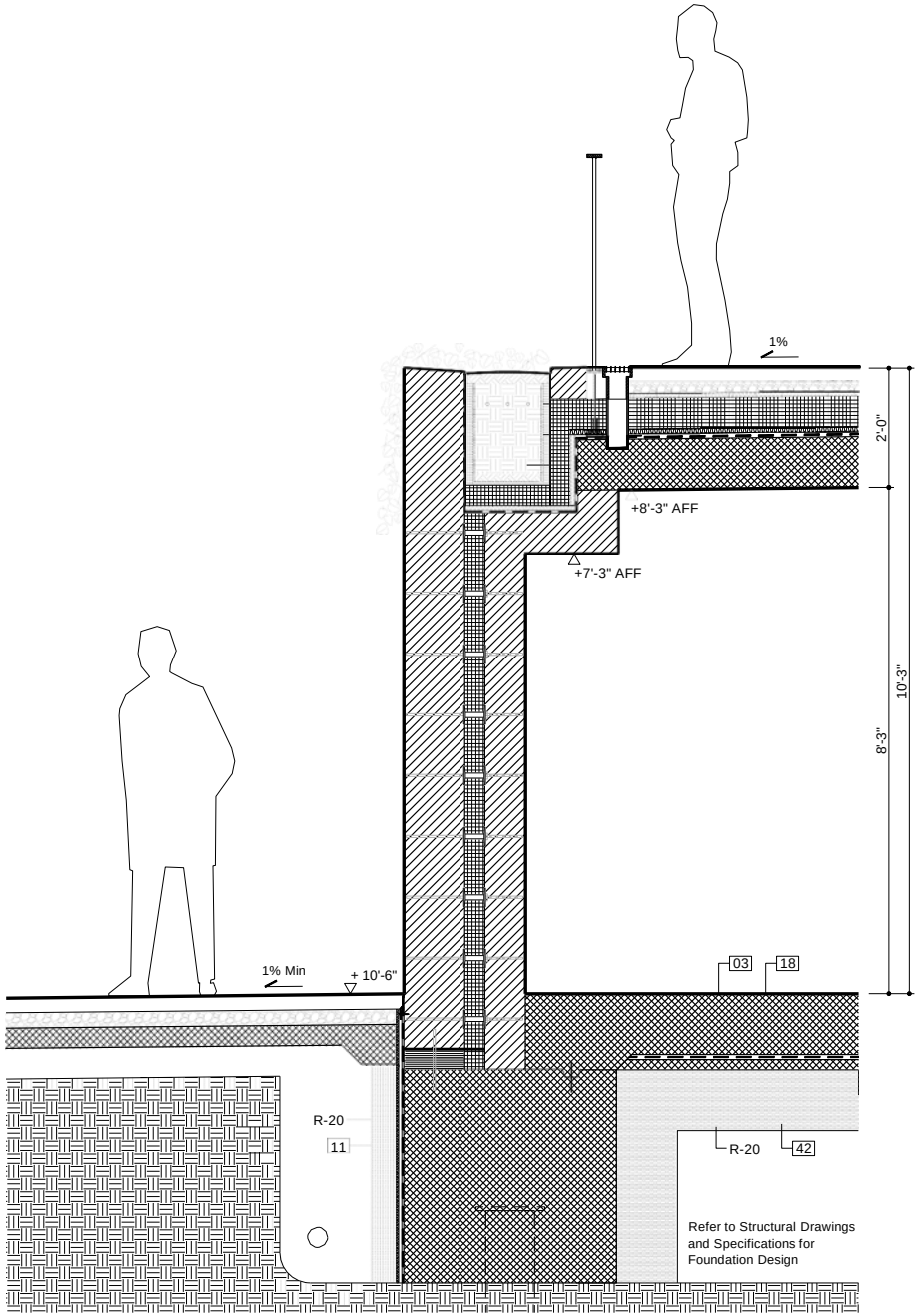
Refer to Structural Drawings
and Specifications for
Foundation Design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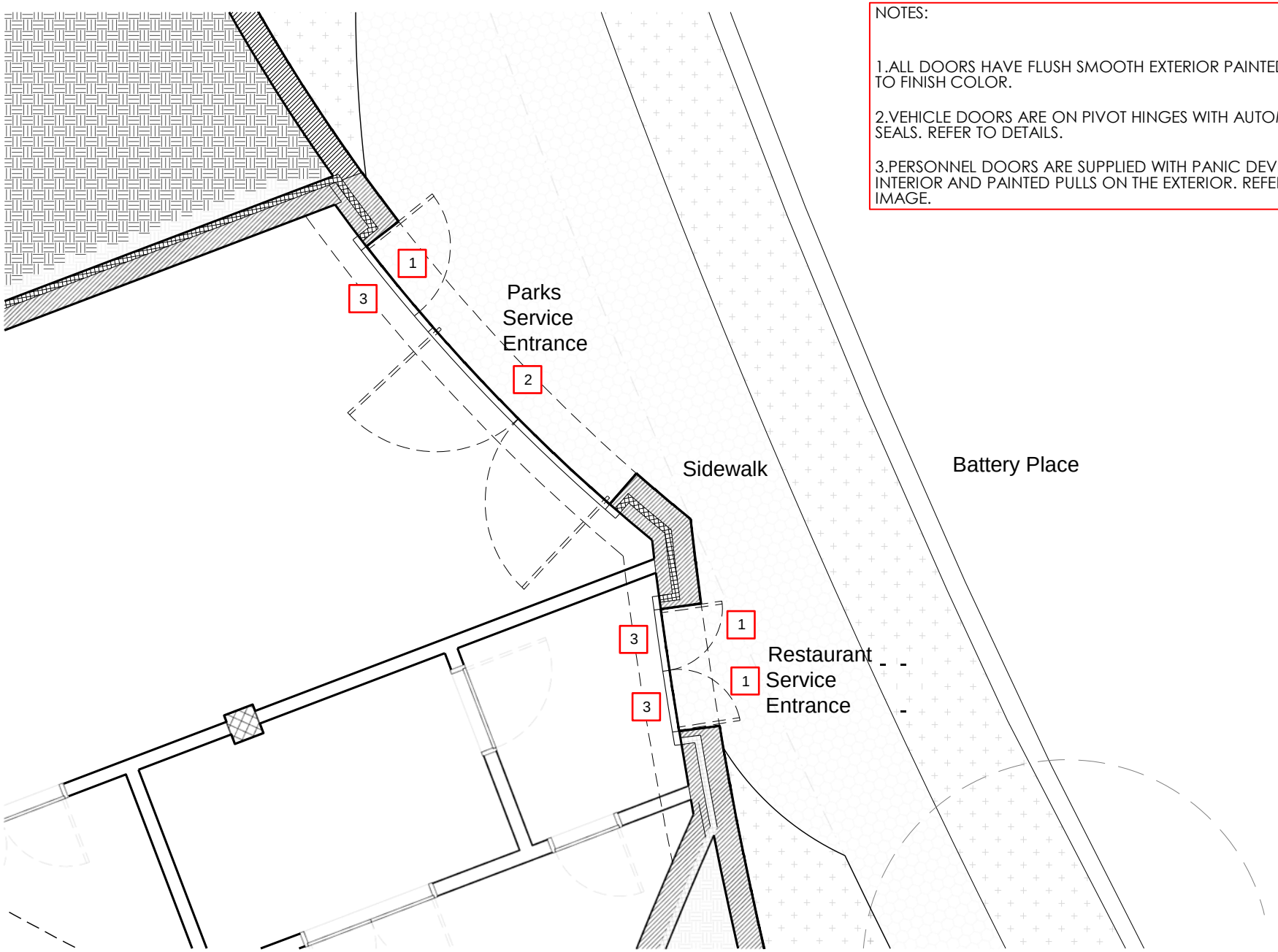

NOTES:
1.ALL DOORS HAVE FLUSH SMOOTH EXTERIOR PAINTED FACES. REFER TO FINISH COLOR.
2.VEHICLE DOORS ARE ON PIVOT HINGES WITH AUTOMATIC SEALS. REFER TO DETAILS.
3.PERSONNEL DOORS ARE SUPPLIED WITH PANIC DEVICES ON THE INTERIOR AND PAINTED PULLS ON THE EXTERIOR. REFER TO PULL IMAGE.
1
3
Parks
Service
Entrance
2
Sidewalk
Battery Place
1
3
Restaurant
Service
Entrance
1
3

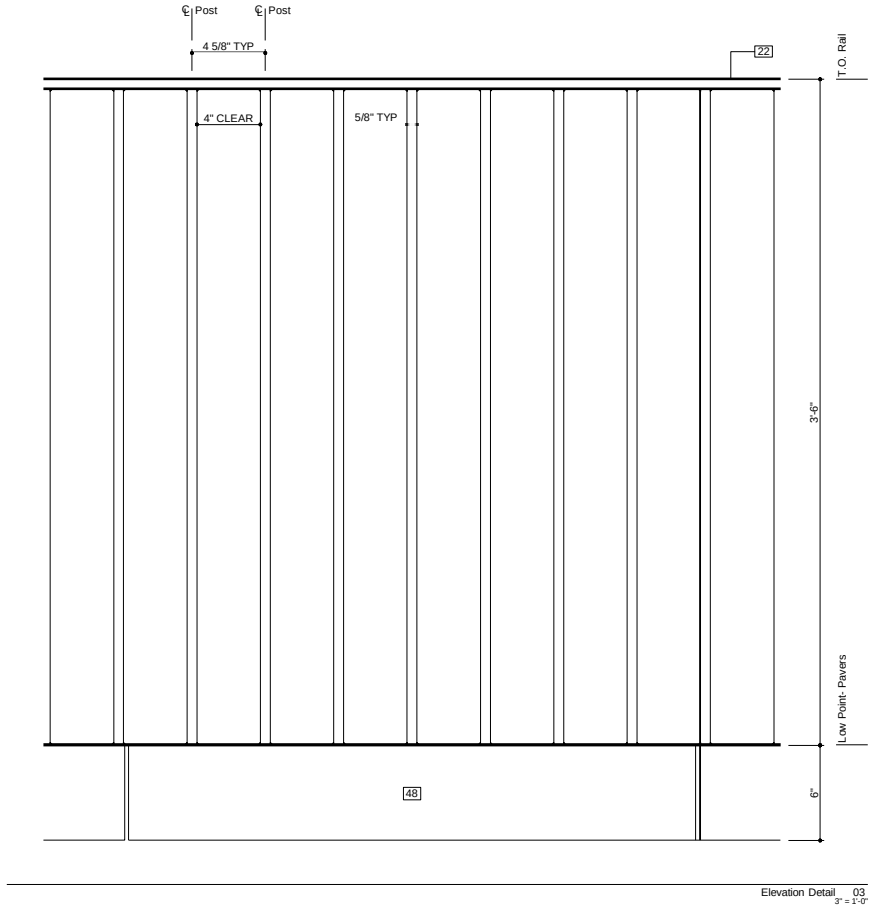
Pigmented Architectural Concrete

Painted Metal Doors
RAL 030 40 30

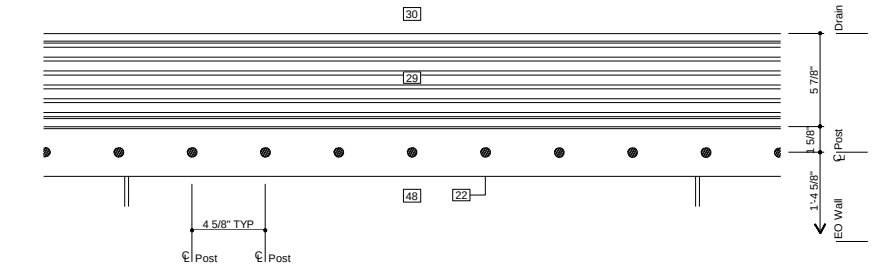
Painted Stainless Steel Wire Door Pulls

Guardrail Precedent

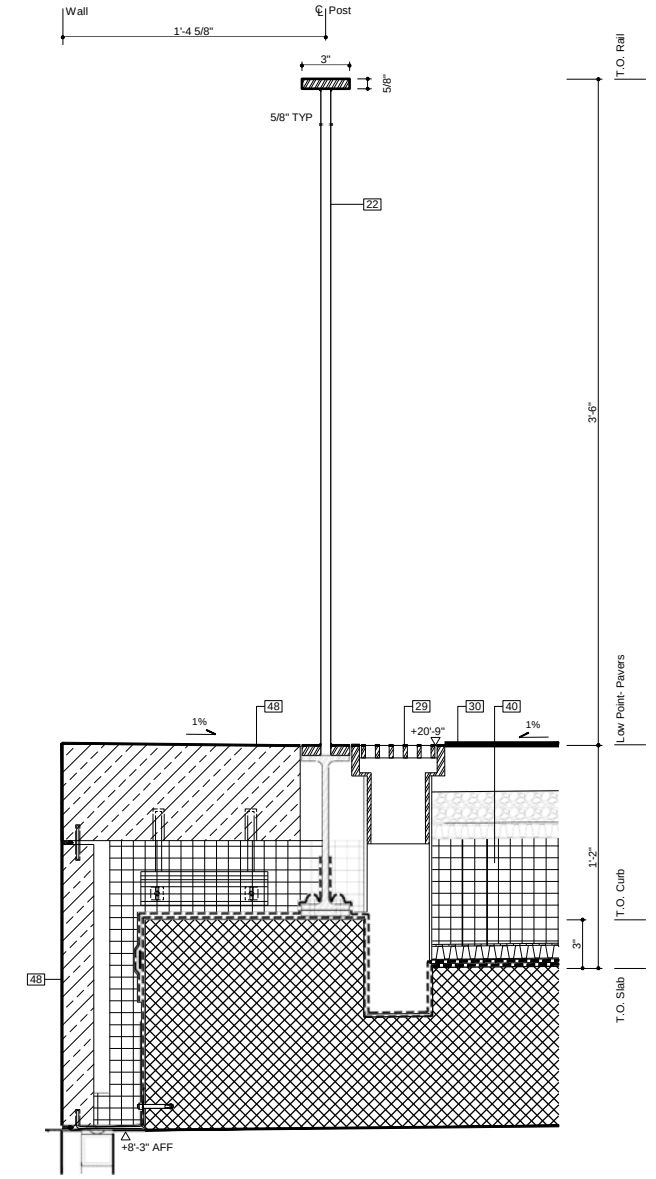
Guardrail Precedent




Elevation Detail 03
3" = 1'-0"




Plan Detail 02
3" = 1'-0"




Section Detail 01
3" = 1'-0"

# BATTERY WHARF

# The Battery Coastal Resiliency

EDC managing on Parks behalf

Public Meetings and Stakeholder Input Coordination

- March 24 – Open House
- BPCA coordination ongoing for Pier A tie-in
- PDC conceptual review ongoing
- NYPD, FDNY, OEM, Statue Cruises, NPS upcoming

Design Progress

- Preliminary Design - early Summer 2021

Conceptual Rendering

# FIDI-SEAPORT MASTER PLAN

# What have we been up to since we last met?

Met with the **Aquatic Resources Advisory Committee (ARAC)** to discuss why entirely on land strategies do not work here and the need to go into the river, and received feedback on there not being a viable permitting pathway for a maximum shoreline extension

Completed **fall and winter aquatic habitat sampling** to better understand the ecological conditions of the East River; spring is ongoing

Completed our **hydrodynamic and wave modeling** to understand the height of future storms, including waves, in our study area to determine the height of coastal protection that will be needed

Hosted a **virtual open house**, a **workshop** on Envisioning a 21st Waterfront, a **panel discussion** on Financing Resiliency Projects in Lower Manhattan, and visited 5th graders at the **Peck Slip School** and high school students at the **Harbor School**

Developed **early project concepts** based on **feedback** from the **regulatory agencies** on the need to justify every inch of fill, as well as **community feedback** on open space in the study area, connections to the waterfront, and what they value the most

# What we've heard through our engagement events and key themes that have emerged

## Process

- Ensure transparency, so the community feels like true partners with the City in this process
- Bring in youth perspectives in our engagement process
- Exhaust all on-land options before looking at going out into the water
- **Provide regular updates and share decision-making materials**

## Design

- Celebrate the historical identity of this area
- Increase the open space in this area, with a variety of uses
- Examine taking down the FDR
- Connect New Yorkers to the waterfront, and make sure they can still get down and touch the water
- Ensure equitable access to maritime assets, maintain the navigability of the pier

## Financing & Development

- Resilience should drive project options, not development
- Project financing should be equitable
- Limit development, and be mindful of neighborhood contexts for where development could be sited

# Sharing Decision-Making Materials

•Response to letter from CB1, CB3, Waterfront Alliance, Rebuild by Design

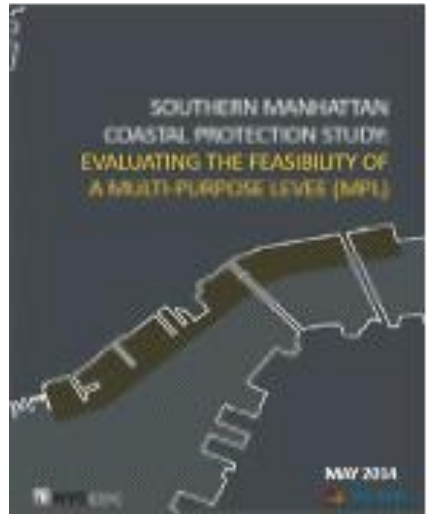
•Seaport City Study and RFP Scope (for study that concluded in **2014**)

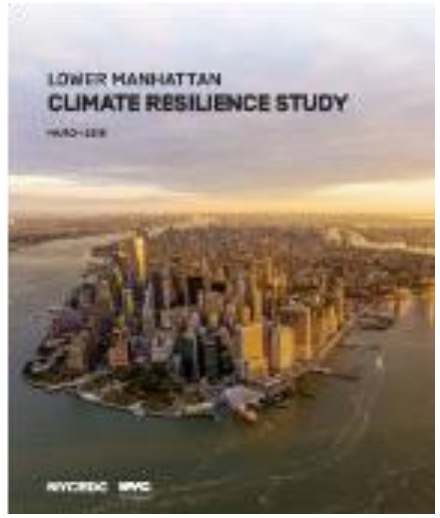
•LMCR Study and RFP Scope (for study that concluded in **2019**)

•FiDi-Seaport RFQ (for current study **2019-2021**)

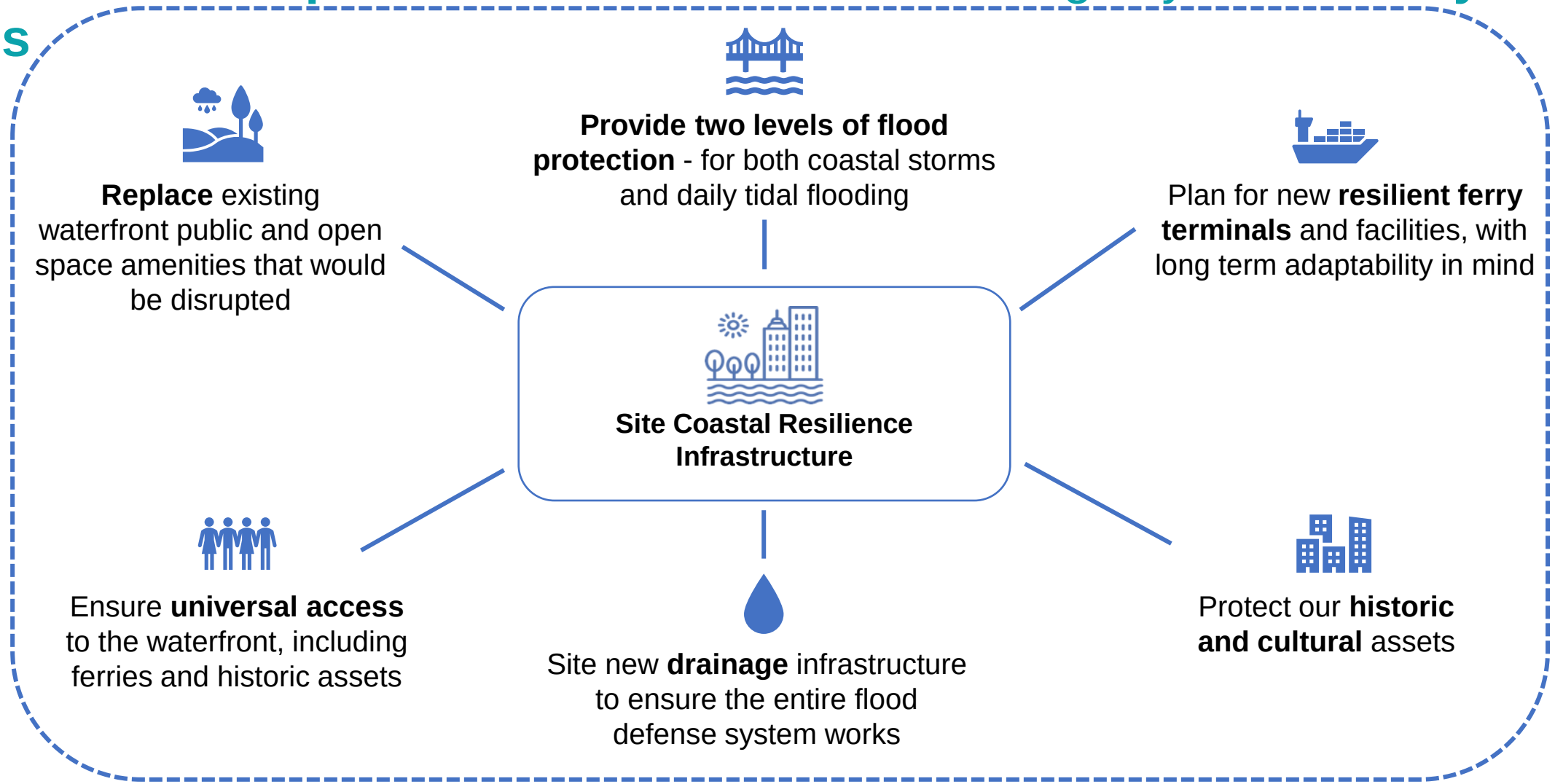
•FiDi-Seaport RFP Scope (for current study **2019-2021**)

•FiDi-Seaport On-Land Memo (produced by Arcadis under current contract after we added this to the scope)



# Articulating our **priorities**: Developing a coastal defense project that is **permittable & implementable** while also achieving key **community goals**




**Implementable:** Permitting Considerations + Construction Feasibility

# Our early project options looked at three shoreline extension lengths; based on technical analysis and feedback, we are now **zeroing in** on a **narrow to moderate** option

### ☒ Entirely On-land

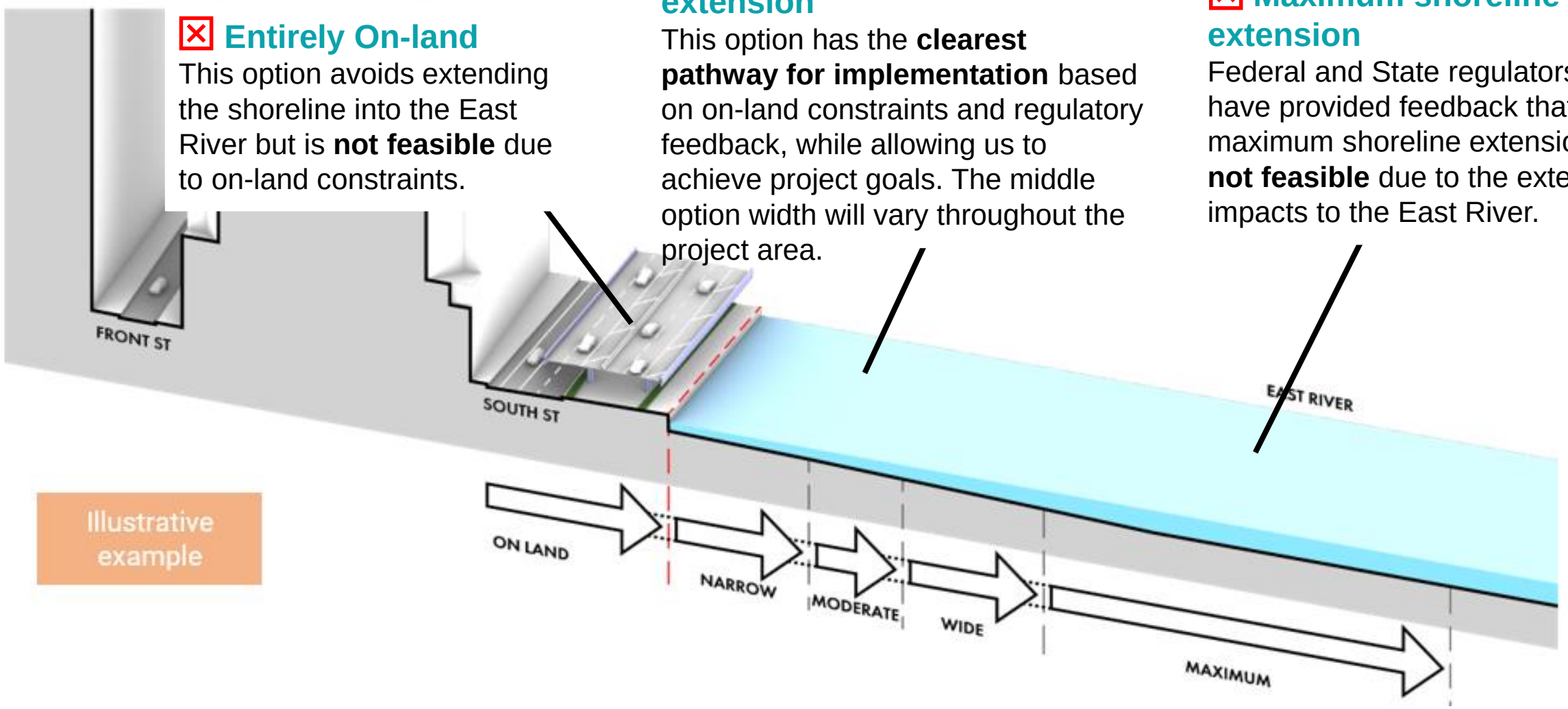
This option avoids extending the shoreline into the East River but is **not feasible** due to on-land constraints.

### ☑ Narrow to moderate extension

This option has the **clearest pathway for implementation** based on on-land constraints and regulatory feedback, while allowing us to achieve project goals. The middle option width will vary throughout the project area.

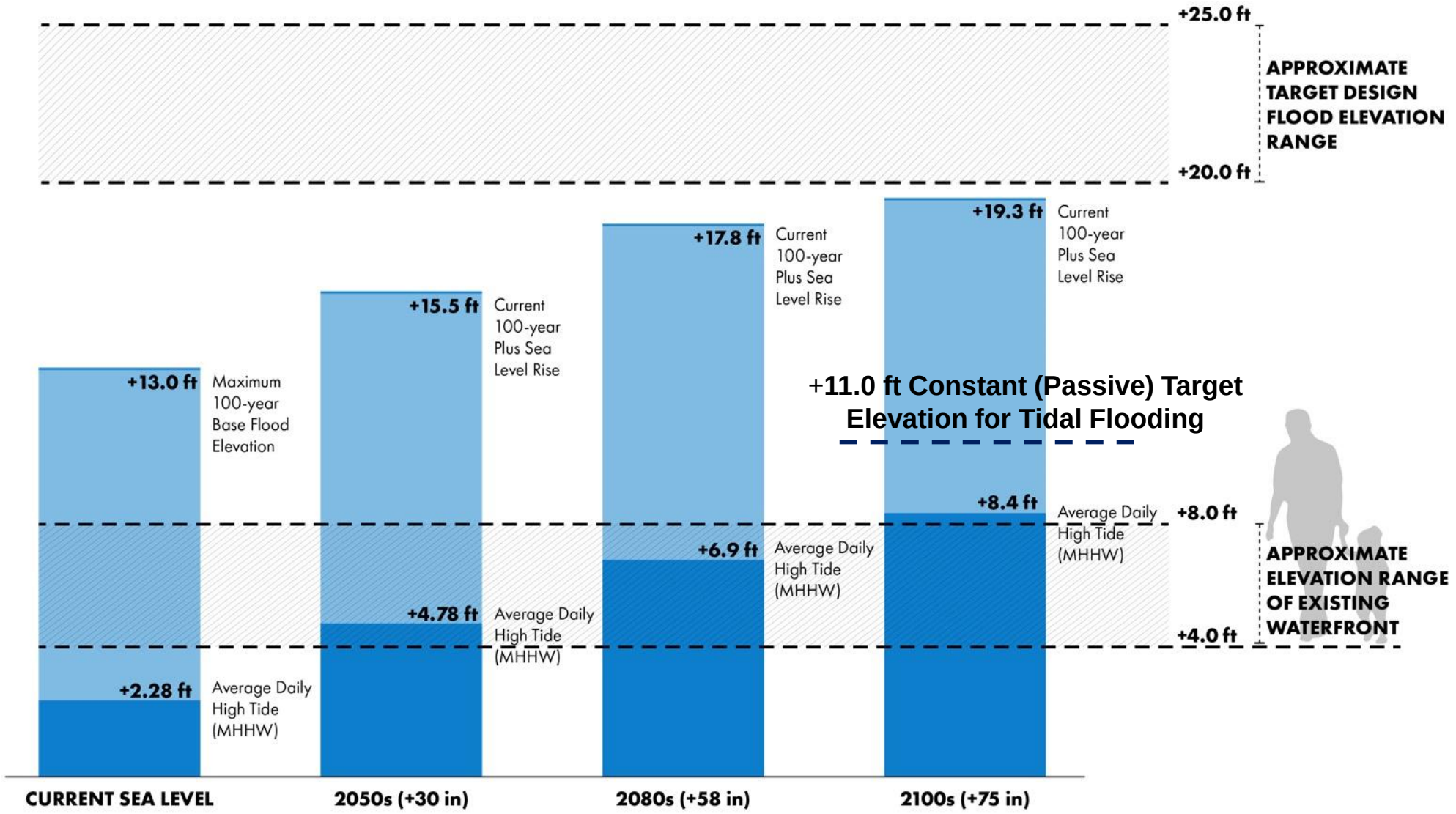
### ☒ Maximum shoreline extension

Federal and State regulators have provided feedback that a maximum shoreline extension is **not feasible** due to the extent of impacts to the East River.



# Why is an on-land option so challenging?

# The project's design flood elevation (DFE) must protect from up to 20-25 feet of flooding from the outset, and/or be designed to adapt in the future.



# What on-land coastal defense strategies have we looked at?

Based on technical analysis, a **floodwall is considered the most viable** coastal defense structure for our target **design flood elevation (DFE)**, or level of protection, of approximately +23 feet (NAVD88).

## Floodwall

A floodwall is the most viable coastal defense option, but requires a significant amount of horizontal, vertical, and underground space which is not available on land.

## Building-Level Approaches

Relying on building-level approaches to provide area-wide flood protection is not practicable given a high DFE, wave loads and forces, and reliance on deployables to maintain street and building access.

## Street Raising

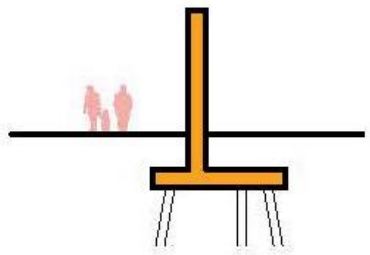
Most street raising projects aim to improve drainage and adapt to rising sea level, not coastal defense. In addition, significantly raising street grades presents unsafe traffic and pedestrian conditions and may require the abandonment of lower-level floors.

## Deployable Measures

Deployable measures are particularly challenging in our study area given the low-lying ground elevation and the tall wave heights.

# What makes an on-land floodwall so challenging in our project area?

1. Requires substantial **vertical space** to reach our DFE of +23 feet, which is limited by the height of the FDR Drive for most of our study area
2. Requires substantial **horizontal space** to construct and access for maintenance, which is limited by the dense urban environment
3. A floodwall has a large foundation which requires the area below it to be clear of any **underground obstructions**. However, our project area has a complex network of underground infrastructure
4. In order to provide a passive level of flood protection (not relying on gates) for frequent tidal flooding in 2100, we need to elevate the ground elevation at the waterfront to 11 feet (NAVD88). However, this grade change will have to be gradual in order to maintain universal **waterfront access**, requiring even more horizontal space to implement

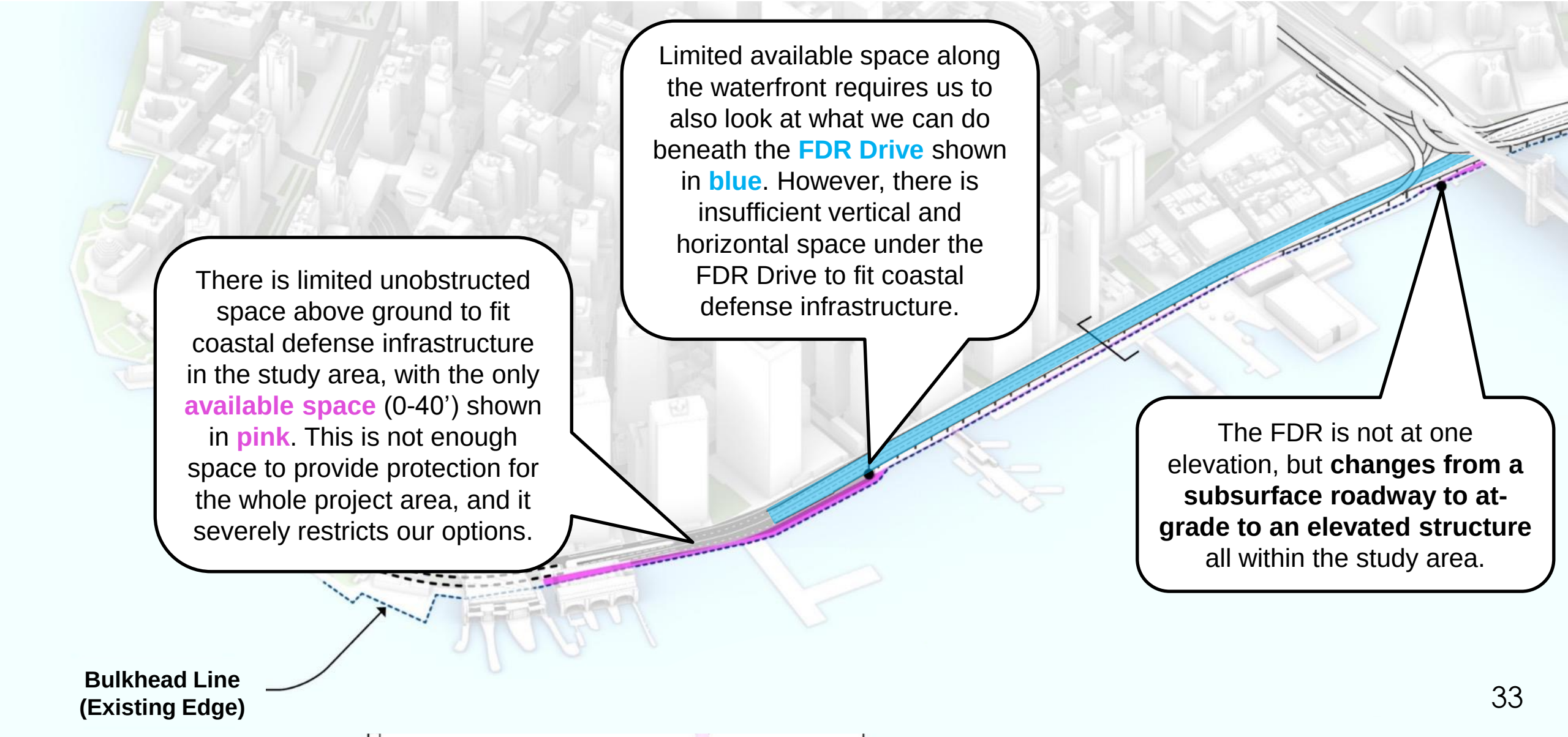


**Floodwall**

**Foundation Width**: 10-15 ft
**Construction Clearance:** 18-20 ft
**Access Requirements**: 15 ft (each side)

**Total Footprint: ~45 feet**

# Why is an on-land option so challenging?

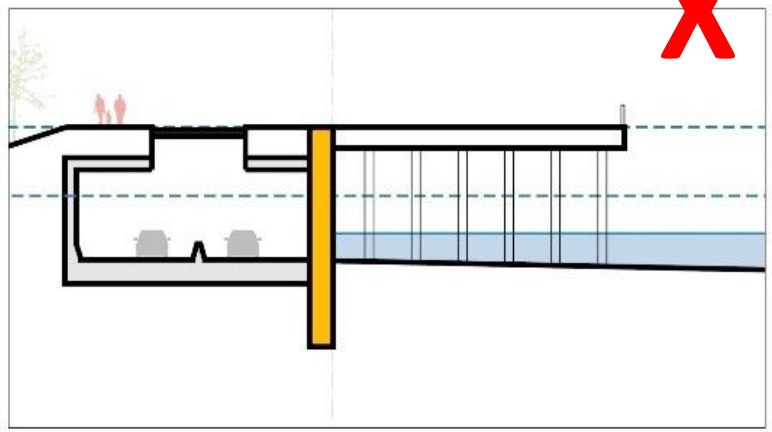


# Why can’t we put a floodwall under the FDR Drive?

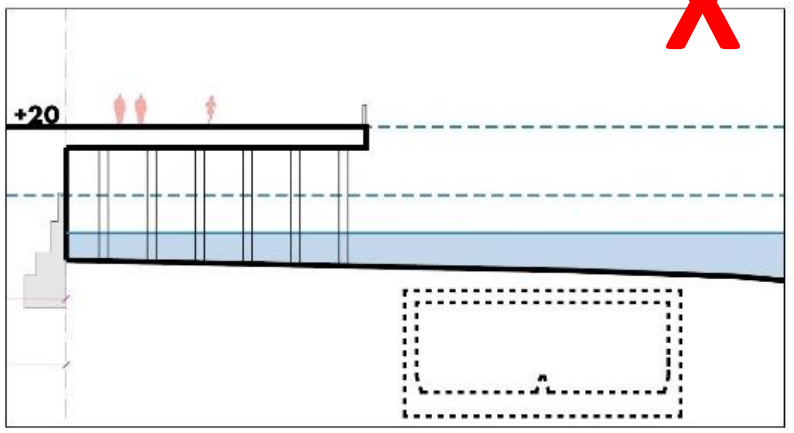
State DOT requires a **vertical clearance** of 5 feet from the FDR viaduct. The height of a floodwall needed to achieve our DFE would exceed the maximum allowable height under the FDR.

# If we modify the FDR Drive, can we achieve our flood protection without going into the water?

- We looked at options to **bury the FDR**, which were deemed infeasible
  - A **trough** (like the Battery Park Underpass) would interfere with the subway tunnels and underground infrastructure
  - A **tunnel** (like the Hugh Carey Tunnel) would have to go into the water and would be extremely expensive
- Both options are extremely costly, technically challenging, and very difficult to implement




*Trough*




*Tunnel*

# If we modify the FDR Drive, can we achieve our flood protection without going into the water?

- Through studying these different options for the FDR Drive, we've learned that replacing the FDR with an at-grade roadway still **does not provide enough space to site flood protection on-land and avoid going into the river.**

We still do not have enough space to achieve our constant level of flood protection on-land while maintaining access to the waterfront

To achieve our waterfront access goals, we would be solely reliant on deployable measures to achieve our target level of flood protection, which is not recommended due to the study area's location relative to the New York Harbor and wave action

Still requires extensive ramping to get back down to the water

We would be impacting the current waterfront programming, with limited space to replace what is currently there today

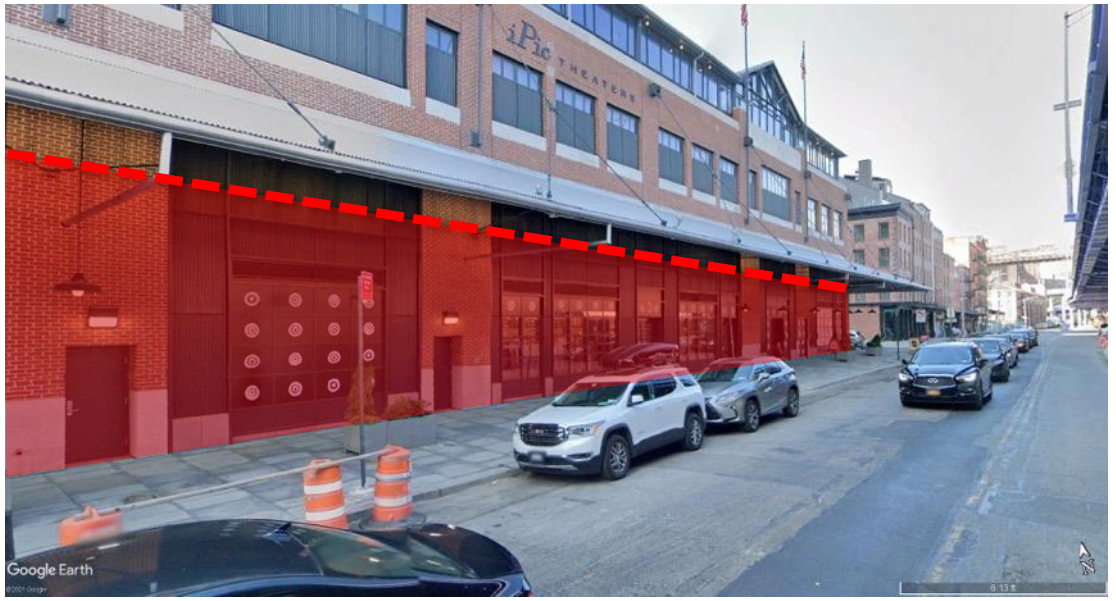
Does not allow for future adaptability of the flood protection system

# Why won't relying on building-level approaches work?

1. Most buildings along the water are not designed to withstand the **wave loads and forces** associated with storm surge, requiring an independent structure to still be constructed.
2. This would impact **access to and from** buildings, requiring many deployable measures, such as gates, to maintain existing connections between the street, sidewalk, and buildings. With **future daily tidal flooding**, this will not be practicable.
3. Building-level approaches would also create a **dependence on private property owners** to provide critical flood protection across the area.

*Source: NYC DCP*

*Building-level approaches may involve a combination of floodproofing and relocating critical systems, possibly abandoning the basement*




*Height of needed building-level flood protection to reach our DFE (South Street)*

# Why won't raised streets work to provide area-wide protection?

1. Requires **independent flood protection** structure with foundation integrated into roadway, particularly challenging for FiDi
2. Significant impact to **existing street grid** and connections, surface drainage, and underground infrastructure (incl. cover)
3. Limited **applicability**:

   Only recommended where existing street is **within 4 feet** of the DFE

   Would still require **relocation** of underground infrastructure and new access points (manholes etc.)


**Coney Island, NY**

- Streets raised at most 6.5 feet to redirect stormwater on peninsula
- Little existing development around streets raised
- No adaptation of existing context to street grade

**Ocean City, NJ**

- Streets raised (on average) 4.5 feet to improve drainage and raise Route 40
- Includes pump stations

# What about deployable measures?

- In some areas **we still need to use deployable measures** to maintain access across the study area. However, given the wave forces in the area, passive measures, such as levees and floodwalls, are preferred.
  - Because the area is low-lying, deployable measures must be used in conjunction with **raising the edge**
- Deployable measures, such as **stop log systems or flip-up gates**, are designed to withstand greater wave forces than measures that can be deployed just ahead of a storm. These are different from “just-in-time” measures, such as Tiger Dams, which are not a long-term solution
  - These types of deployable measures still require adequate vertical, horizontal, and underground space to accommodate **foundation requirements and on-site storage**

***Flip-Up Gate***
*Source: PS Flood Barriers*

***Stop Log / Plank System***
*Source: 140 West Street*

***Roller Gates***
*Source: PS Flood Barriers*

# Why can’t we put a deployable flip-up gate under the FDR Drive?

The FDR columns have wide foundations, from which a **horizontal clearance** of 5 feet is required. This does not leave enough horizonal space to construct a flip-up gate that would flip up to the height required to achieve our DFE.

# How does needed drainage infrastructure add to these challenges?

- New **large-scale drainage infrastructure** will be required for our costal defense system to work and to ensure that the existing drainage system provides the same level of service under future sea level rise
- To ensure rainwater does not **“pond” or collect** behind the coastal defense, a combination of pumping and storage solutions are being considered
- At a minimum, this would require a **pump station** with necessary pipelines, which would collect and pump rainwater into the East River during wet weather events**.** This could take up to 13,000 square feet both above and below ground

***Pump Station in Hoboken, NJ***
**Source: NJ.com**

***Manhattan Pump Station***

# To recap why an entirely on-land project is infeasible…

1. We cannot site an **entirely on-land** project that protects against daily tidal flooding and coastal storms while **maintaining public waterfront access** and maritime uses.

2. There is very limited **available space** along the waterfront. In addition, there is not enough vertical space beneath **the FDR Drive** to construct our floodwall, nor is there enough horizontal space to fit a flip-up gate.

3. Some options to **modify the FDR Drive** are infeasible and overly expensive, while others would not generate enough additional space for a floodwall that maintains waterfront access.

4. Neither **building-level solutions** or **street raising** are viable alternatives for most of our project area.

5. While **deployable measures** have a lot of utility and may play a role in any coastal defense solution, we cannot solely rely on them to provide the level of protection required across the whole project area.

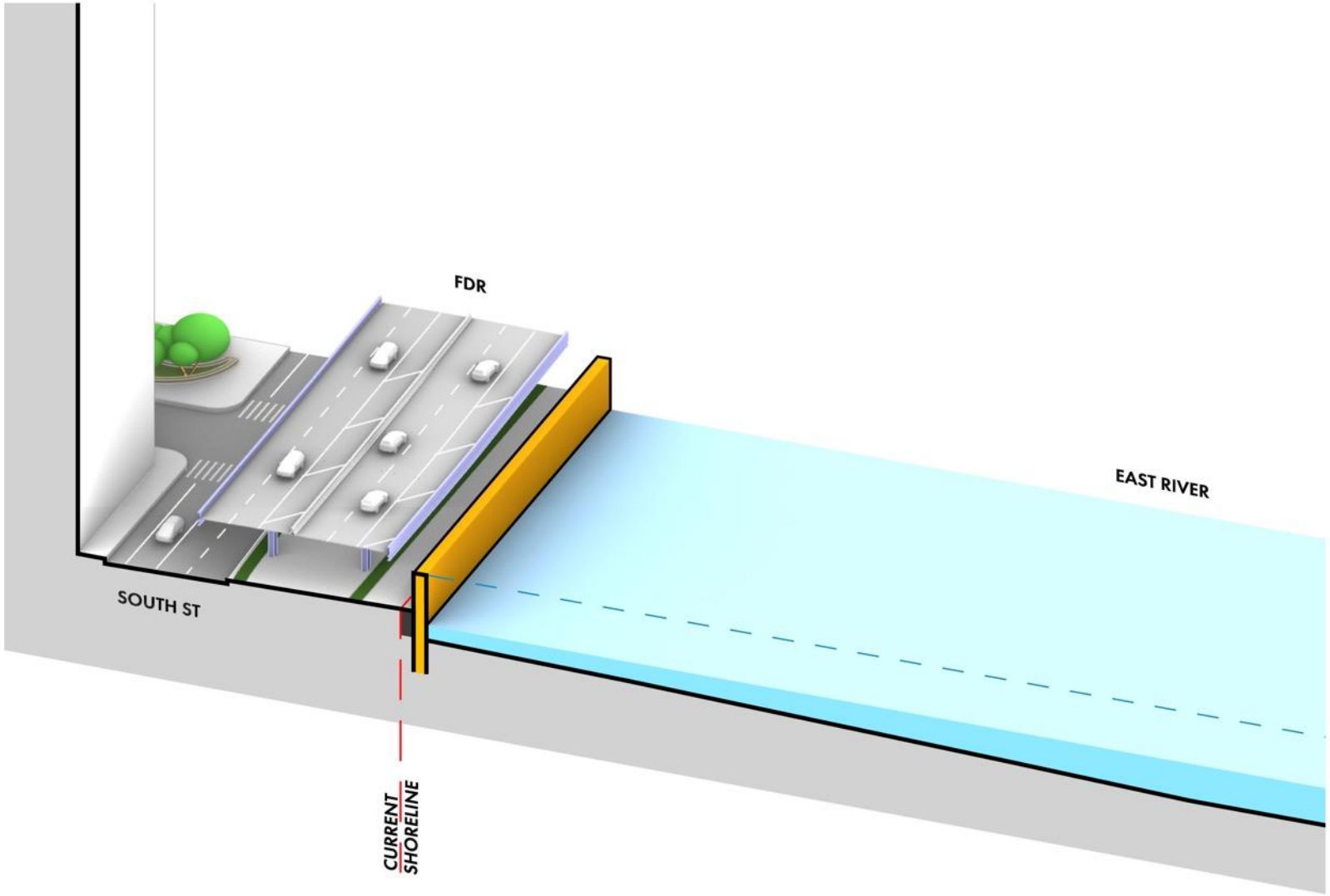
6. A complex network of **underground infrastructure** resides beneath the streets and can't be easily moved. Constructing our foundations for the coastal defense must carefully consider the performance of each element to ensure our drainage infrastructure, transportation network, and utilities continue to function.

7. New **drainage infrastructure** is necessary for our coastal defense to work and will require a substantial additional amount of above-ground and underground space.

# How have we been approaching the design of the project?

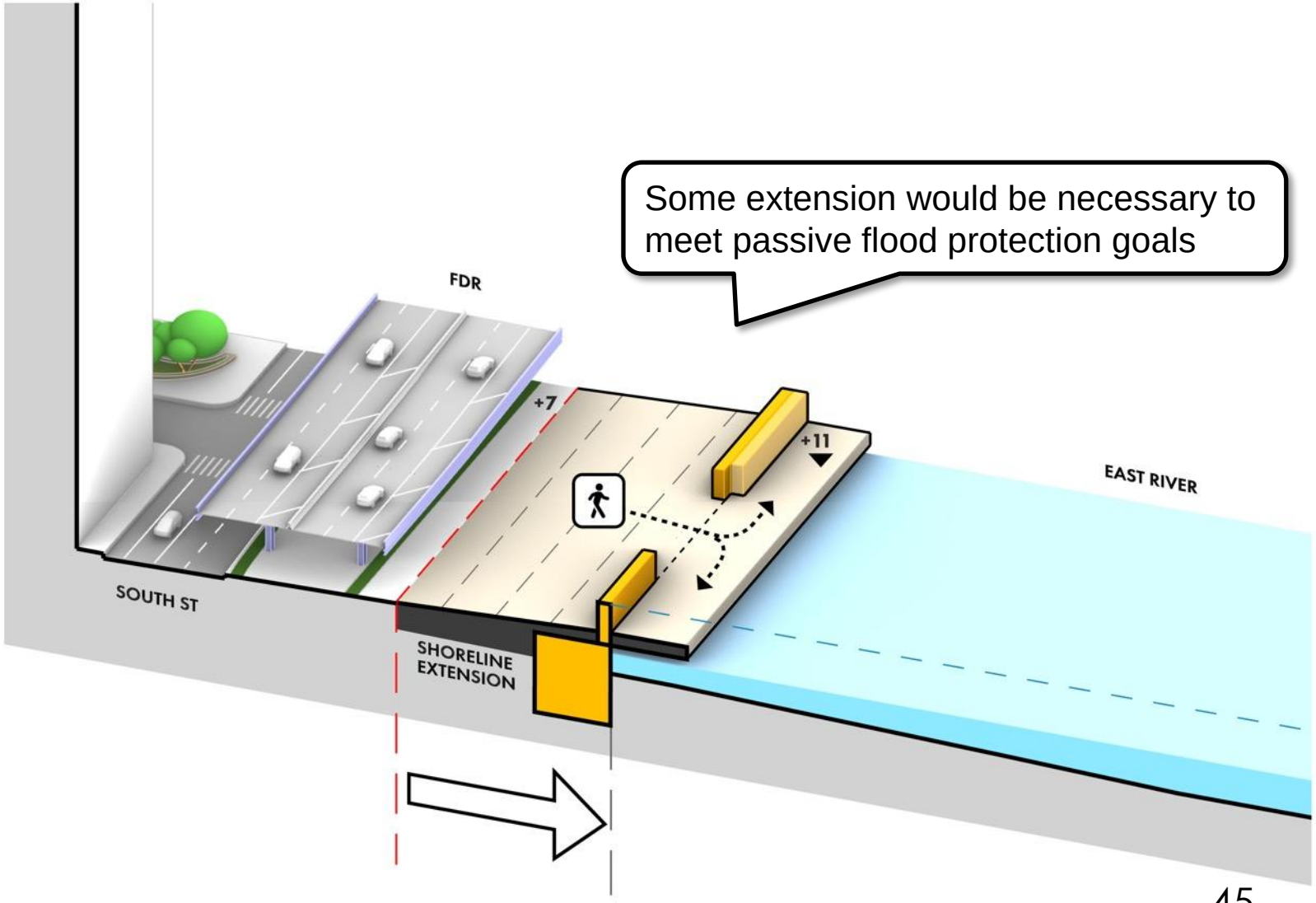
# How do we build our coastal defense without walling off the city?

- While constructing a wall along the existing bulkhead line would provide constant flood protection for Lower Manhattan, it would ***not*** meet other project goals, including:
  - Provide the necessary space needed to site new **drainage** infrastructure
  - Maintain **key connections** between the upland neighborhood and the waterfront for key maritime functions & water-borne transportation
- In addition, a wall at the water's edge would create an **unsafe condition** beneath the FDR Drive, with poorly lit corridors and unhealthy air quality



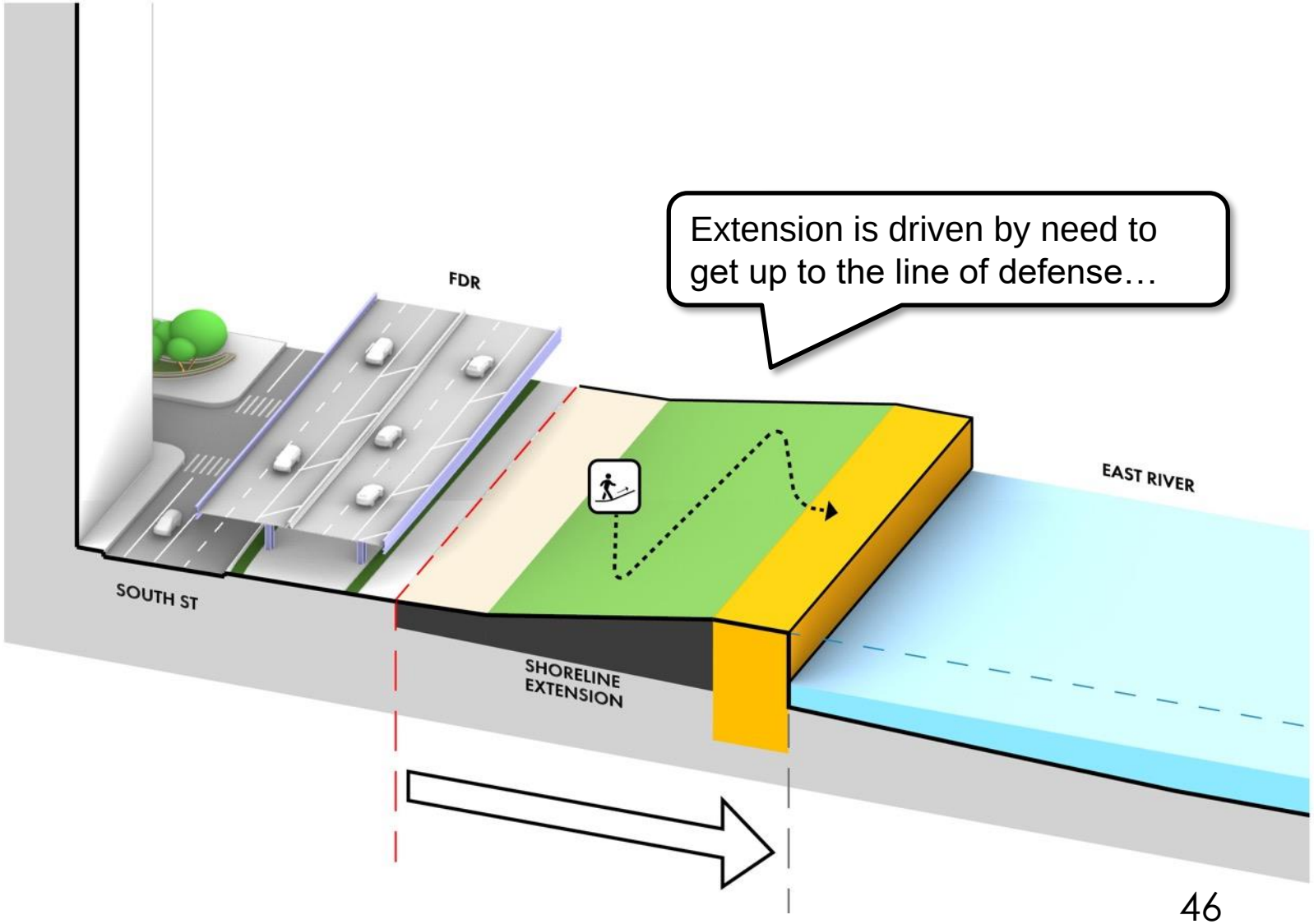
# Why is a solution that relies predominantly on gates not applicable here?

- FiDi Seaport has larger waves compared to neighboring projects due to its location relative to the NY Harbor. Larger waves, as well as lower ground elevations make **deployable measures – like gates – less suitable** for our project area.
- In addition, the area is vulnerable to **future daily tidal flooding**; therefore, we need to design to a constant “passive” level of flood protection that is always there
- As a result, gates must be used **sparingly** and in concert with passive measures to ensure a reliable, operable, and maintainable coastal defense system



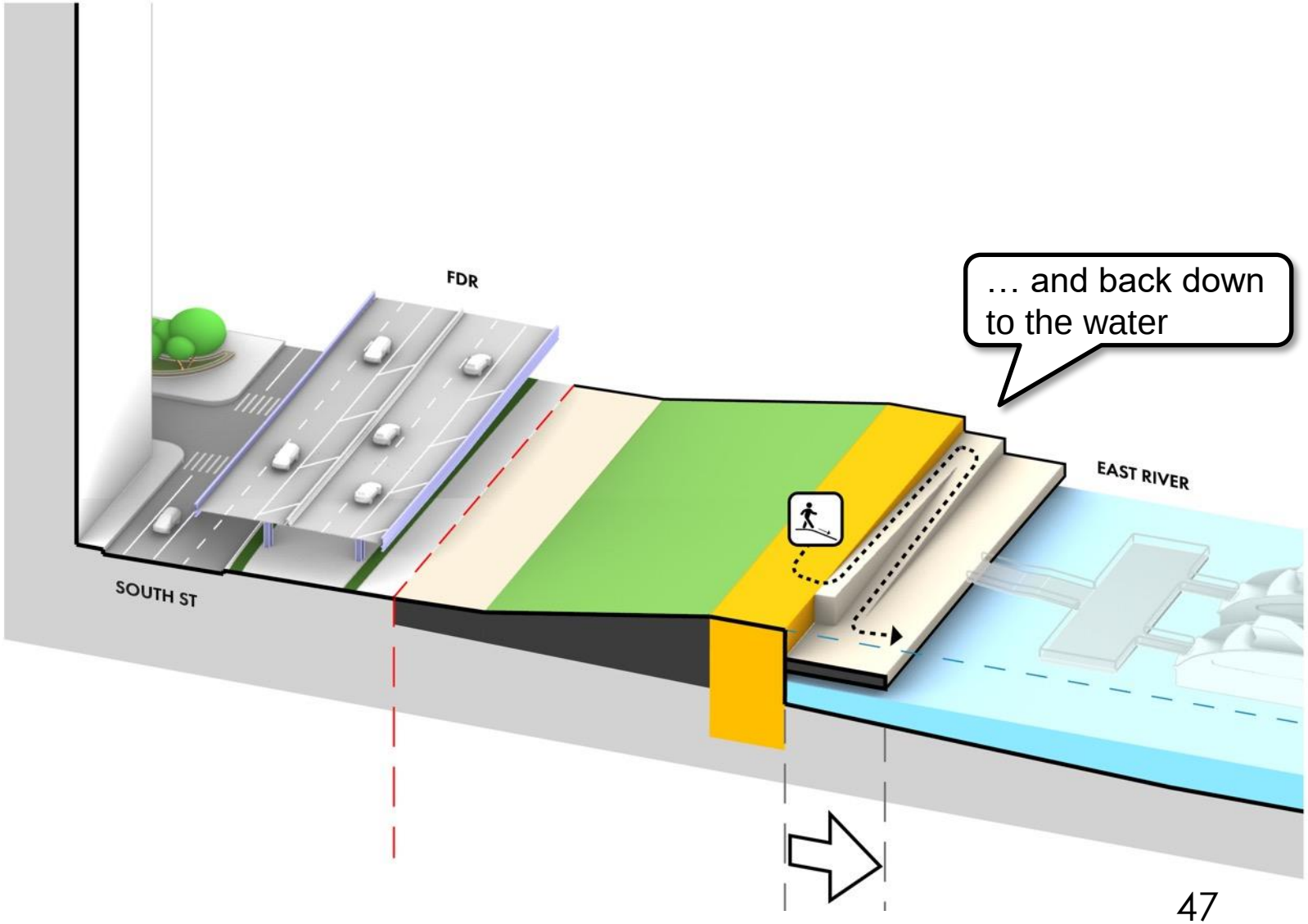
# In order to achieve the project's goals, we are proposing to extend the shoreline of Lower Manhattan

- While siting the coastal defense, we need to maintain **universal access to the water** - meaning that everyone, regardless of ability or age, can access and participate in public life
- Space is needed to allow for the appropriate slopes and grade changes to ensure **access for all** getting up and over the design flood elevation
- Space is also needed to provide **emergency and maintenance access** (vehicular) to the flood defense, maritime uses, & water
- Within this space there are also opportunities to site **drainage** infrastructure, capture **stormwater run-off**, and replace **existing open space**

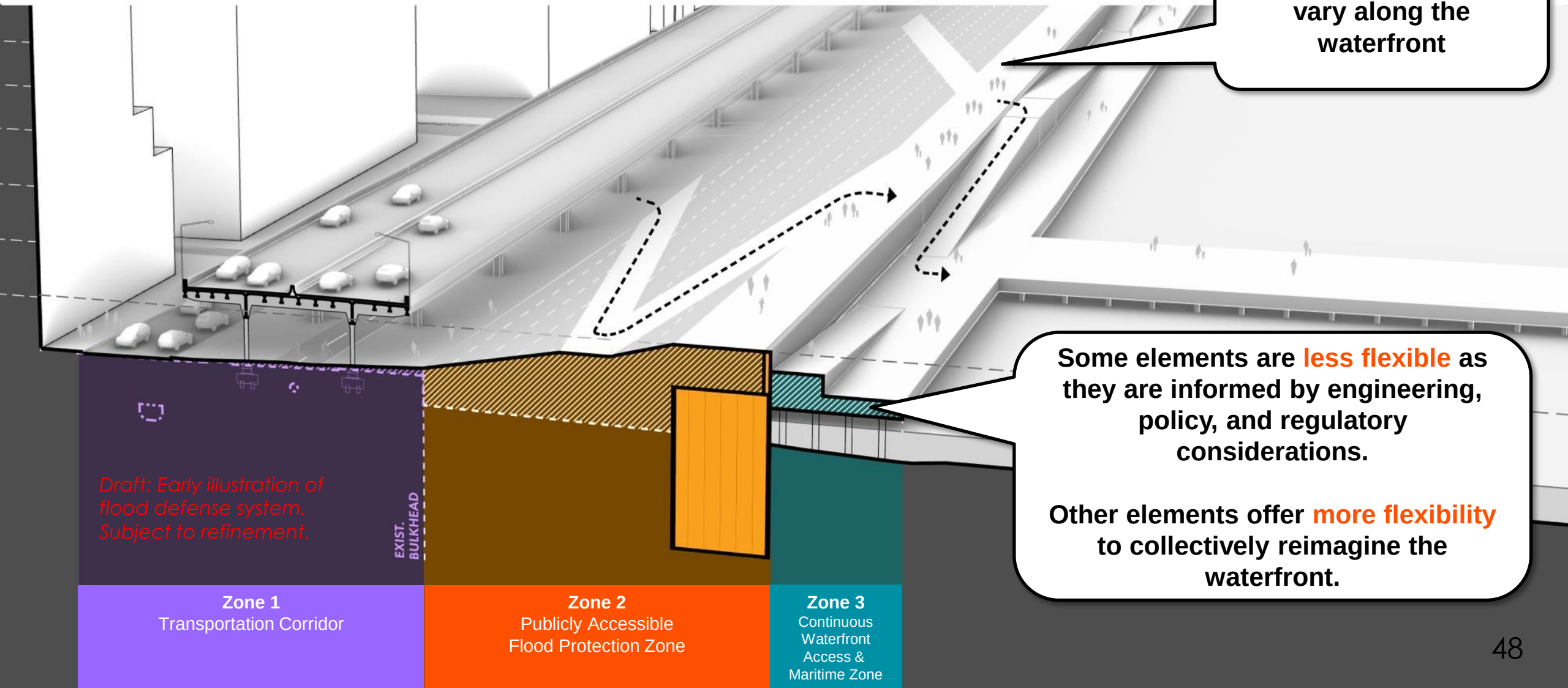


# This includes a multilevel waterfront to meet site access needs, as well as space to connect to maritime uses and a publicly accessible waterfront

- We also need to accommodate **universal access** from the neighborhood back down from the design flood elevation to the water's edge
- At the water's edge, we need to:
  - Plan for **adaptive maritime uses**, acknowledging their unique functions as well as vulnerability to sea level rise and storms
  - Provide a **continuous waterfront esplanade** in keeping with the East River Esplanade plan, with access to these maritime functions

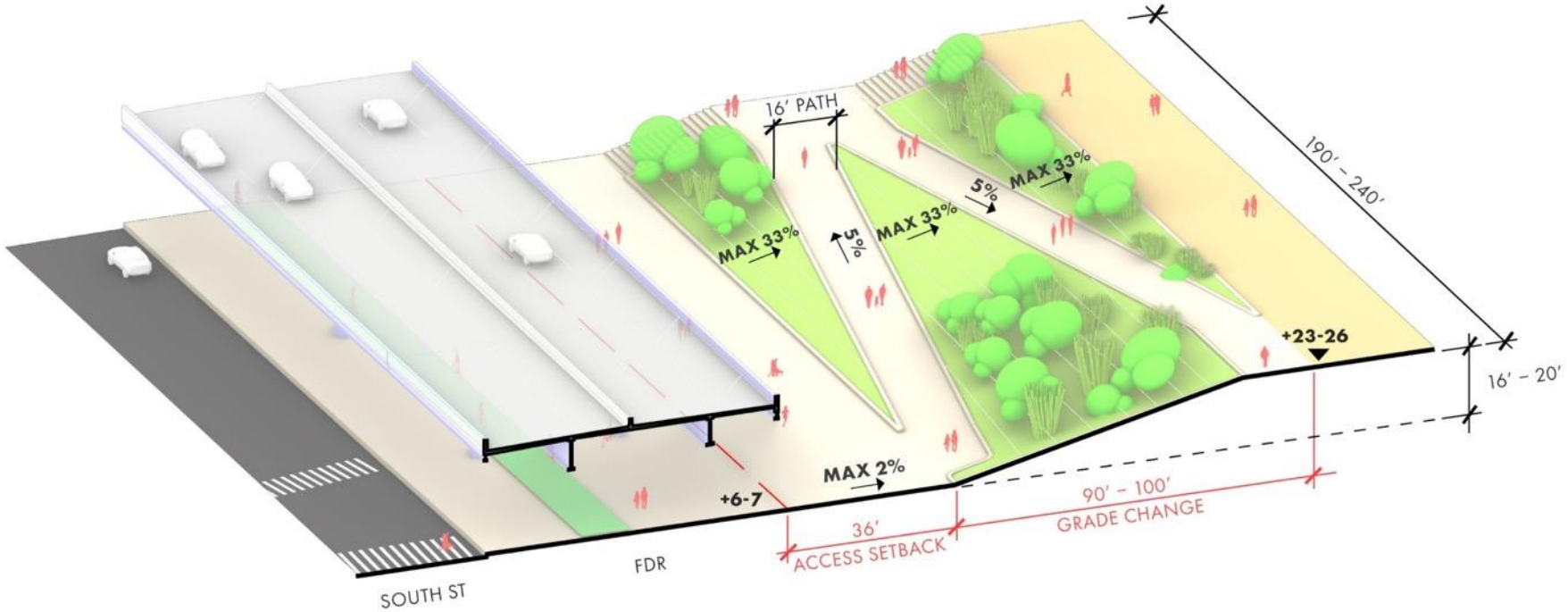


# Our design must get people up to and down from our flood protection, providing three distinct zones for us to design.



# How can we provide universal access at frequent access points in line with the East River Esplanade vision?

- A switchback allows a user to arrive at a similar point along the waterfront that they entered, as well as flexibility in connecting multiple access paths across the site
- Slopes that are not too steep ensure we can maintain plantings while also the ability to capture stormwater runoff
- A 16’ wide path provides enough space for users to access the waterfront, as well as sufficient space for vehicles to access the site for operations & maintenance




**Case 1: 16’ Change**
(2) Access paths @16’ ea = 32’
16’ vertical at 33% slope = 48’
80’ + Contingency

**Case 2: 20’ Change**
(2) Access paths @16’ ea = 32’
20’ vertical at 33% slope = 60’
92’ + Contingency

***Note: this configuration is not a specific design, it is a basis for estimating space needs for access***

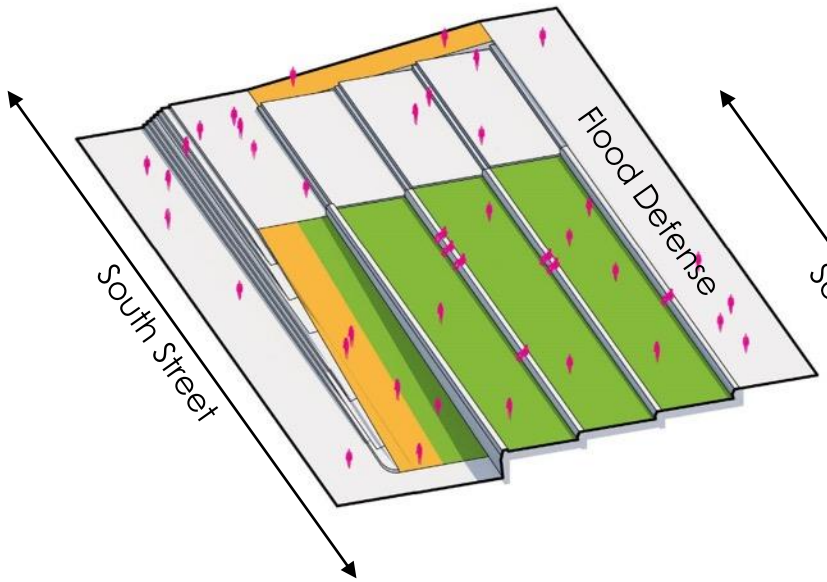
# Public Access & Program

*Getting up to the flood protection*

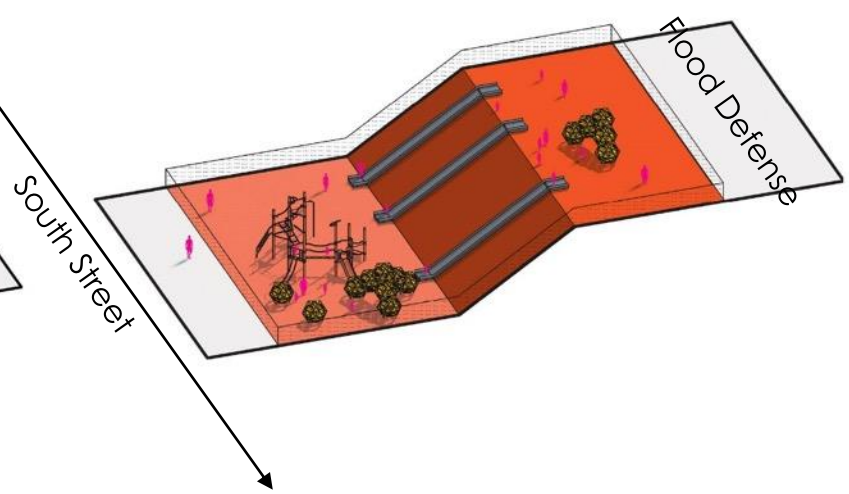
**Where is there flexibility for community feedback to guide the project options?**

***"Public park space that is open, available, accessible with a variety of different programs that address many groups' needs"***

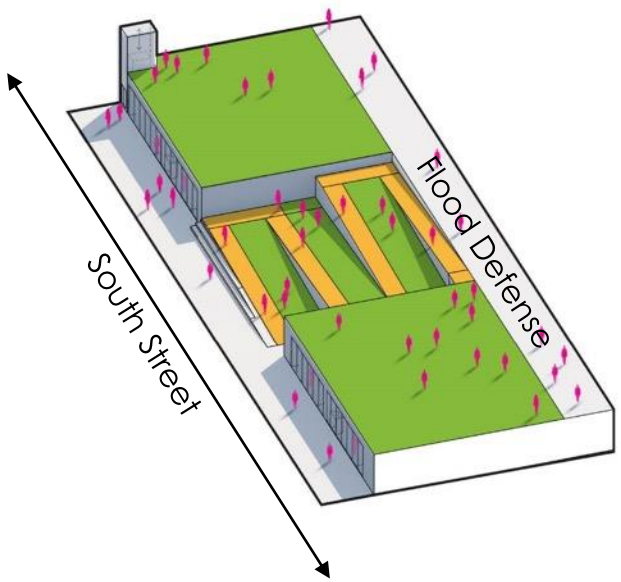
- How do we better connect the community with the waterfront?
- How should we get up to the design flood elevation from the city?
- What different programs and amenities would you like to see here? (plazas/lawns, playgrounds, active programming, dog parks, cultural facilities, etc.)
- What role do structures / buildings play in shaping the waterfront?




Multi-level Open Space




**Recreational Space**




**Buildings**



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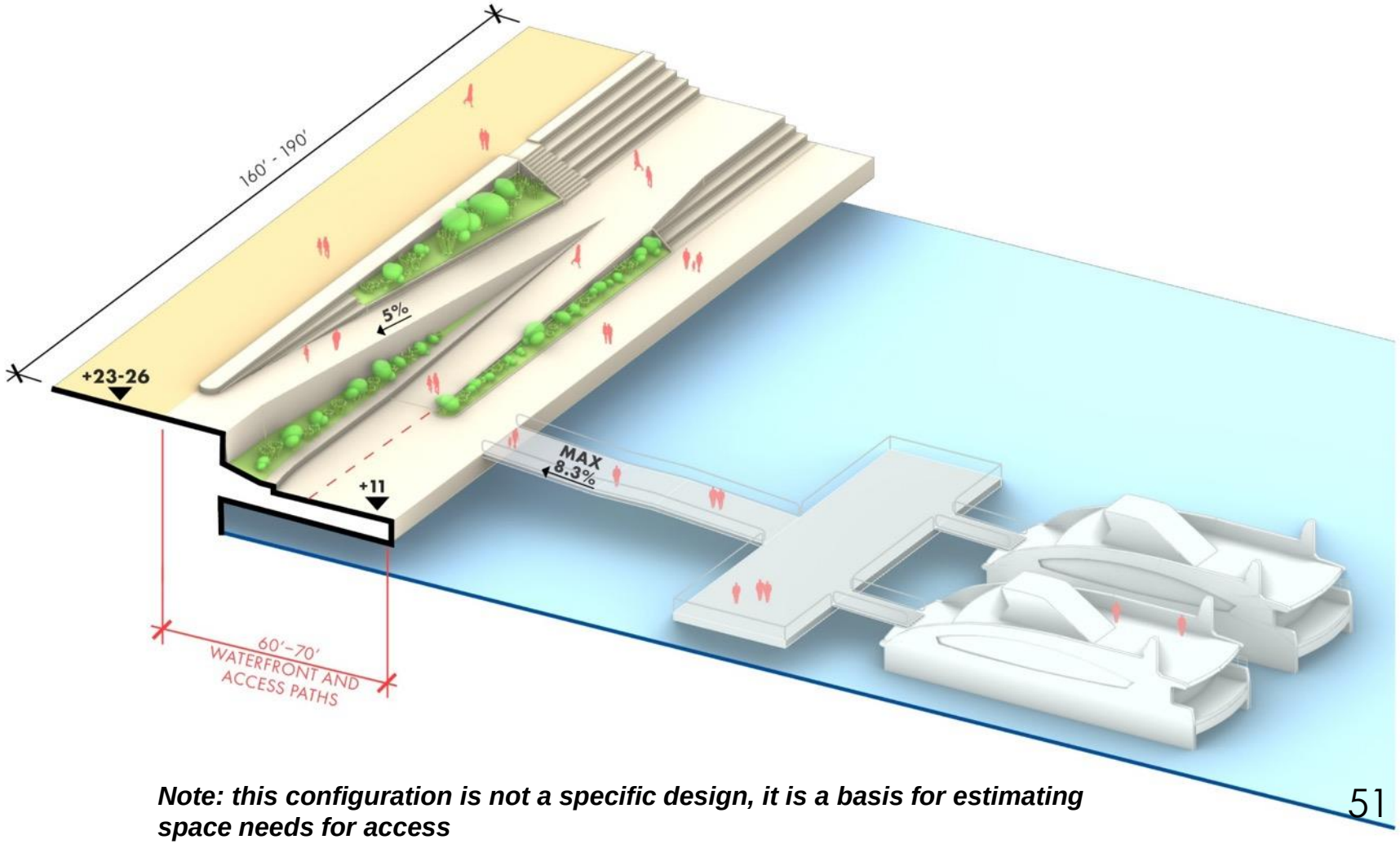
# Waterfront & Maritime Access

*Getting back to the water, maritime uses, and a continuous waterfront esplanade along the East River*

## Where will we co-create?

- What should the experience of the East River esplanade be?
- Looking at other examples from around NYC, what design elements would you most like to see along a waterfront esplanade?
- How should we treat walls along the waterfront esplanade?
- What kinds of programs and opportunities should we prioritize at the water's edge?

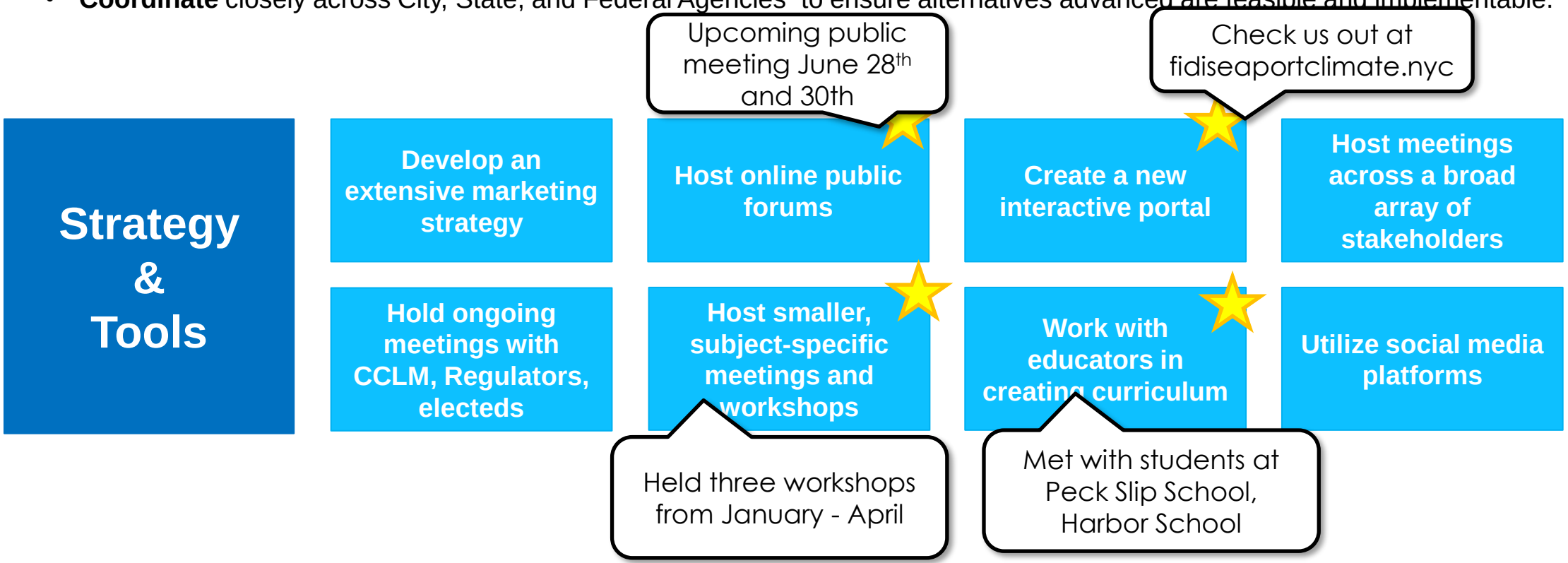



***Note: this configuration is not a specific design, it is a basis for estimating space needs for access***

# Public Engagement Approach

**Empowering** stakeholders by advancing understanding of the science of climate risks and the technical constraints and tradeoffs of building flood protection in the study area.

- Create opportunities for **co-creation** to develop project options that meet the needs and priorities of local and regional stakeholders.
- **Delegate** power to planning partners to expand engagement and bring more people into the conversation.
- Actively **consult** with individuals and organizations with a stake in the project and incorporate feedback into the project development
- **Coordinate** closely across City, State, and Federal Agencies to ensure alternatives advanced are feasible and implementable.





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# LMCR UPCOMING ENGAGEMENT

# Upcoming LMCR Public Engagement

| Projects | Timeline | | | |
|---|---|---|---|---|
| | June | July | August | Fall |
| Battery Park City South | CB 1 EP Update (6/21) | | | Project Scoping Meeting |
| Battery Park City North/ West | CB 1 EP Update (6/21) | | | Project Kickoff |
| The Battery | CB 1 EP Update (6/21) | | | Public Meeting #2 |
| FiDi-Seaport | CCLM 5 (6/16)<br>**Open House #3 (June 28, 30th)**<br>CB1 EP Update (6/21) | | | |
| BMCR | | | | Procurement Process Updates (DDC) |
| Overall LMCR Strategy | CB 1 EP Update (6/21) | | Quarterly Update Call | |