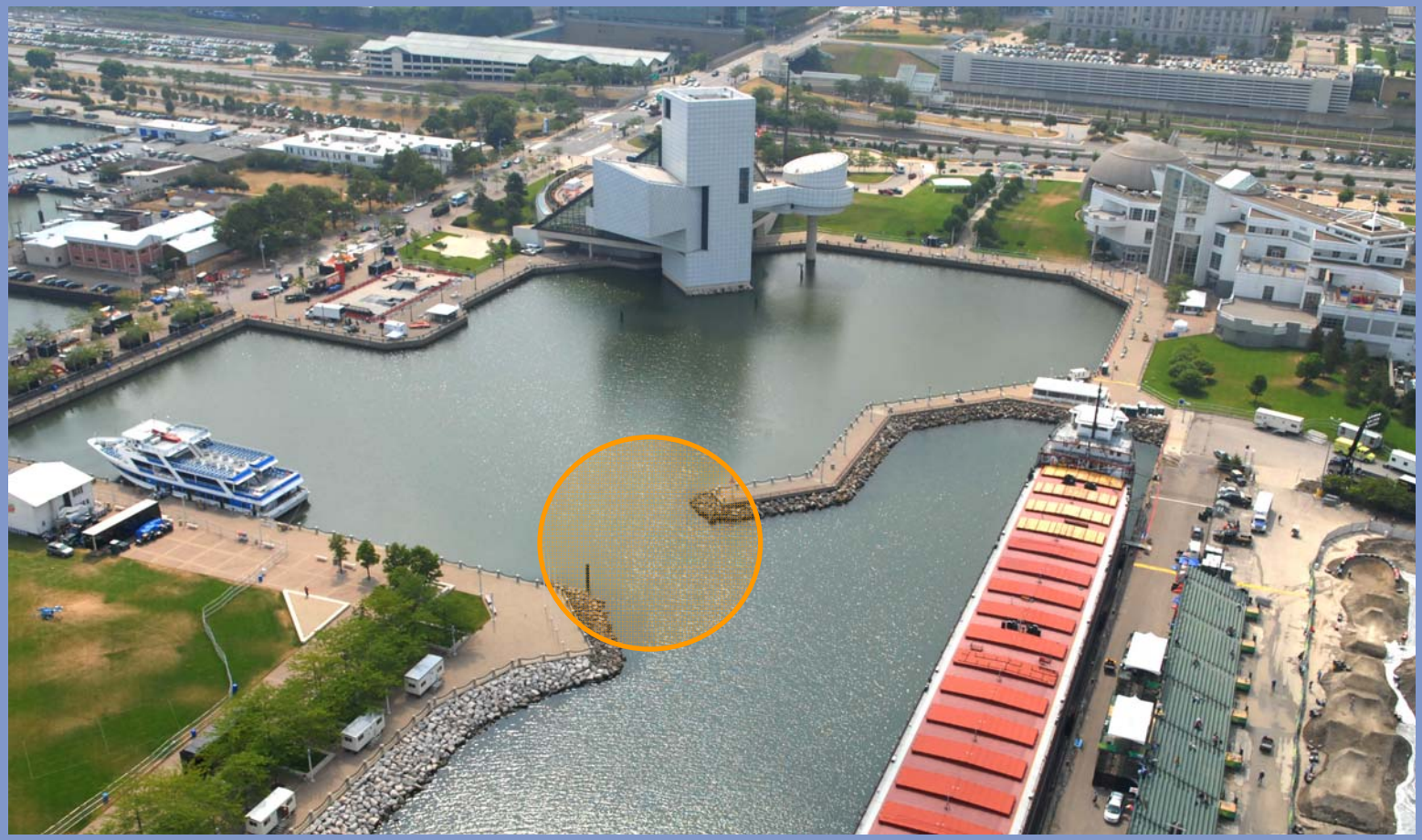
# North Coast Harbor Pedestrian Bridge

## City of Cleveland, Ohio



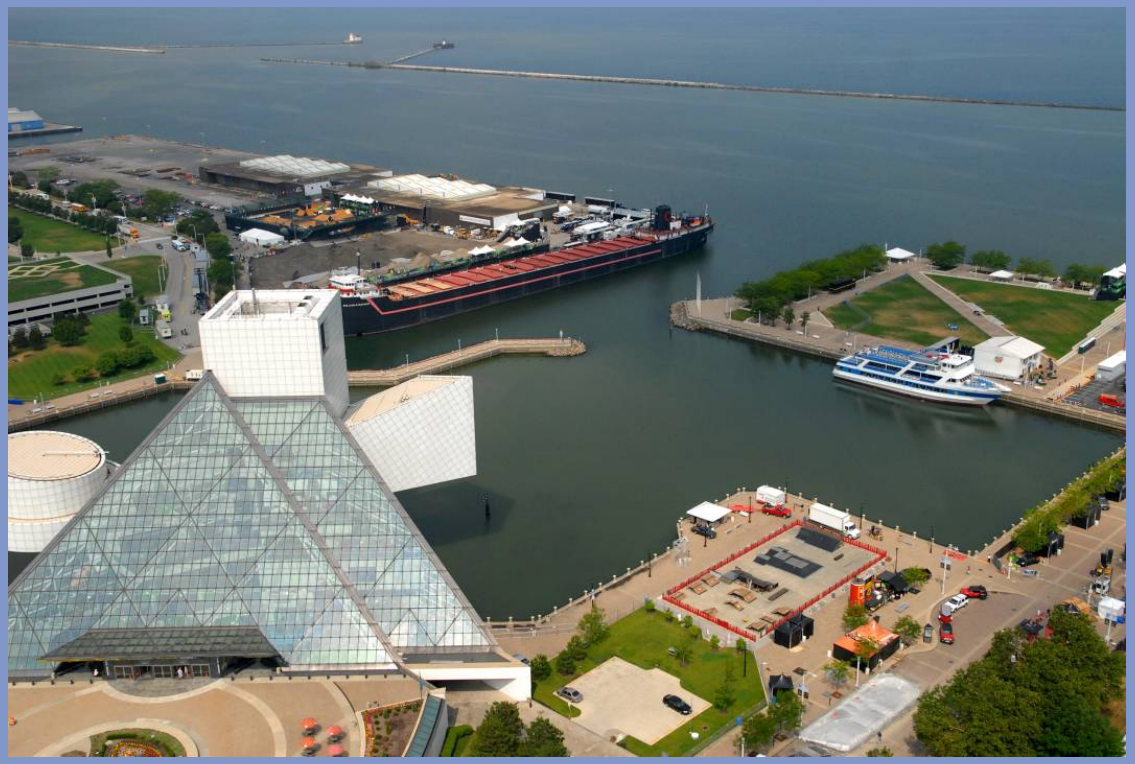
**Wilbur Smith Associates / Rosales + Partners / SBP**

BBC&M Engineering, Inc. / KS Associates, Inc. / Collins Engineers, Inc.

**07.21.2009**

## Workshop Agenda

- Introduction
- Schedule
- Findings
- Conceptual Alternatives
- Alternative Matrix
- Feasible Alternatives



# North Coast Harbor Pedestrian Bridge

**Ohio Department of Transportation**

**City of Cleveland**
Division of Engineering & Construction
Cleveland City Planning Division

**Stakeholder Advisory Committee**

**Wilbur Smith Associates**
Stephen Goodreau
Project Manager

**Rosales + Partners**
Miguel Rosales
Bridge Architect

**Schlaich Bergermann & Partner**
Michael Stein
Structural Engineer

**BBC&M Engineering, Inc.**
Mary Sharrett
Environmental Engineer

**KS Associates, Inc.**
Mark Yeager
Chief Surveyor

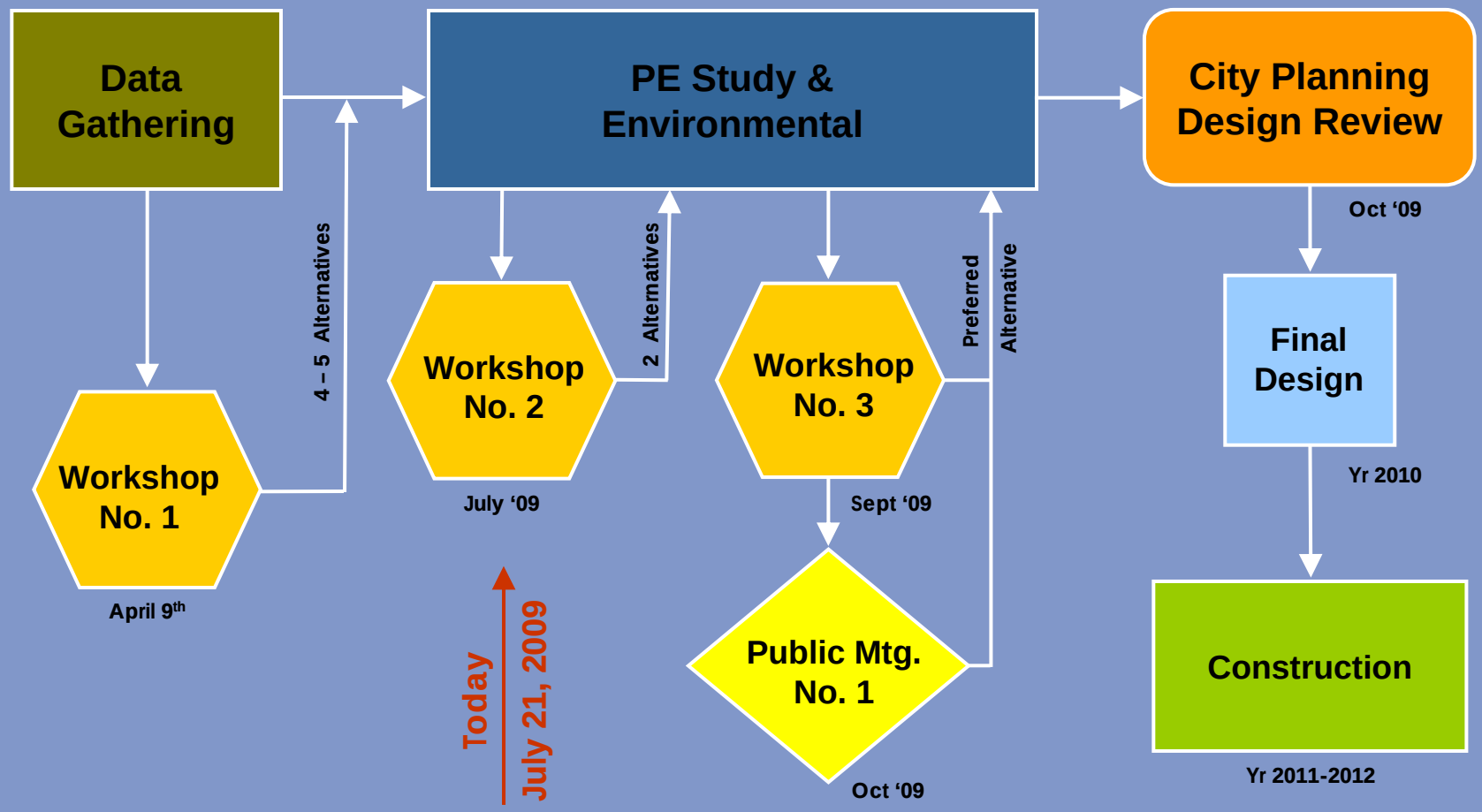
**Collins Engineers, Inc.**
Heath Pope
Underwater Inspection

Wilbur Smith Associates

Rosales + Partners

Schlaich Bergermann & Partner

# Design Process



## Environmental Findings:



- **ESA Screening**
  - ✓ No Additional ESA recommended
  - ✓ Lake Erie sediment has potential impact from Industrial and Marine use.
- **Ecological**
  - ✓ No listed species, Indiana Bat Roosts, and no mussel beds.
  - ✓ Permanent impact to Habitat due to foundation construction.
  - ✓ Temporary impacts to water quality during construction. Mitigated by Storm water pollution plan.
  - ✓ Minimal long-term impact to habitat and water quality.
- **Cultural Resources**
  - ✓ E. 9th Street Pier
  - ✓ Remaining portions cut off below grade from past construction
  - ✓ No significant impact anticipated.

## Environmental Findings: Permitting

**North Coast Harbor Pedestrian Bridge**

**Section 404**

- ✓ USACE permit for fill/dredged material
- ✓ Nationwide permit since minor project

- **Section 401**
  - ✓ OEPA water quality certification (WQC)
  - ✓ Nationwide permit since minor project
  - ✓ WQC pre-certified under NWP

- **Section 10**
  - ✓ USACE permit for work in navigable waters.
  - ✓ USACE Buffalo District has jurisdiction
  - ✓ Processed jointly with the NWP
  - ✓ Application used to be same as 404 submittal.

- **Section 9**
  - ✓ US Coast Guard (USCG) Section 9 bridge permit
  - ✓ USCG District 9
  - ✓ The CE, WQC, and Section 404 permit submitted USCG

- **Costal Zone Management**
  - ✓ ODNR implements the Coastal Management Program
  - ✓ ODOT to coordinate with ODNR
  - ✓ Based on MOU, ODOT projects processed as a CE and use NWPs are considered consistent with the OCMP.

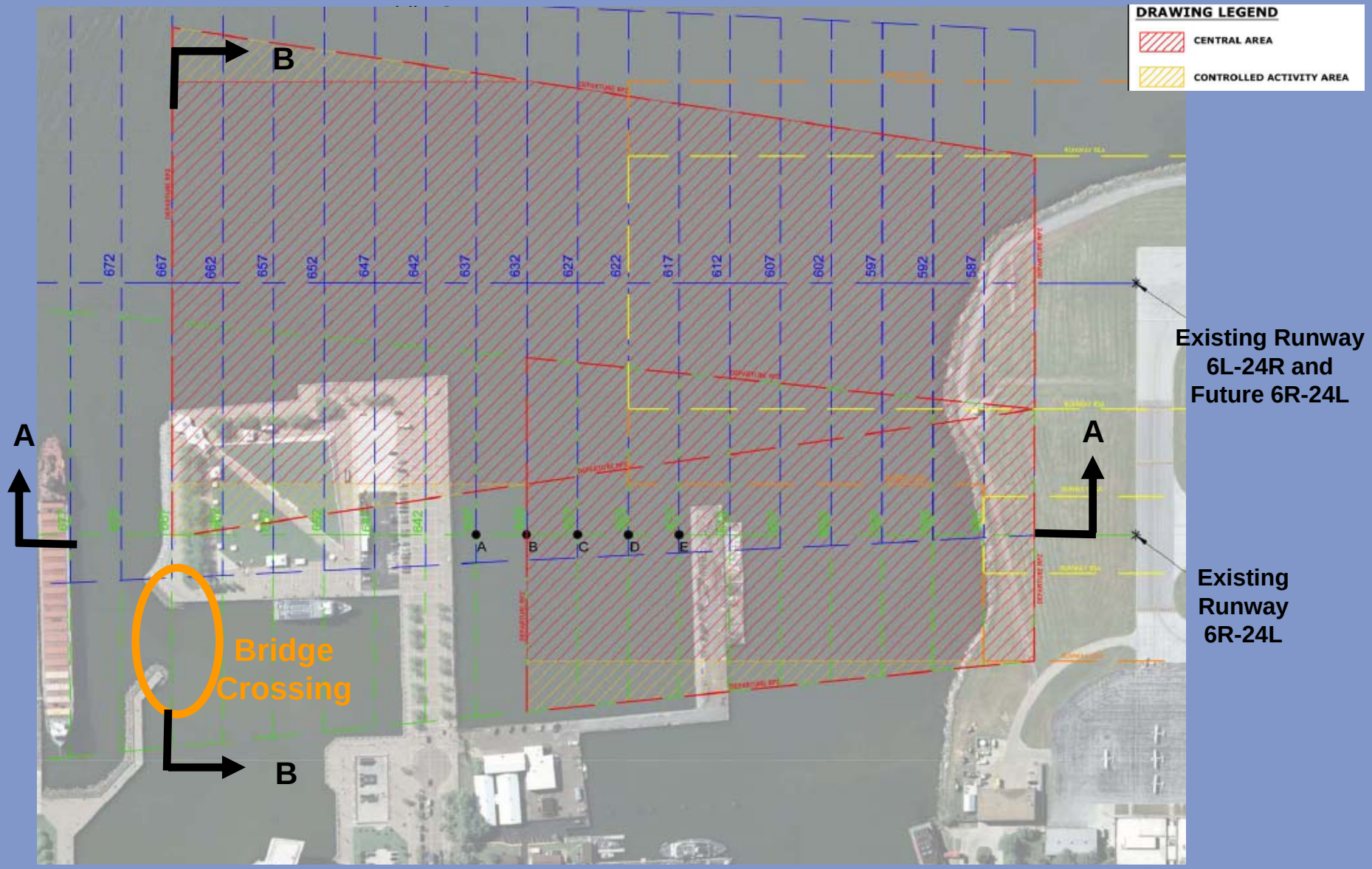
## Preliminary Engineering:

**US Coast Guard Criteria**

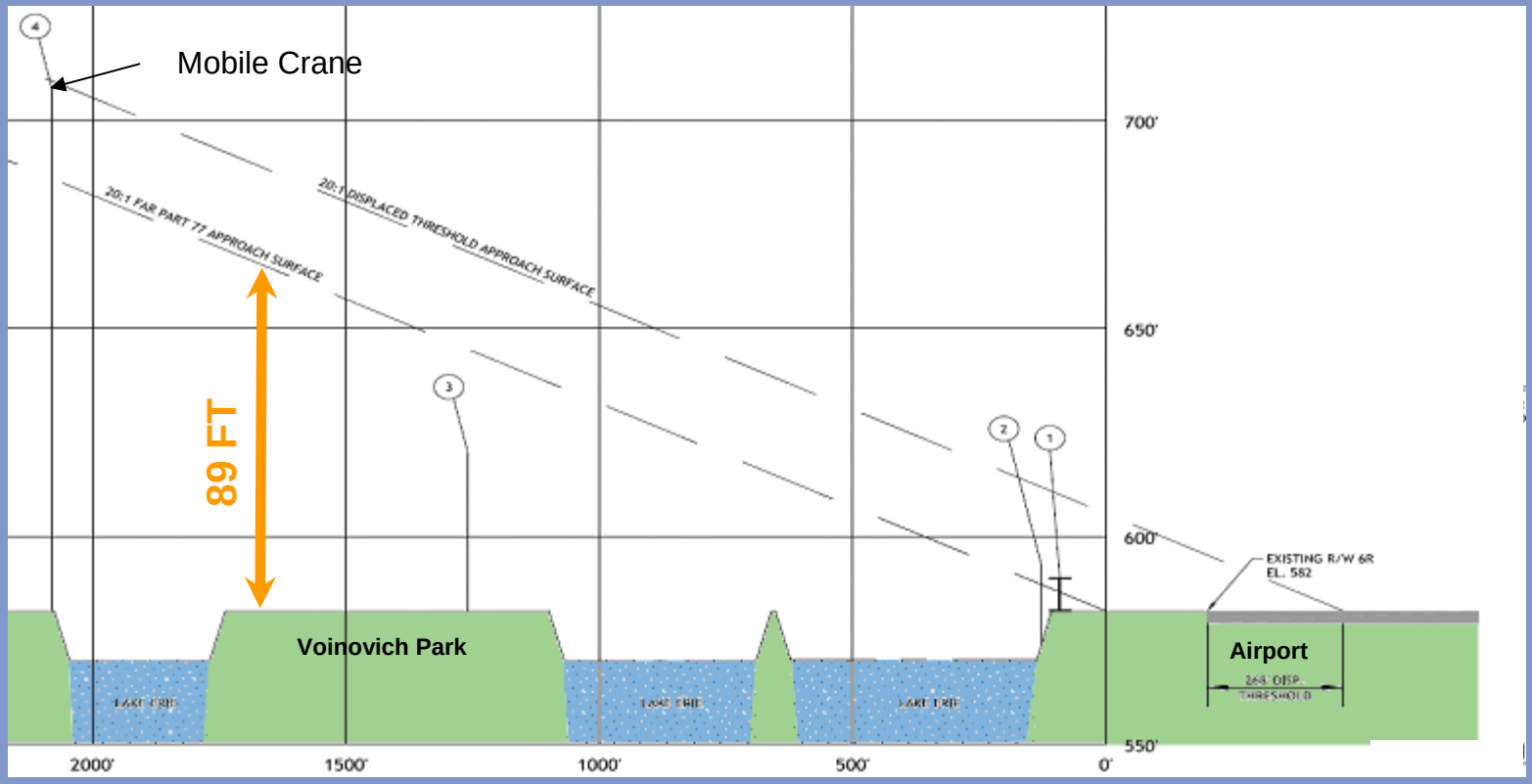
- 90 ft wide x 70 ft tall opening
- Relocate Navigate Light & Signs
- Timber Dolphins

## Preliminary Engineering: FAA Surfaces

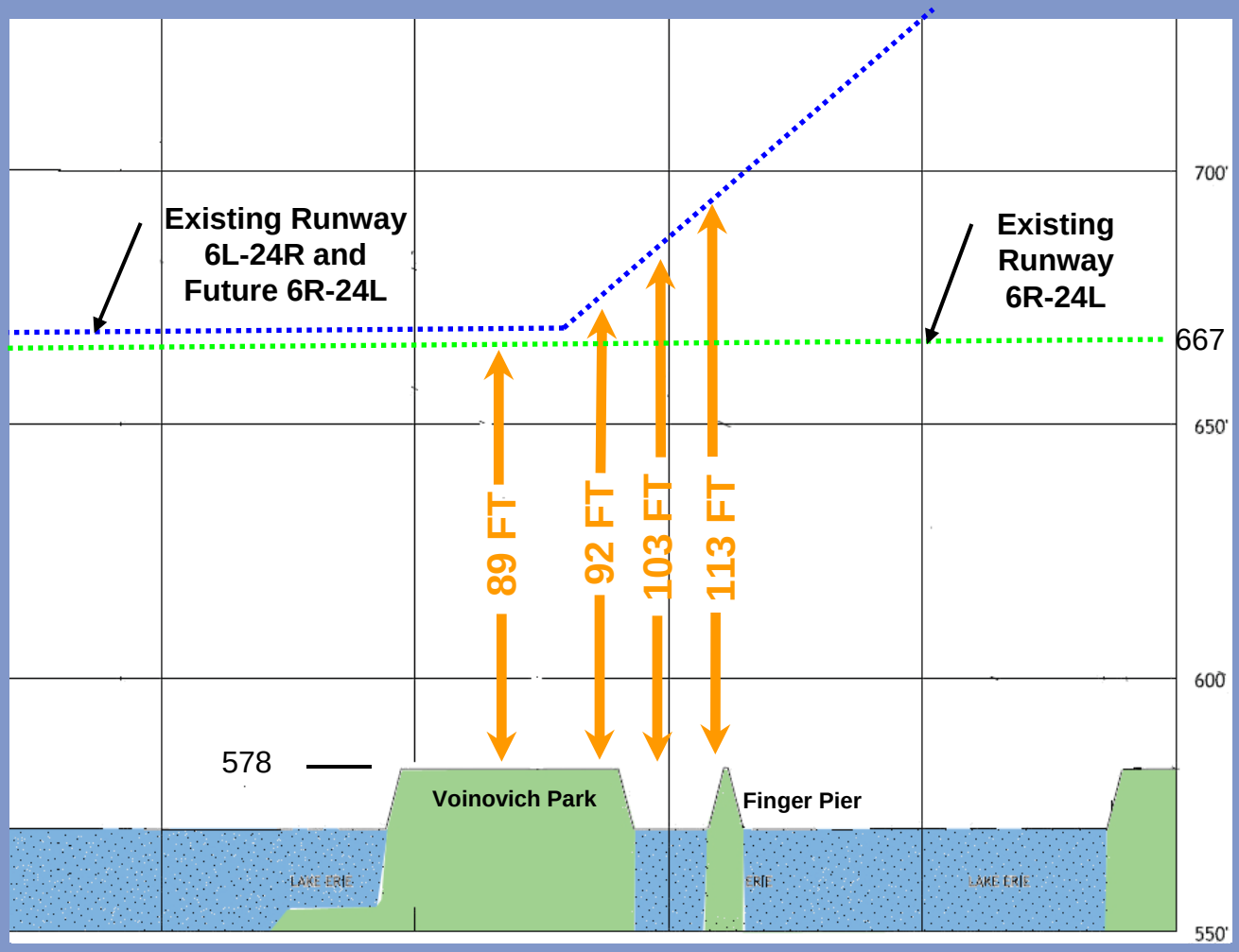
## North Coast Harbor Pedestrian Bridge



## Existing Runway 6R-24L



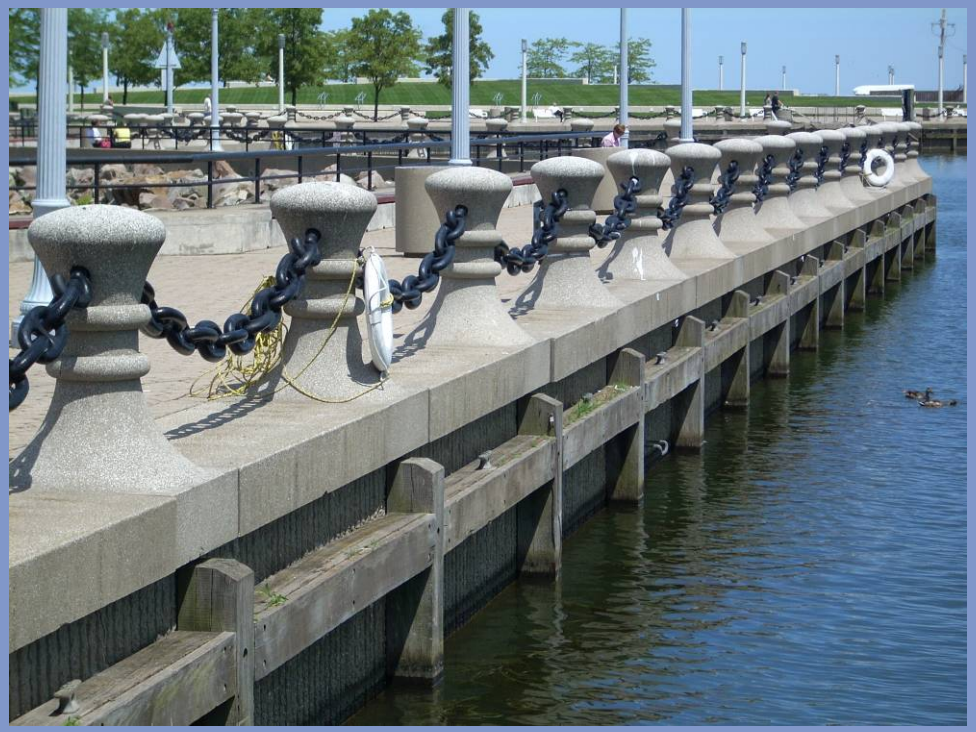

## Section A - A

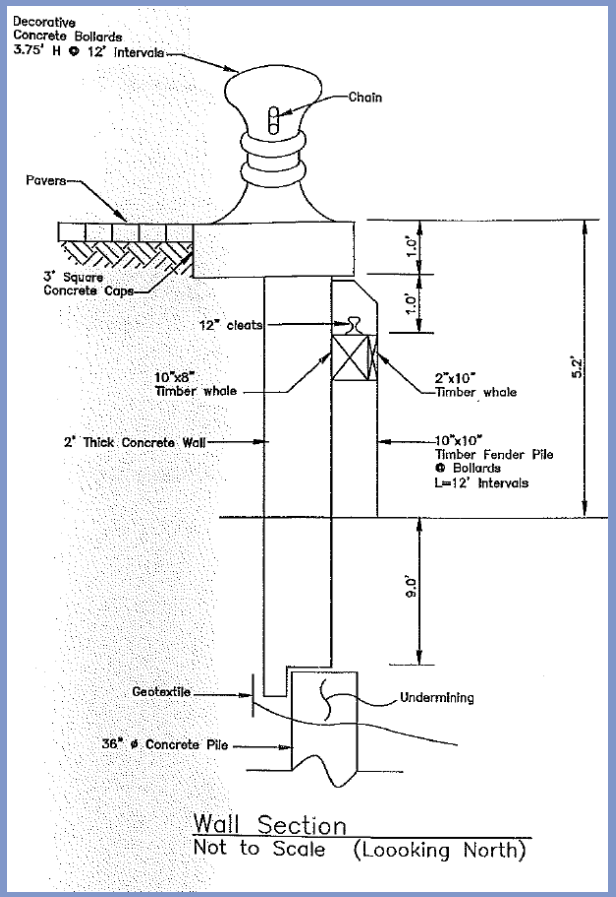

Existing Runway
6L-24R and
Future 6R-24L
Existing
Runway
6R-24L
700'
667
650'
600'
550'
89 FT
92 FT
103 FT
113 FT
578
Voinovich Park
Finger Pier
LAKE ERIE
LAKE ERIE
LAKE ERIE

## Section B - B

## Preliminary Engineering:

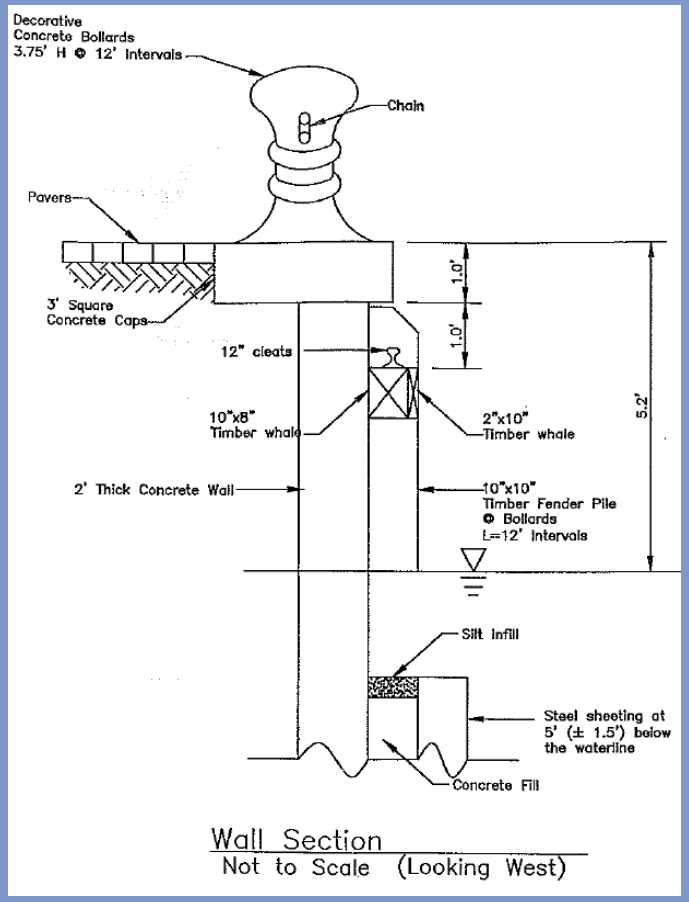
### Underwater Inspection – Finger Pier





## Preliminary Engineering:

### Underwater Inspection – South Wall



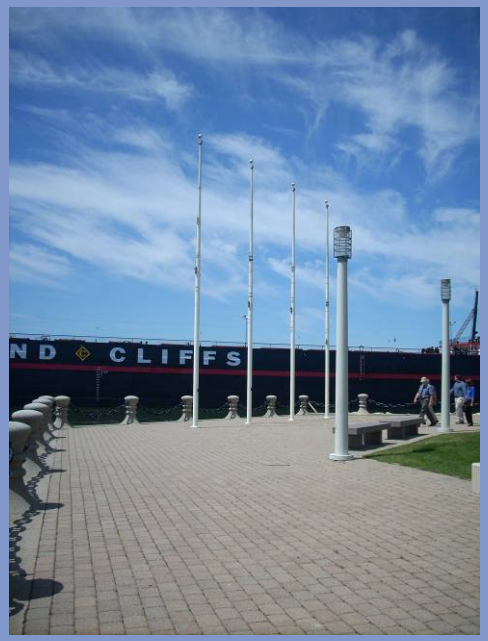
## Preliminary Engineering:

**Geotechnical**

- **20 ft loose to firm Silty SAND fill**
- **76 ft to 82 ft Clayey SILT & Silty CLAY**
- **Shale 96 to 102 feet**
- **Water at 572 ft (Lake Level)**

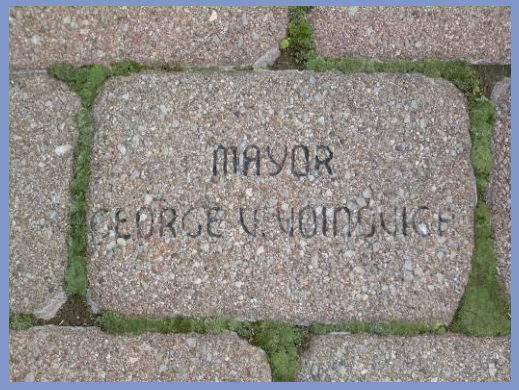
## Preliminary Engineering:

### Site Impacts – Voinovich Park



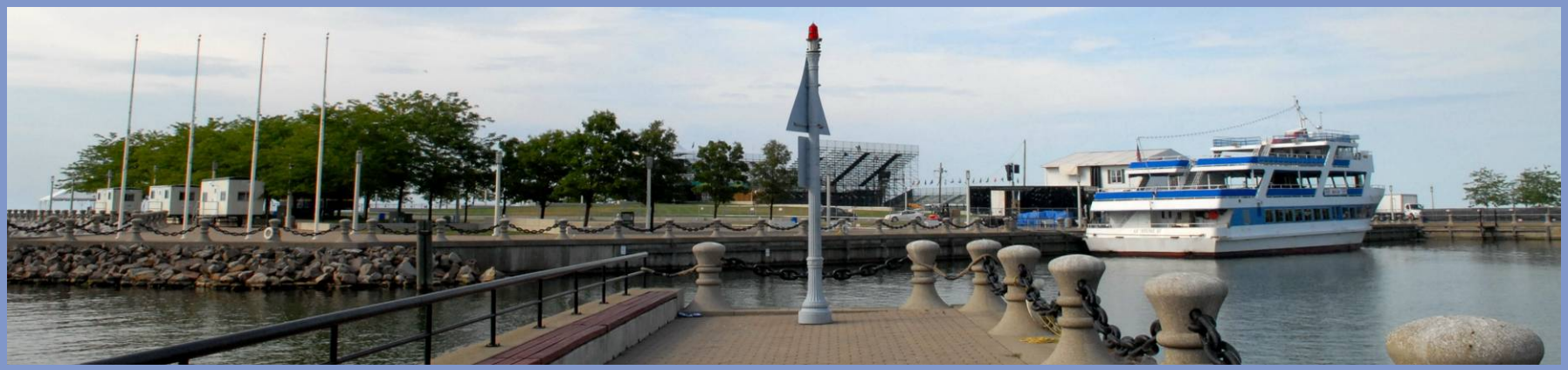

## Preliminary Engineering:

### Site Impacts – Finger Pier



## Goals & Objectives:

- Provide secondary pedestrian access to / from Voinovich Park
- Provide an elegant and timeless structural expression that celebrates the crossing and enhances the City of Cleveland and its harbor
- Create a pleasant and safe experience for users crossing the bridge promoting connectivity for both pedestrians and bicyclists along the waterfront
- Optimize construction cost, structural efficiency and minimize bridge superstructure depth
- Provide accessibility and navigation to the inner harbor
- Respond to maintenance considerations and reduced life cycle cost
- A landmark bridge that reflects current technology and innovation



## Design Criteria:

- Vertical clearance over the navigation channel is 70ft minimum
- Width of the bridge is 12 feet minimum
- Channel horizontal clearance is 90 ft minimum width
- ADA accessibility, 5% maximum slope
- Railing height is 42 inches minimum
- Pedestrian loading (Non-vehicular)
- Safety and aesthetic lighting will be provided
- FAA height restrictions 92’ to 113’ above ground surface elevation

# North Coast Harbor Pedestrian Bridge

# North Coast Harbor Pedestrian Bridge

## Constraints & Issues

- **Construction Budget ($4.06 Million Federal)**
- **Cleveland Lakefront Bikeway**
- **FAA height restrictions**
- **Tall Ships & other public events**
- **Goodtime III**
- **Harbor of Refuge**
- **Operational issues**
- **Annual & long term maintenance**
- **Other**

# North Coast Harbor Pedestrian Bridge

# North Coast Harbor Pedestrian Bridge

Alignment Type 1

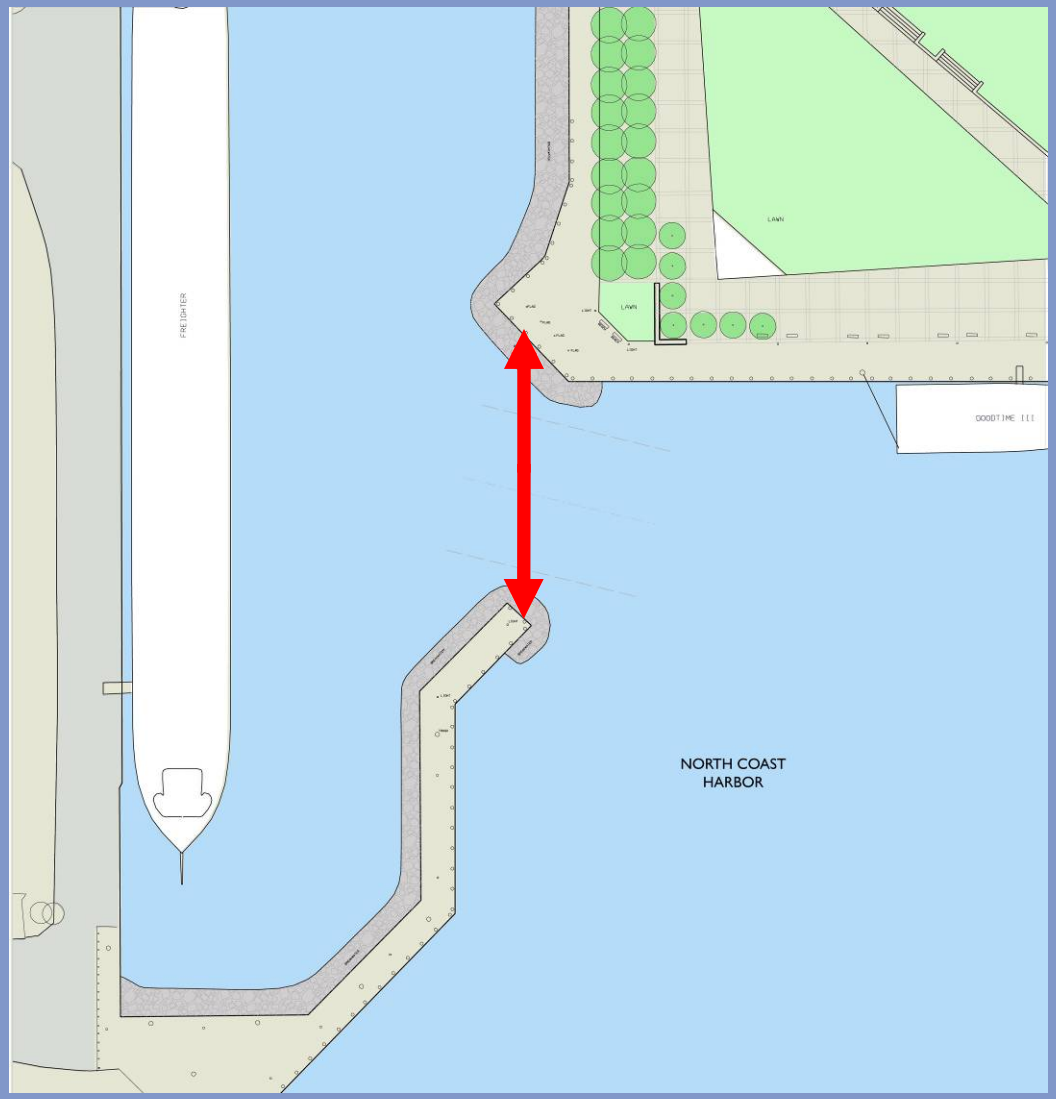
# North Coast Harbor Pedestrian Bridge

Alignment Type 2

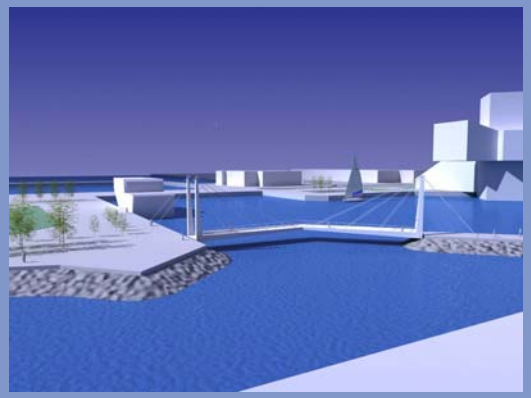
# North Coast Harbor Pedestrian Bridge

Alignment Type 3

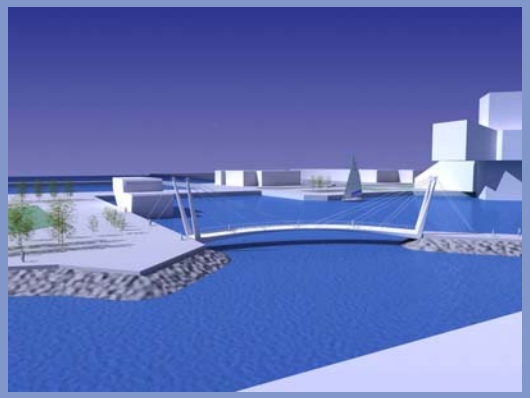
# North Coast Harbor Pedestrian Bridge



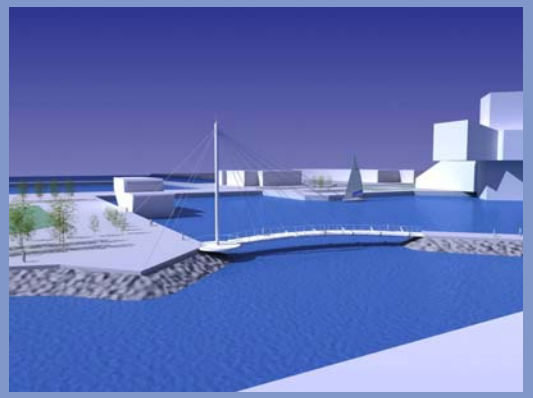
# North Coast Harbor Pedestrian Bridge



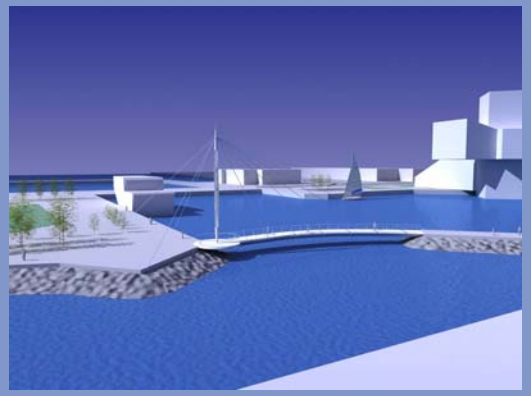
**Concept A**



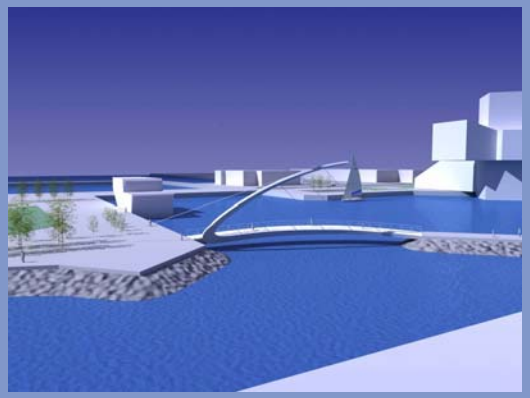
**Concept B**



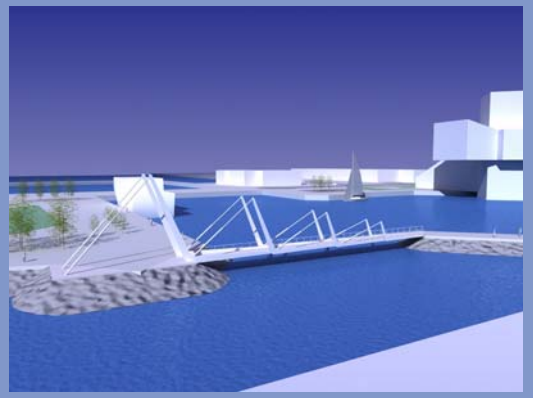
**Concept C**



**Concept D**



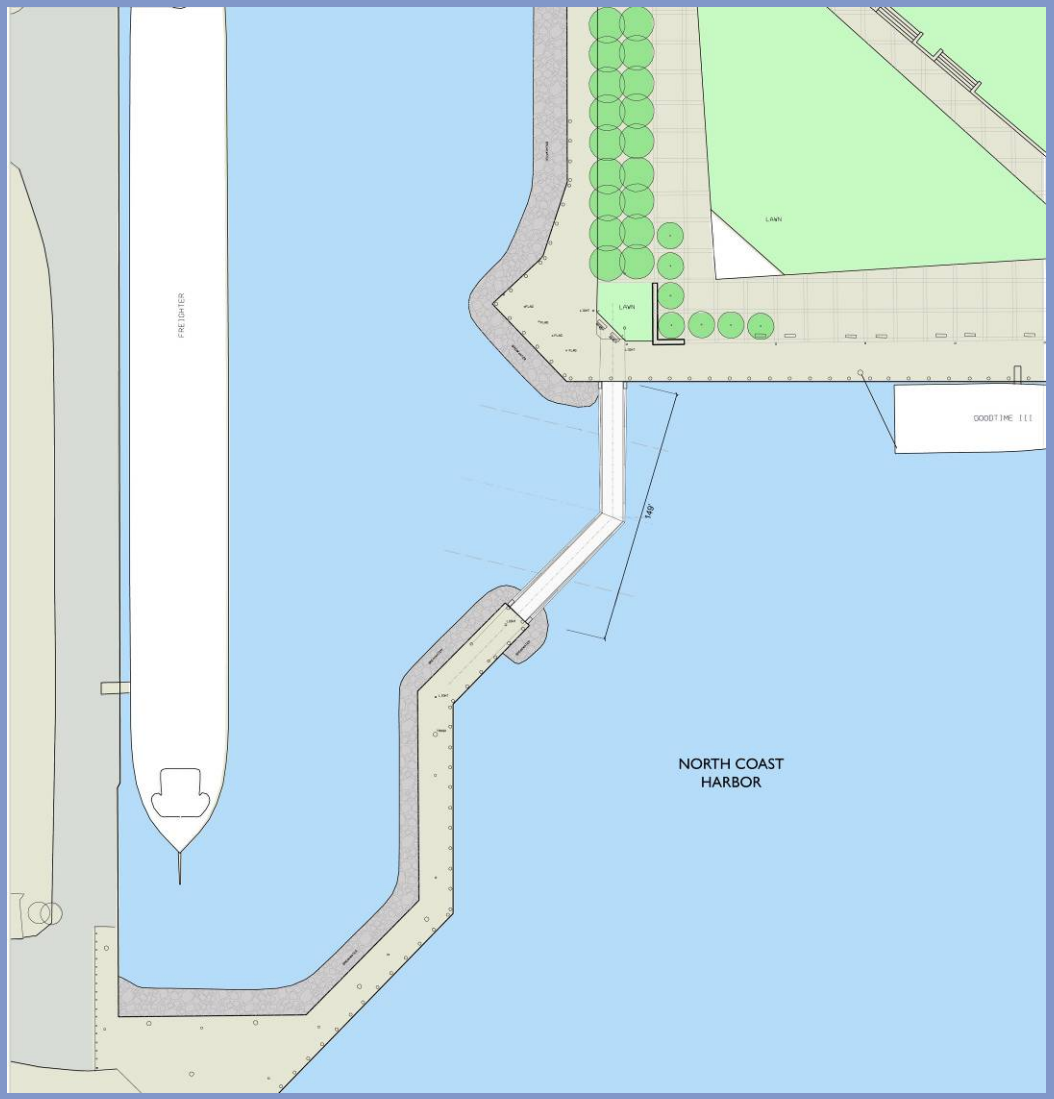
**Concept E**



**Concept F**

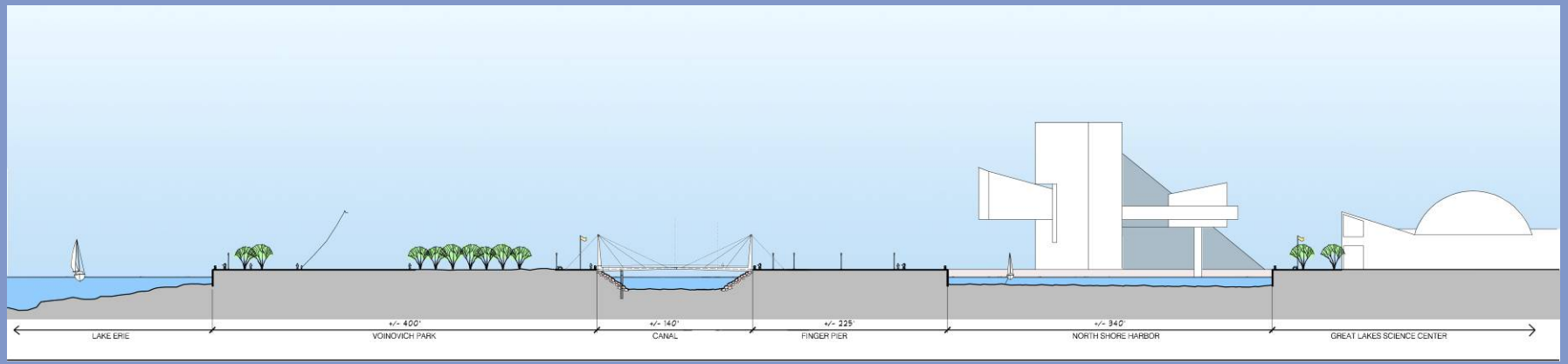
Concept A Plan

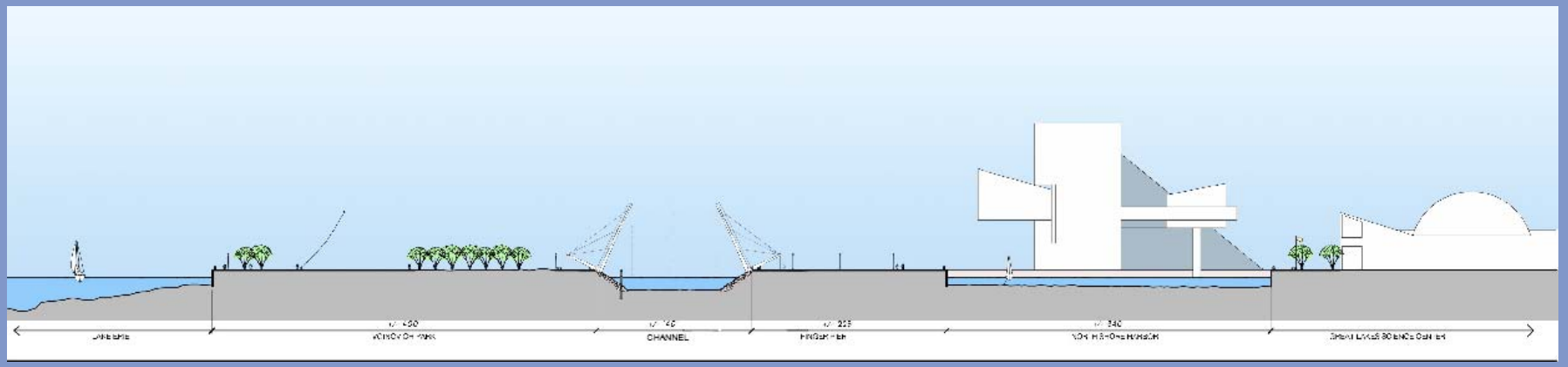
# North Coast Harbor Pedestrian Bridge



Concept A Context Section

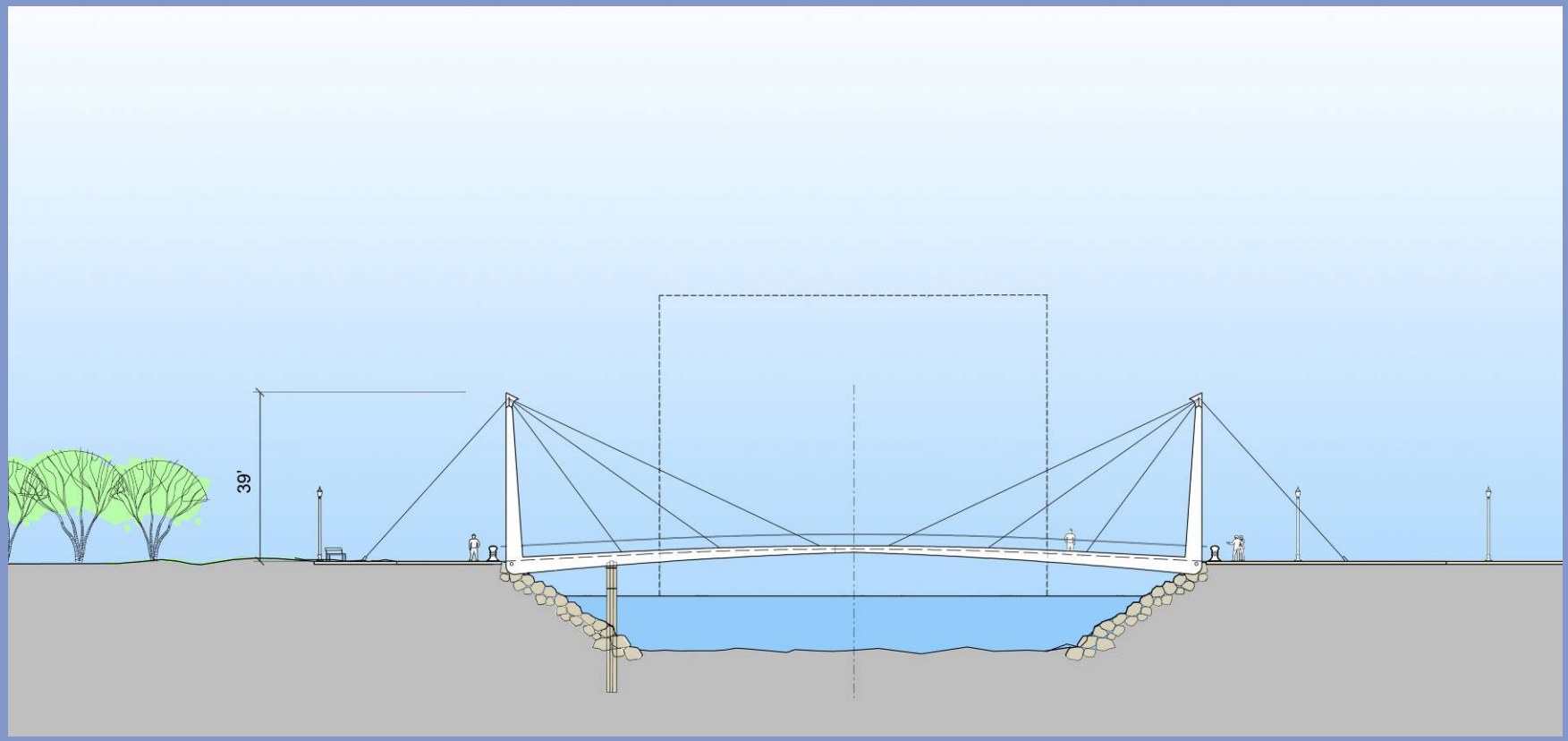
# North Coast Harbor Pedestrian Bridge



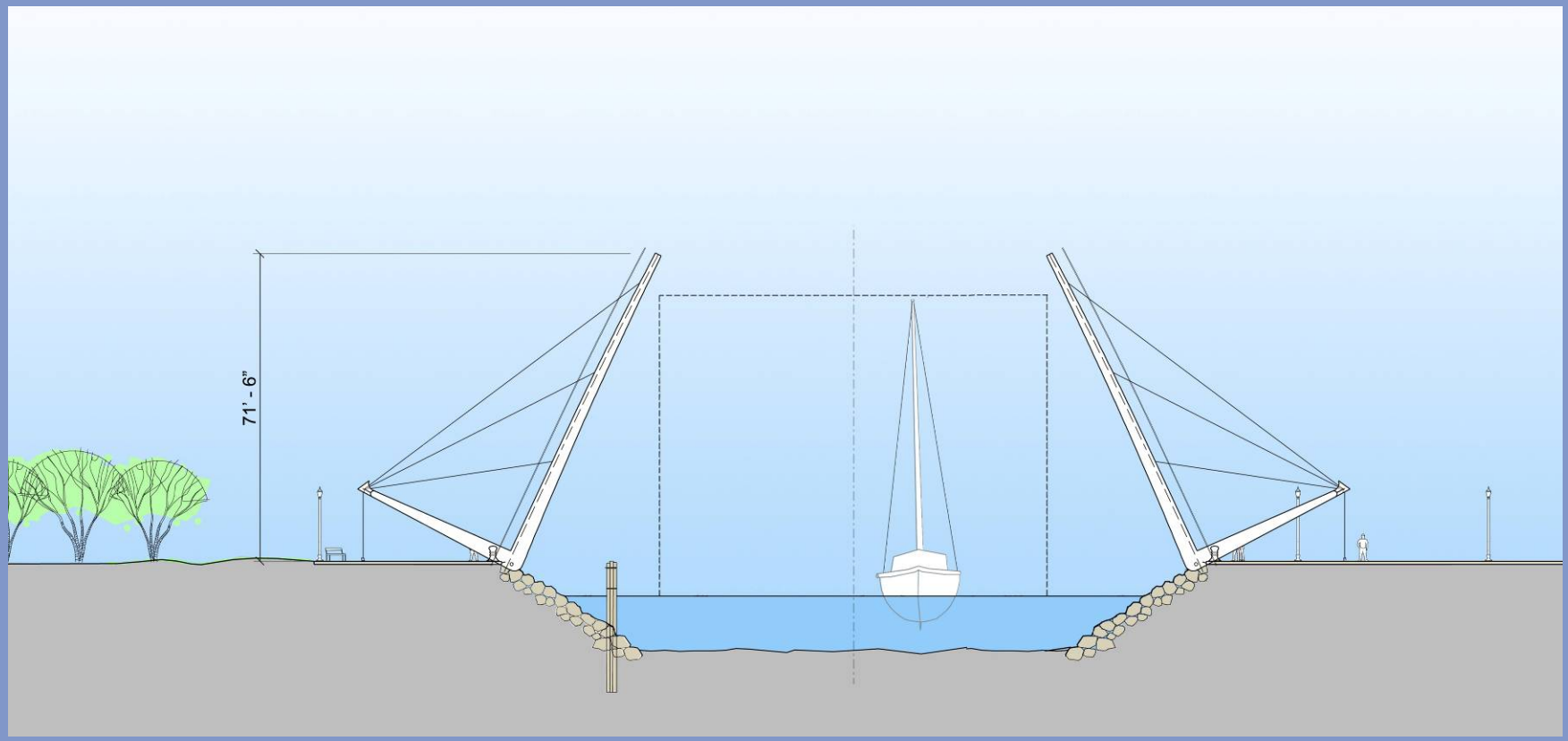
Concept A Elevation - Closed

# North Coast Harbor Pedestrian Bridge



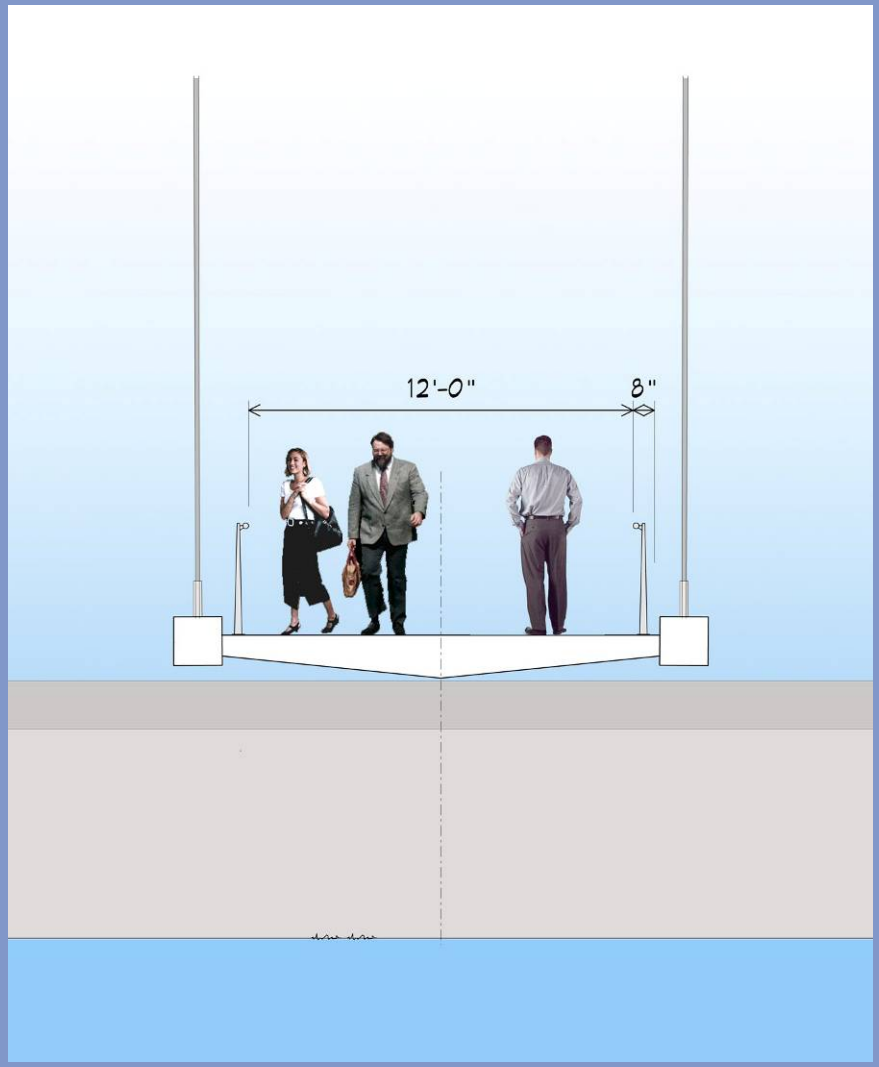
Concept A Elevation - Open

# North Coast Harbor Pedestrian Bridge



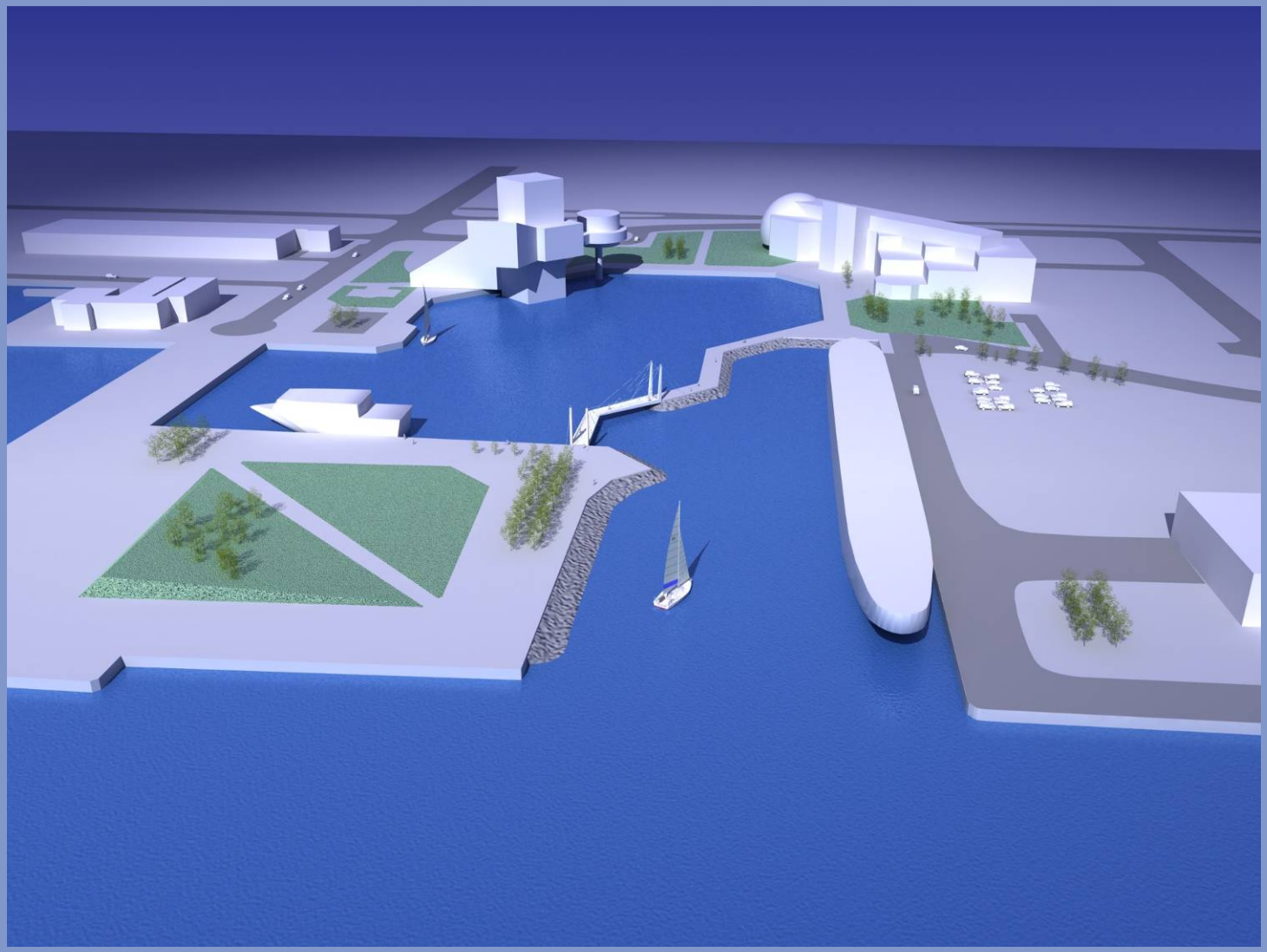
Concept A Detail Section

# North Coast Harbor Pedestrian Bridge



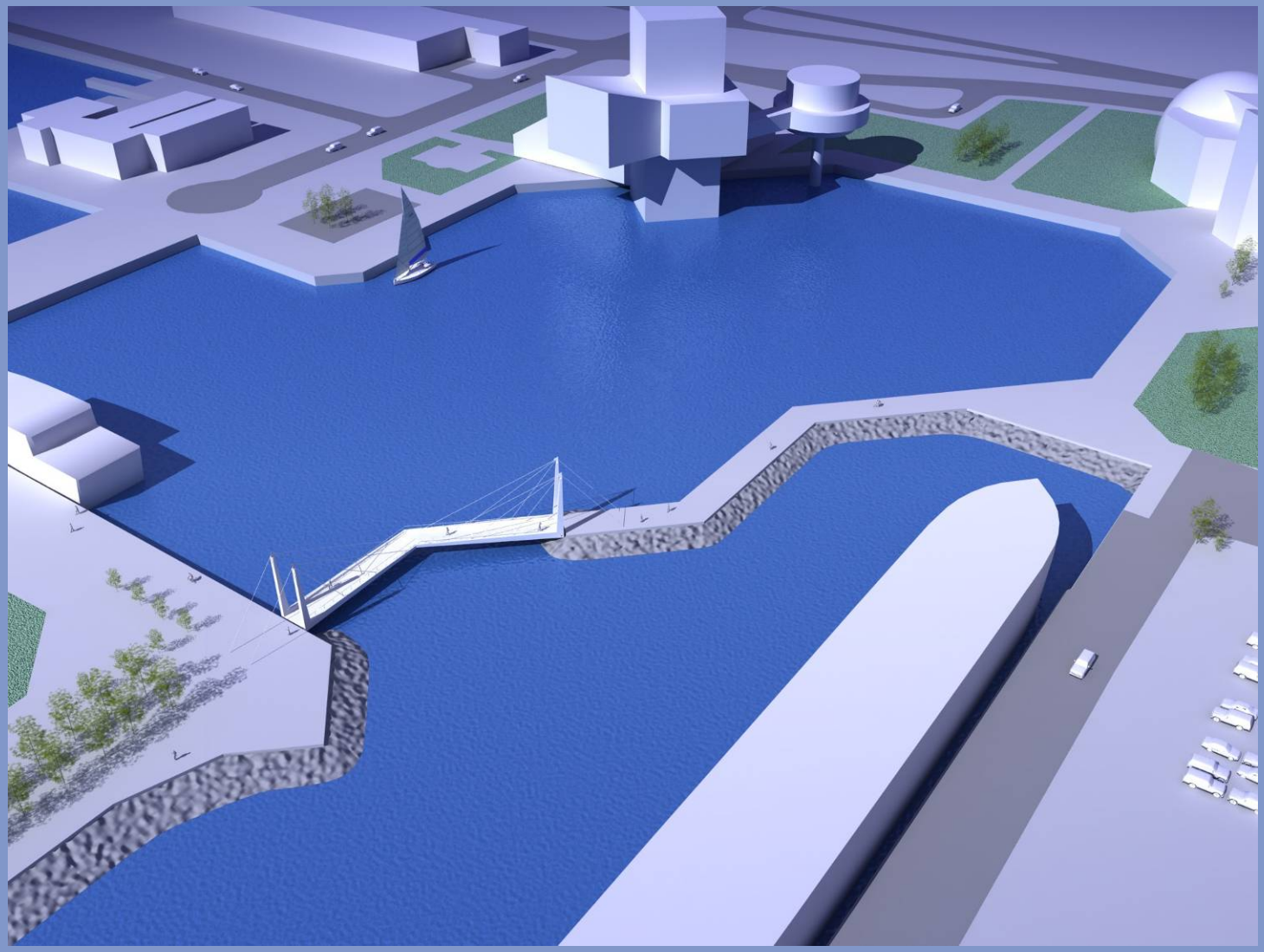
Concept A

# North Coast Harbor Pedestrian Bridge



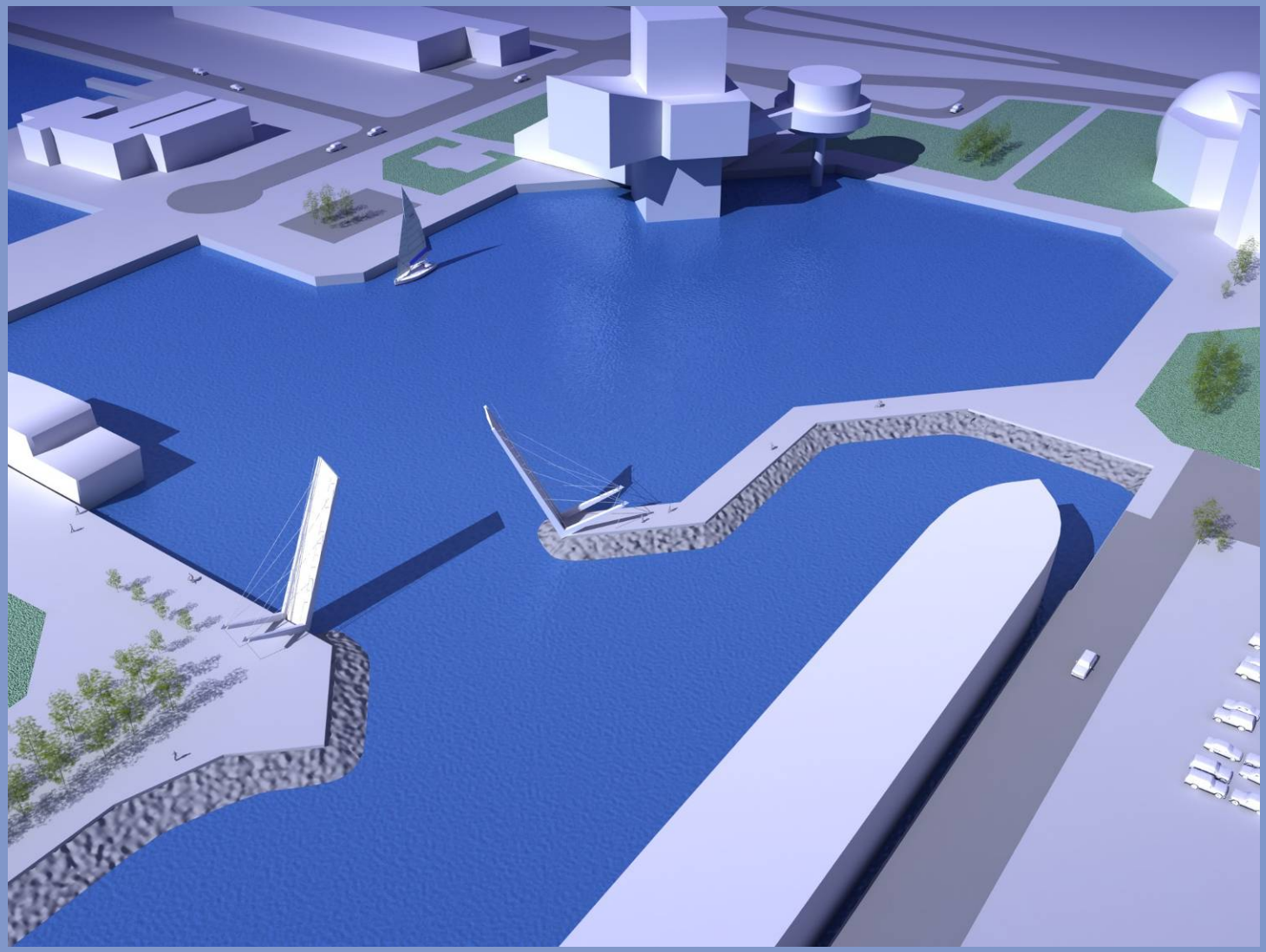
Concept A

# North Coast Harbor Pedestrian Bridge



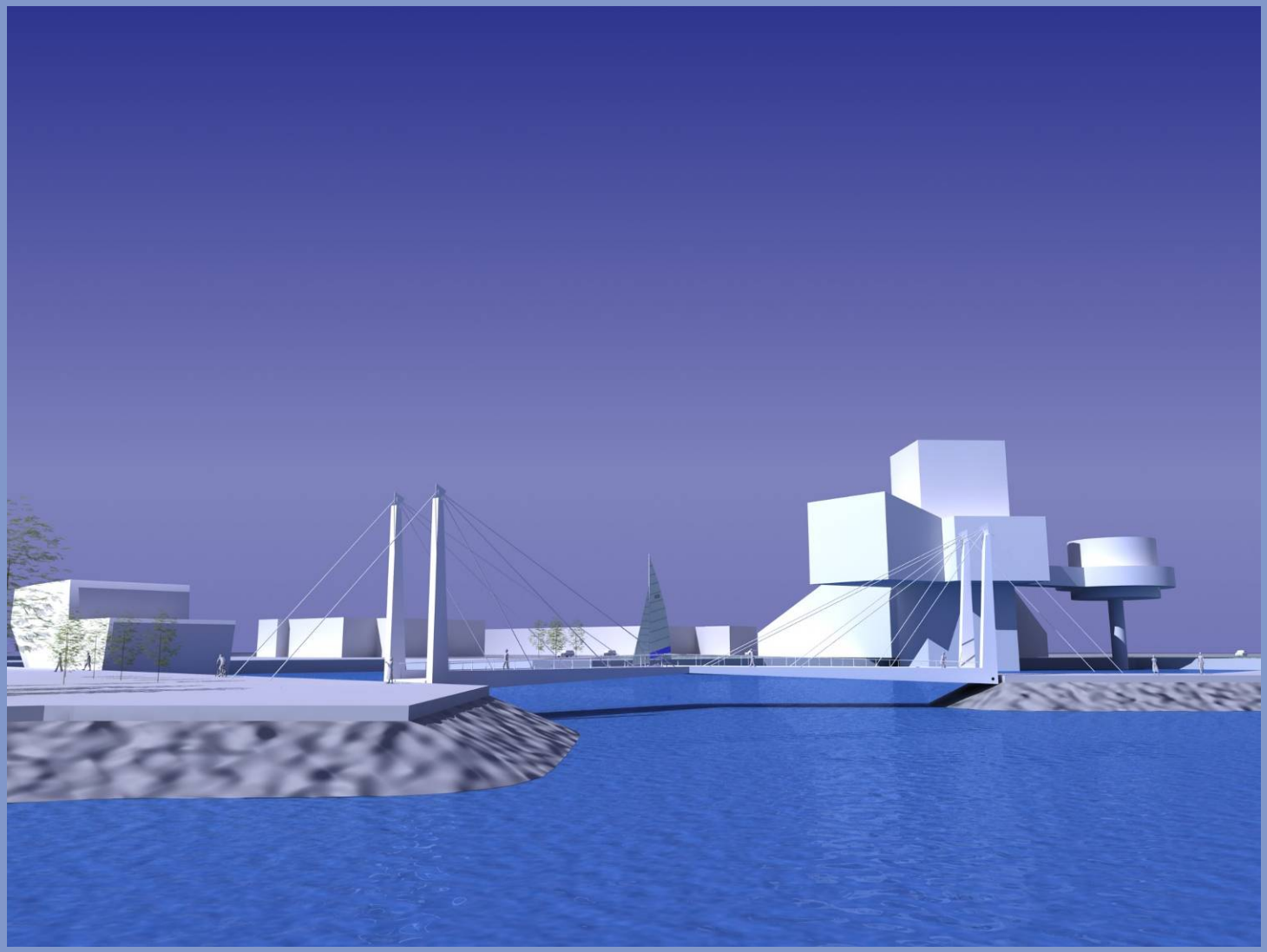
Concept A

# North Coast Harbor Pedestrian Bridge



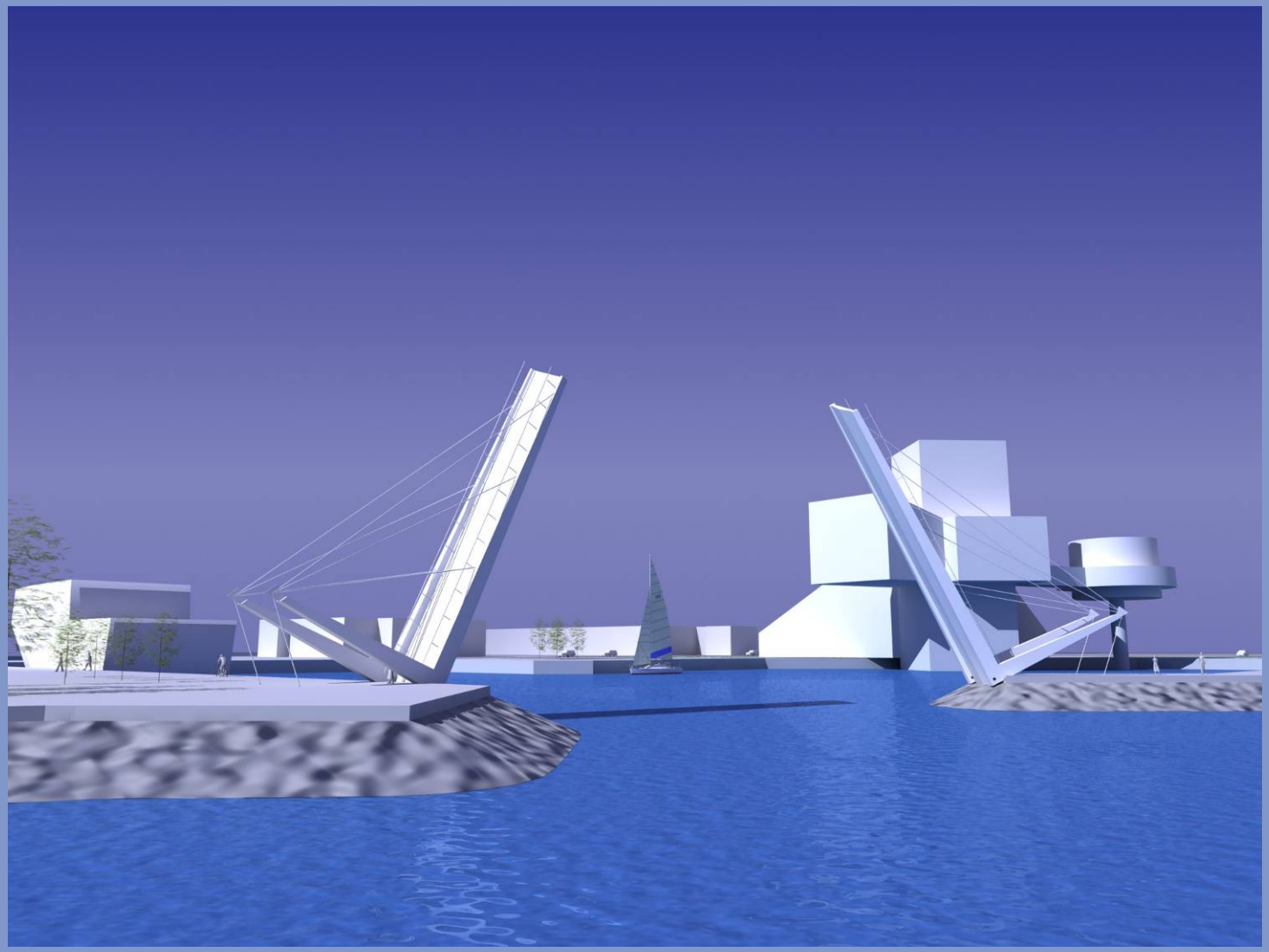
Concept A

# North Coast Harbor Pedestrian Bridge



Concept A

# North Coast Harbor Pedestrian Bridge



Concept A

# North Coast Harbor Pedestrian Bridge

Concept A

# North Coast Harbor Pedestrian Bridge

Concept A

# North Coast Harbor Pedestrian Bridge

Concept A

# North Coast Harbor Pedestrian Bridge

Concept A

# North Coast Harbor Pedestrian Bridge

Concept A

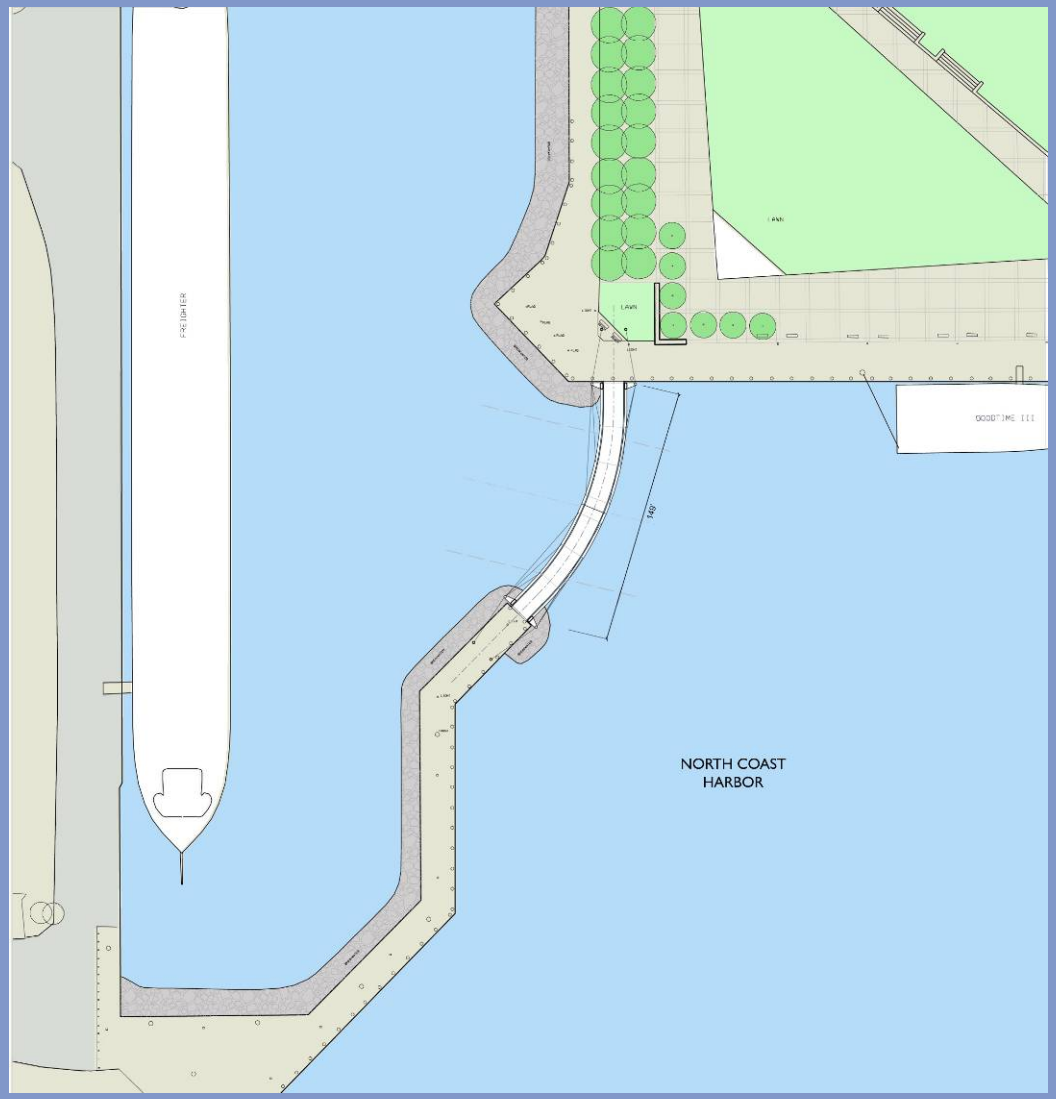
# North Coast Harbor Pedestrian Bridge

Concept A

# North Coast Harbor Pedestrian Bridge

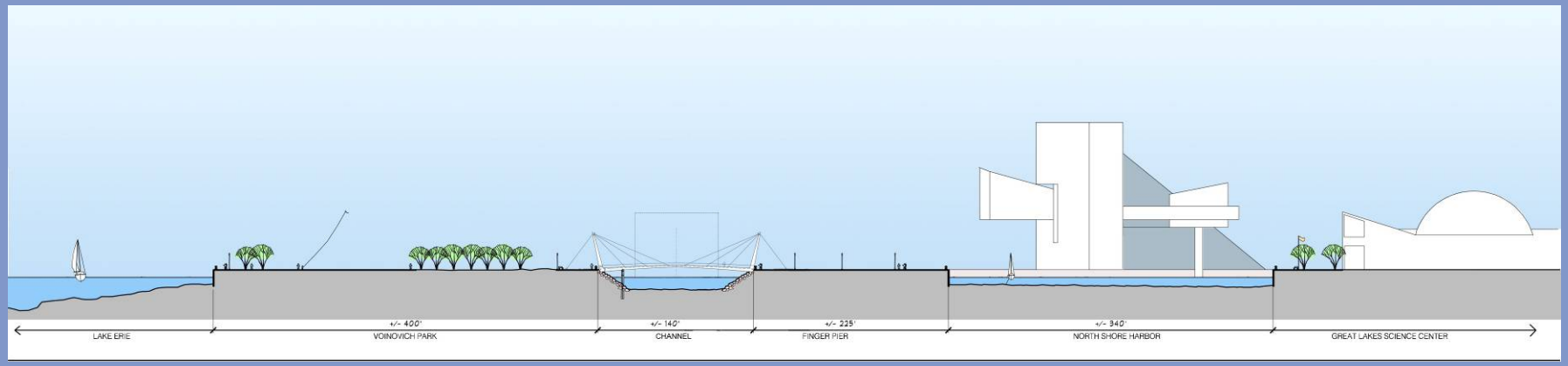
Concept B Plan

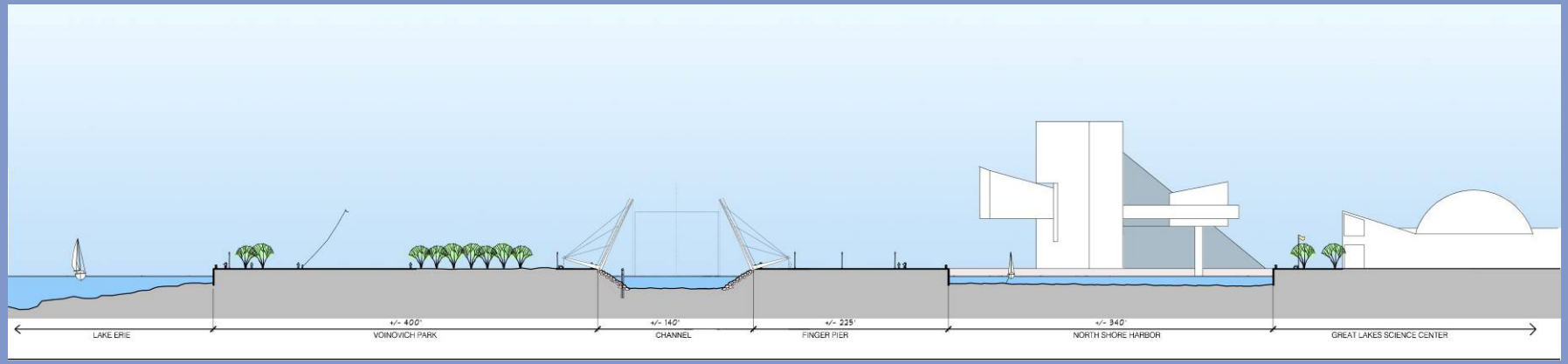
# North Coast Harbor Pedestrian Bridge



## Concept B Context Section

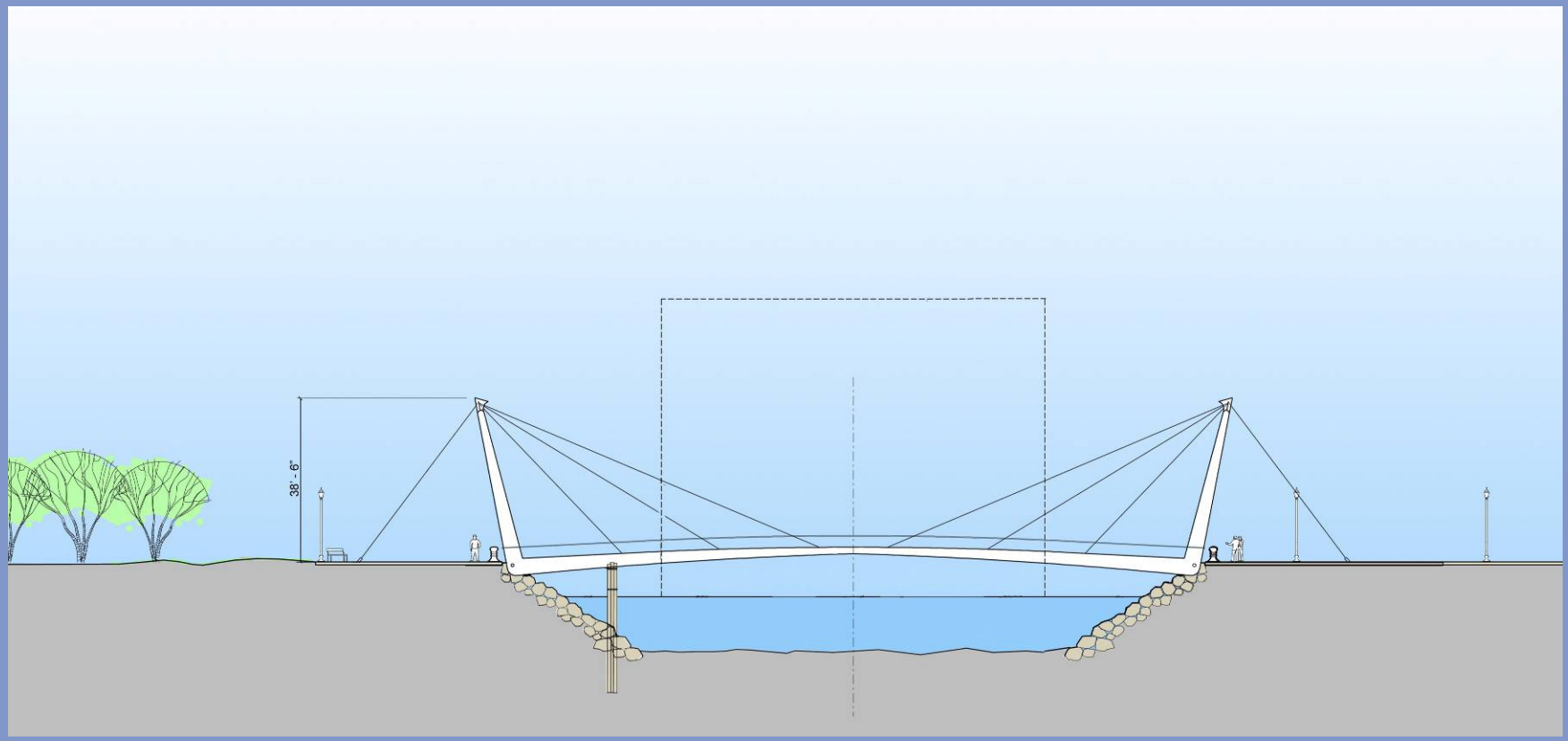
# North Coast Harbor Pedestrian Bridge



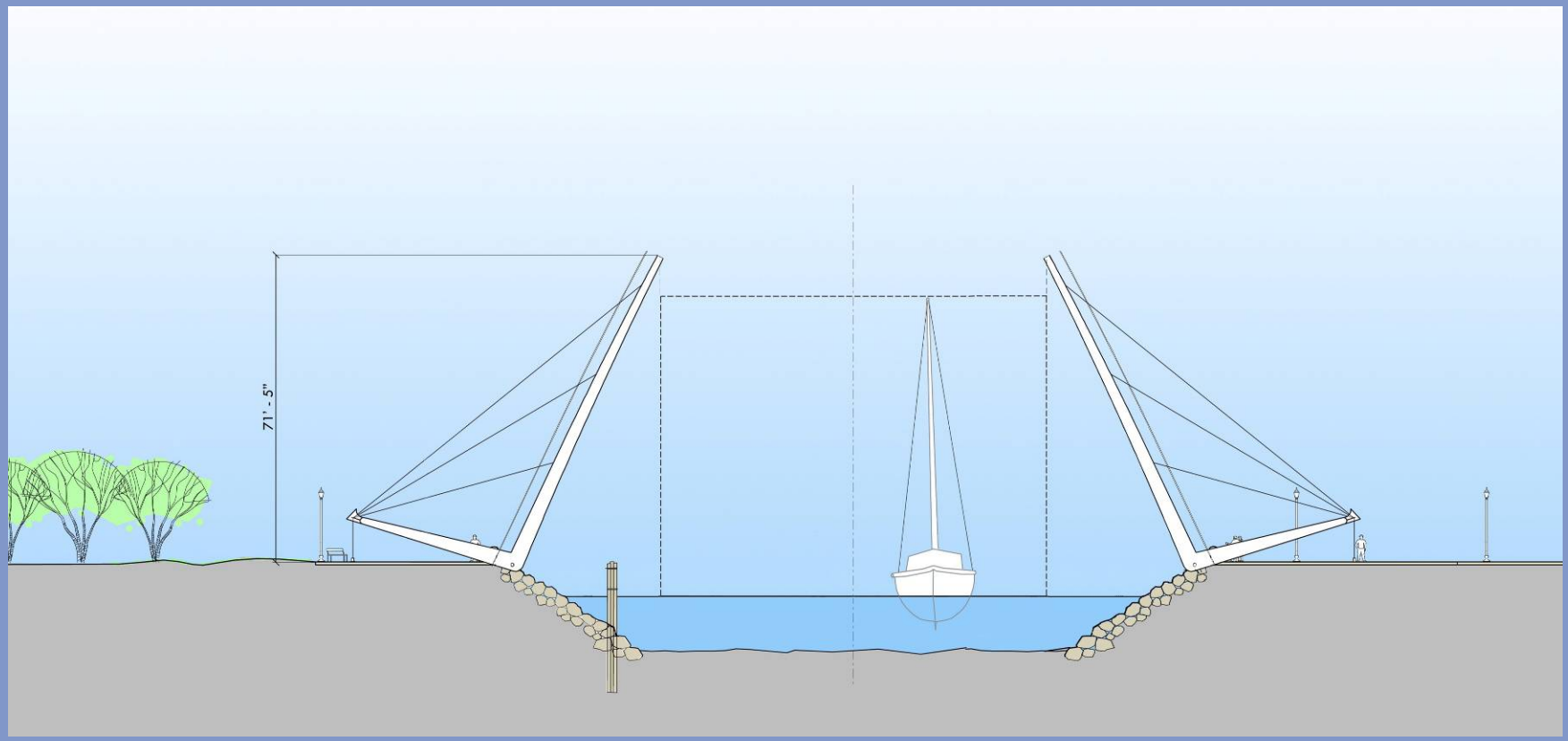
Concept B Elevation - Closed

# North Coast Harbor Pedestrian Bridge

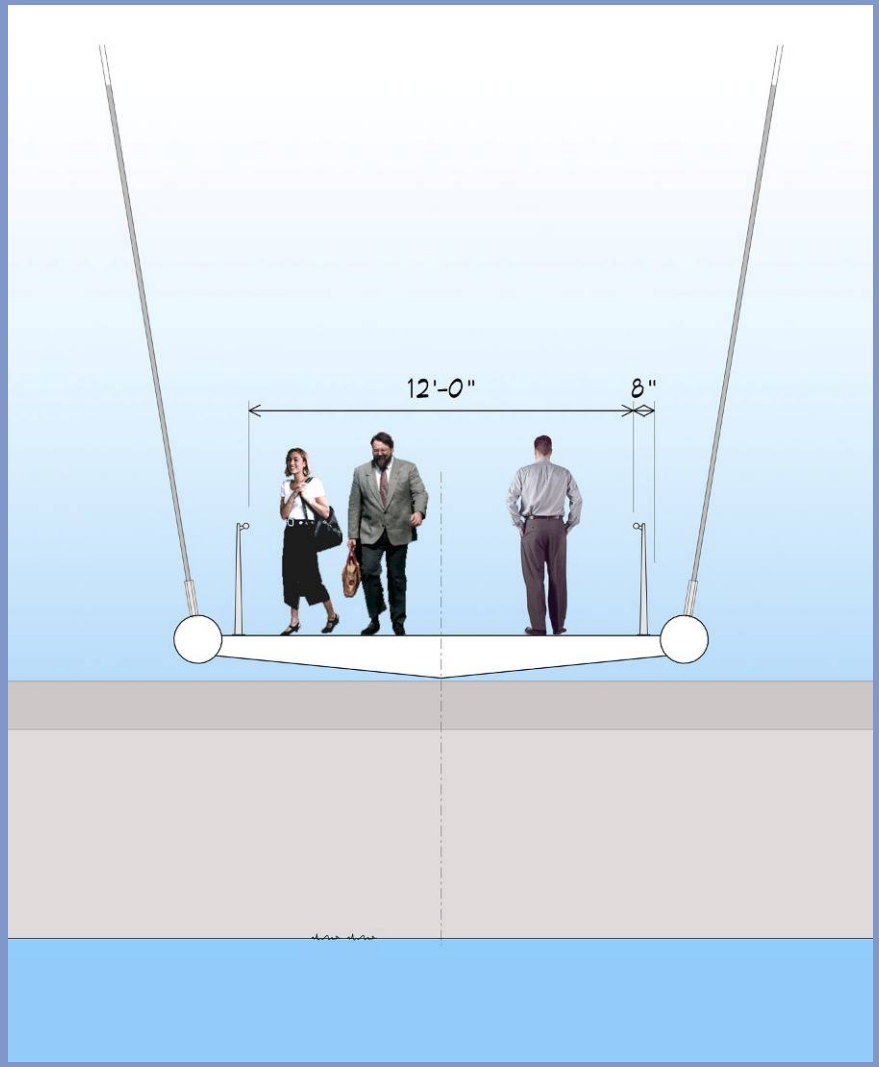


Concept B Elevation - Open

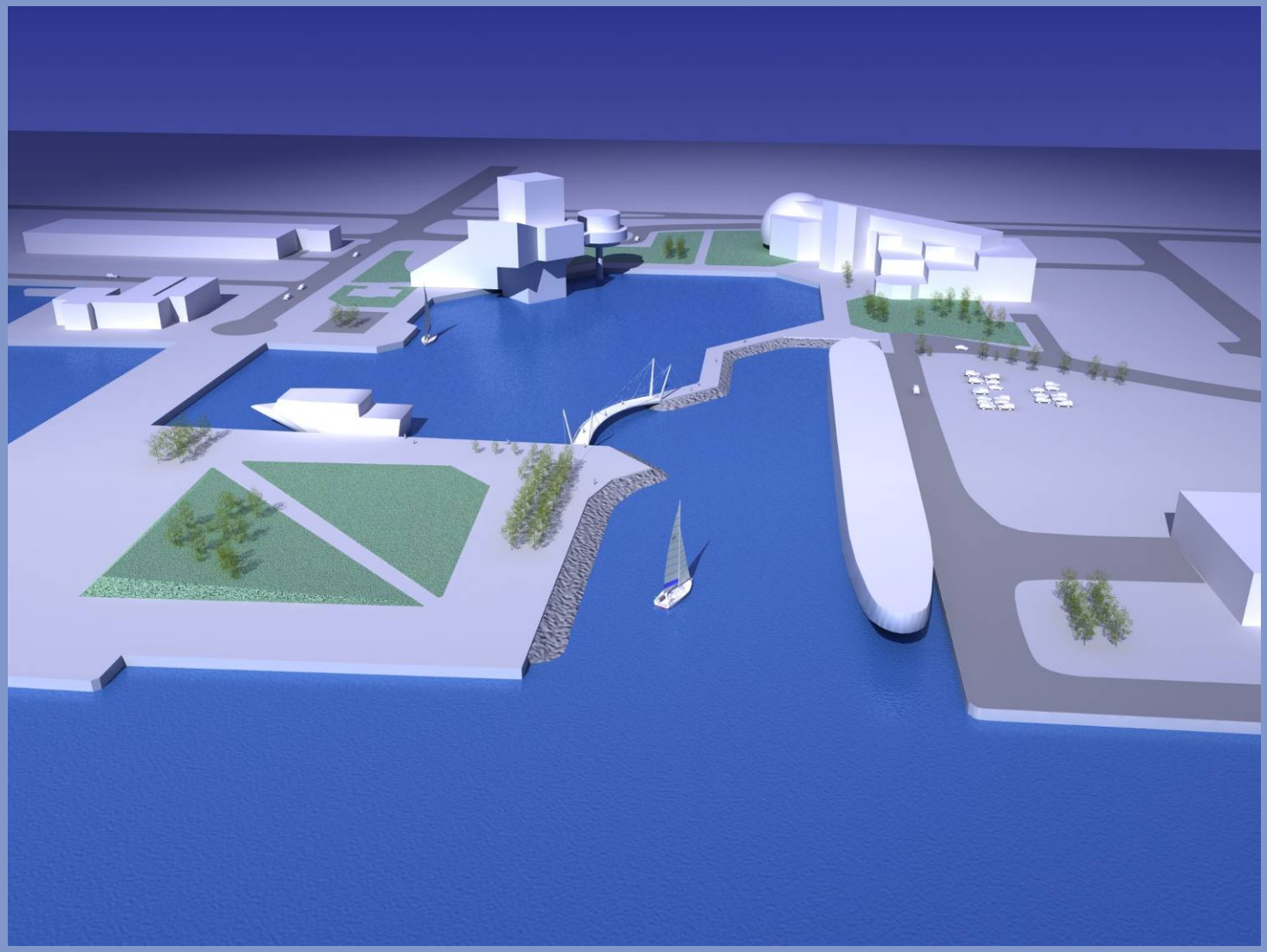
# North Coast Harbor Pedestrian Bridge



# North Coast Harbor Pedestrian Bridge

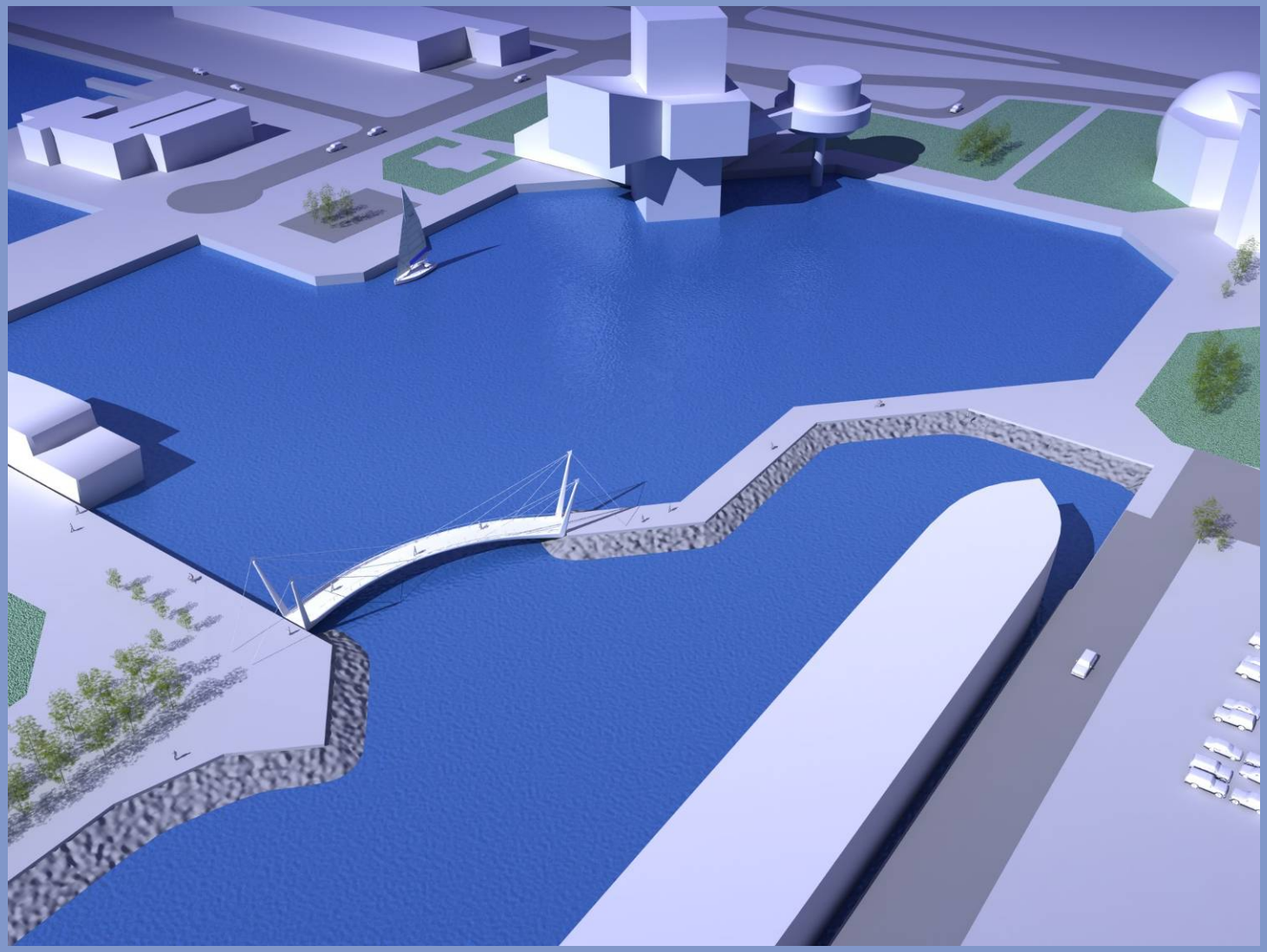


# North Coast Harbor Pedestrian Bridge



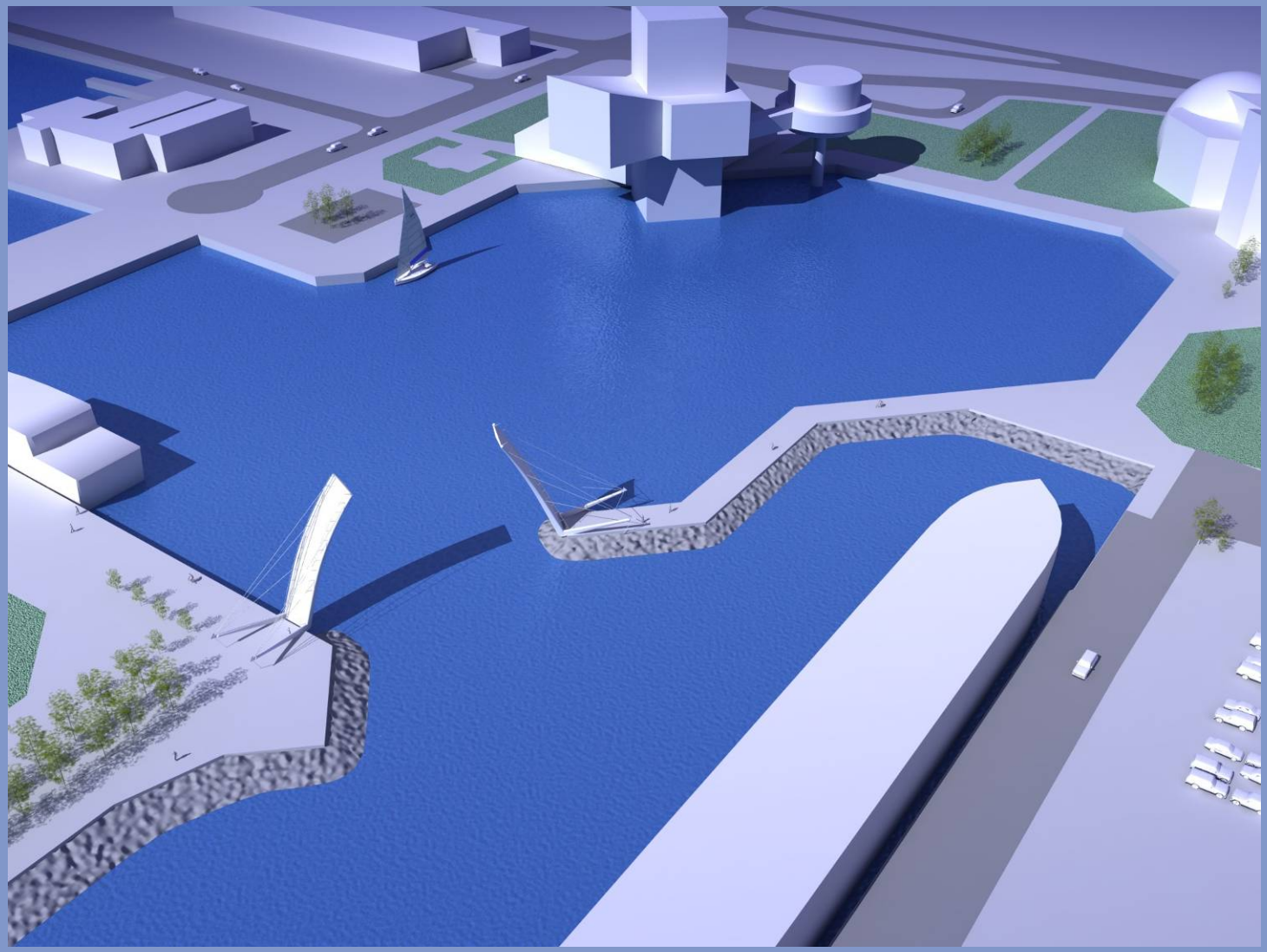
Concept B

# North Coast Harbor Pedestrian Bridge



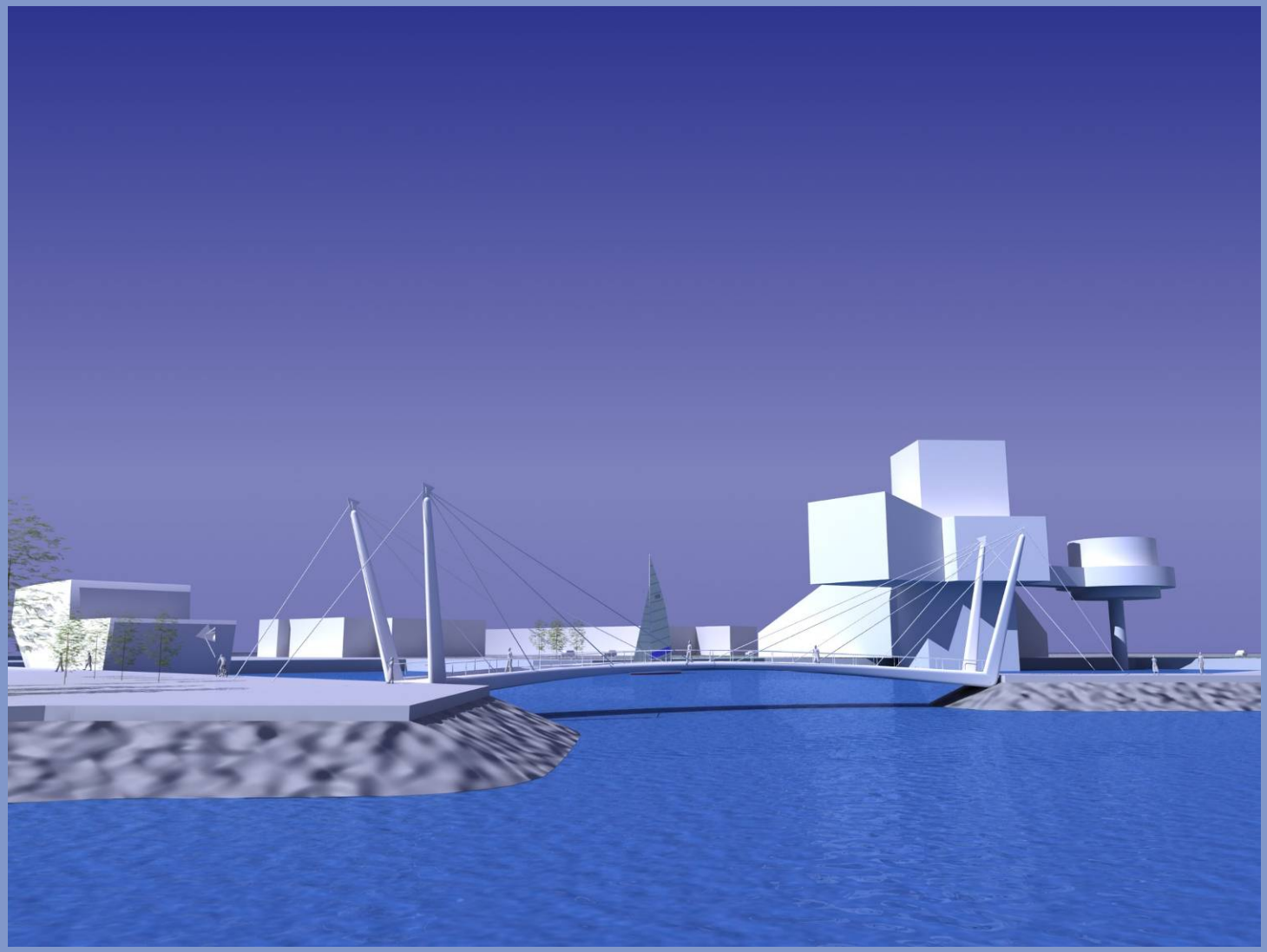
Concept B

# North Coast Harbor Pedestrian Bridge

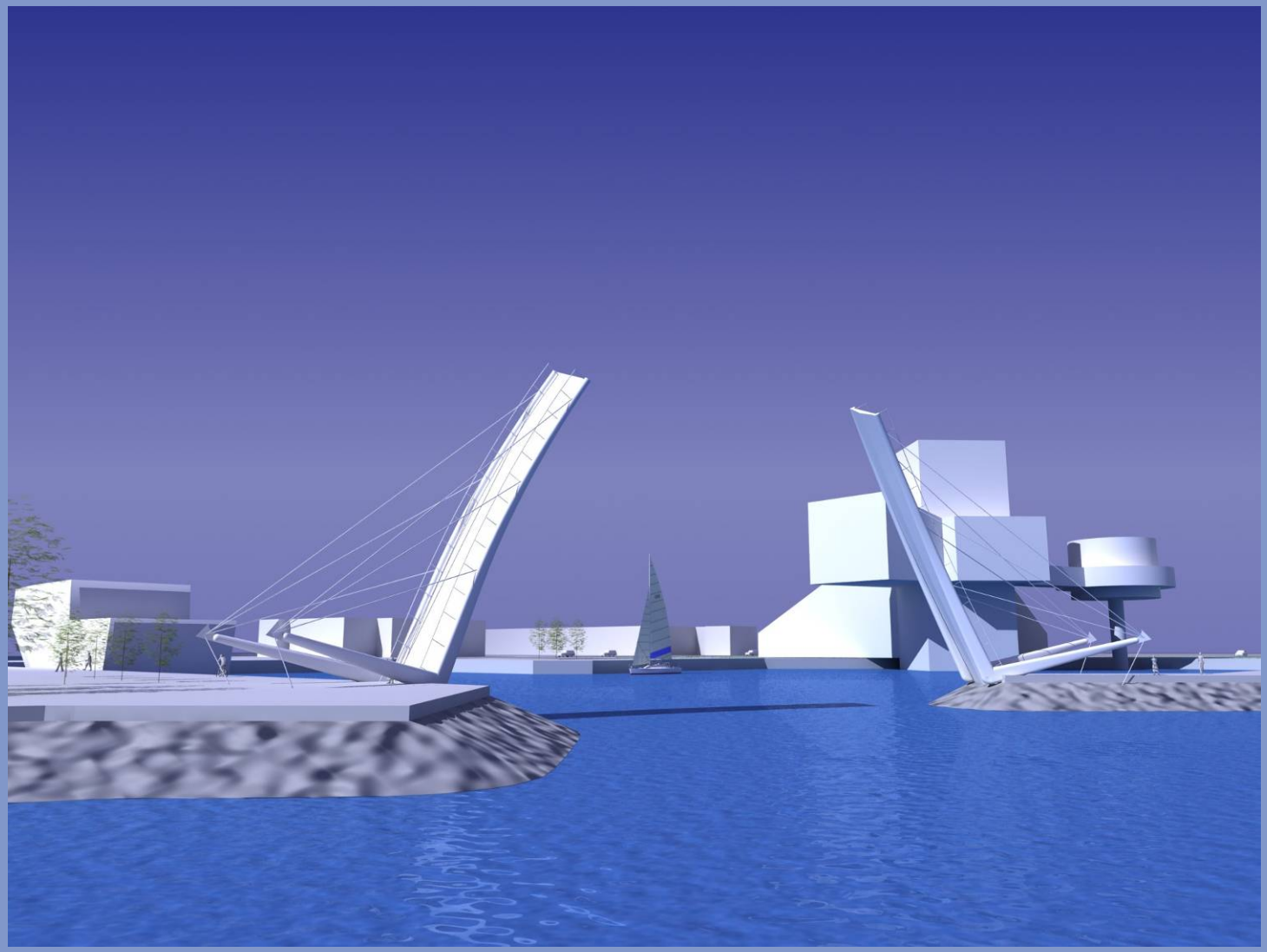


Concept B

# North Coast Harbor Pedestrian Bridge



# North Coast Harbor Pedestrian Bridge



Concept B

# North Coast Harbor Pedestrian Bridge

Concept B

# North Coast Harbor Pedestrian Bridge

Concept B

# North Coast Harbor Pedestrian Bridge

Concept B

# North Coast Harbor Pedestrian Bridge

Concept B

# North Coast Harbor Pedestrian Bridge

Concept B

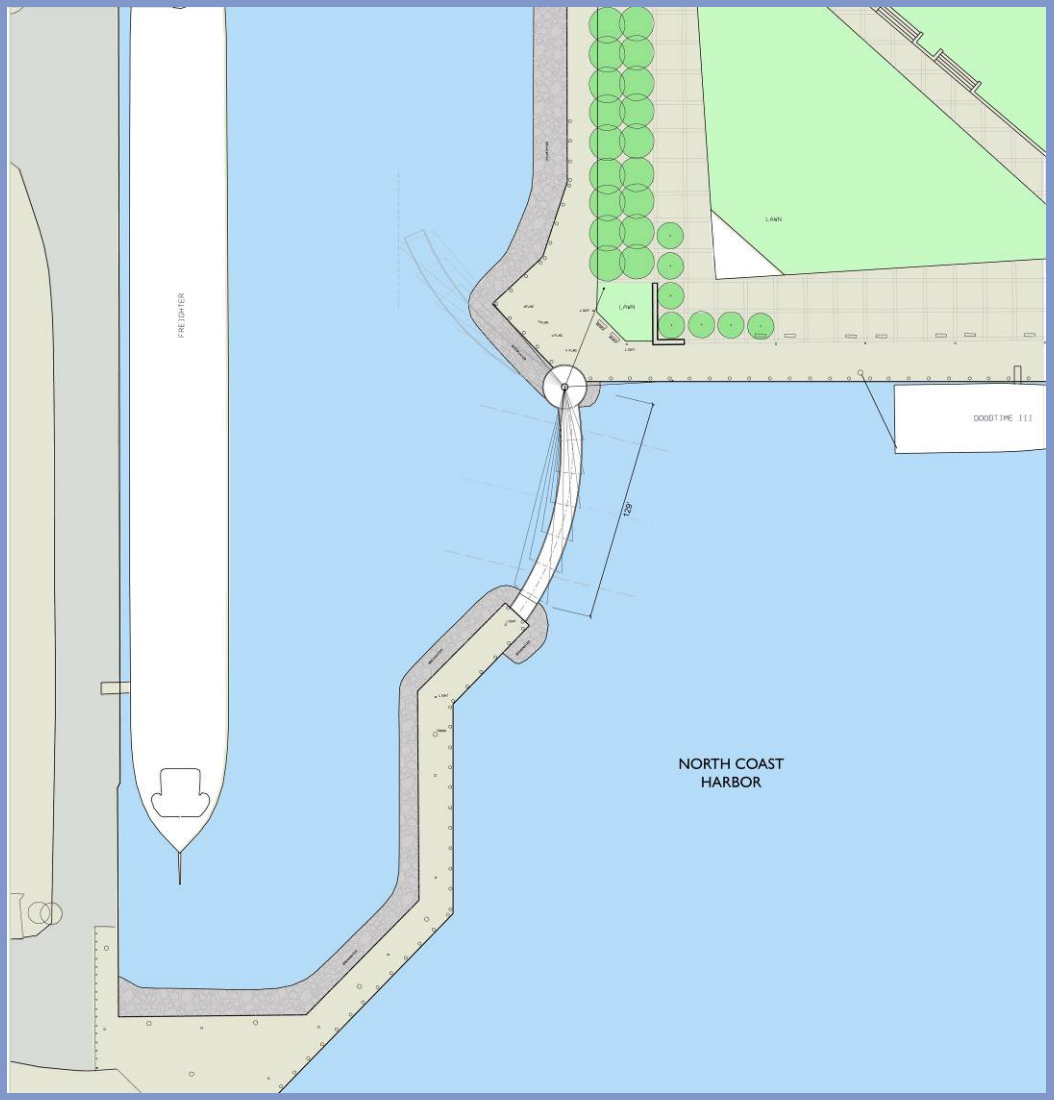
# North Coast Harbor Pedestrian Bridge

Concept B

# North Coast Harbor Pedestrian Bridge

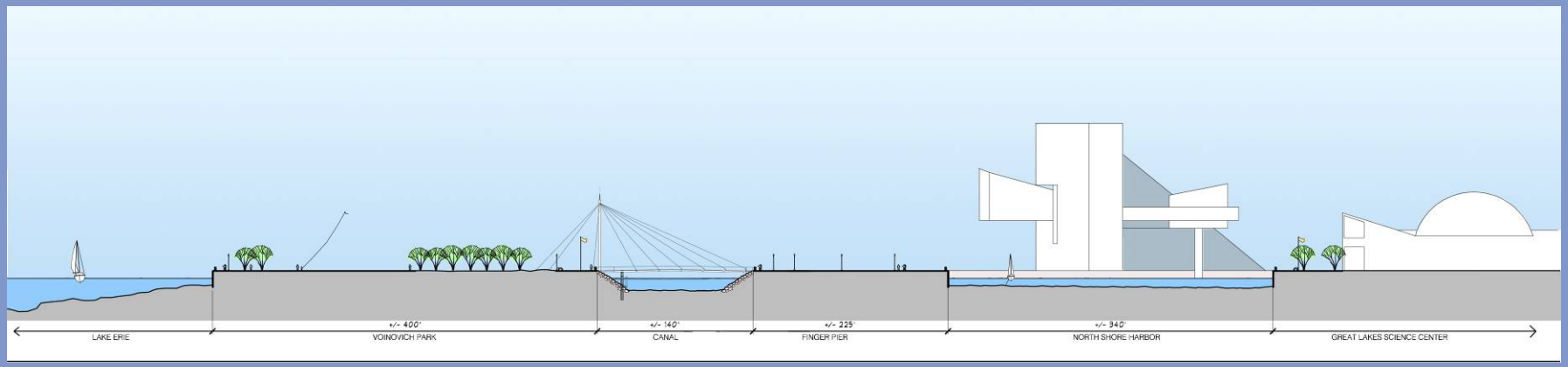
Concept C Plan

# North Coast Harbor Pedestrian Bridge



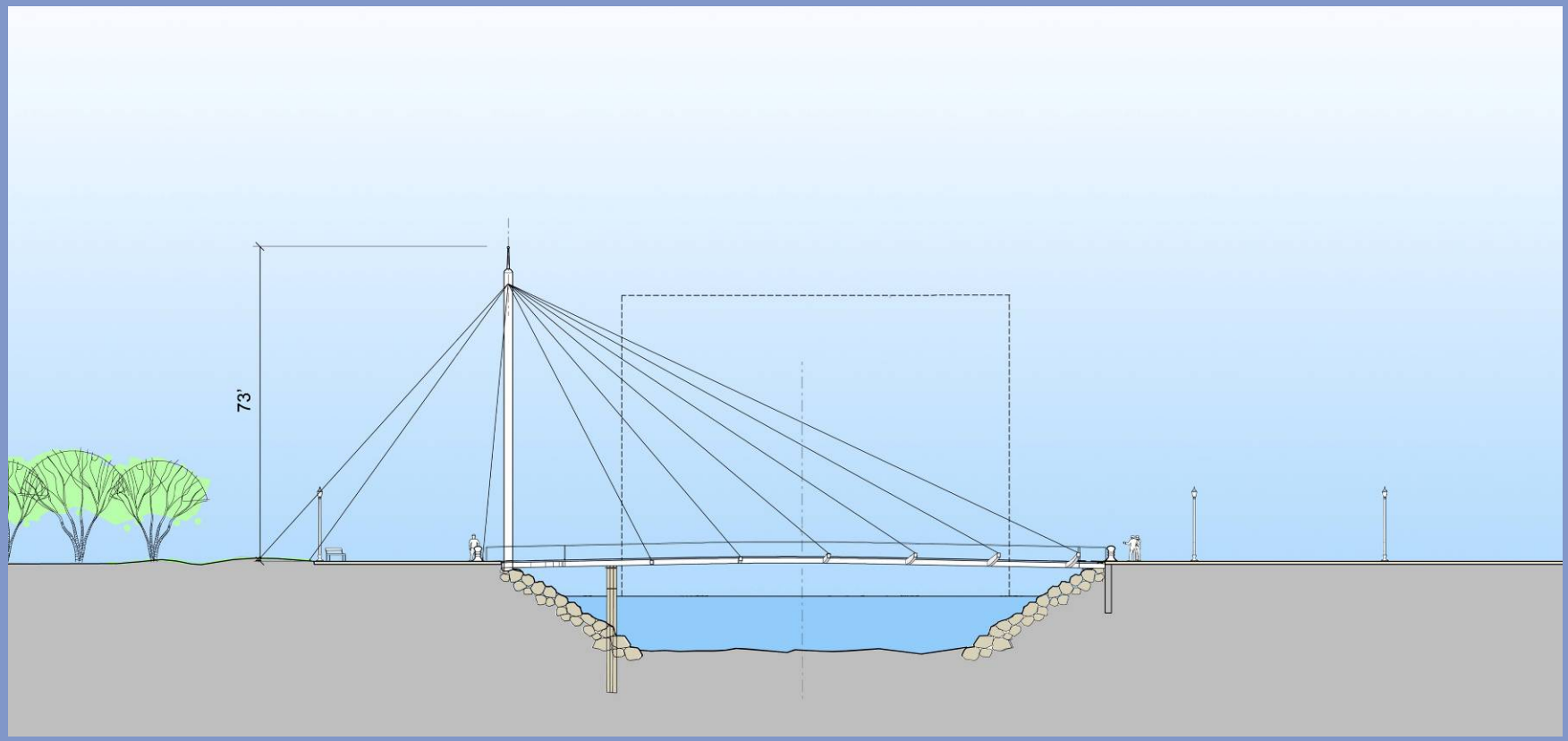
Concept C Context Section

# North Coast Harbor Pedestrian Bridge



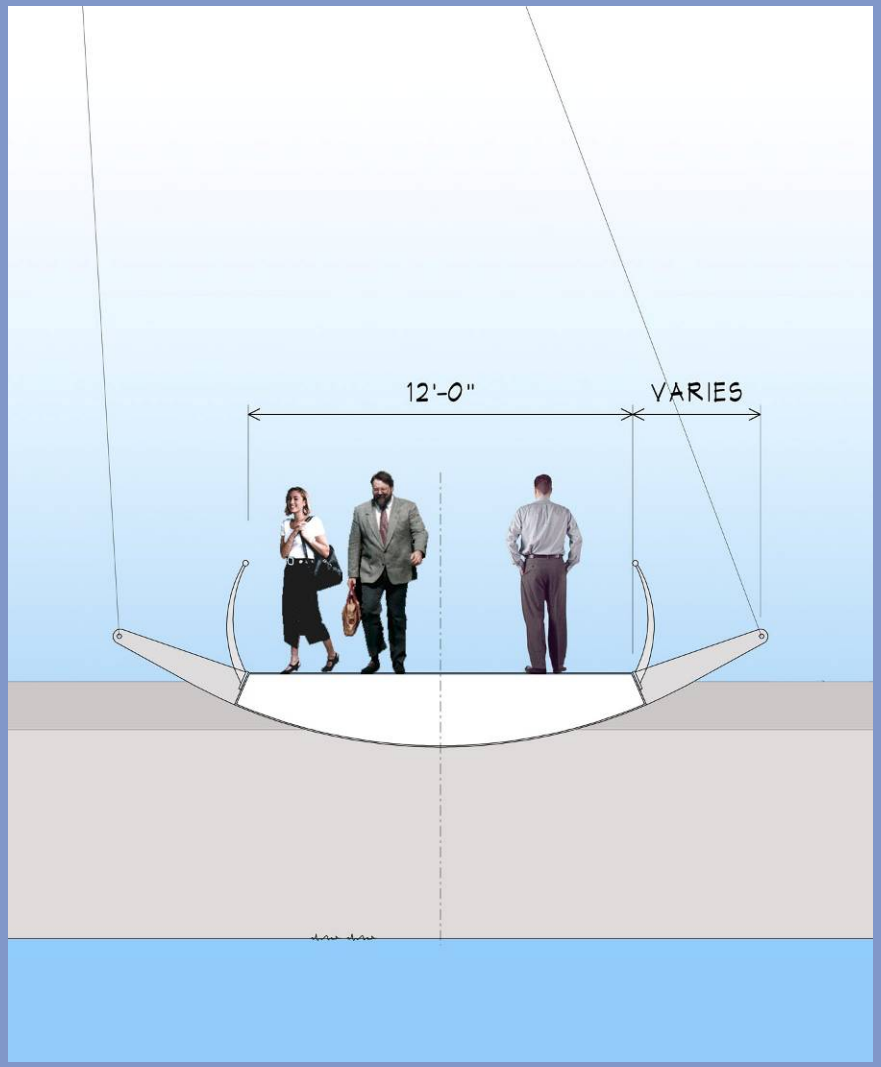
Concept C Elevation

# North Coast Harbor Pedestrian Bridge

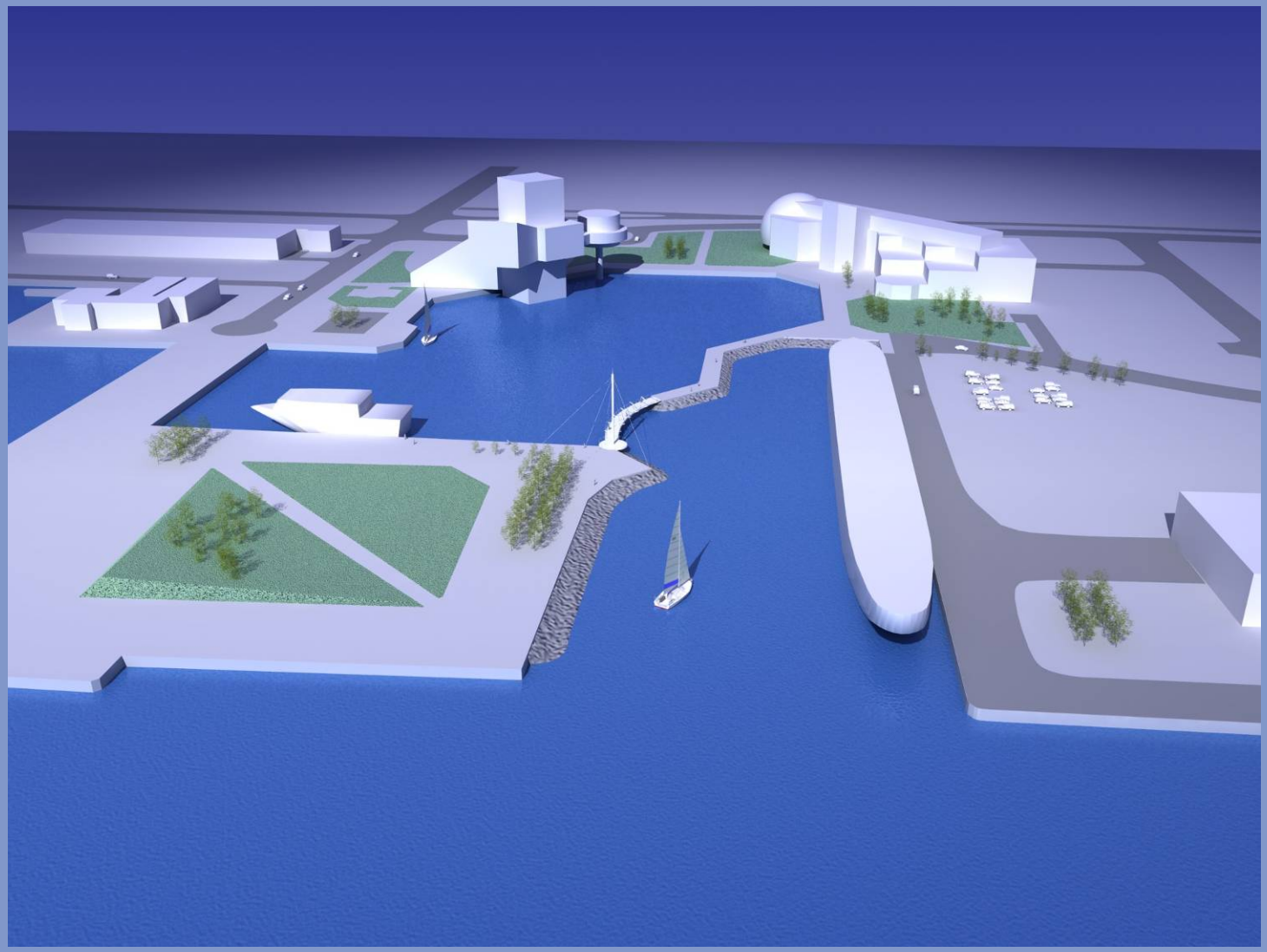


Concept C Detail Section

# North Coast Harbor Pedestrian Bridge

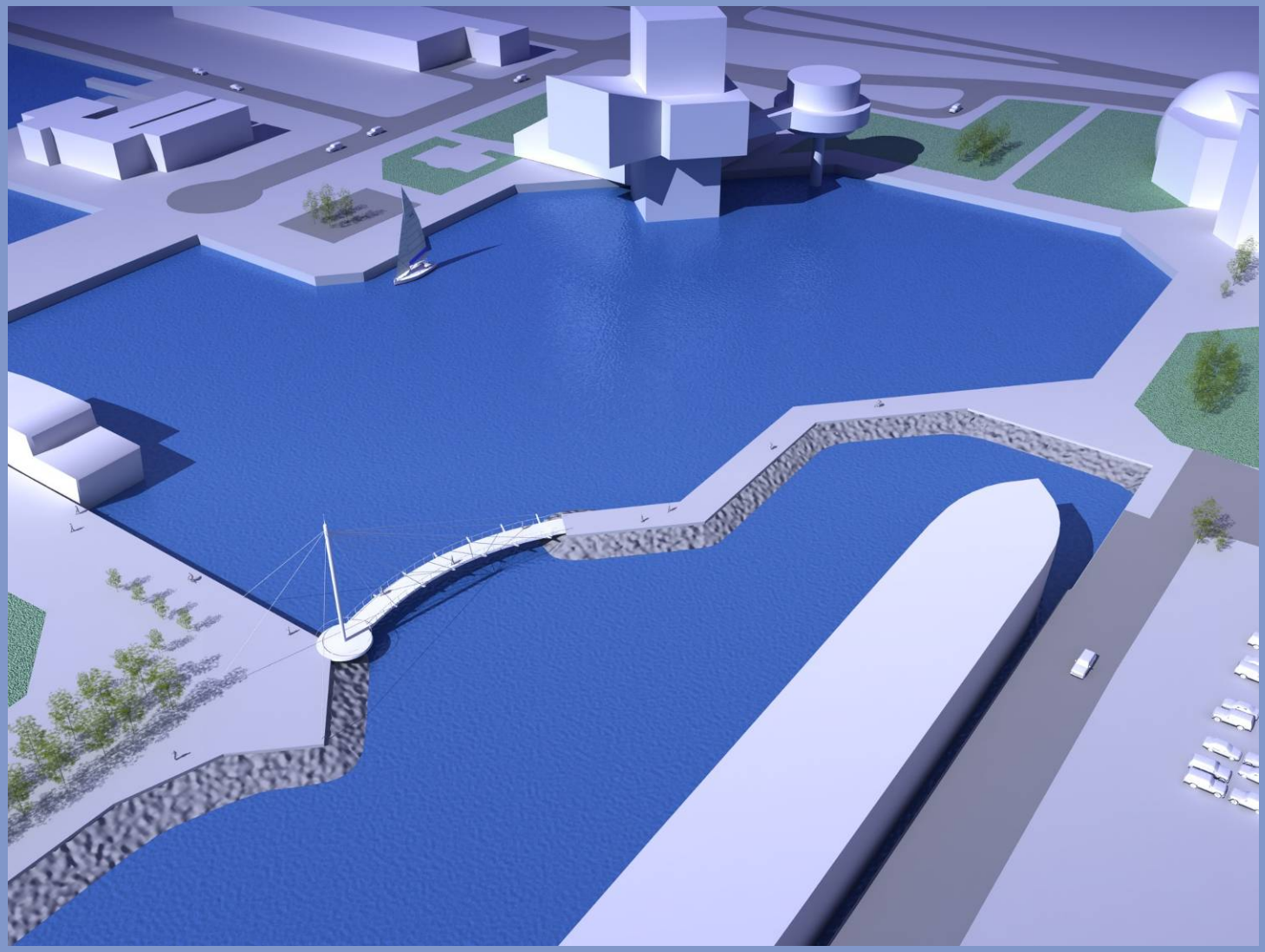


# North Coast Harbor Pedestrian Bridge



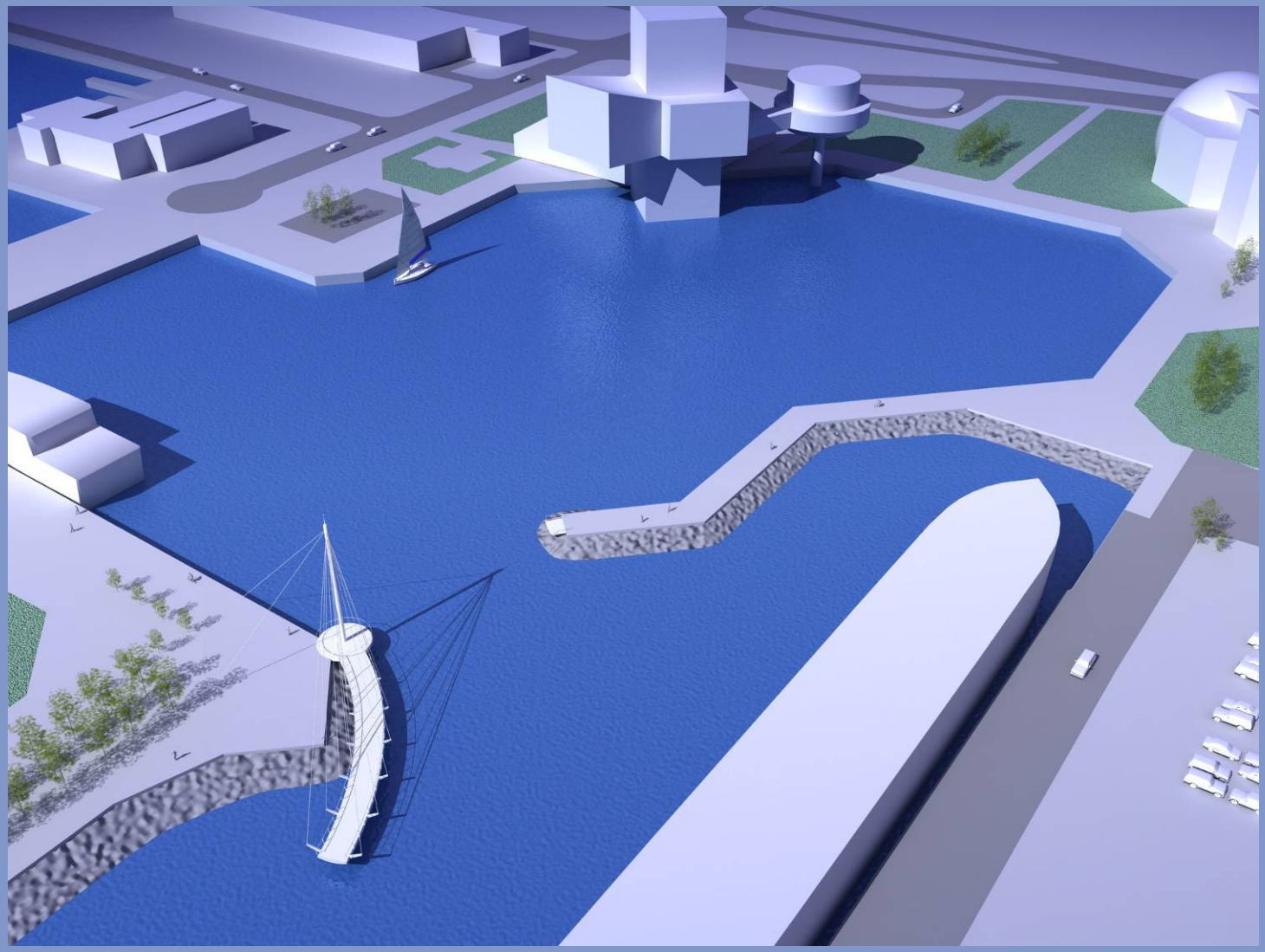
Concept C

# North Coast Harbor Pedestrian Bridge



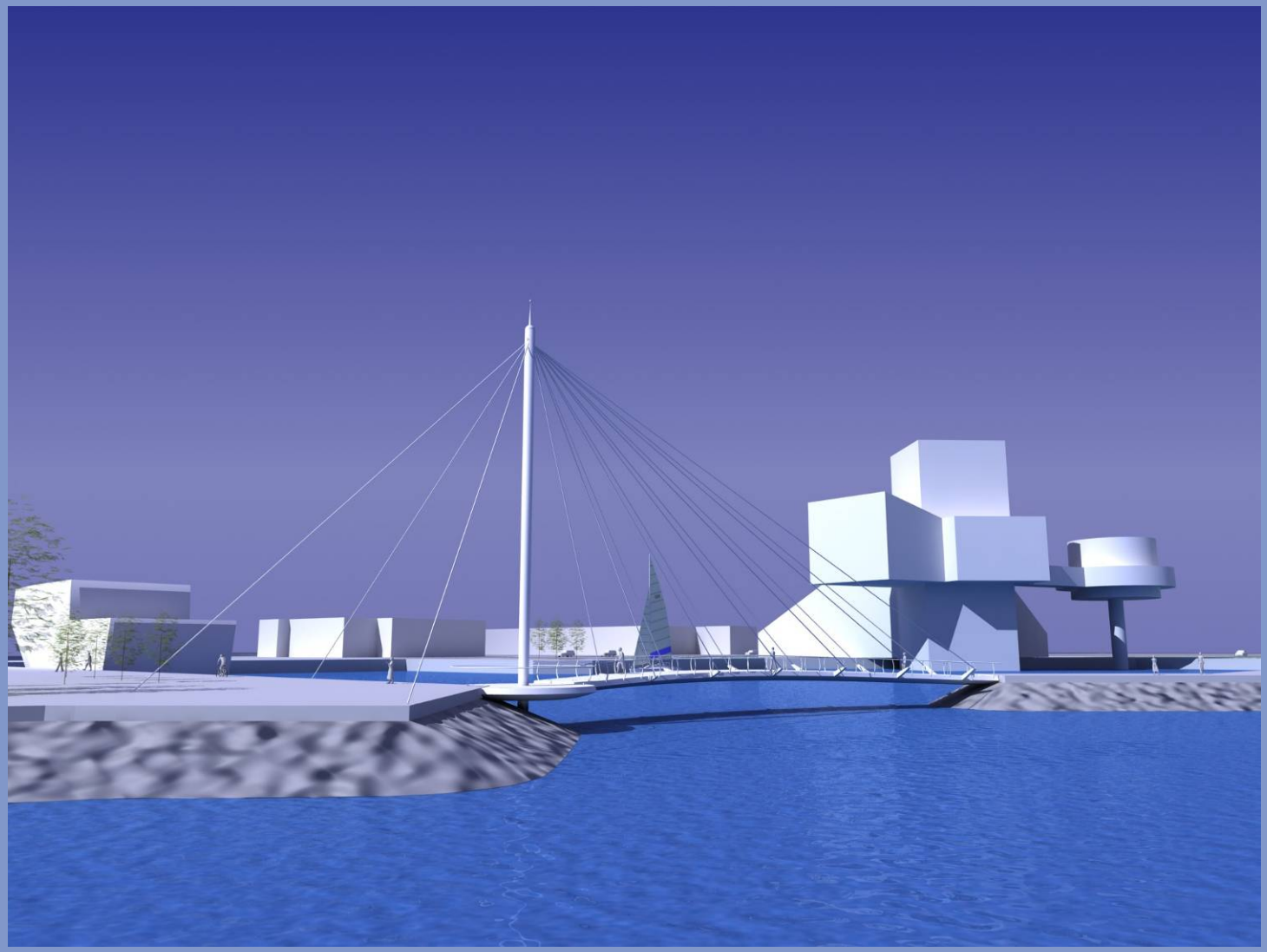
Concept C

# North Coast Harbor Pedestrian Bridge

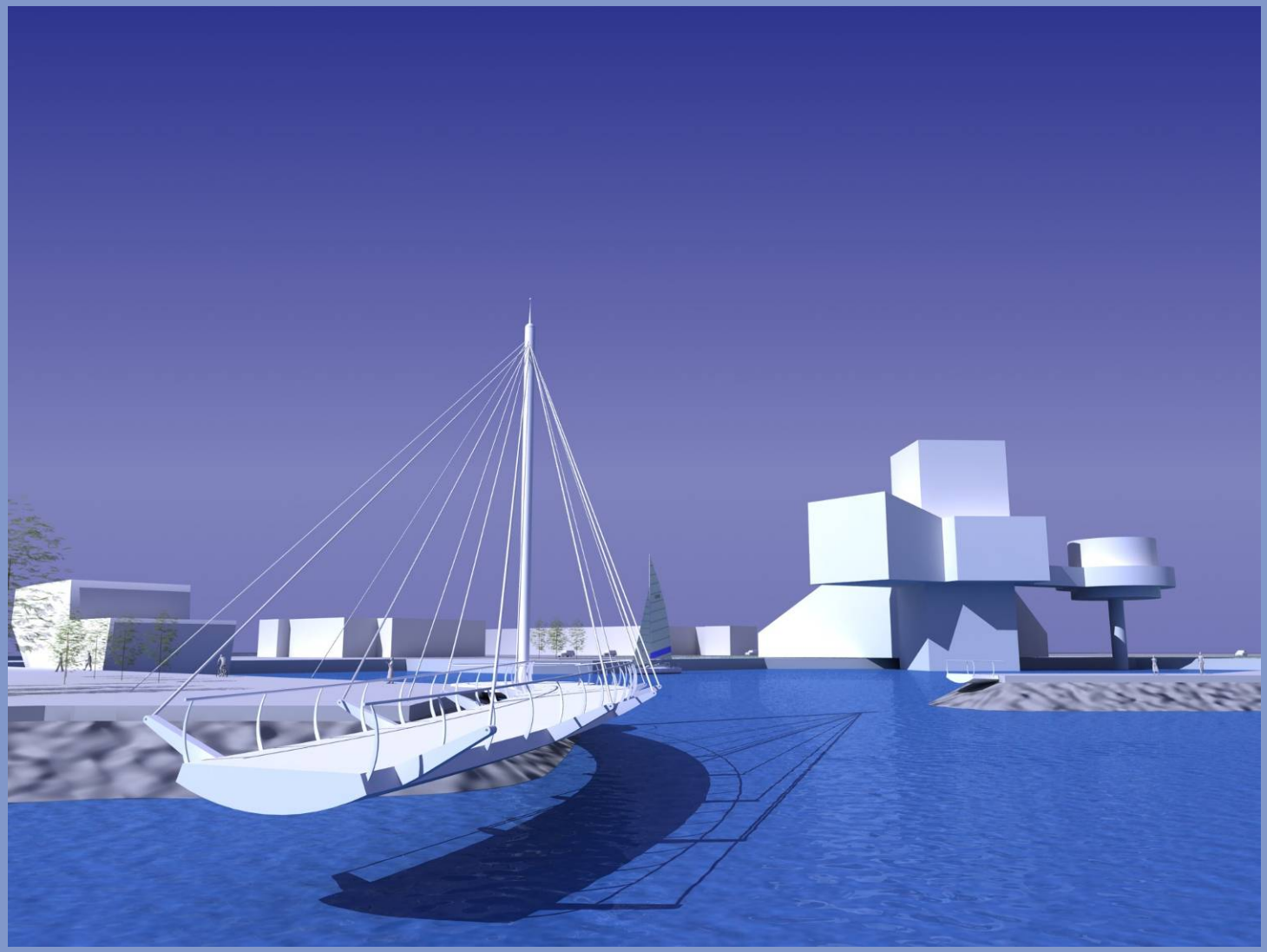


Concept C

# North Coast Harbor Pedestrian Bridge



# North Coast Harbor Pedestrian Bridge



Concept C

# North Coast Harbor Pedestrian Bridge

Concept C

# North Coast Harbor Pedestrian Bridge

Concept C

# North Coast Harbor Pedestrian Bridge

Concept C

# North Coast Harbor Pedestrian Bridge

Concept C

# North Coast Harbor Pedestrian Bridge

Concept C

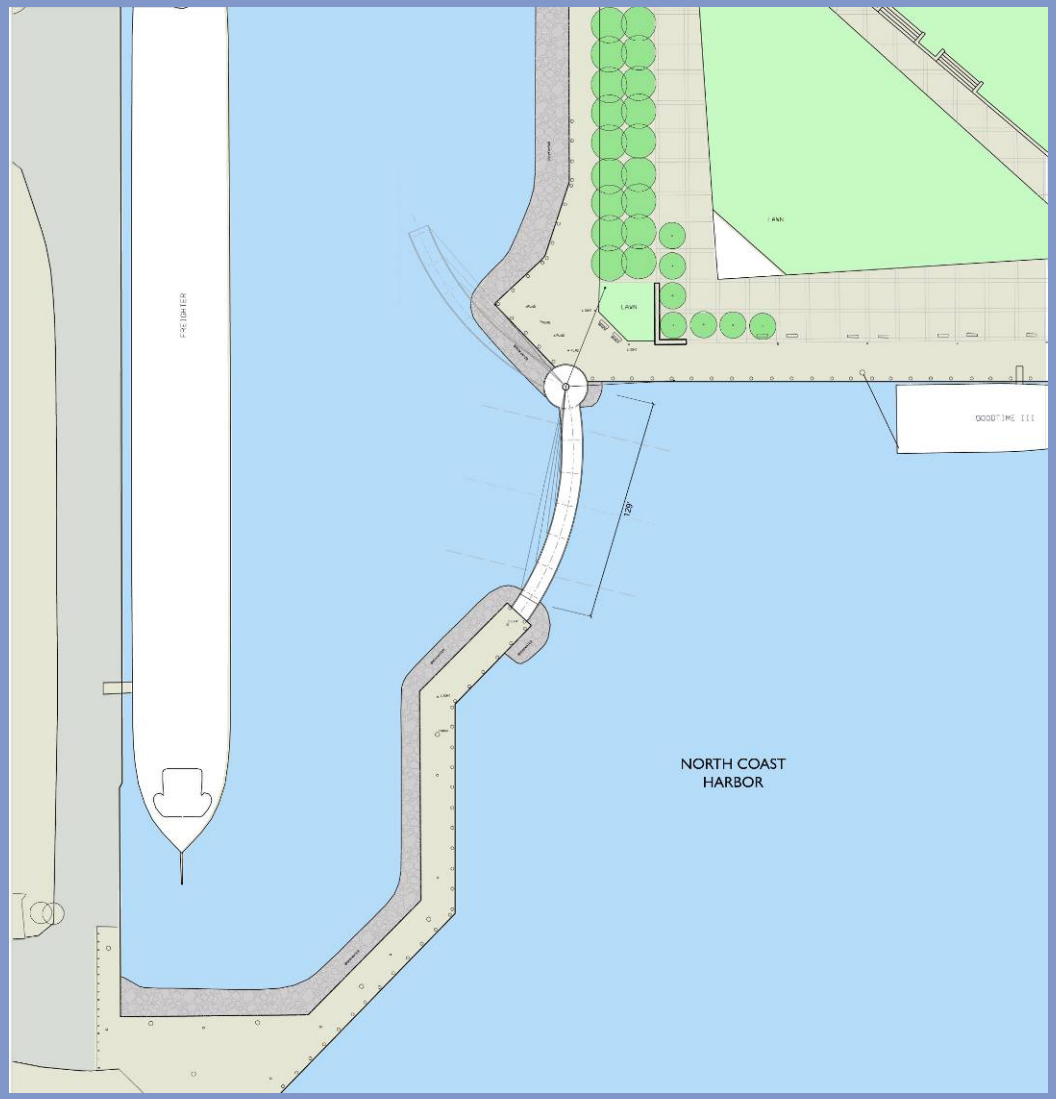
# North Coast Harbor Pedestrian Bridge

Concept C

# North Coast Harbor Pedestrian Bridge

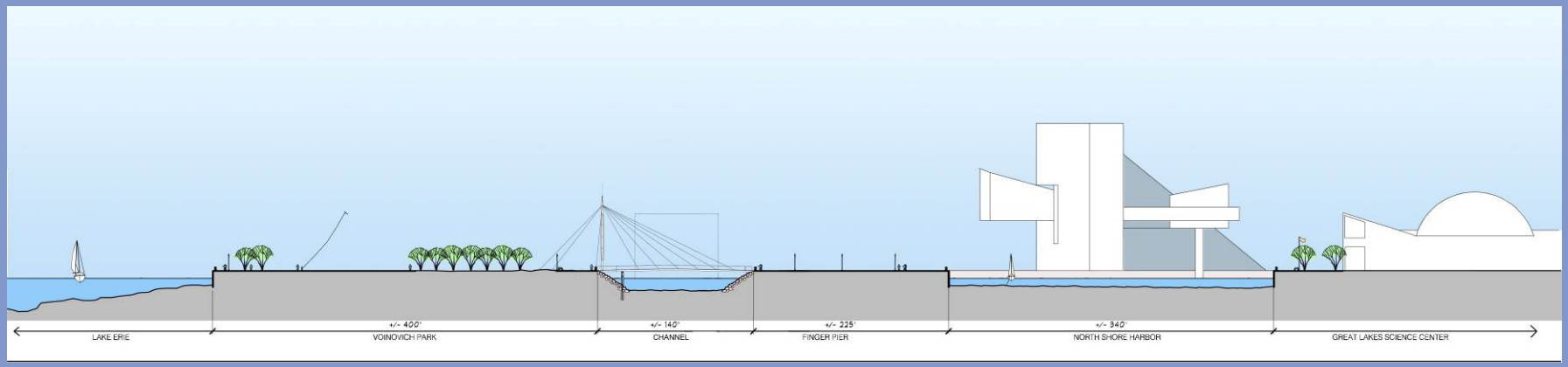
Concept D Plan

# North Coast Harbor Pedestrian Bridge



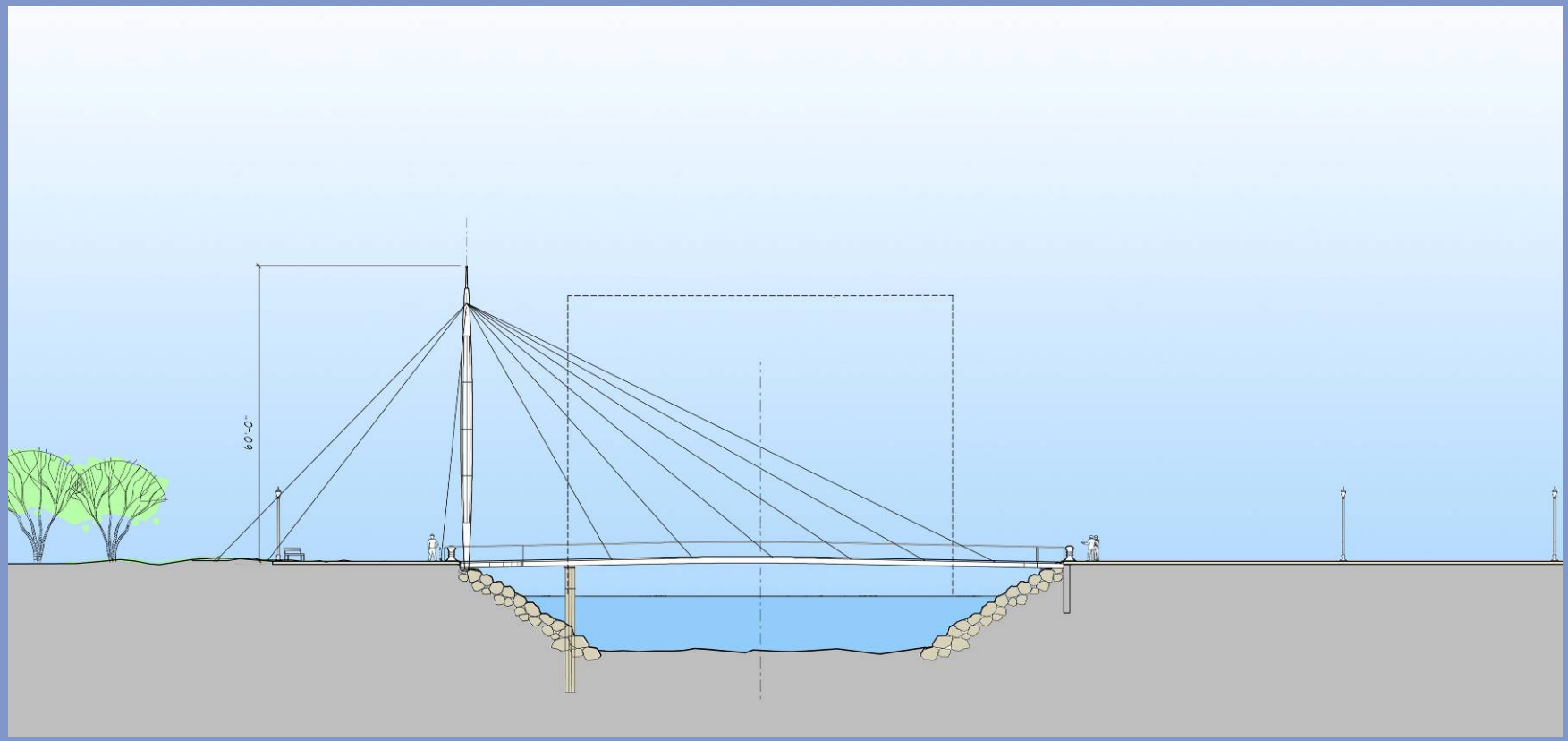
Concept D Context Section

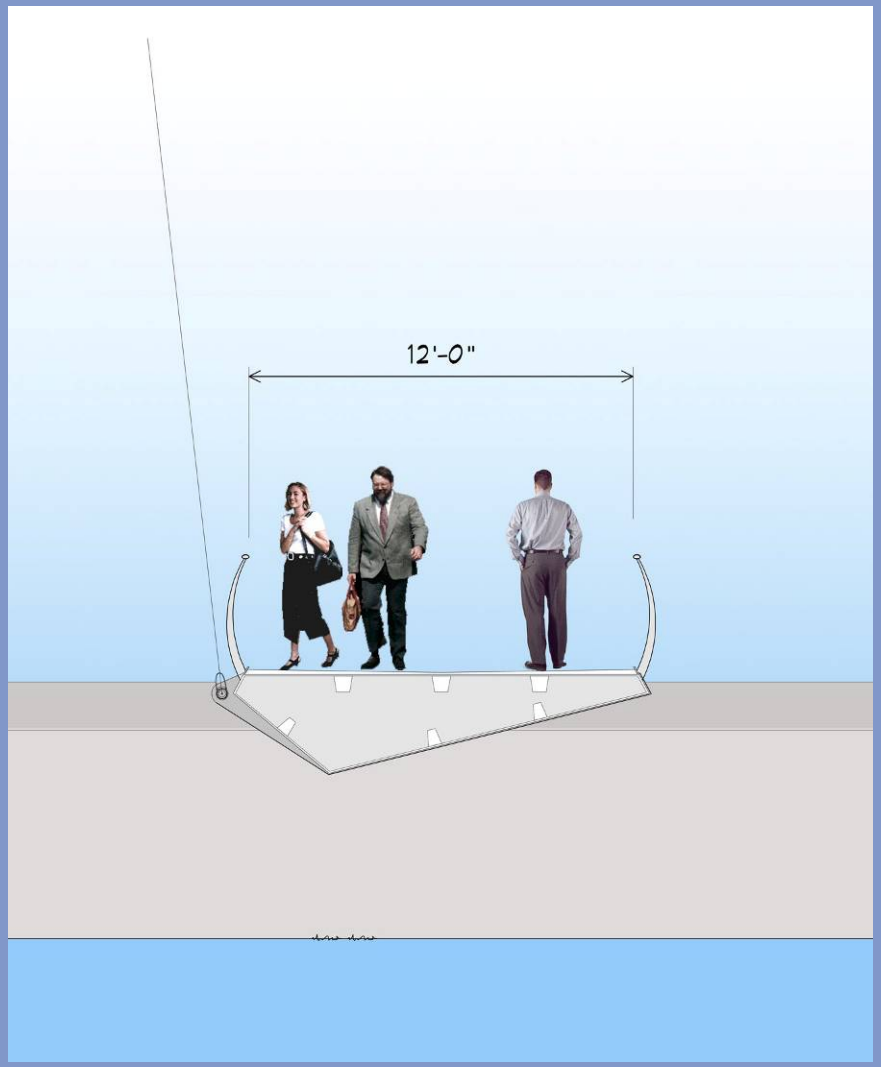
# North Coast Harbor Pedestrian Bridge



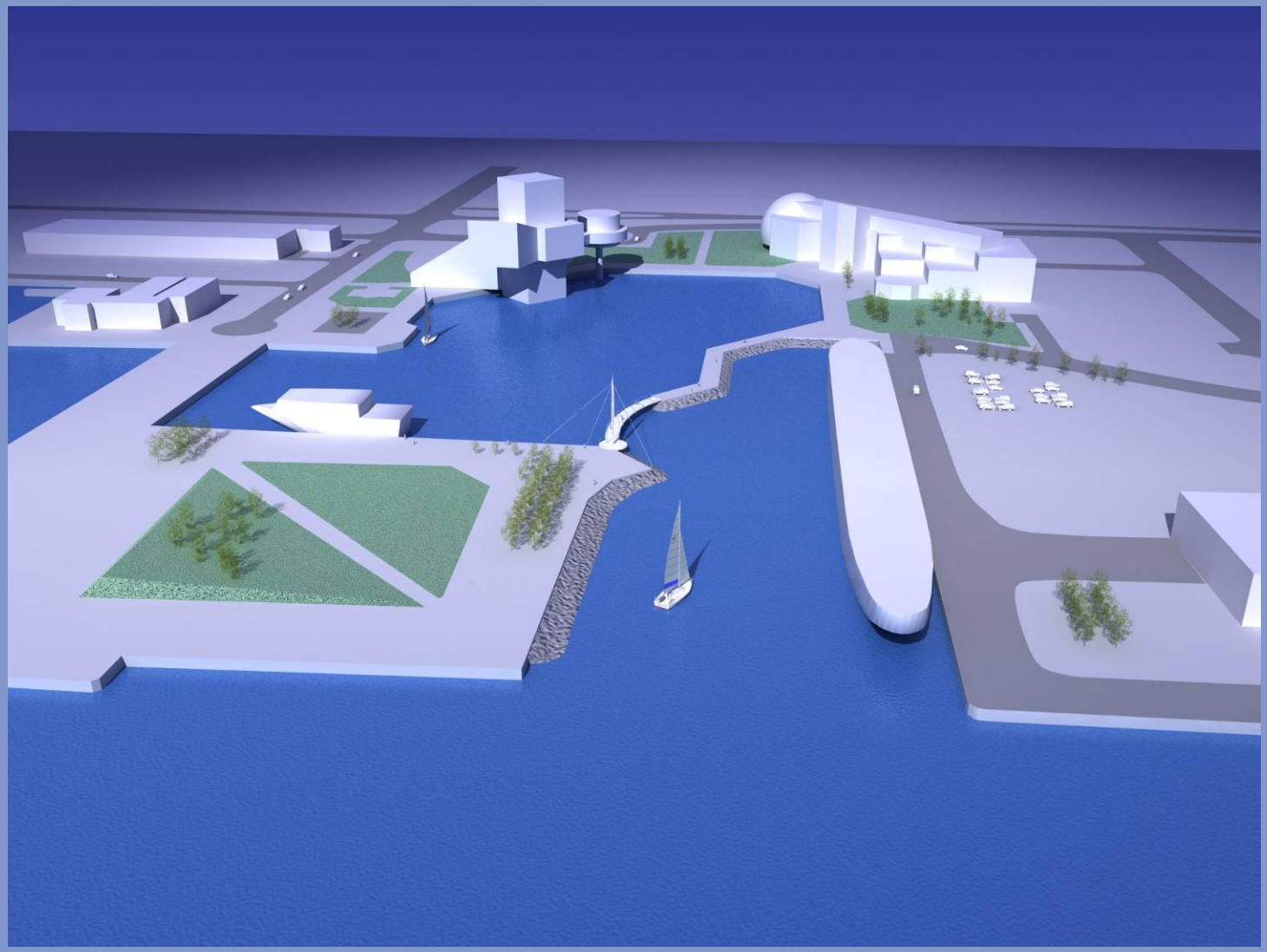
Concept D Elevation

# North Coast Harbor Pedestrian Bridge



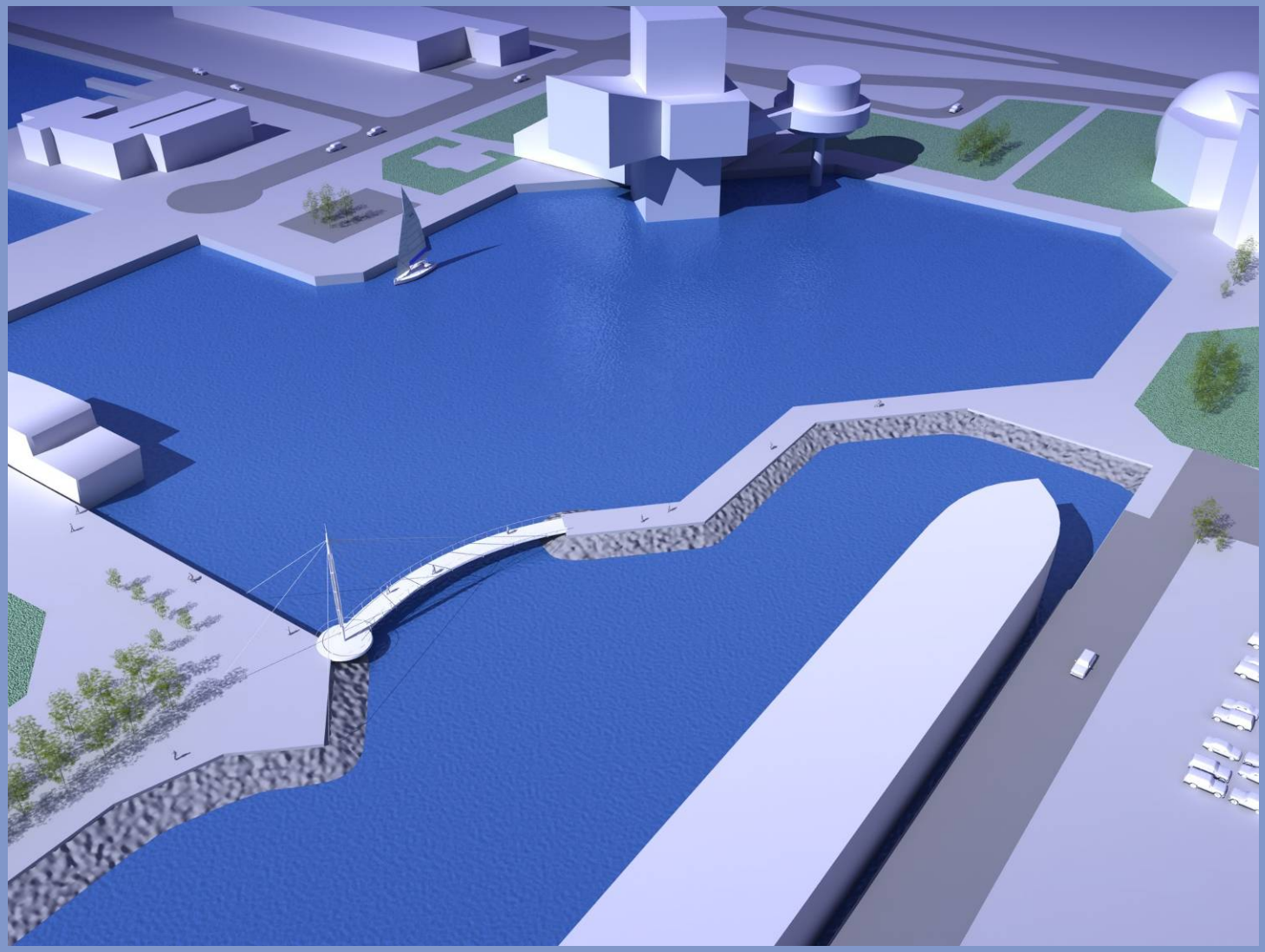

12'-0"

# North Coast Harbor Pedestrian Bridge



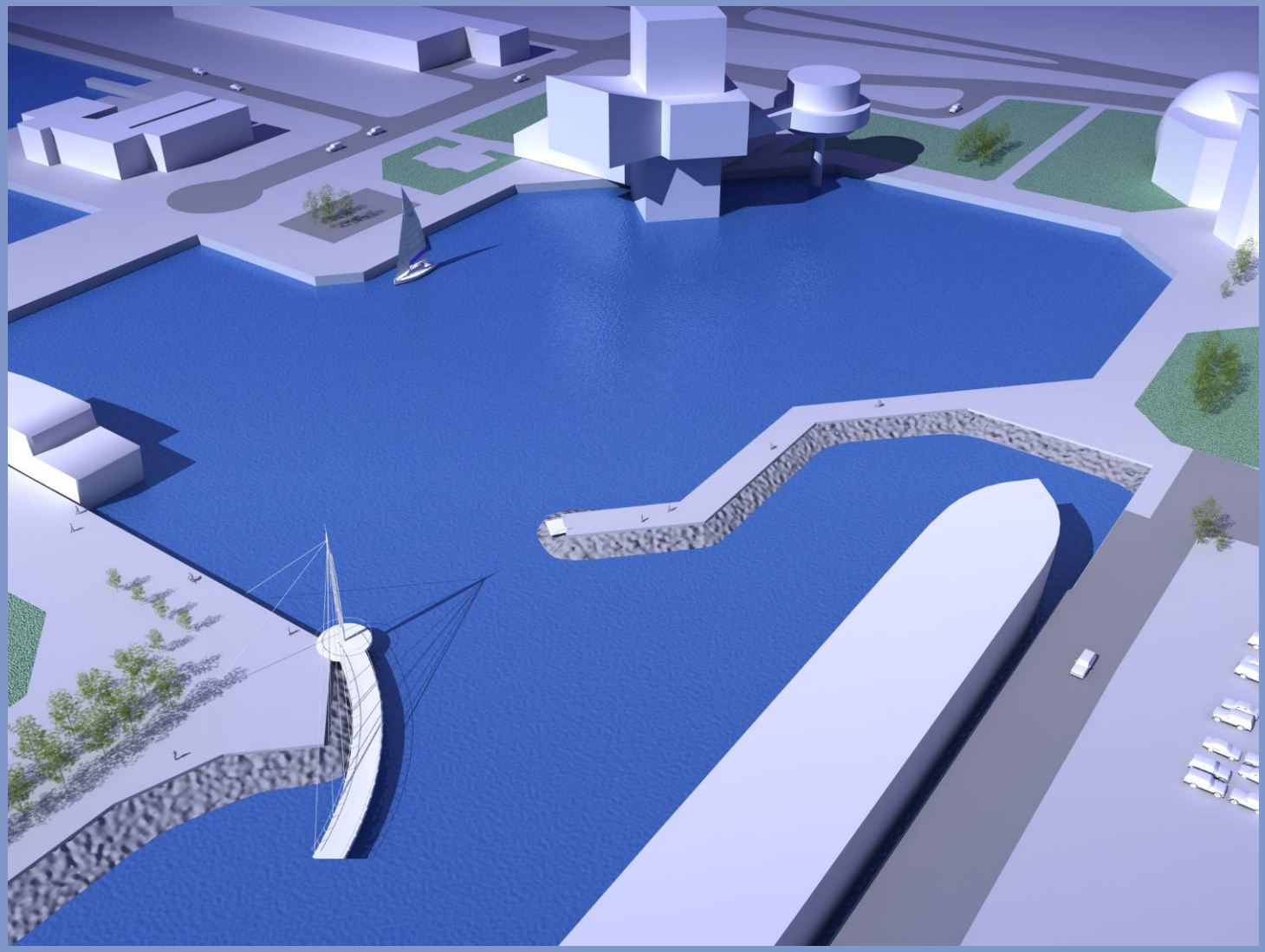
Concept D

# North Coast Harbor Pedestrian Bridge



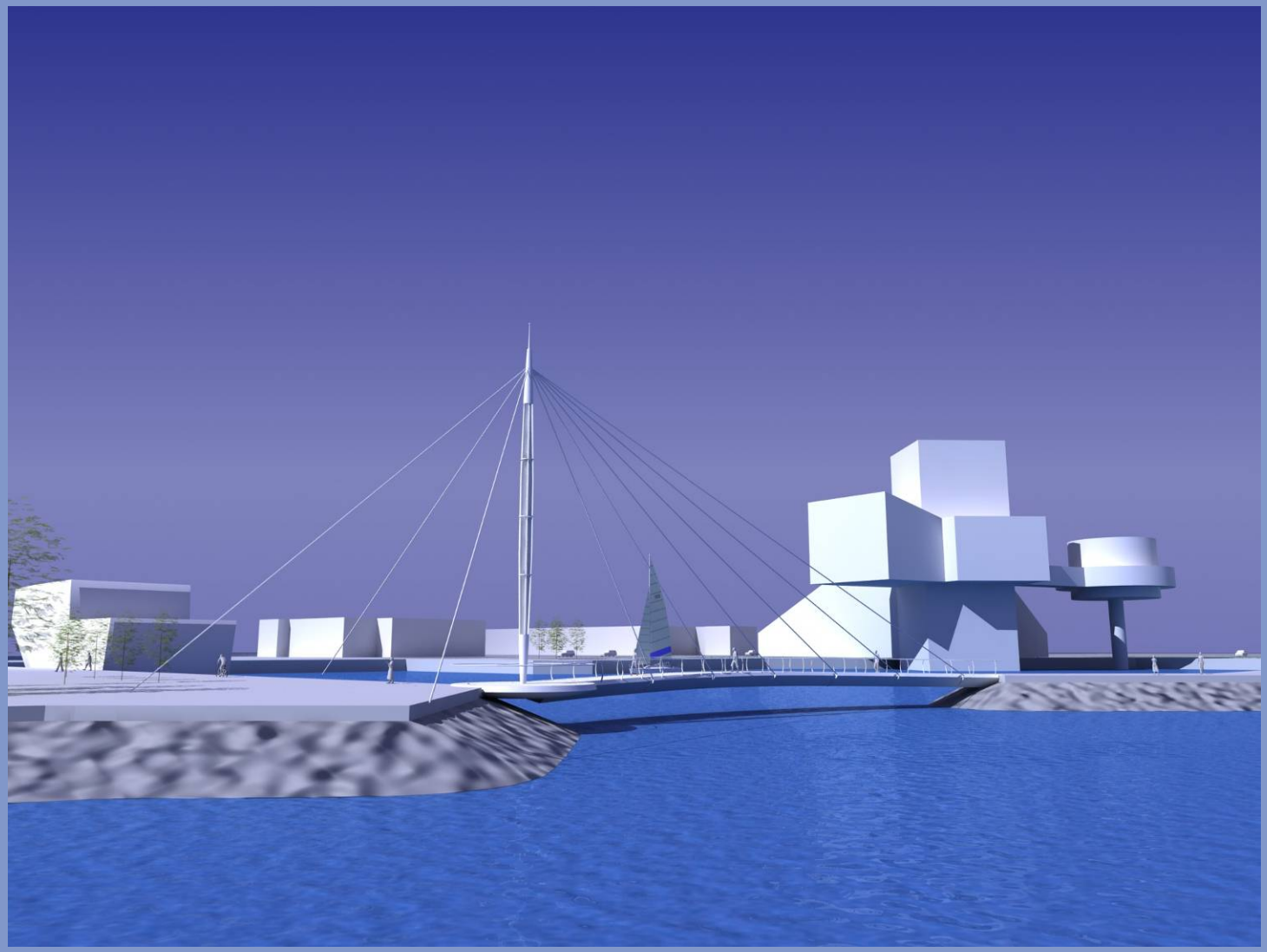
Concept D

# North Coast Harbor Pedestrian Bridge

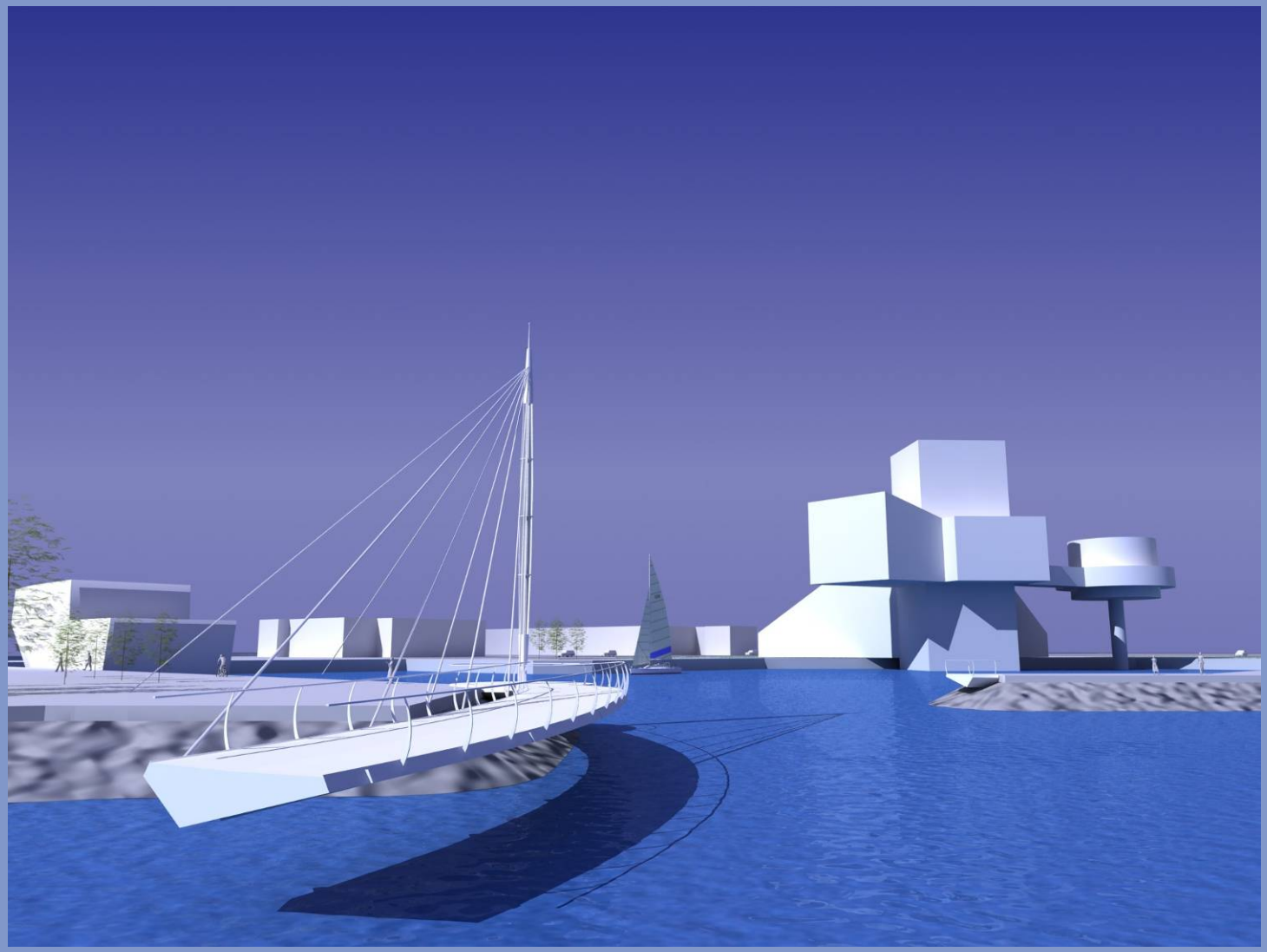


Concept D

# North Coast Harbor Pedestrian Bridge



# North Coast Harbor Pedestrian Bridge



Concept D

# North Coast Harbor Pedestrian Bridge

Concept D

# North Coast Harbor Pedestrian Bridge

Concept D

# North Coast Harbor Pedestrian Bridge

Concept D

# North Coast Harbor Pedestrian Bridge

Concept D

# North Coast Harbor Pedestrian Bridge

Concept D

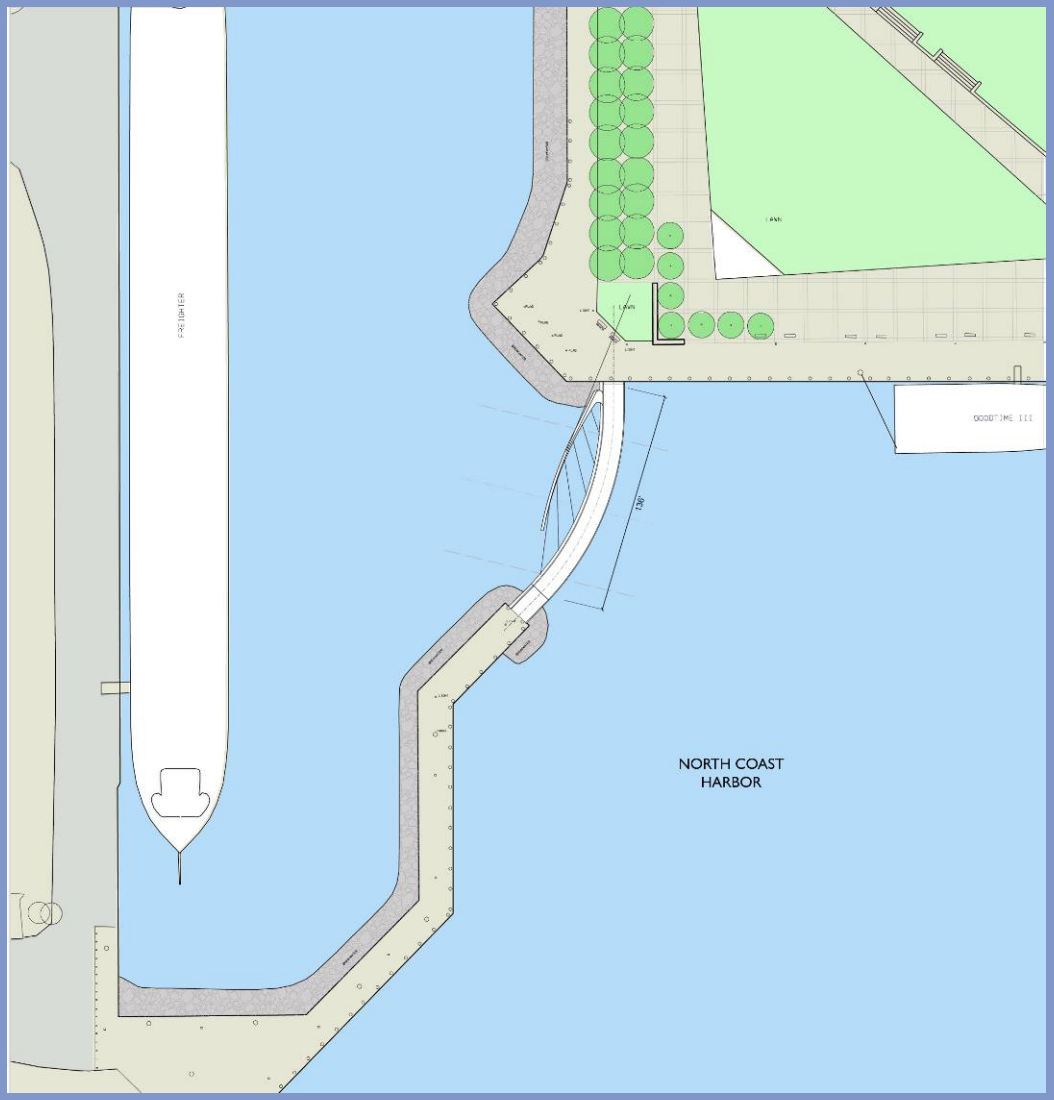
# North Coast Harbor Pedestrian Bridge

Concept D

# North Coast Harbor Pedestrian Bridge

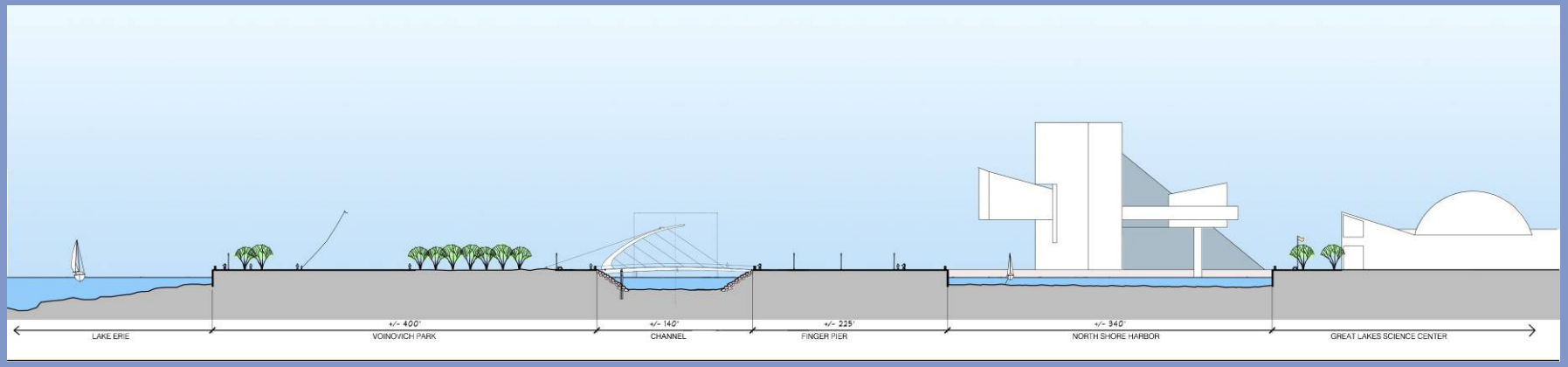
Concept E Plan

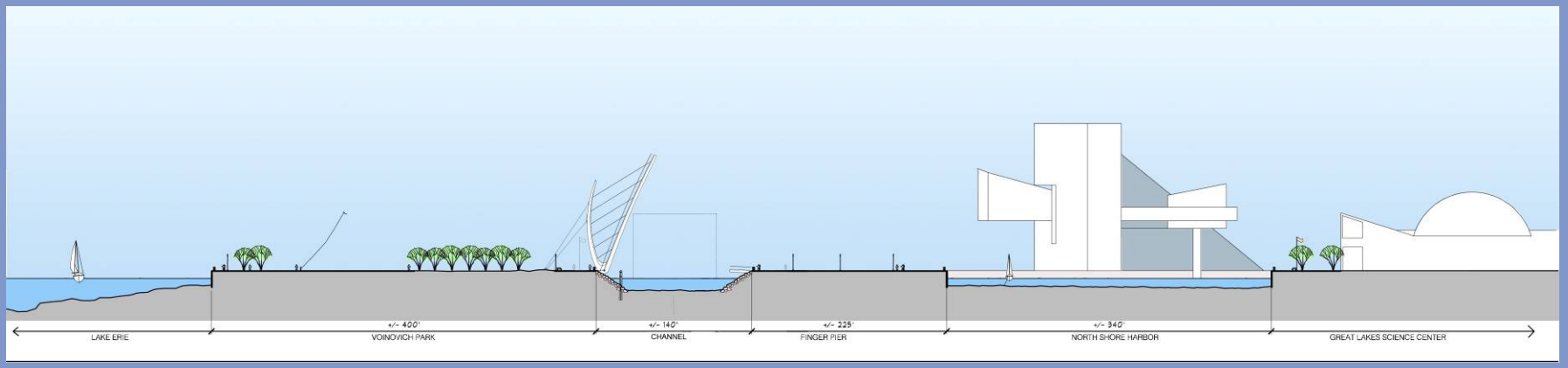
# North Coast Harbor Pedestrian Bridge



Concept E Context Section

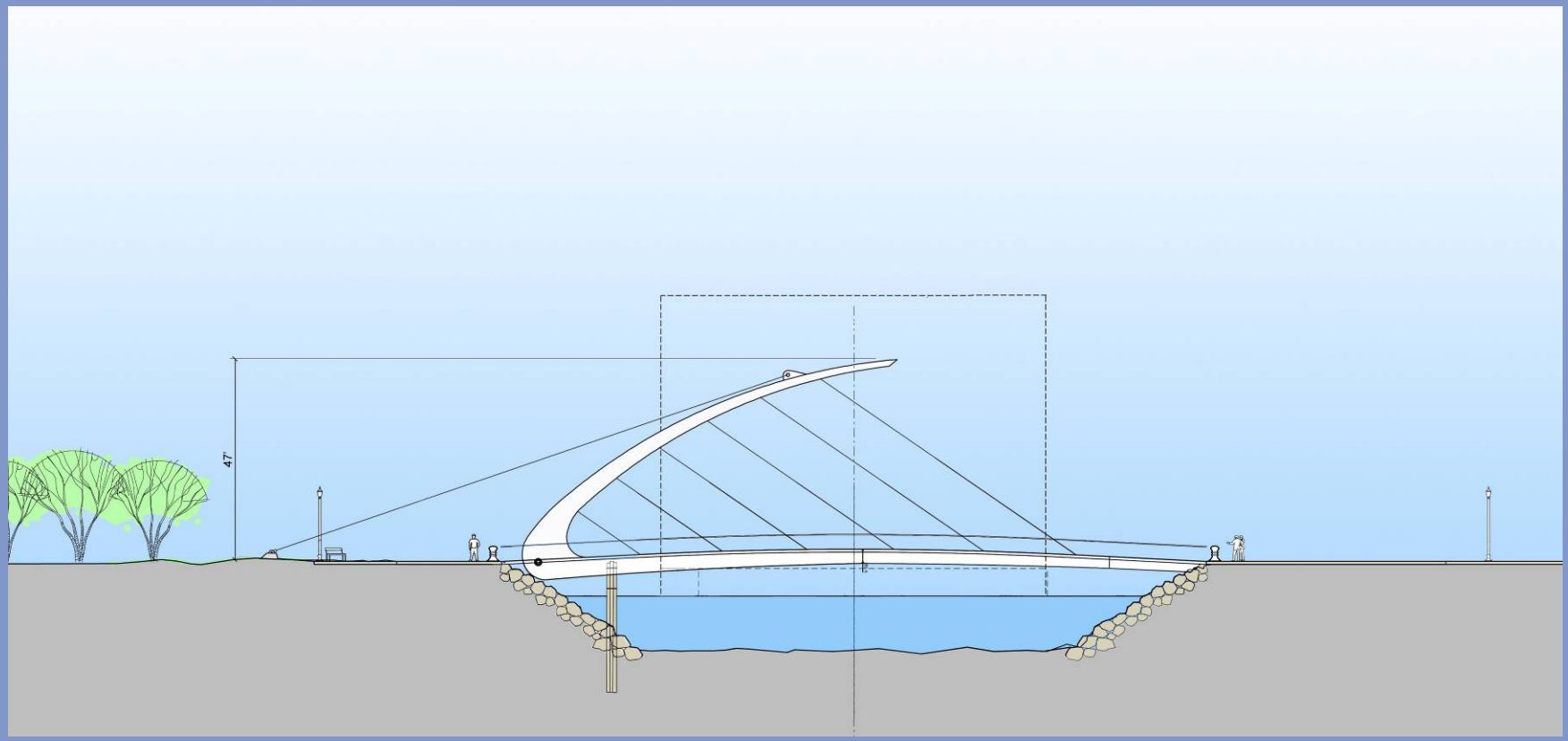
# North Coast Harbor Pedestrian Bridge



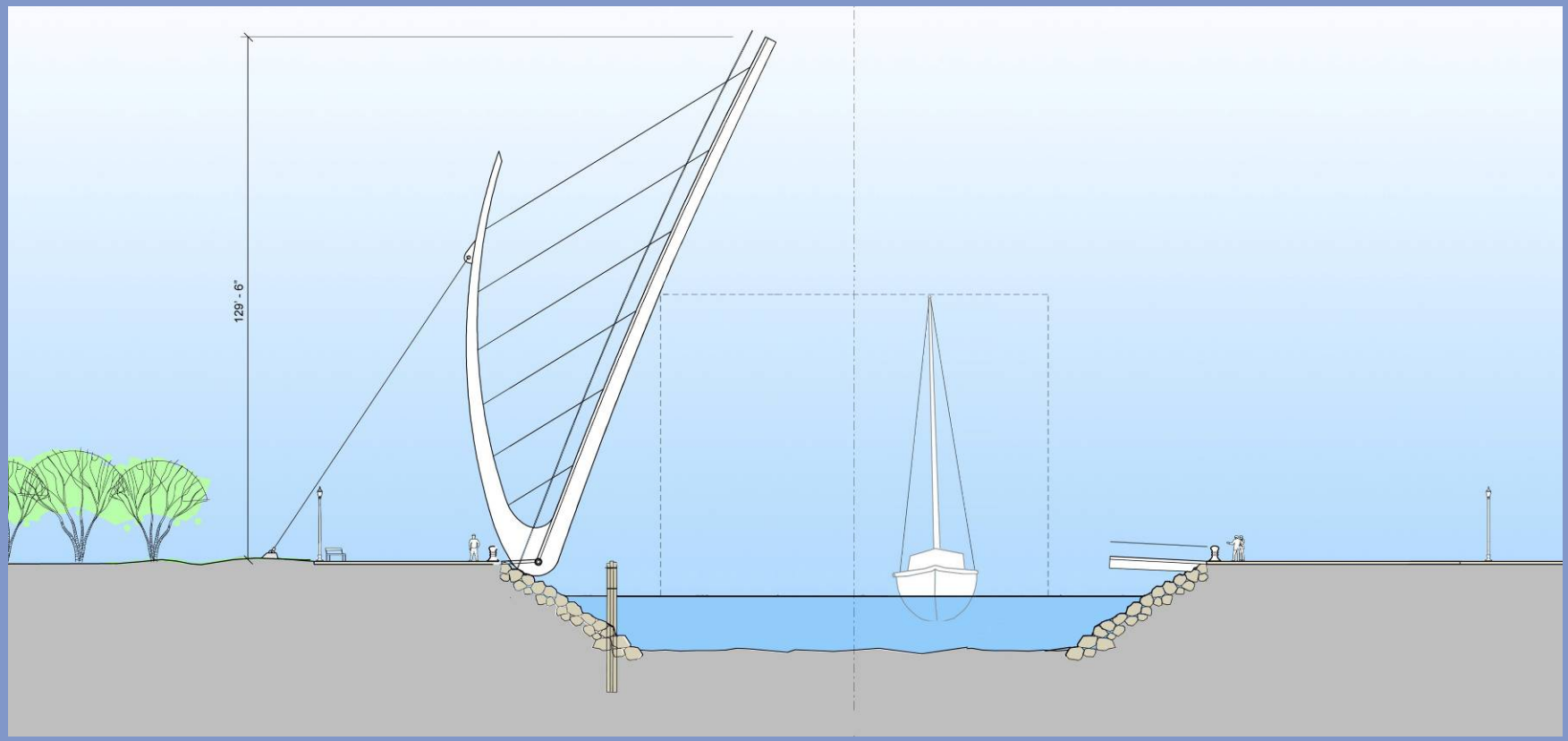
Concept E Elevation - Closed

# North Coast Harbor Pedestrian Bridge

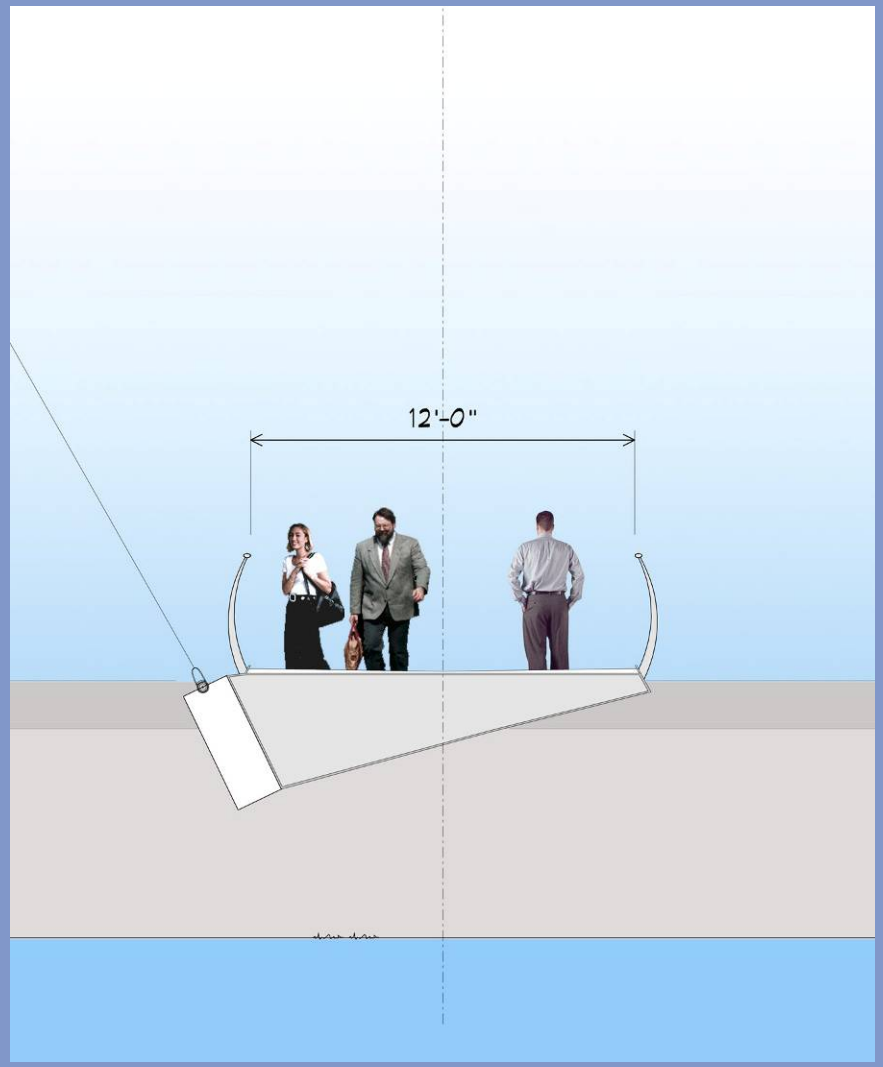


Concept E Elevation - Open

# North Coast Harbor Pedestrian Bridge

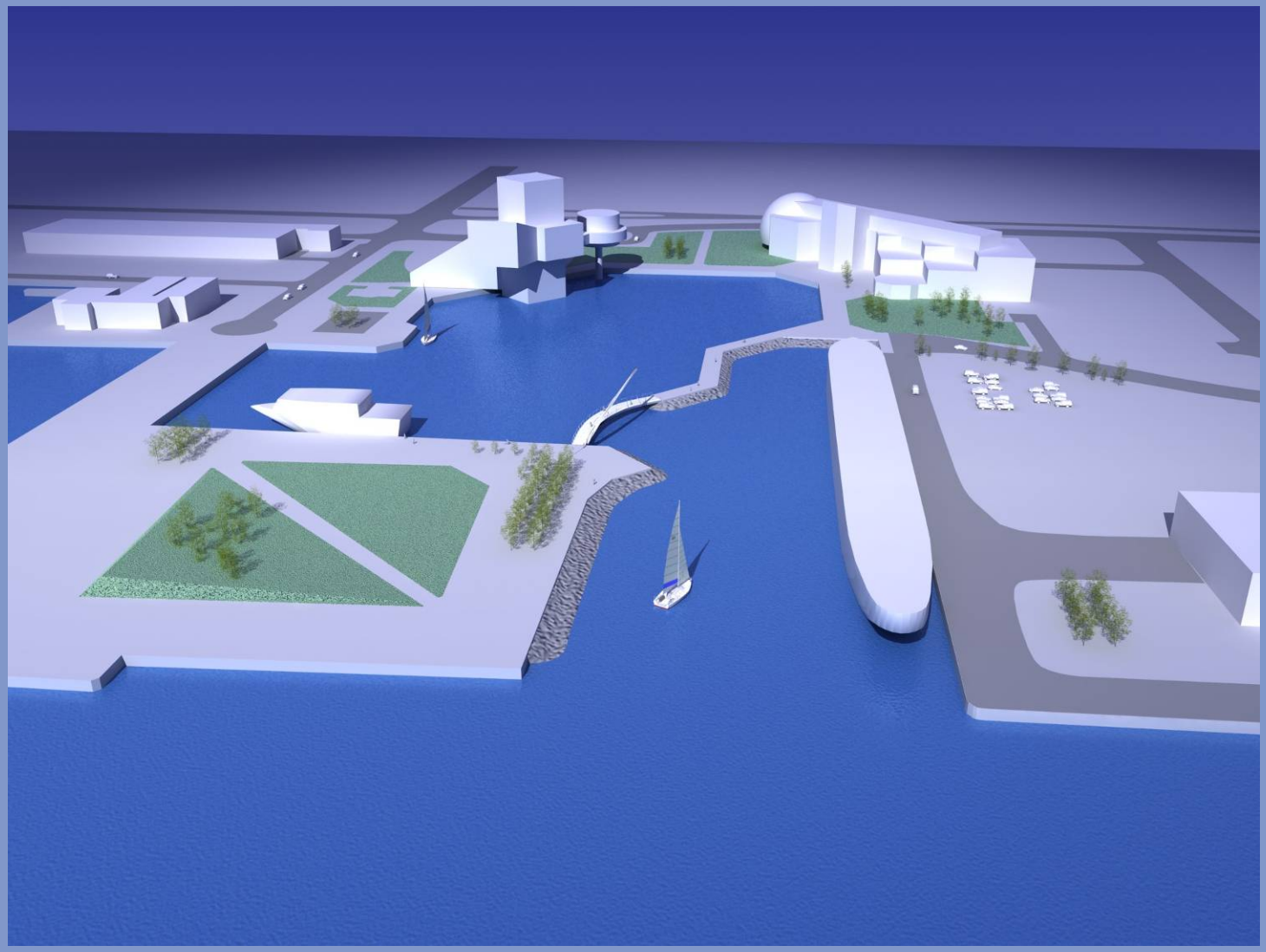


# North Coast Harbor Pedestrian Bridge



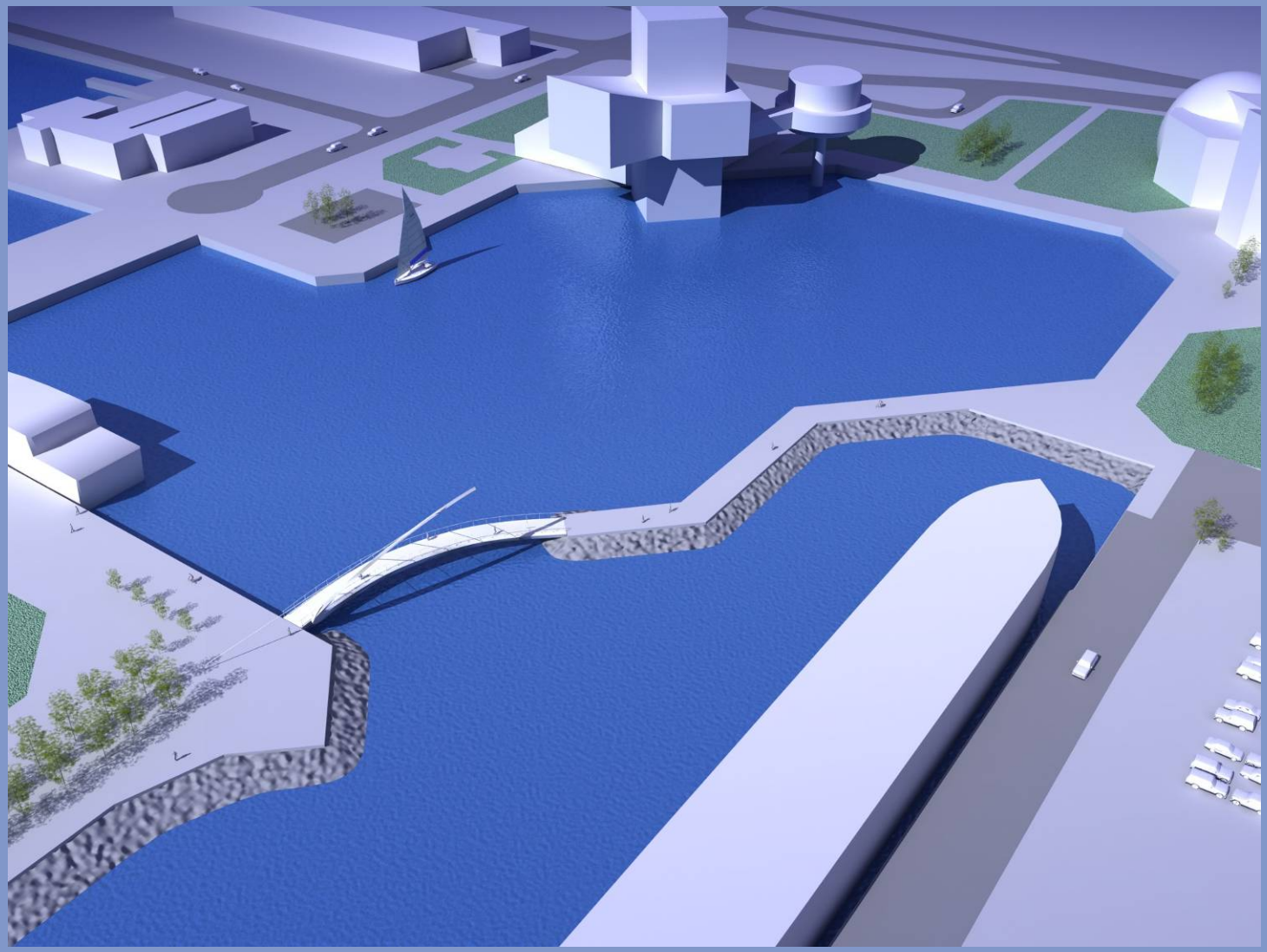
Concept E

# North Coast Harbor Pedestrian Bridge



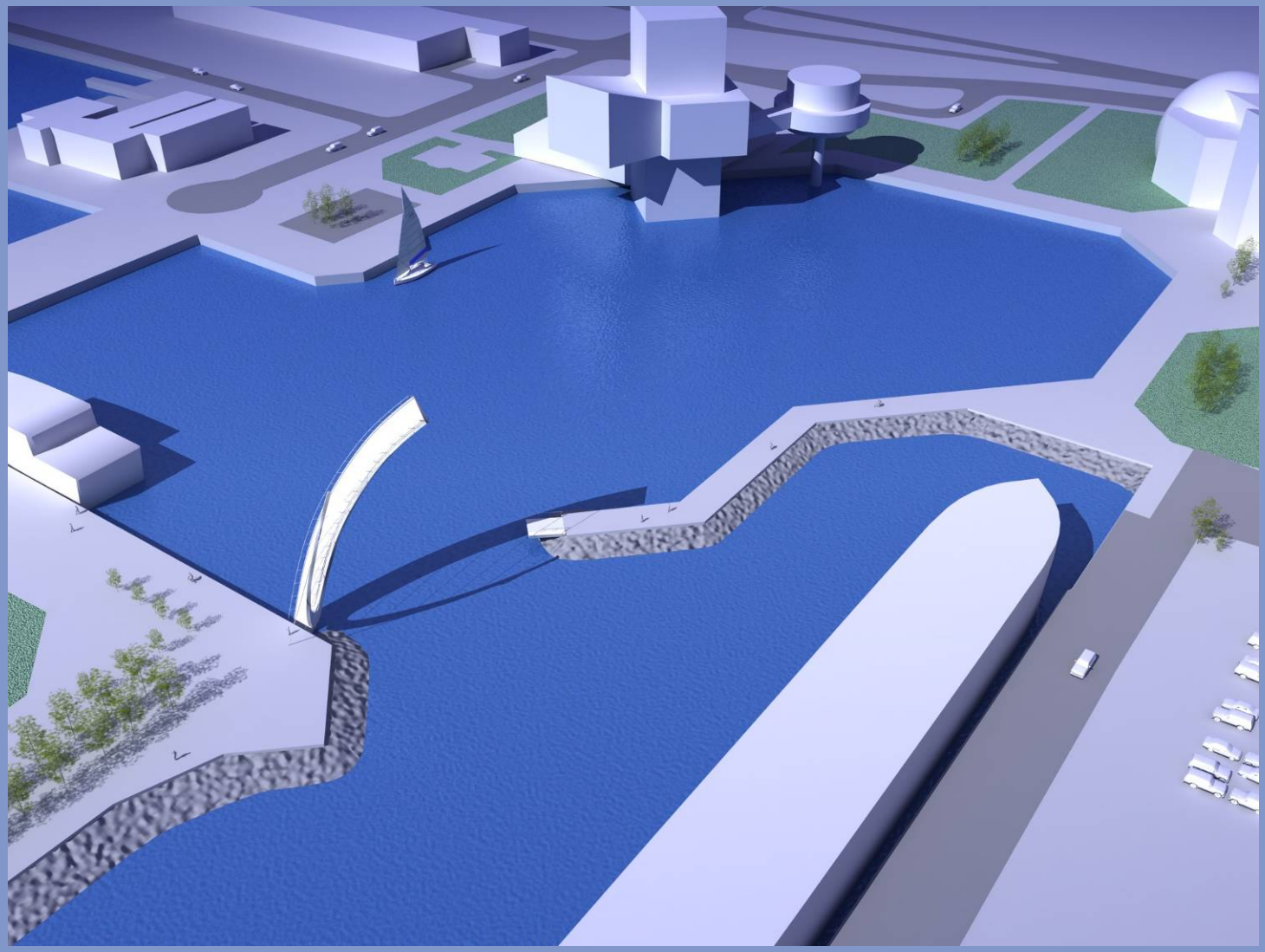
Concept E

# North Coast Harbor Pedestrian Bridge



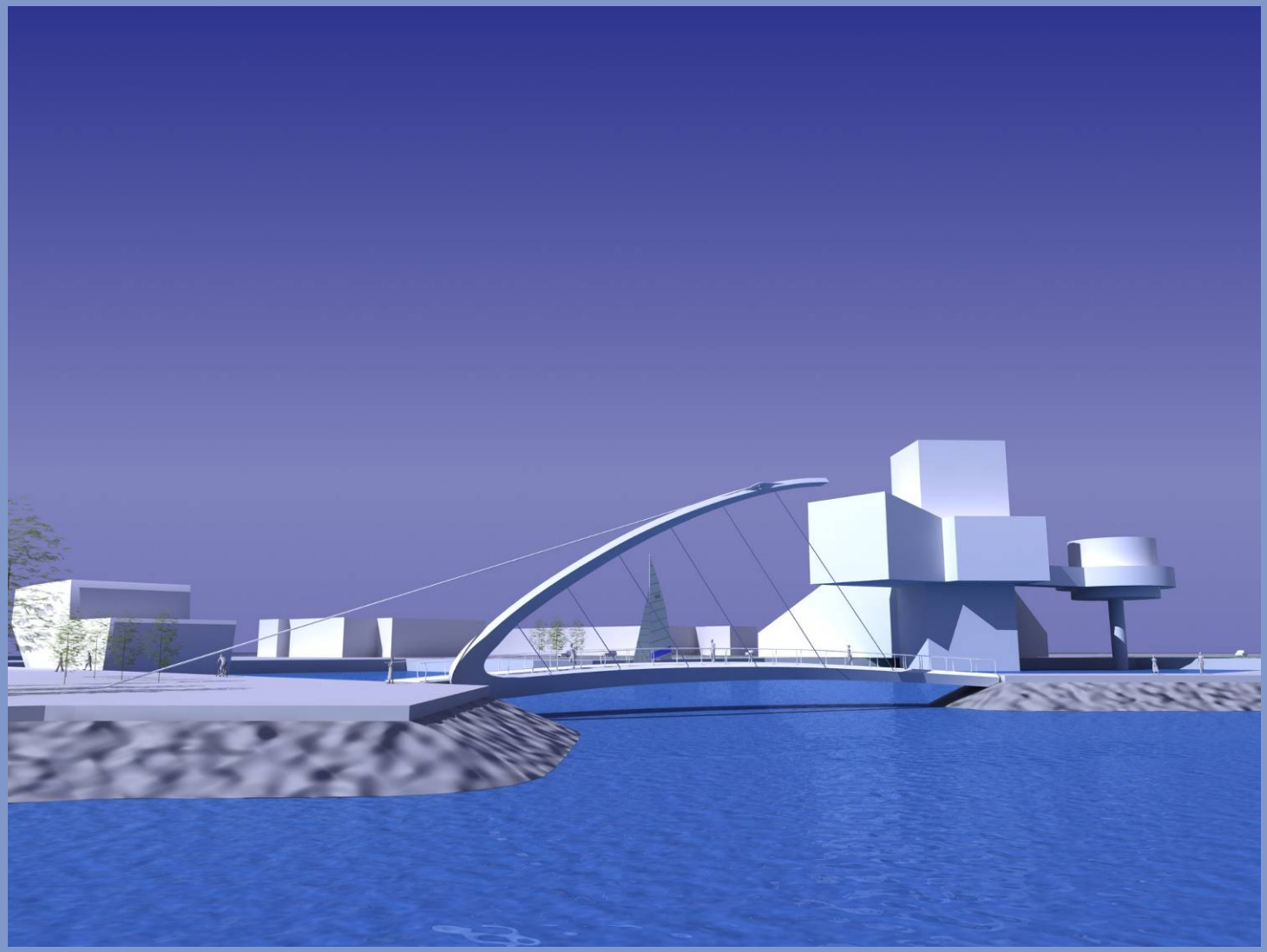
Concept E

# North Coast Harbor Pedestrian Bridge



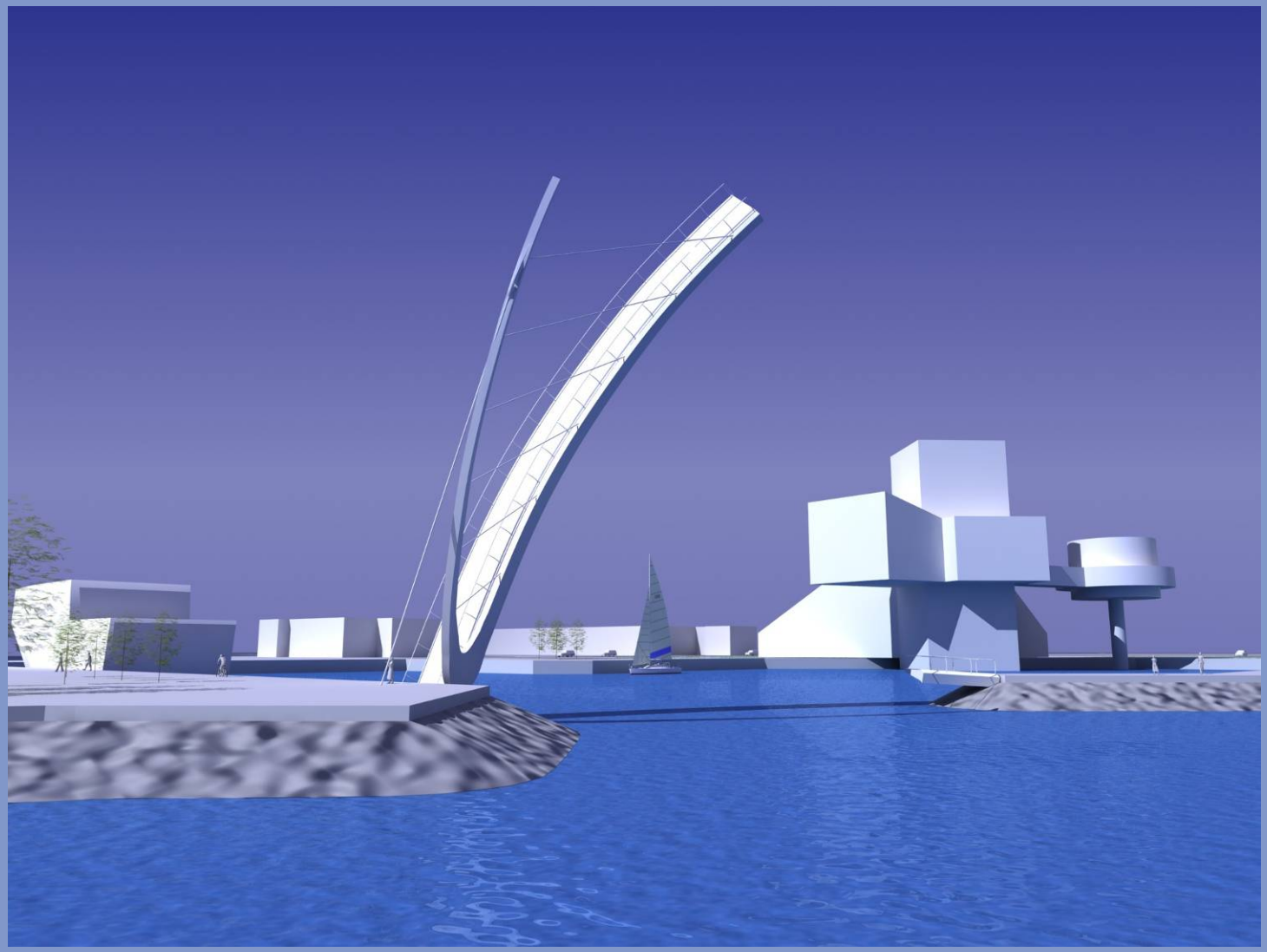
Concept E

# North Coast Harbor Pedestrian Bridge



Concept E

# North Coast Harbor Pedestrian Bridge



Concept E

# North Coast Harbor Pedestrian Bridge

Concept E

# North Coast Harbor Pedestrian Bridge

Concept E

# North Coast Harbor Pedestrian Bridge

Concept E

# North Coast Harbor Pedestrian Bridge

Concept E

# North Coast Harbor Pedestrian Bridge

Concept E

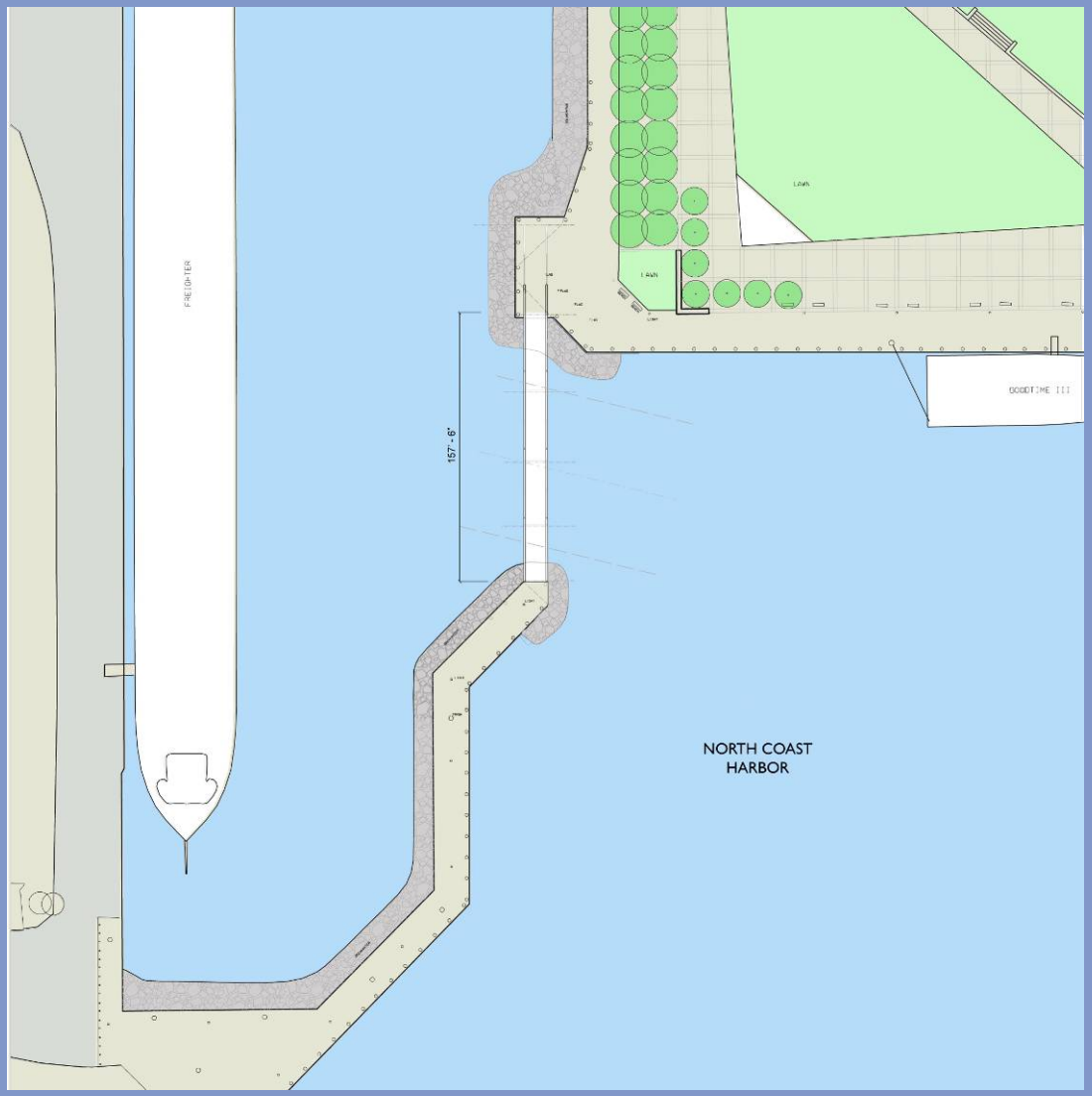
# North Coast Harbor Pedestrian Bridge

Concept E

# North Coast Harbor Pedestrian Bridge

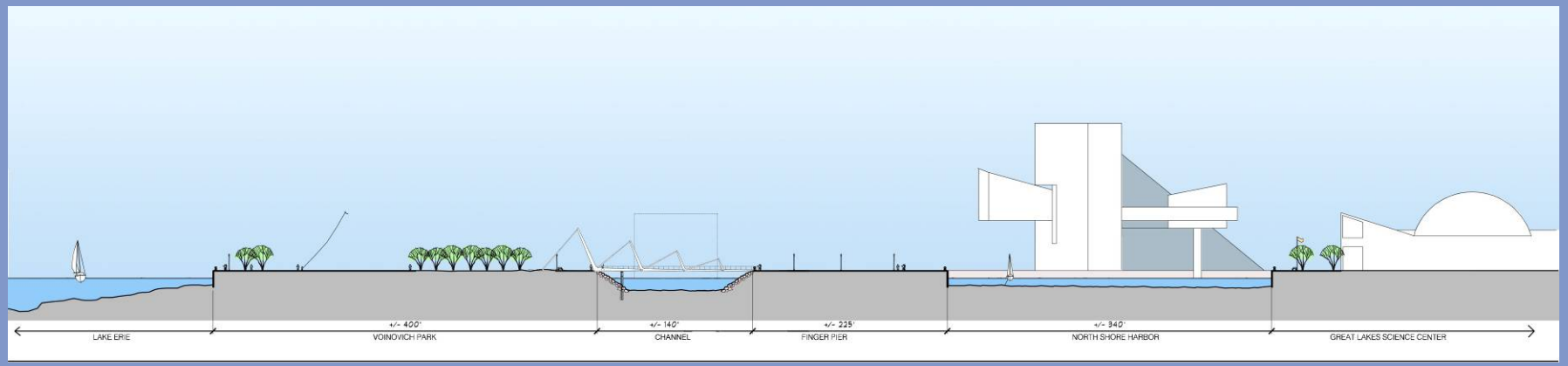
Concept F Plan

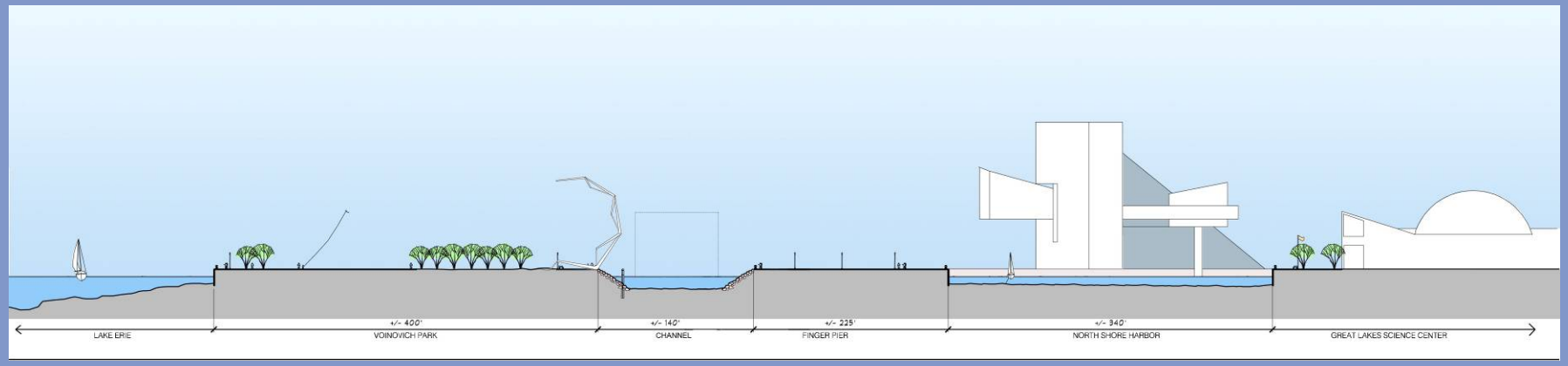
# North Coast Harbor Pedestrian Bridge



Concept F Context Section

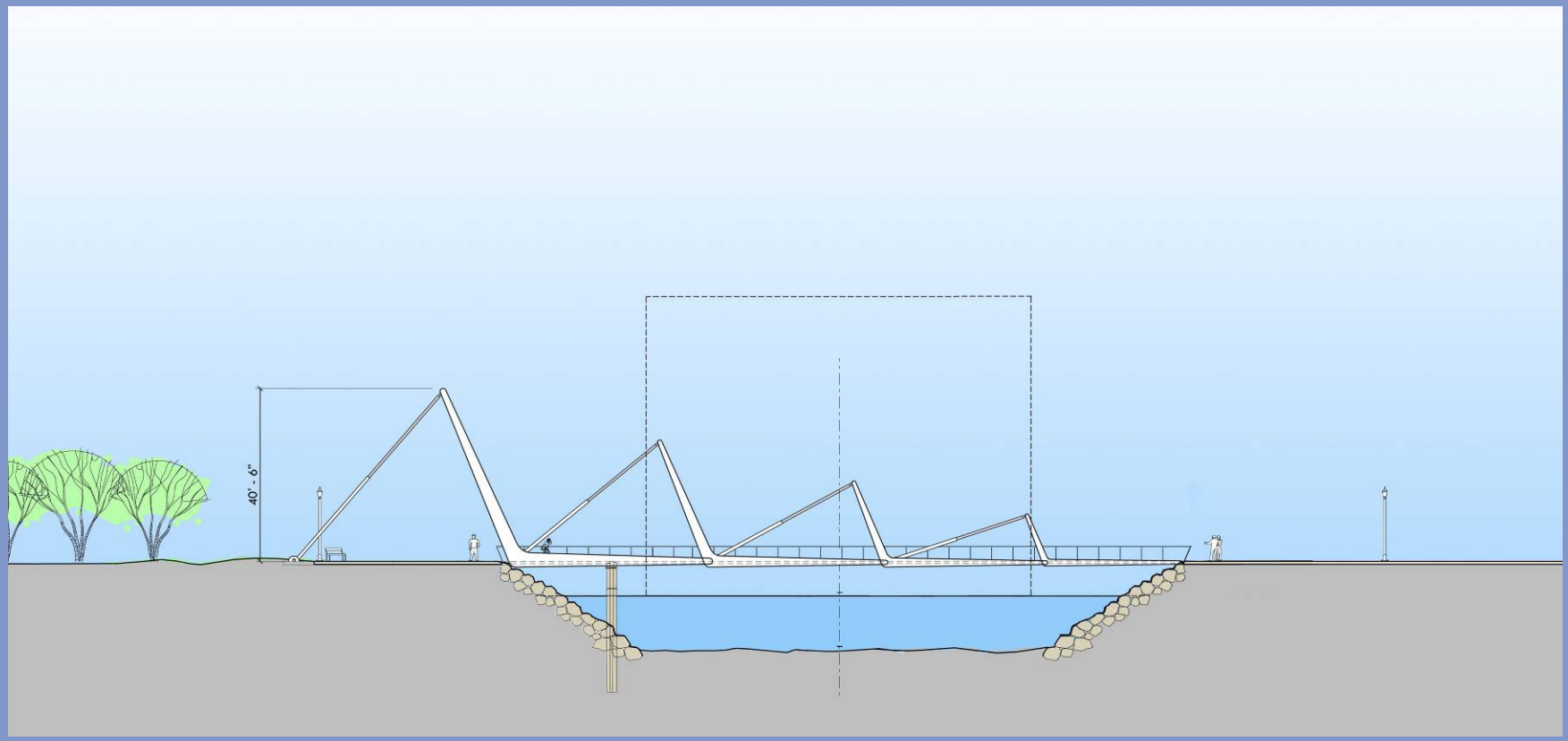
# North Coast Harbor Pedestrian Bridge



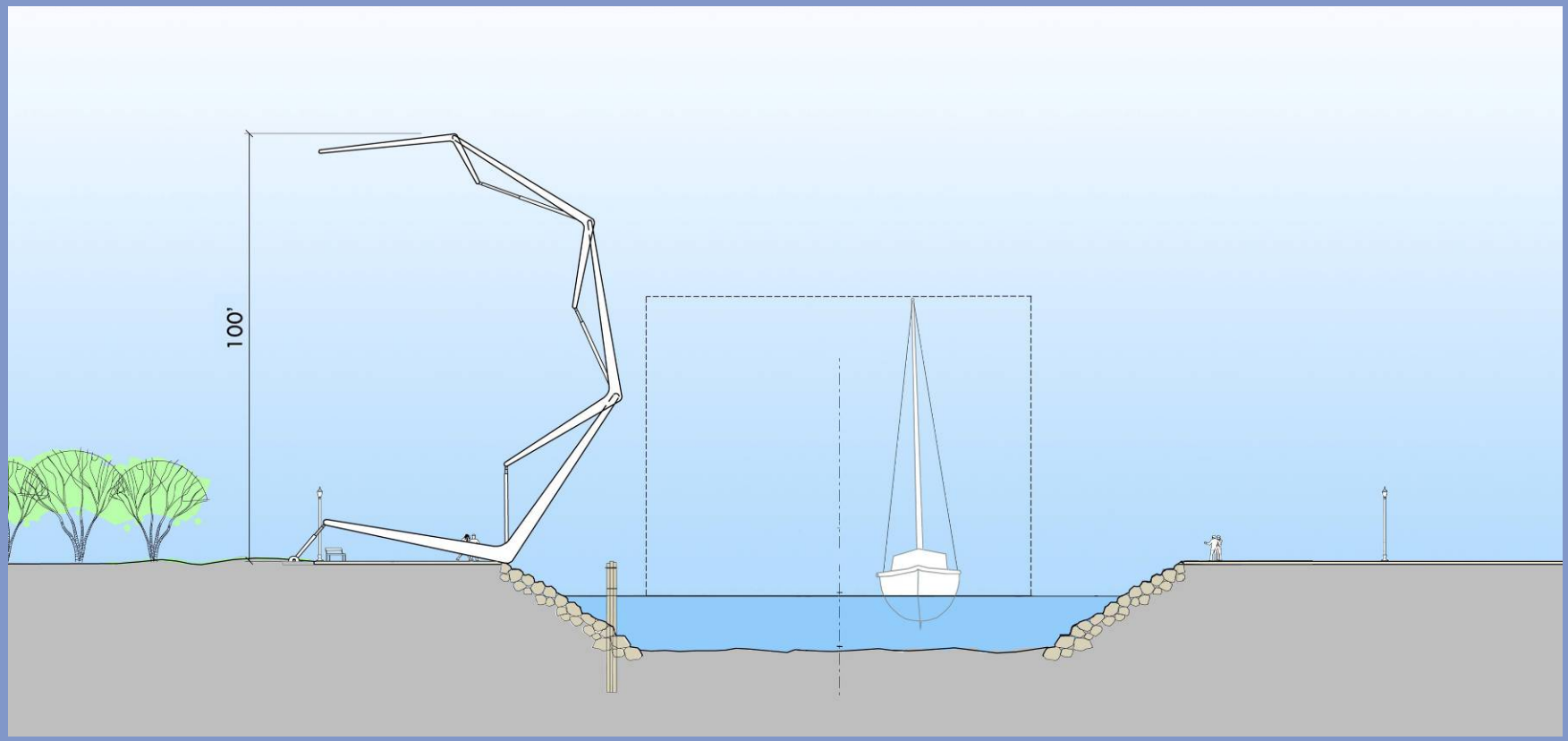
Concept F Elevation - Closed

# North Coast Harbor Pedestrian Bridge

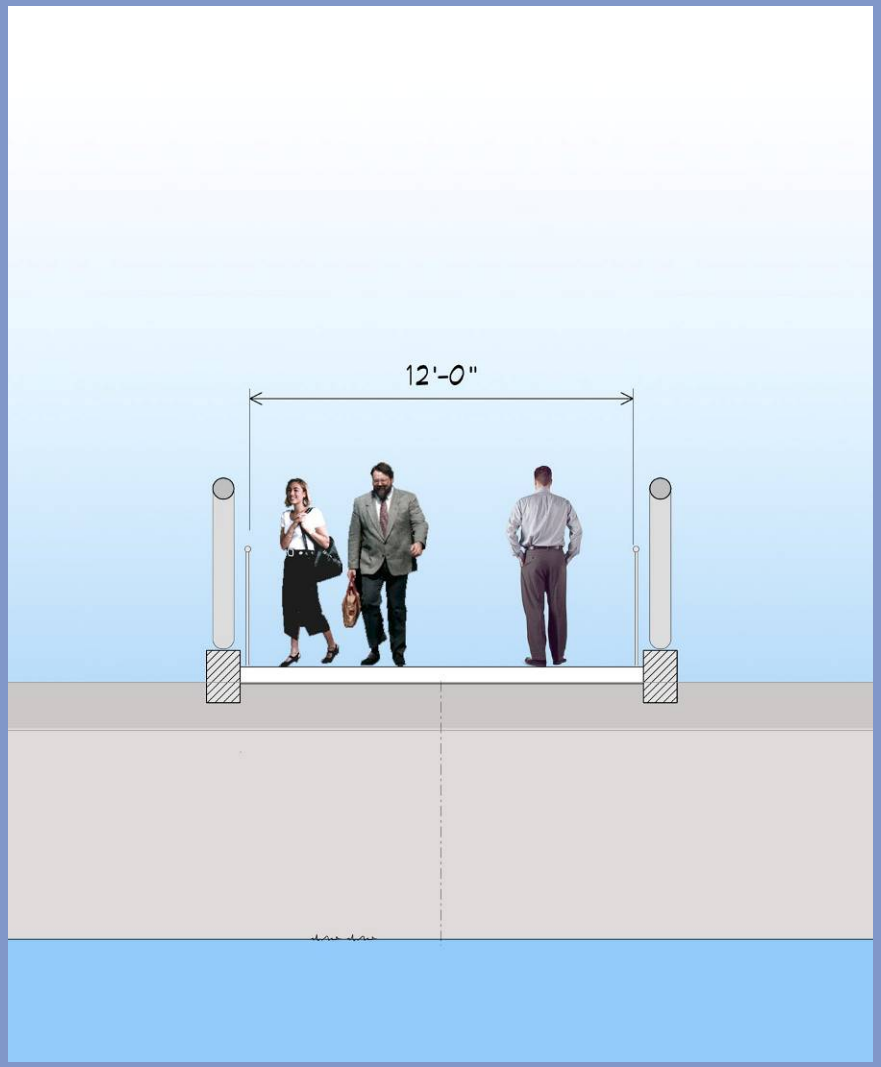


Concept F Elevation - Open

# North Coast Harbor Pedestrian Bridge

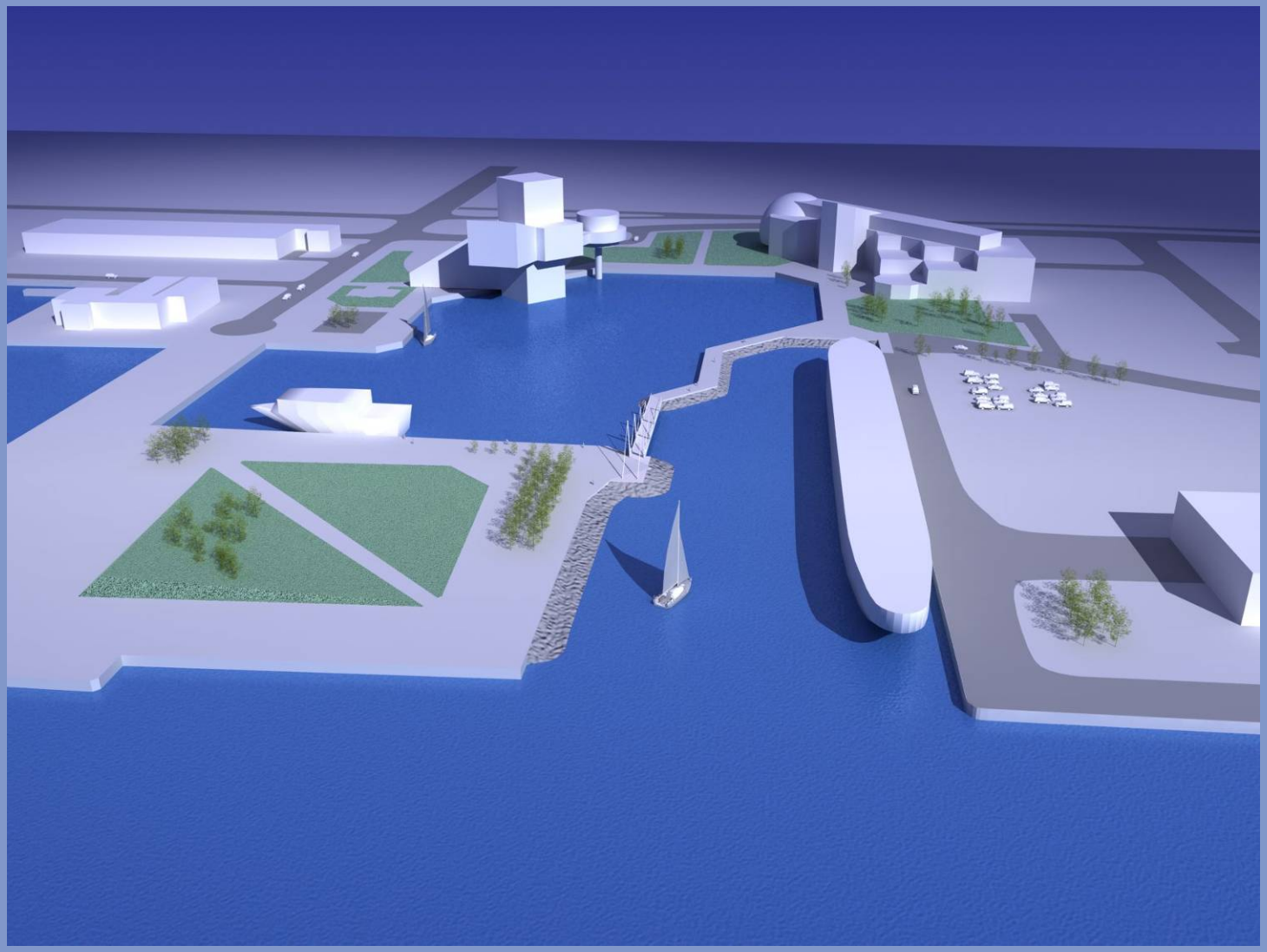


# North Coast Harbor Pedestrian Bridge



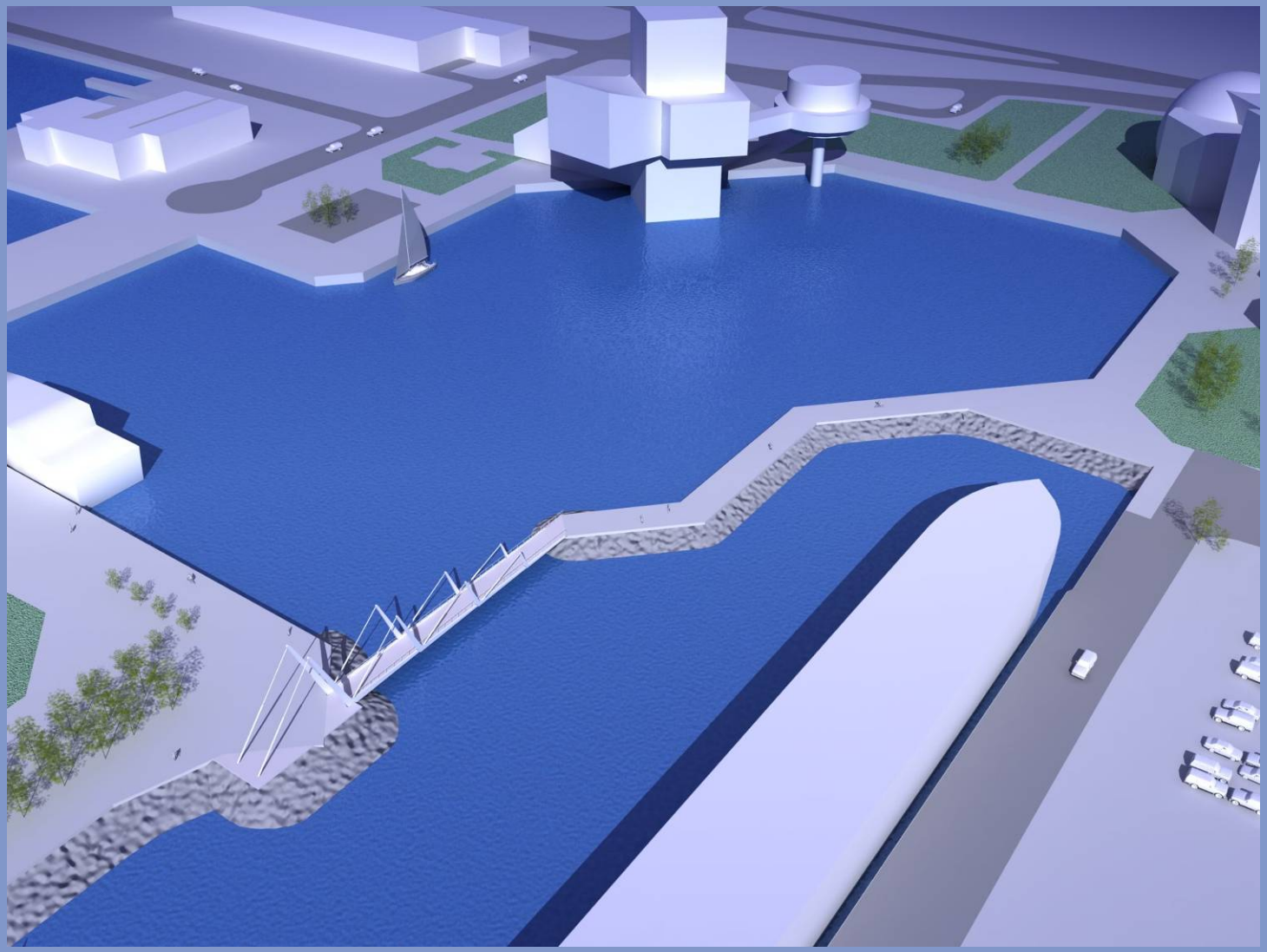
Concept F

# North Coast Harbor Pedestrian Bridge



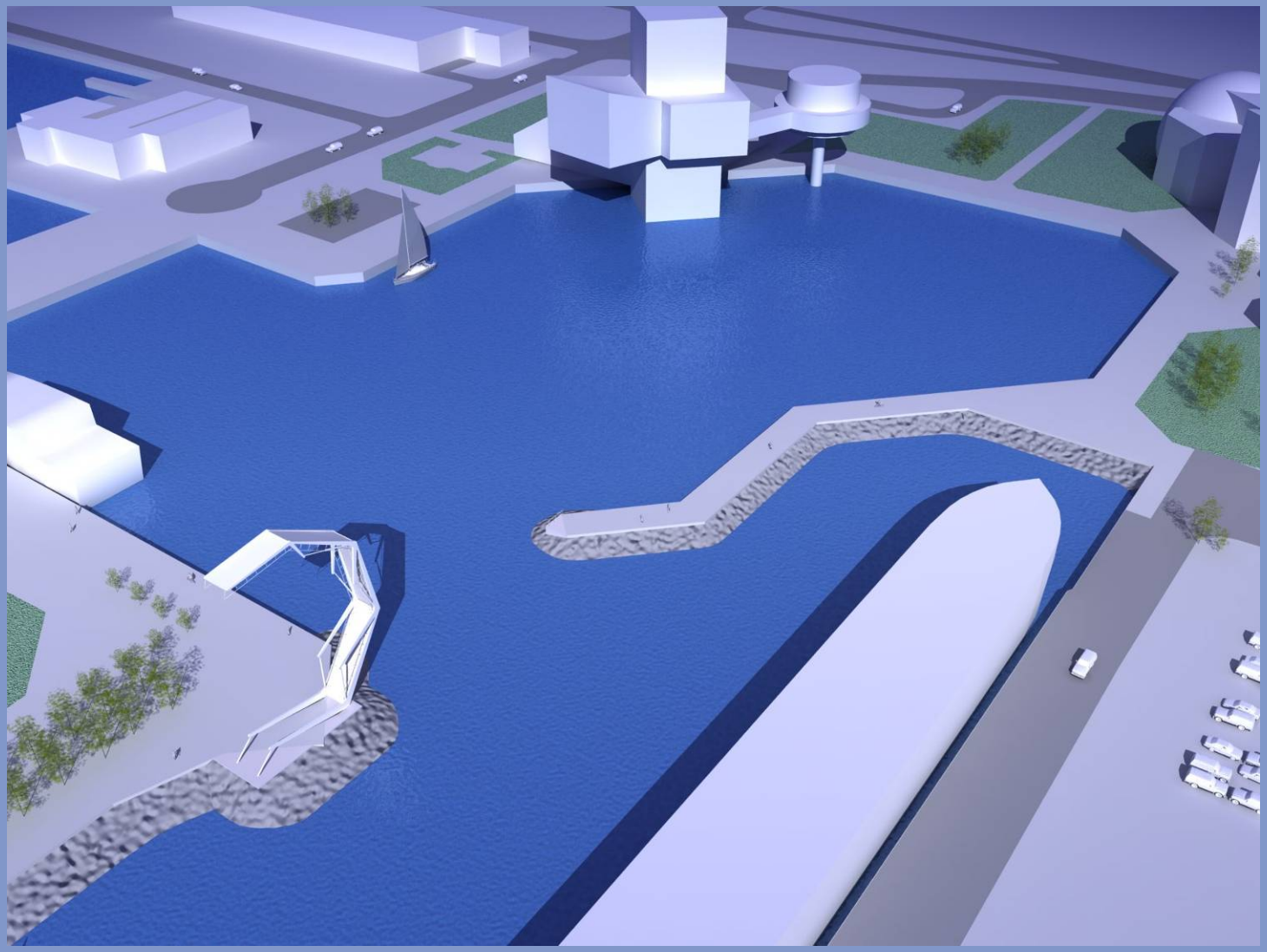
Concept F

# North Coast Harbor Pedestrian Bridge



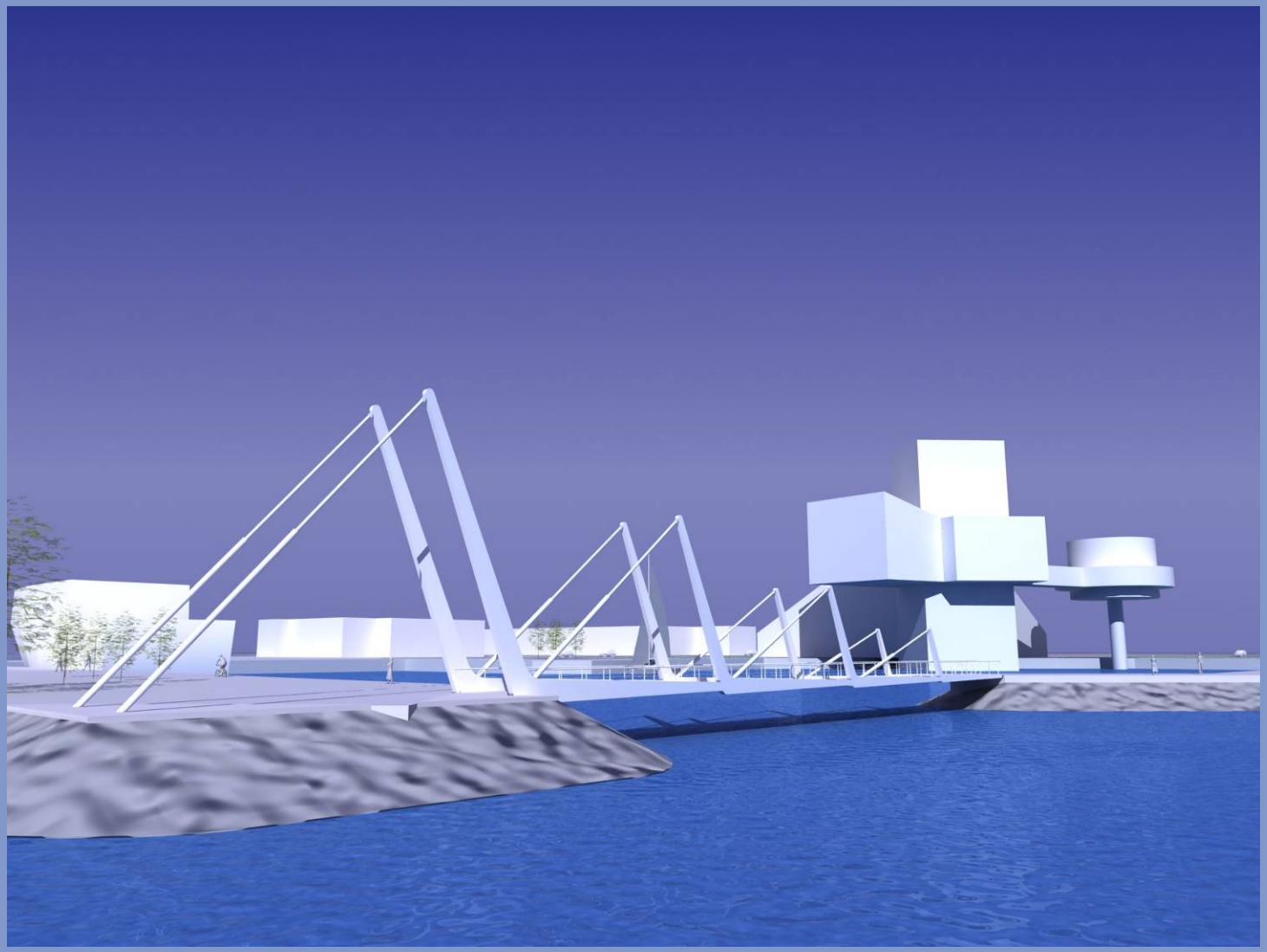
Concept F

# North Coast Harbor Pedestrian Bridge



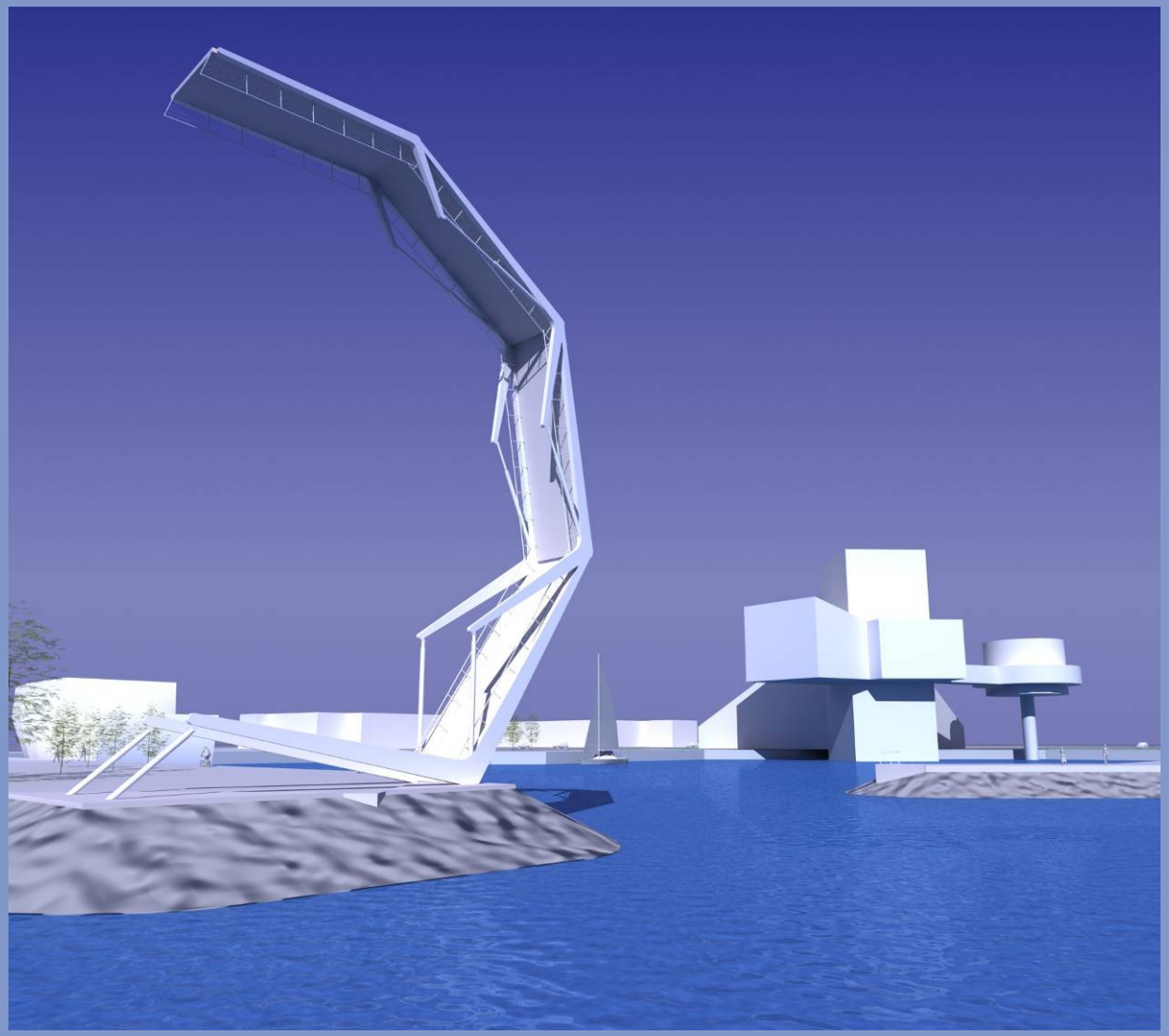
Concept F

# North Coast Harbor Pedestrian Bridge



Concept F

# North Coast Harbor Pedestrian Bridge



Concept F

# North Coast Harbor Pedestrian Bridge

Concept F

# North Coast Harbor Pedestrian Bridge

Concept F

# North Coast Harbor Pedestrian Bridge

Concept F

# North Coast Harbor Pedestrian Bridge

Concept F

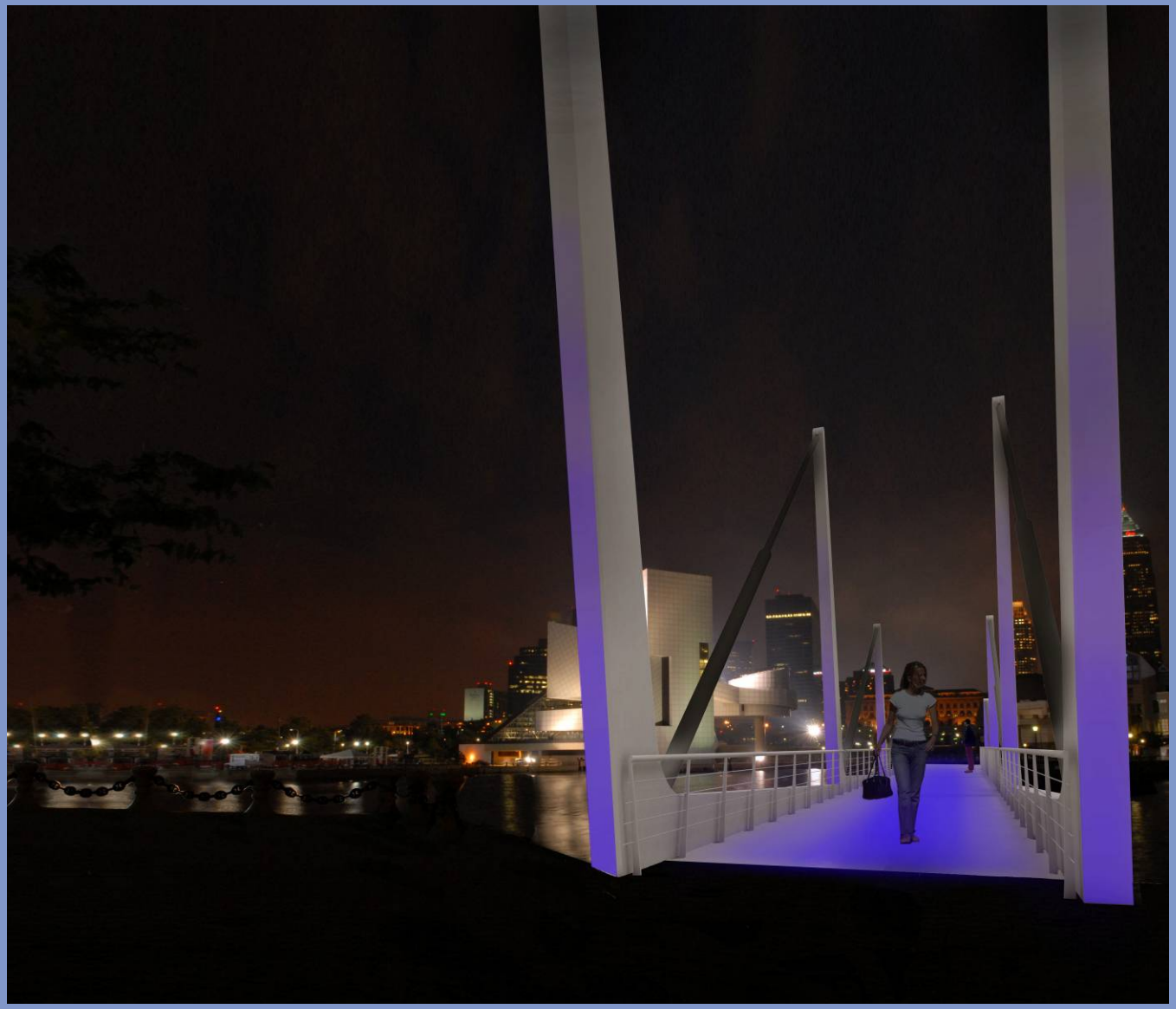
# North Coast Harbor Pedestrian Bridge

Concept F

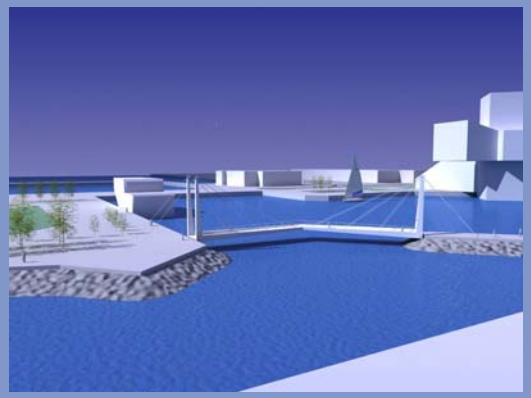
# North Coast Harbor Pedestrian Bridge

Concept F

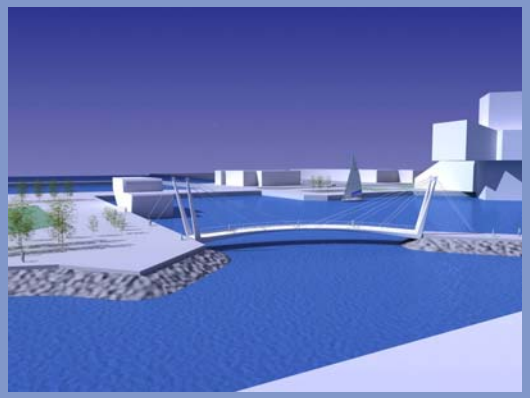
# North Coast Harbor Pedestrian Bridge



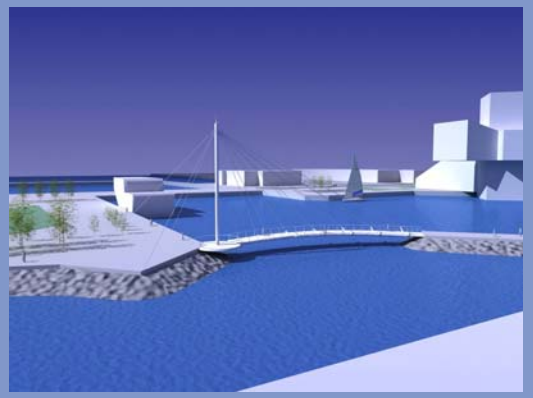
# North Coast Harbor Pedestrian Bridge



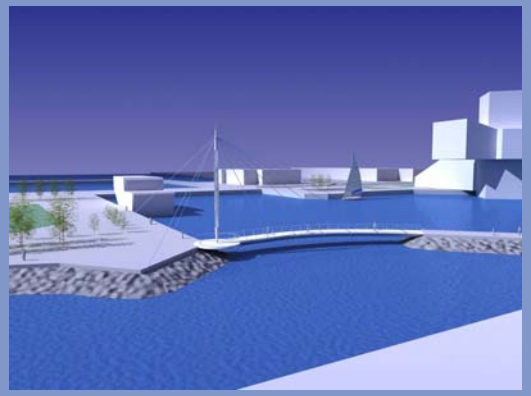
**Concept A**



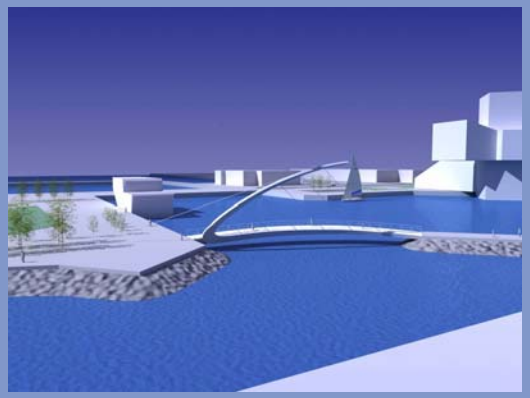
**Concept B**



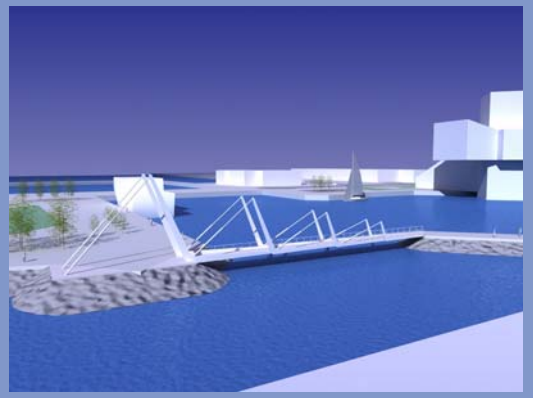
**Concept C**



**Concept D**



**Concept E**



**Concept F**

# North Coast Harbor Pedestrian Bridge

| Bridge Concept | Closed Height | Open Height |
|---|---|---|
| A | 39' | 71'-6" |
| B | 38'-6" | 71'-6" |
| C | N/A | 73' |
| D | N/A | 60' |
| E | 47' | 129'-6" |
| F | 40'-6" | 100' |

Concept A

Concept B

Concept C

Concept D

Concept E

Concept F

# North Coast Harbor Pedestrian Bridge

| Bridge Concept | Cost | Maintenance / Life Cycle Cost | Visual / Aesthetic | Navigation | Airspace | Environmental / Park Impact | Total |
|---|---|---|---|---|---|---|---|
| A | 2 | 2 | 1 | 3 | 3 | 2 | 13 |
| B | 2 | 2 | 3 | 3 | 3 | 2 | 15 |
| C | 2 | 1 | 1 | 1 | 2 | 2 | 9 |
| D | 1 | 1 | 2 | 1 | 2 | 2 | 9 |
| E | 1 | 2 | 3 | 2 | 1 | 2 | 13 |
| F | 1 | 2 | 3 | 3 | 2 | 3 | 14 |

**LEGEND:** 1. Worst 2. Neutral 3. Best

**Concept A**

**Concept B**

**Concept C**

**Concept D**

**Concept E**

**Concept F**

# Thank You