Transformation of the Seattle Waterfront

Monique Anderson, PE

SHANNON & WILSON



“The best prophet of the future is the past.”

Lord Byron



“Digging into our past helps us plan for digging in the future.”

L. Byron, PE



Transformation of the Seattle Waterfront

long, long ago

Late 1700s

1800s

Late 1800s

Early 1900s

- *Regrade Seattle*
- *Build Seawall*

Mid 1900s

- *Build Viaduct*

2000 - 2018

- *Replace Seawall*
- *Build Tunnel*
- *Demolish Viaduct*

After 2018

- *Revitalize Waterfront*

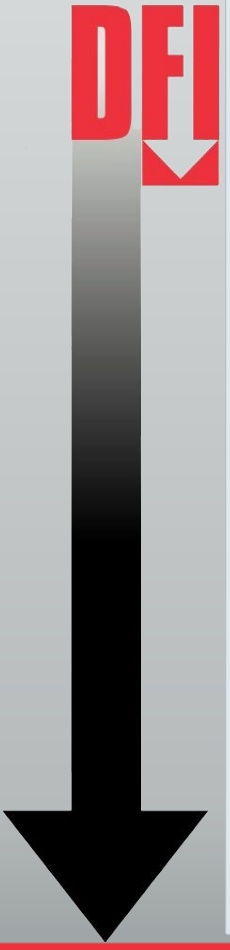


https://pauldorpat.com/seattle-now-then-archive/

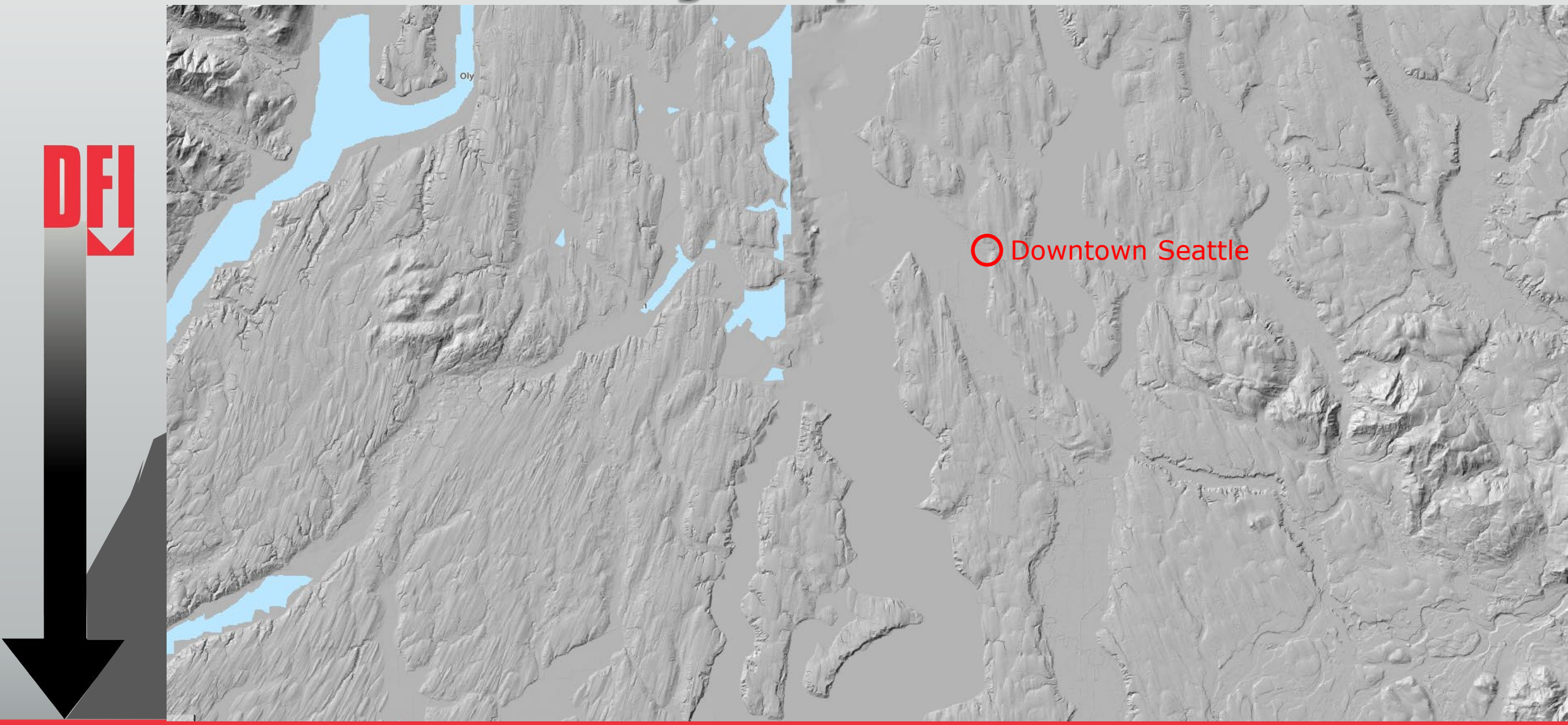
Geologic History

- The Seattle area topography and geology has been shaped by:
  - Tectonics
  - Seismicity
  - Glaciers
  - Volcanos
  - Lakes
  - Rivers
  - Deltas
  - Humans




DFI

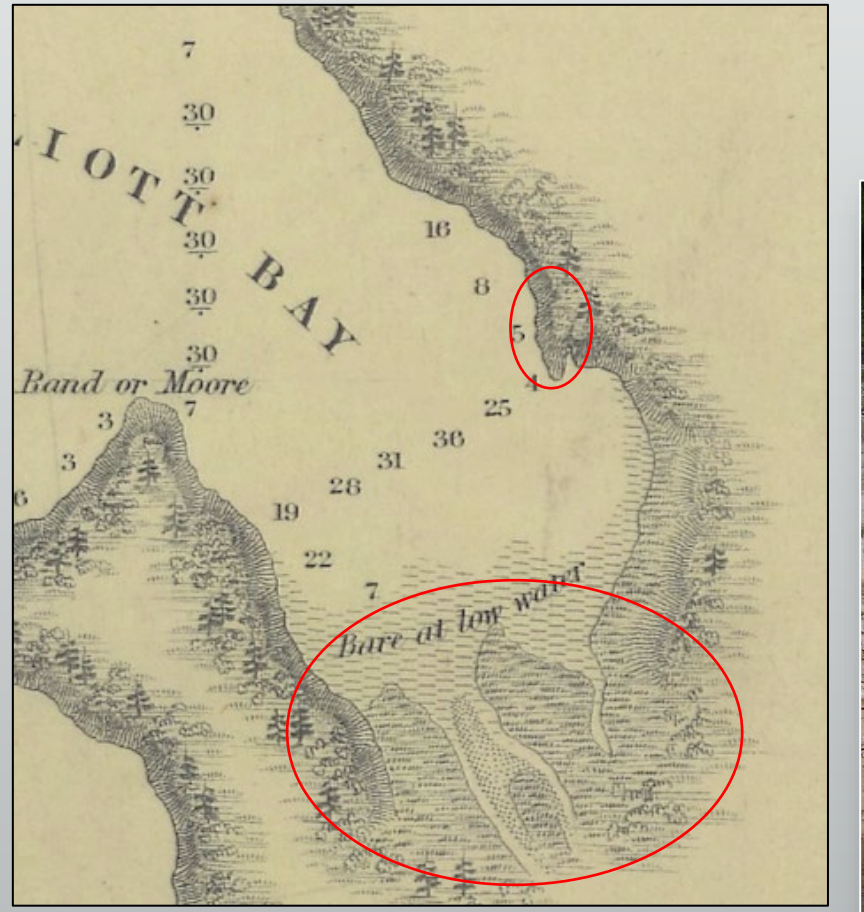
Geologic Deposition



Where are we?


DFI
ELLIOTT BAY
Pt. Rand or Moore
Pt Roberts
Bare at low water
1841
Duwamish River
99
Madison St
Martin Luther King Jr

The former Seattle landscape





Transformation of the Seattle Waterfront

long,
long ago



Late
1700s

1800s

Late
1800s

Early
1900s

- *Regrade Seattle*
- *Build Seawall*

Mid
1900s

- *Build Viaduct*

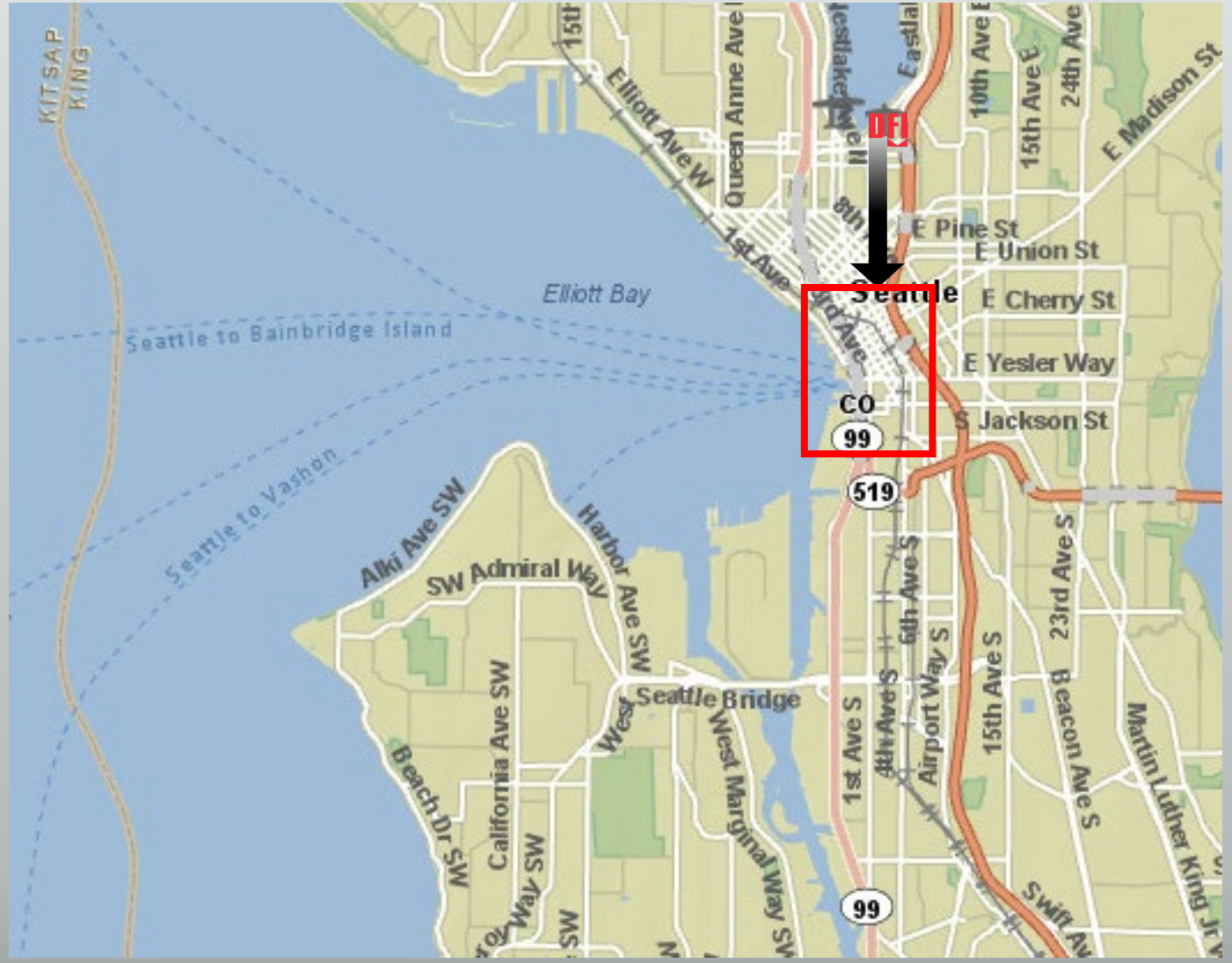
2000 -
2018

- *Replace Seawall*
- *Build Tunnel*
- *Demolish Viaduct*

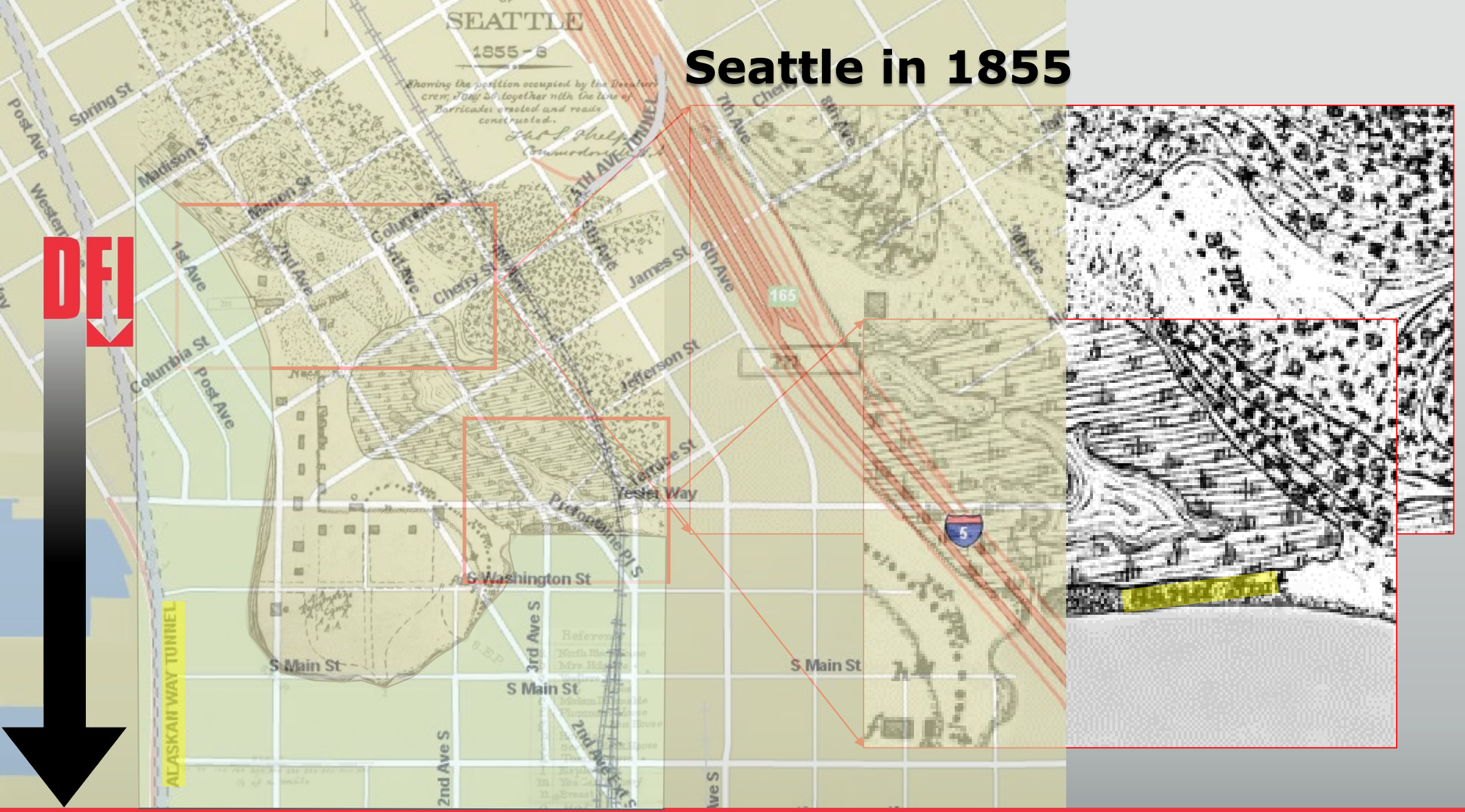
After
2018

- *Revitalize Waterfront*

Downtown Seattle



Seattle in 1855



DFI

Transformation of the Seattle Waterfront

long,
long ago

Late
1700s

Early
1800s

Late
1800s

Early
1900s

- *Regrade Seattle*
- *Build Seawall*

Mid
1900s

- *Build Viaduct*

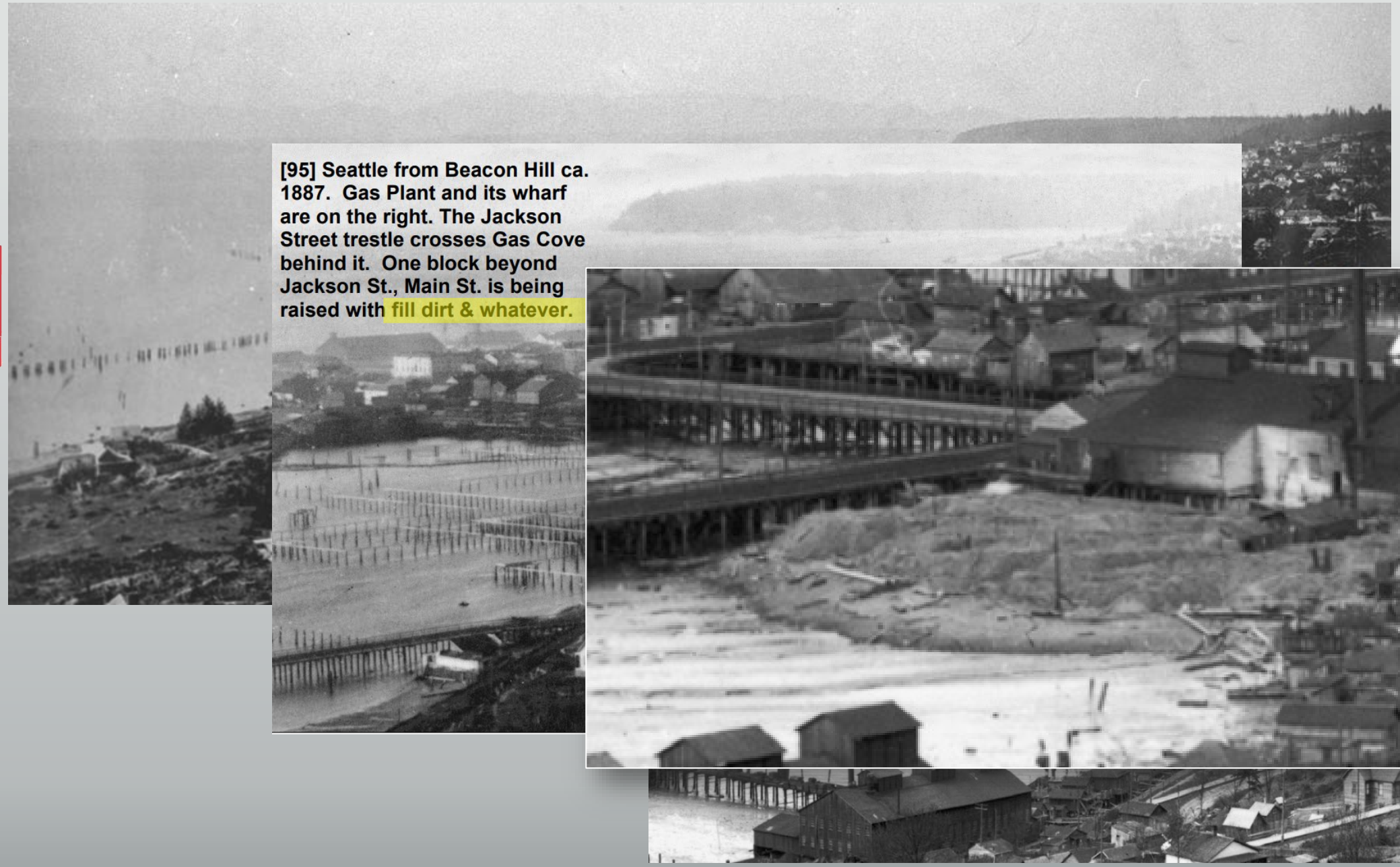
2000 -
2018

- *Replace Seawall*
- *Build Tunnel*
- *Demolish Viaduct*

After
2018

- *Revitalize Waterfront*





[95] Seattle from Beacon Hill ca. 1887. Gas Plant and its wharf are on the right. The Jackson Street trestle crosses Gas Cove behind it. One block beyond Jackson St., Main St. is being raised with fill dirt & whatever.

Transformation of the Seattle Waterfront

long,
long ago

Late
1700s

Early
1800s

Late
1800s

Early
1900s

- *Regrade Seattle*
- *Build Seawall*

Mid
1900s

- *Build Viaduct*

2000 -
2018

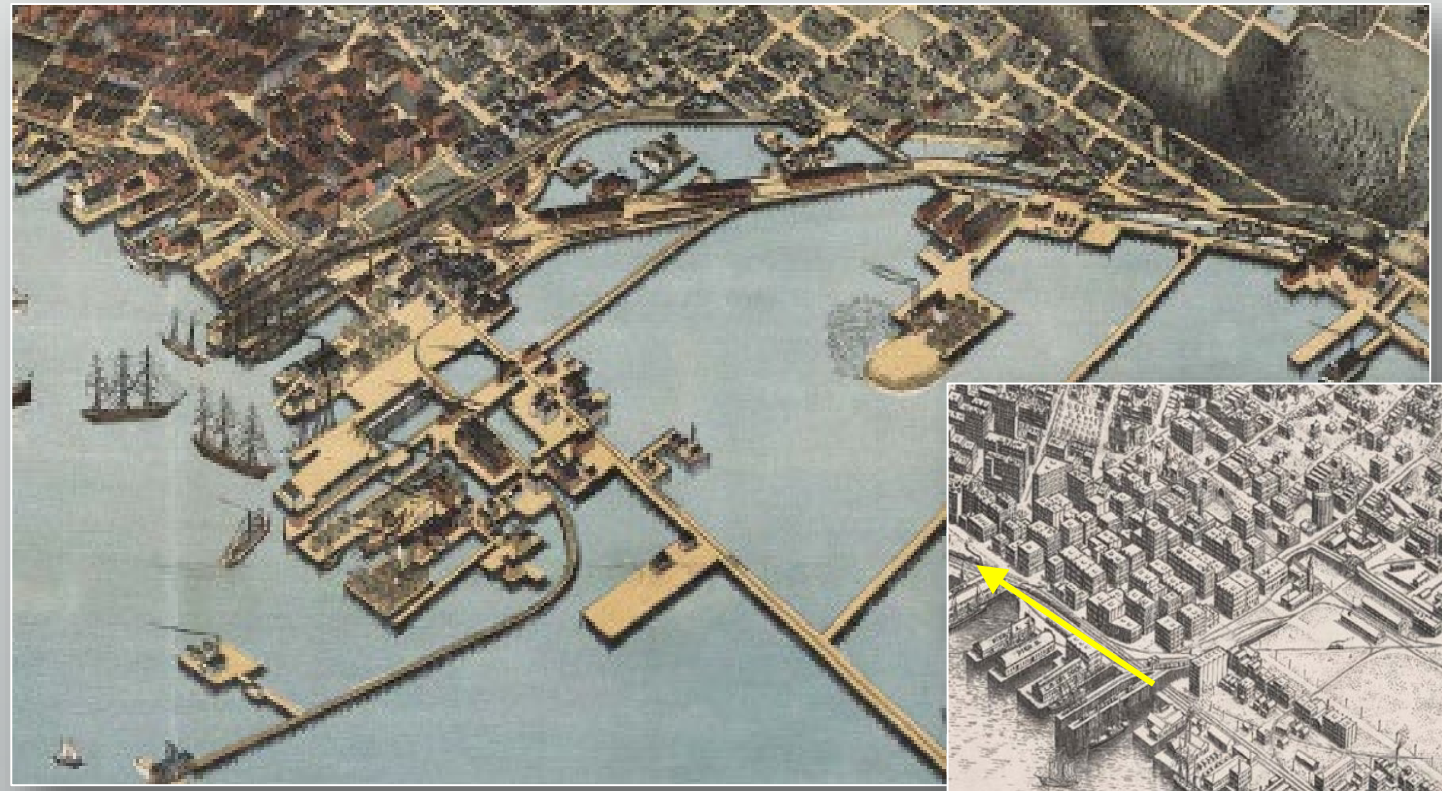
- *Replace Seawall*
- *Build Tunnel*
- *Demolish Viaduct*

After
2018

- *Revitalize Waterfront*

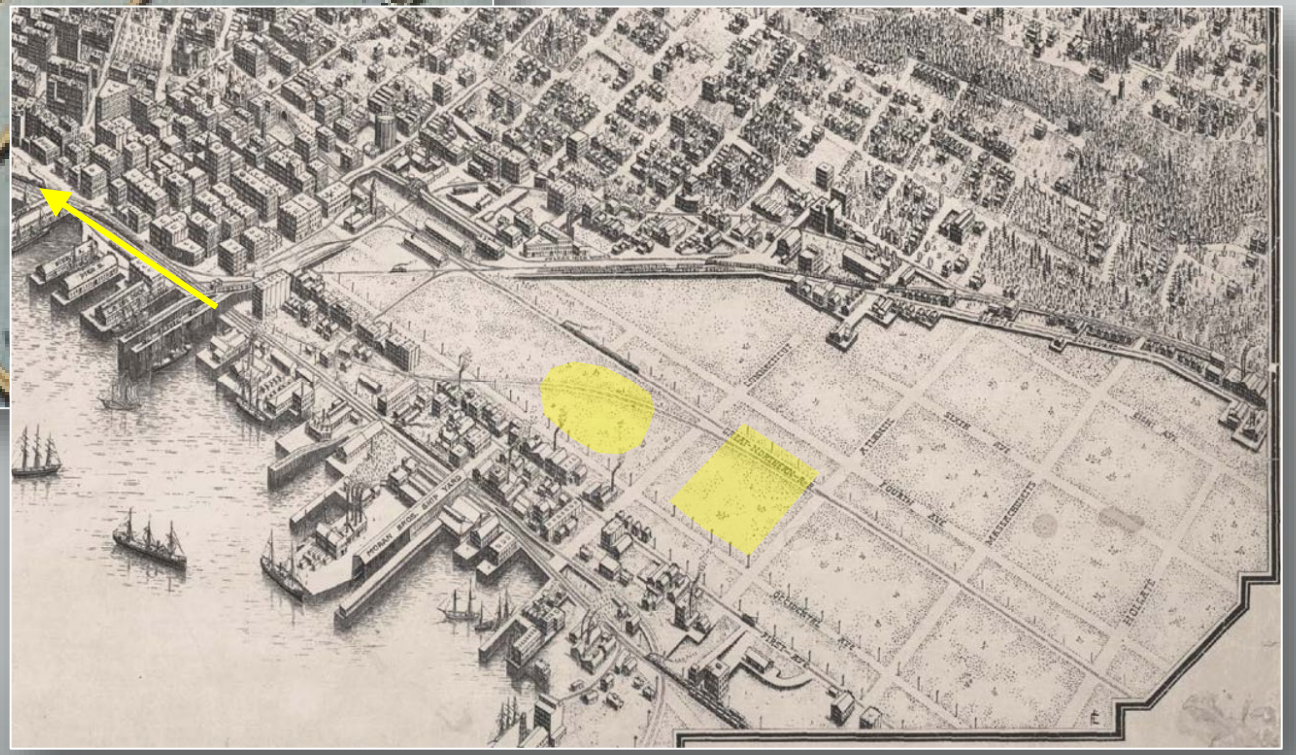


Making more land



1891

1904



Building the seawall



Transformation of the Seattle Waterfront

long,
long ago

Late
1700s

Early
1800s

Late
1800s

Early
1900s

Mid
1900s

- *Build Viaduct*

2000 -
2018

- *Replace Seawall*
- *Build Tunnel*
- *Demolish Viaduct*

After
2018

- *Revitalize Waterfront*



Building the viaduct





Photo 2. Spacing of wood piles 12' to 15' on center.



“Digging into our past helps us plan for digging in the future.”

L. Byron, PE

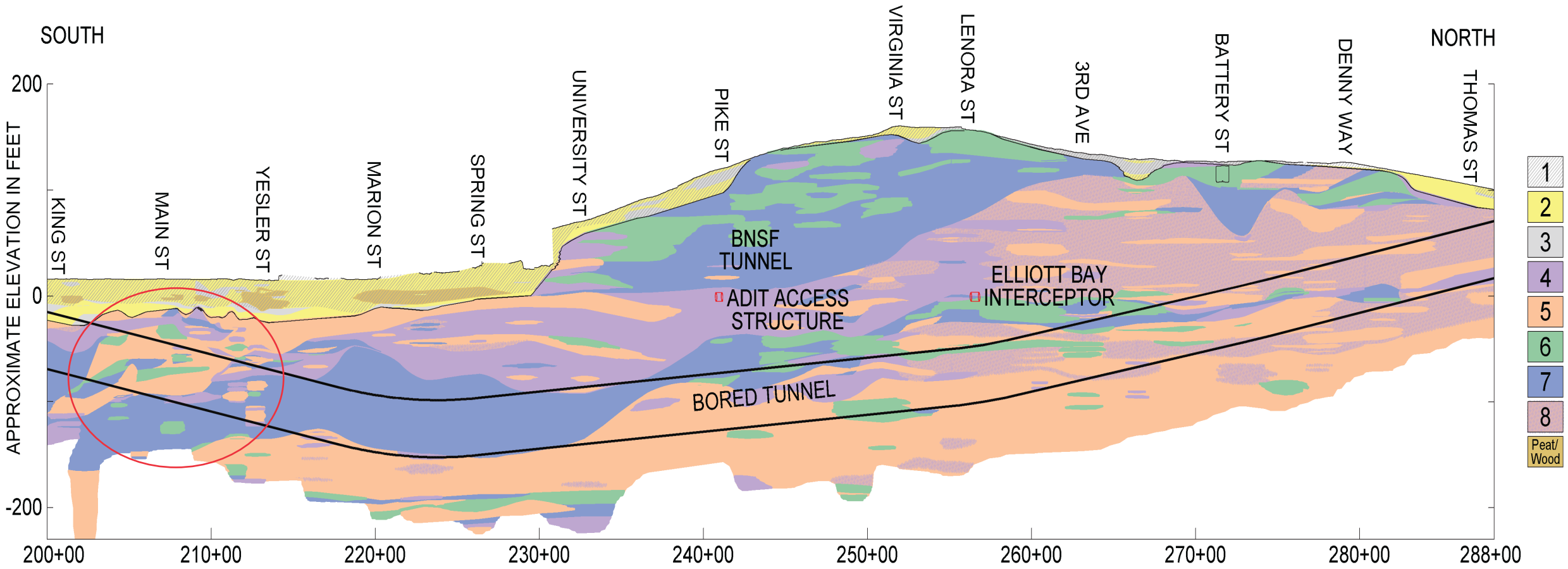


Subsurface Risks along the Waterfront

- Loose fill "and whatever"
  - Loose sand
  - Debris, bricks, charcoal, etc.
  - Railroad ties
  - Ballast
  - Buried things
- Wood/sawdust
  - Old trestle/falsework piles
  - Sawmill debris
- Variable subsurface conditions
  - Alluvial, deltaic, beach, etc.
  - Hard/dense glacial soil
  - Disconnected
  - High groundwater

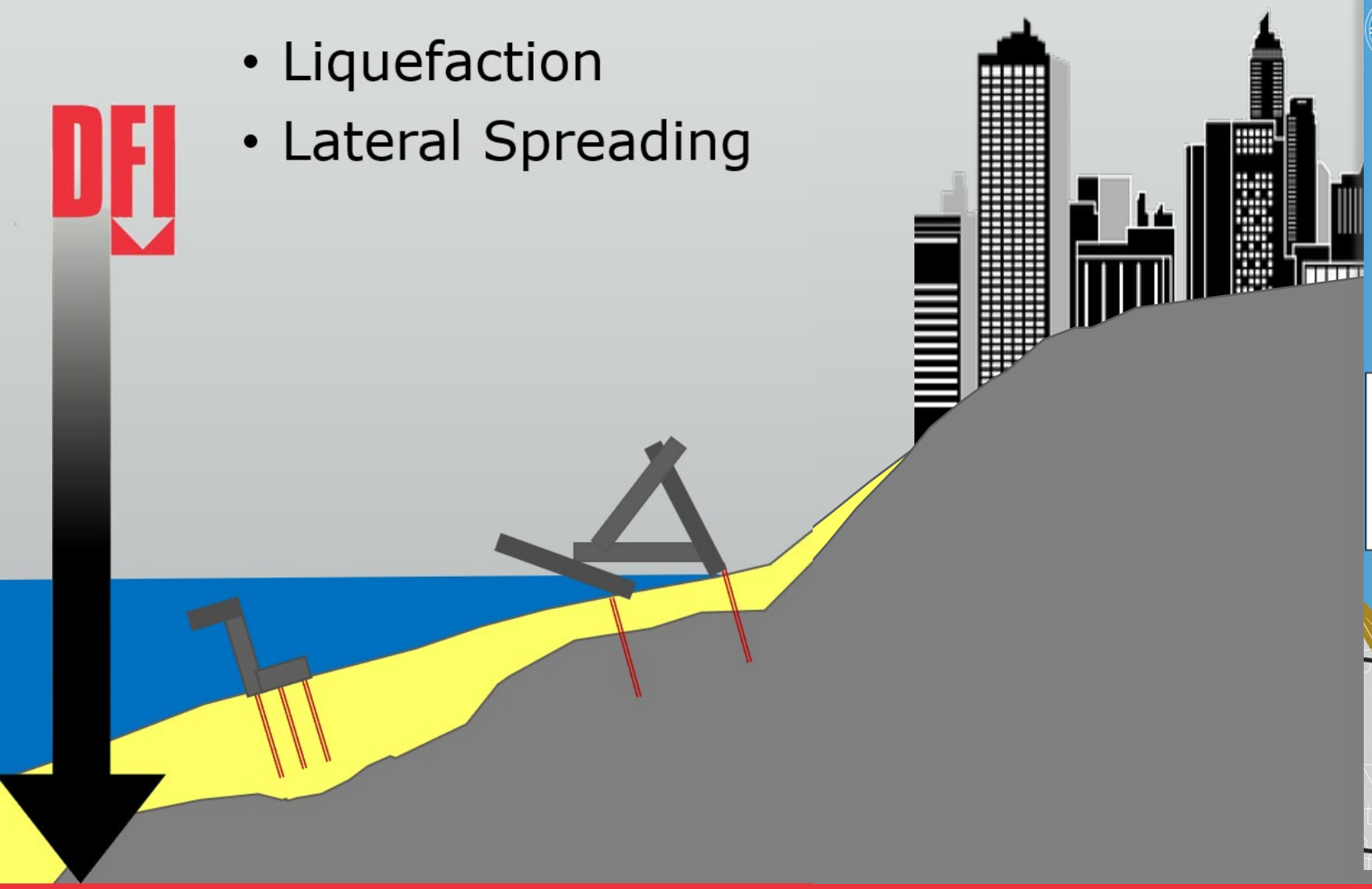


Subsurface Risks along the Waterfront



Subsurface Risks along the Waterfront

- Liquefaction
- Lateral Spreading





Transformation of the Seattle Waterfront

long,
long ago

Late
1700s

Early
1800s

Late
1800s

Early
1900s

Mid
1900s

2000 -
2018

- *Replace Seawall*
- *Build Tunnel*
- *Demolish Viaduct*

After
2018

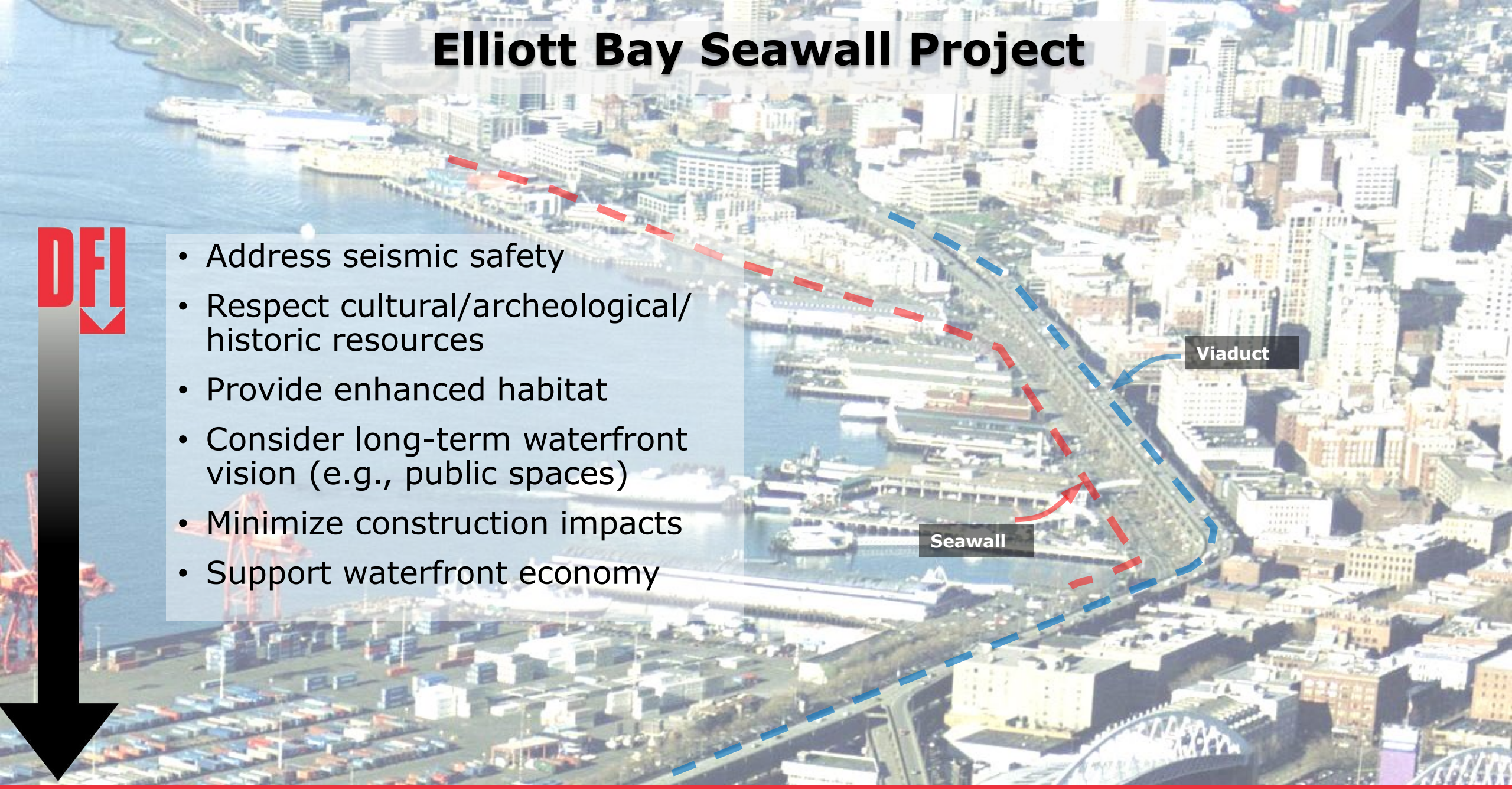
- *Revitalize Waterfront*



Alaskan Way Viaduct - Earthquake Simulation - YouTube

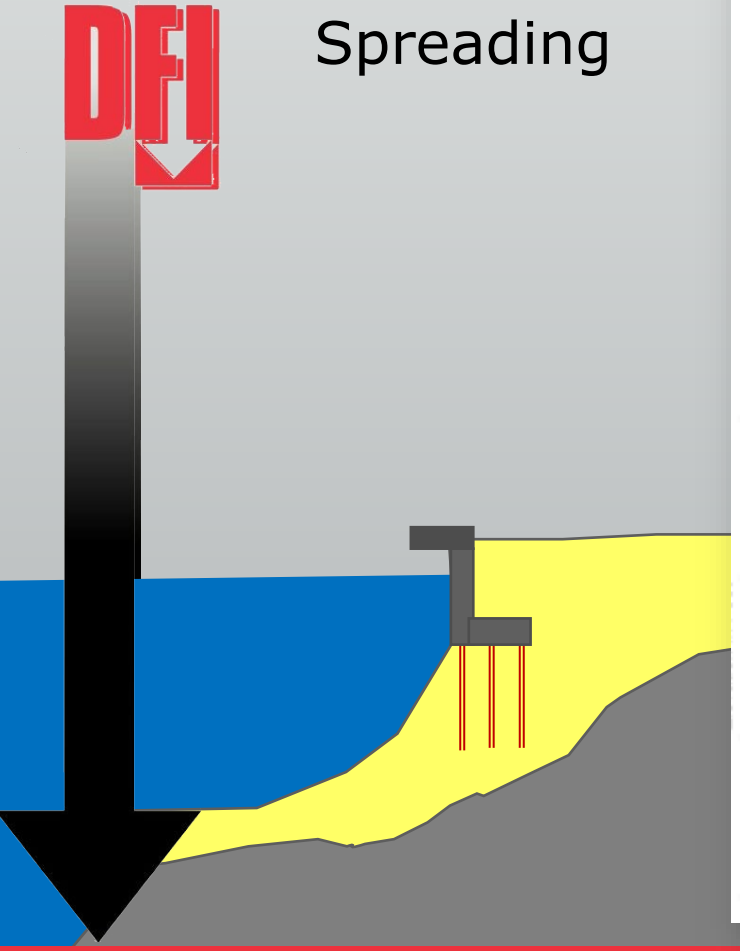
Elliott Bay Seawall Project

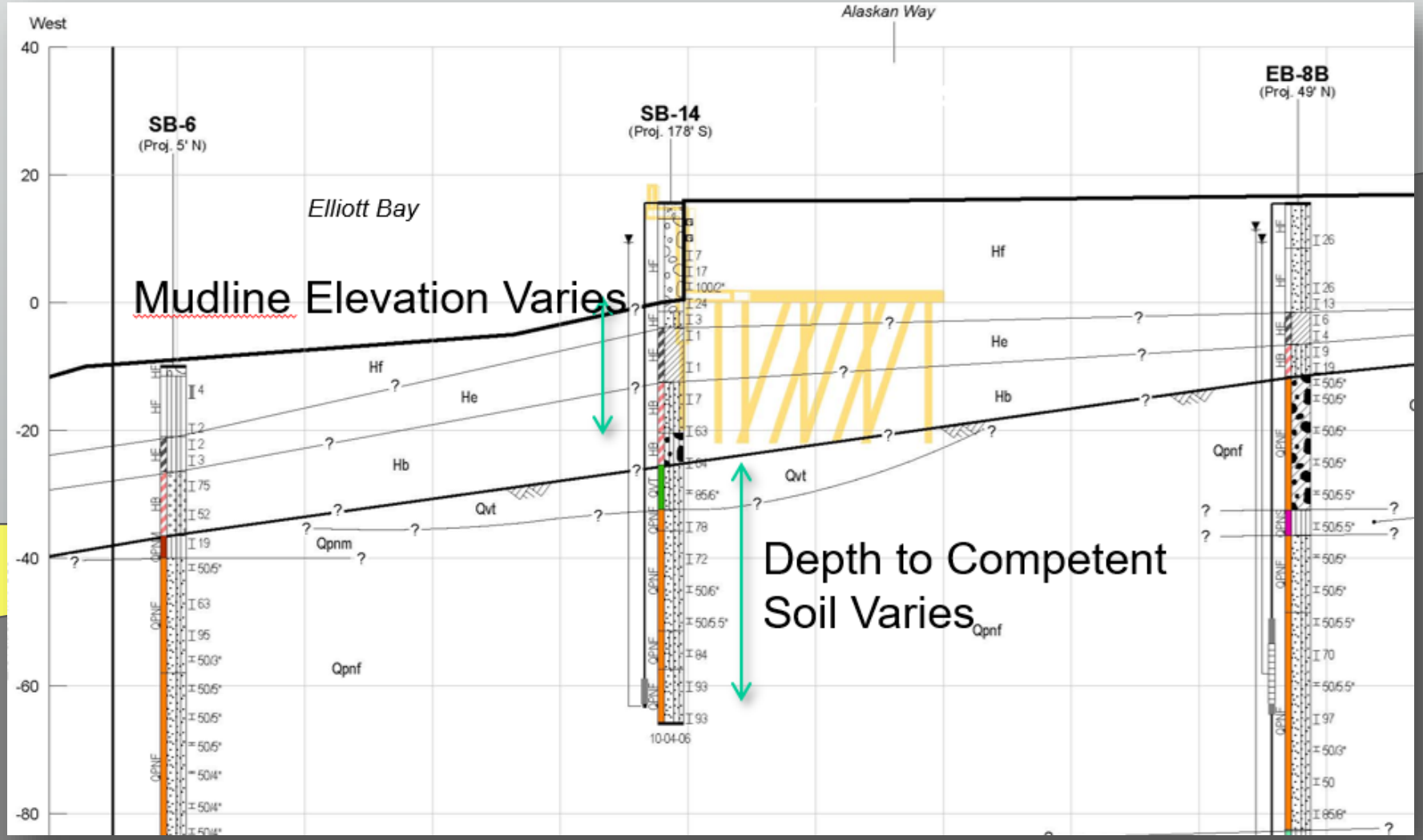
- Address seismic safety
- Respect cultural/archeological/ historic resources
- Provide enhanced habitat
- Consider long-term waterfront vision (e.g., public spaces)
- Minimize construction impacts
- Support waterfront economy



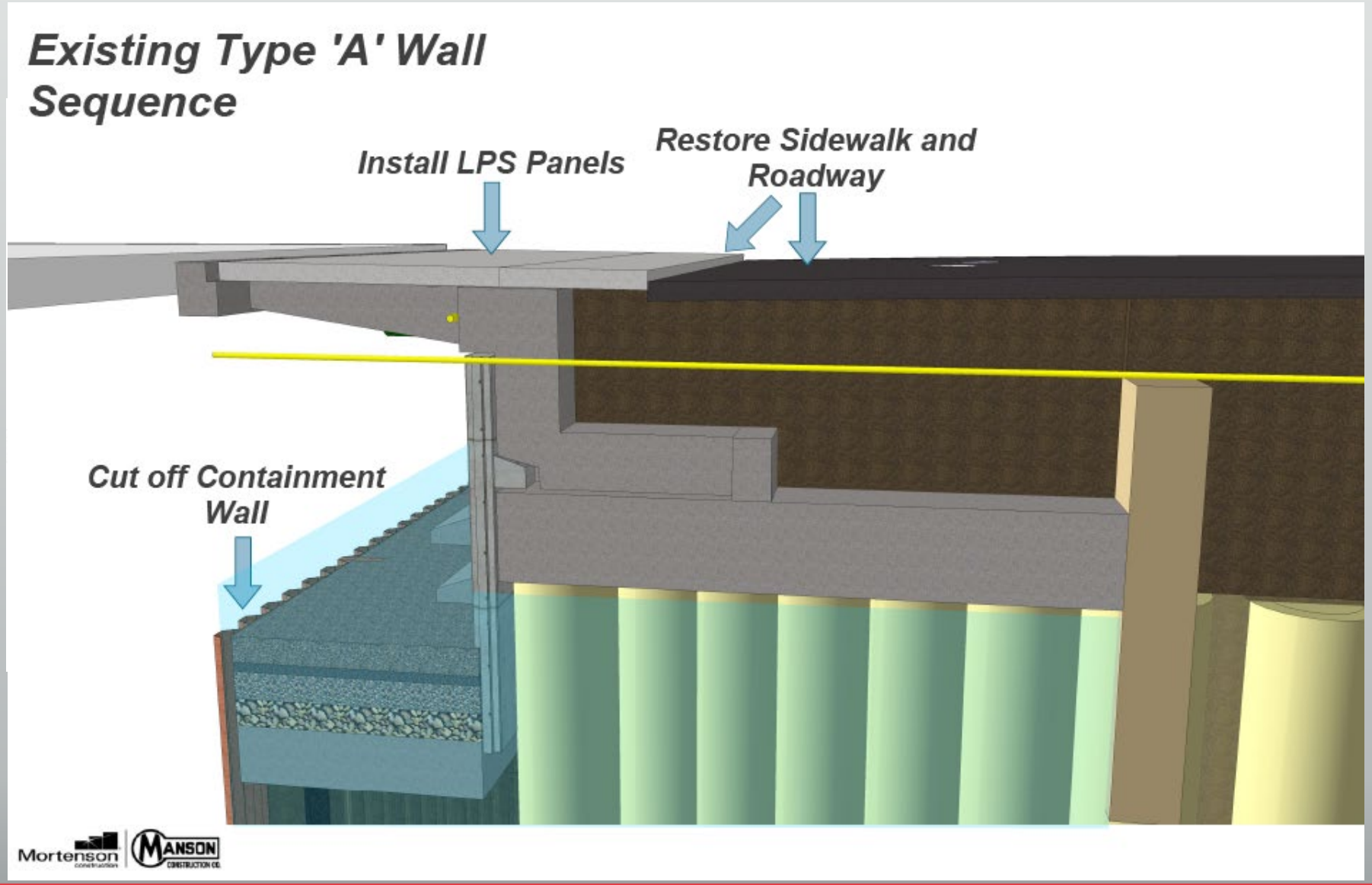
Elliott Bay Seawall Project

- Liquefaction
- Lateral Spreading





Design and Construction



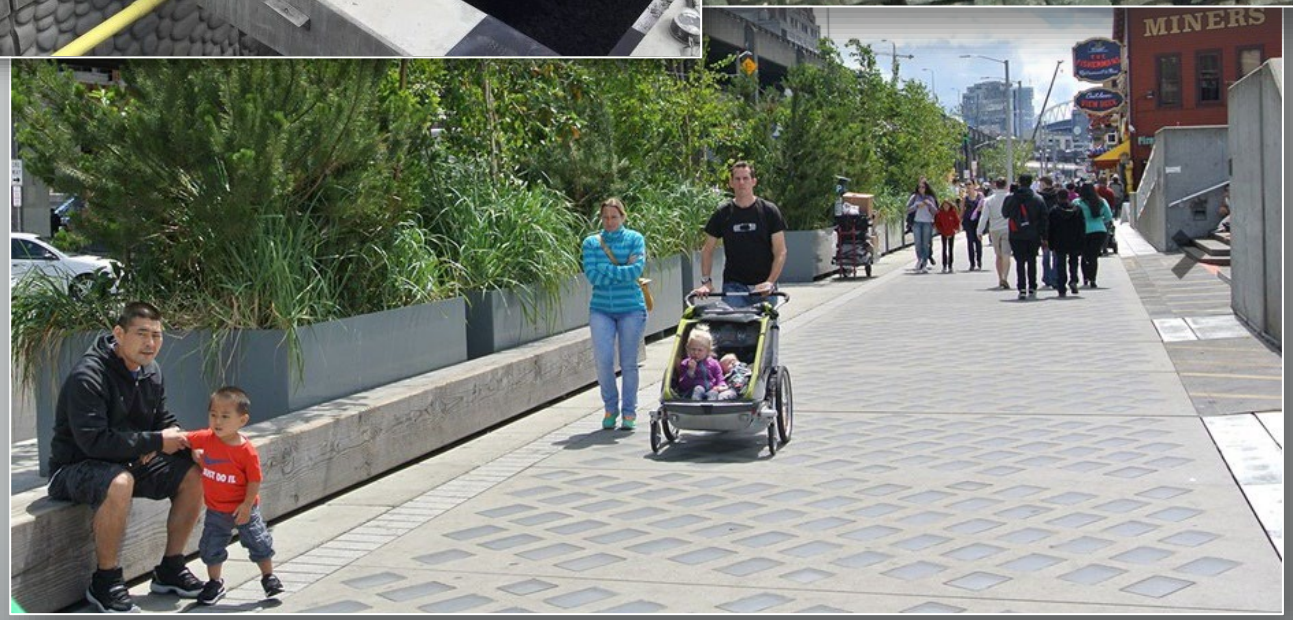
Construction Experiences



Successful Achievement of the Goals



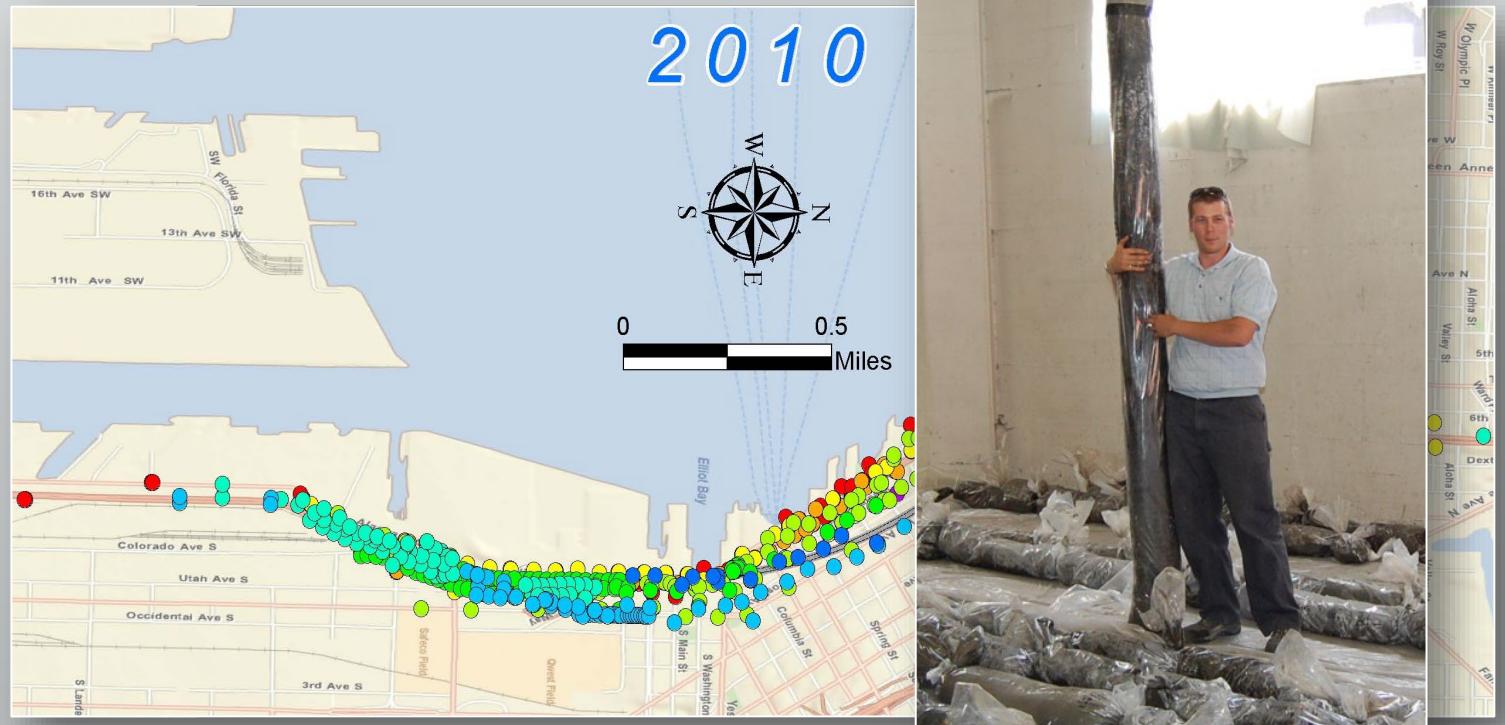






The Alaskan Way Viaduct Replacement Project

- Original Alternatives (2004)
  - Cut and Cover Tunnel
  - Aerial (wider)
  - Rebuild
  - Surface/Transit
- Revised Alternatives (2006)
  - Bored Tunnel
  - Cut and Cover Tunnel
  - Elevated Structure
- Bored Tunnel Alternative (2009)



530+ borings, ~10 mi o
400+ piezometers, 1000

The SR 99 Bored Tunnel Project

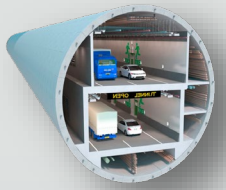




~ 2 miles long

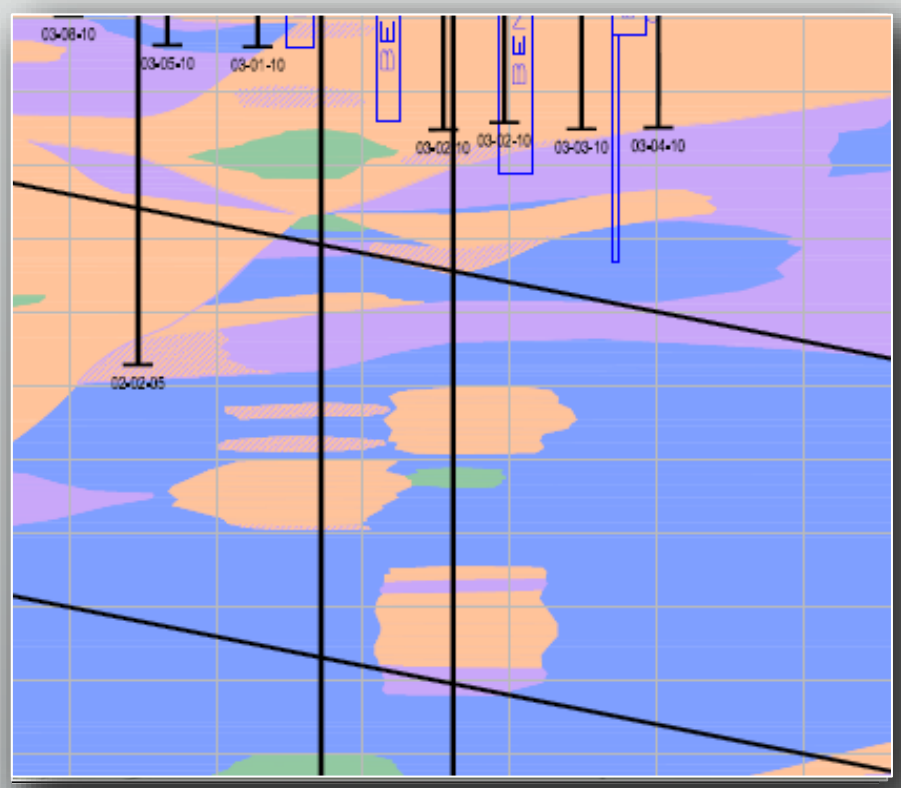
~ 57.5 feet in diameter

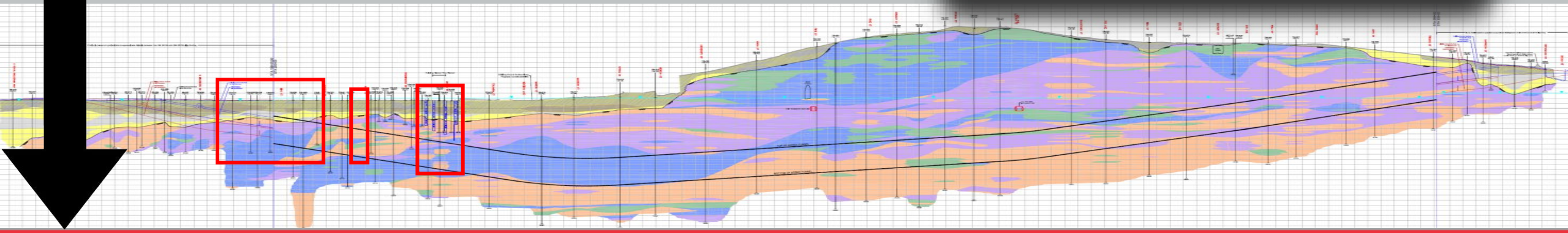
~ 200 feet below grade



The SR 99 Bored Tunnel Project

- Starting in sand over glacial
- Got stopped near Pioneer Square
- Had to go under the viaduct piles
- Mixed face conditions along route
  - Abrasive soils
  - Sticky soils
  - Running sands

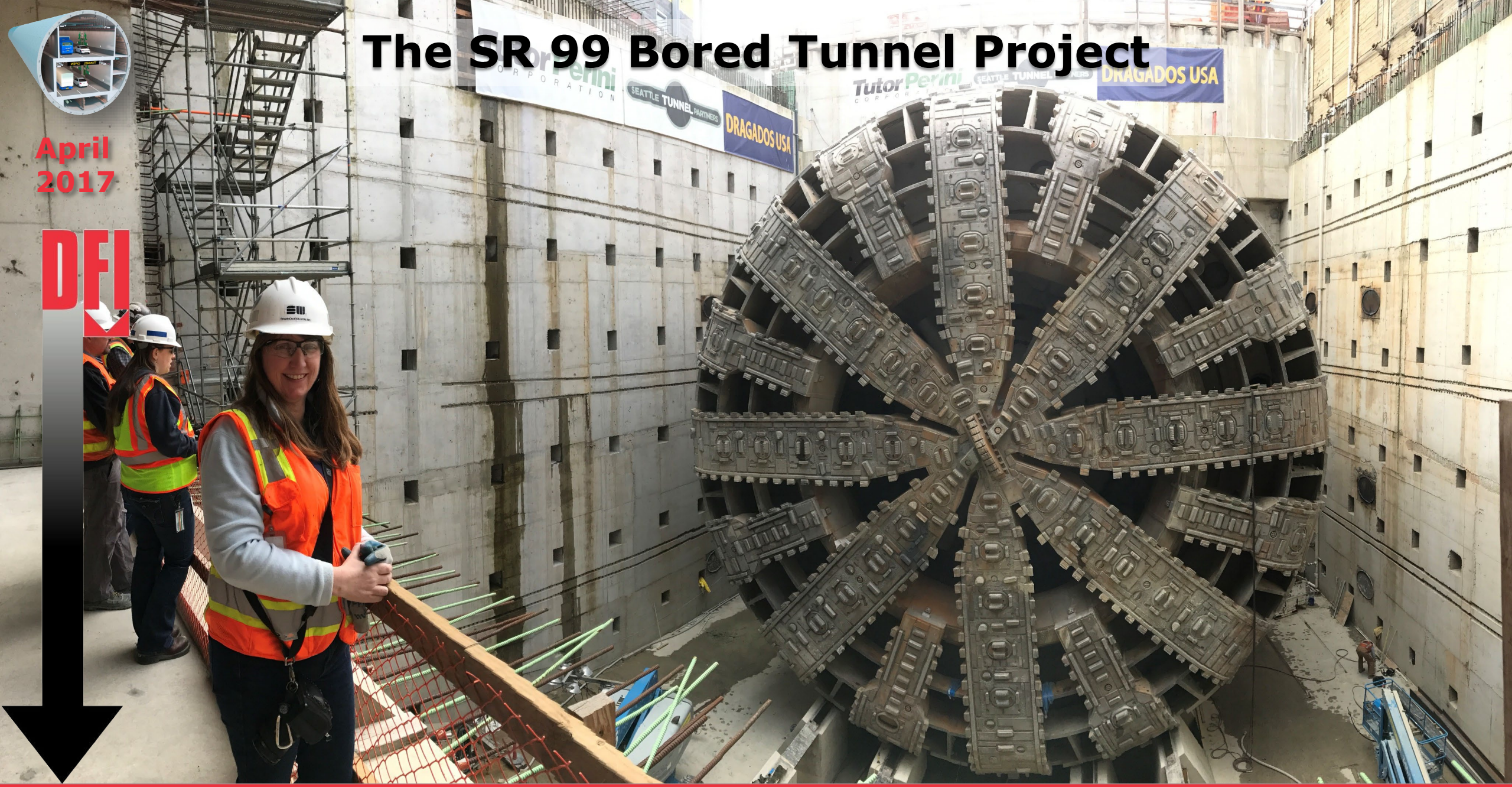




The SR 99 Bored Tunnel Project

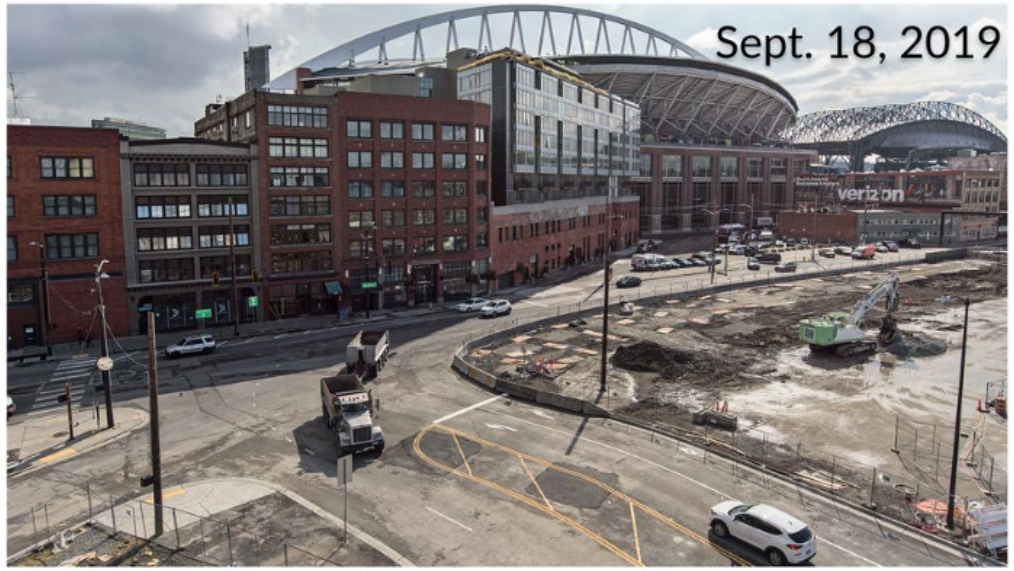
April 2017

DFI



Demolishing the Viaduct



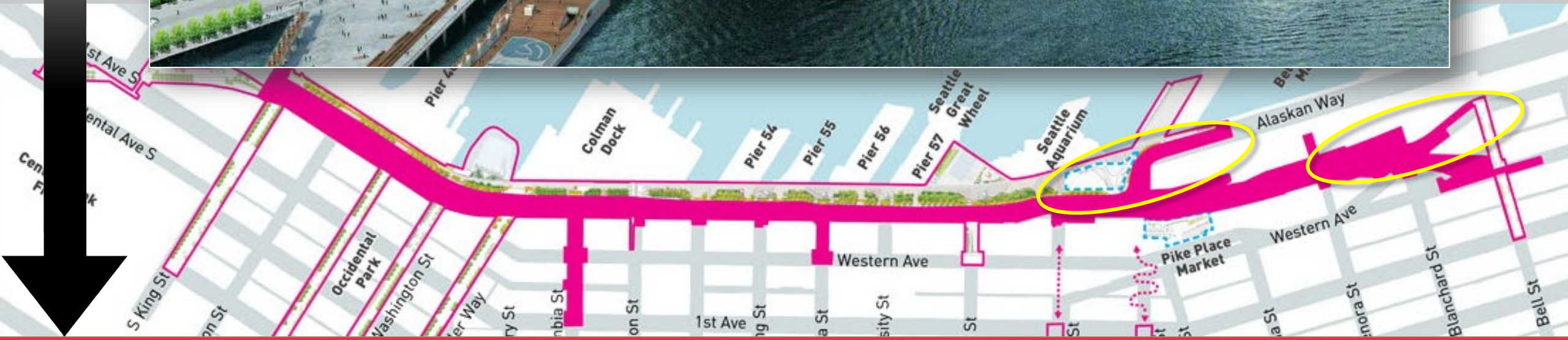






Waterfront Seattle



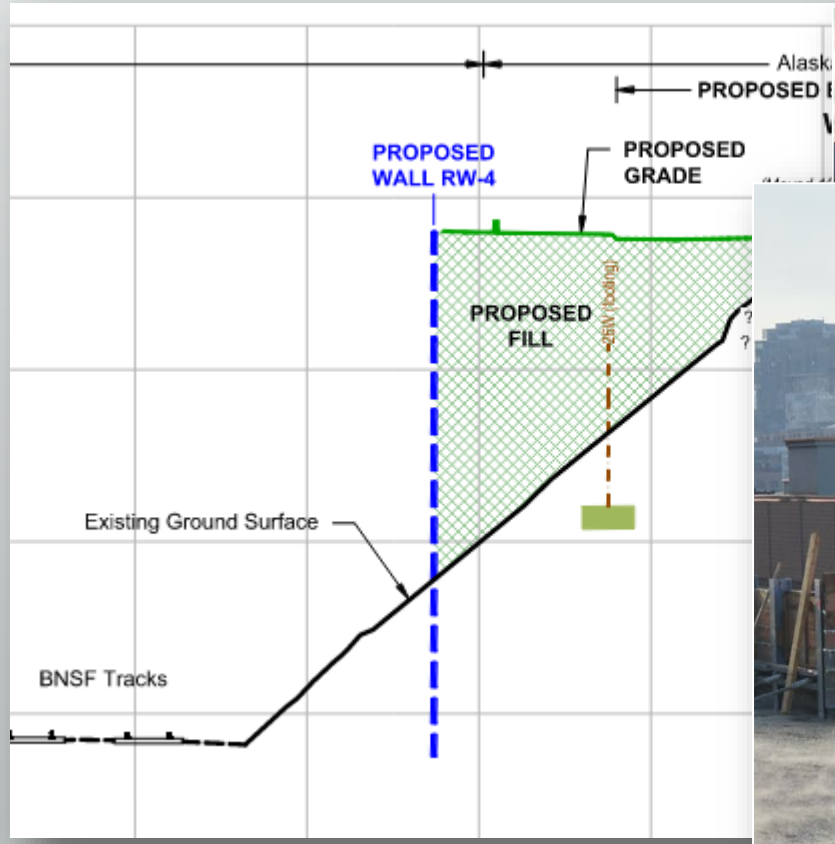


Elliott Way Wall





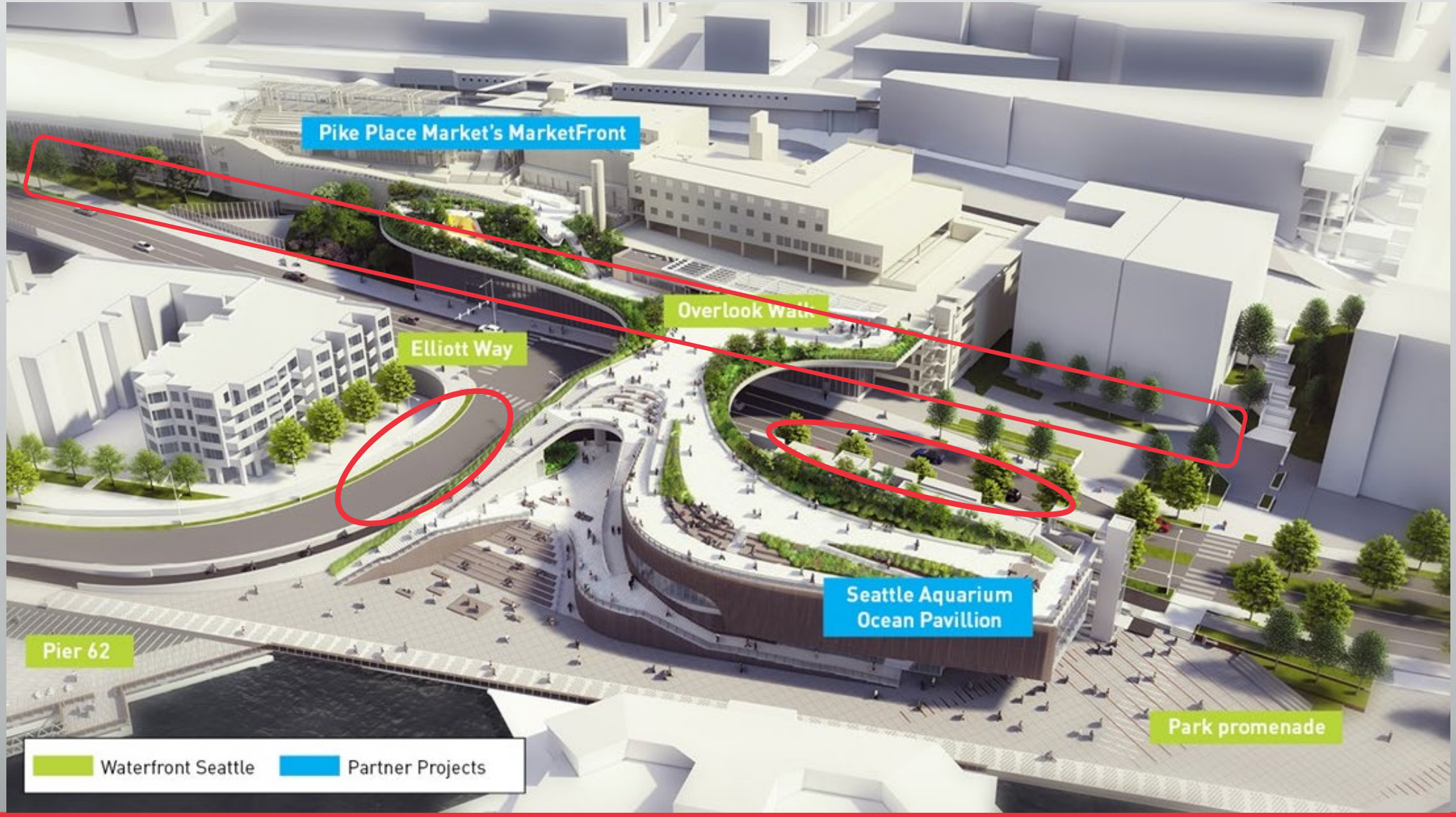
Elliott Way Wall



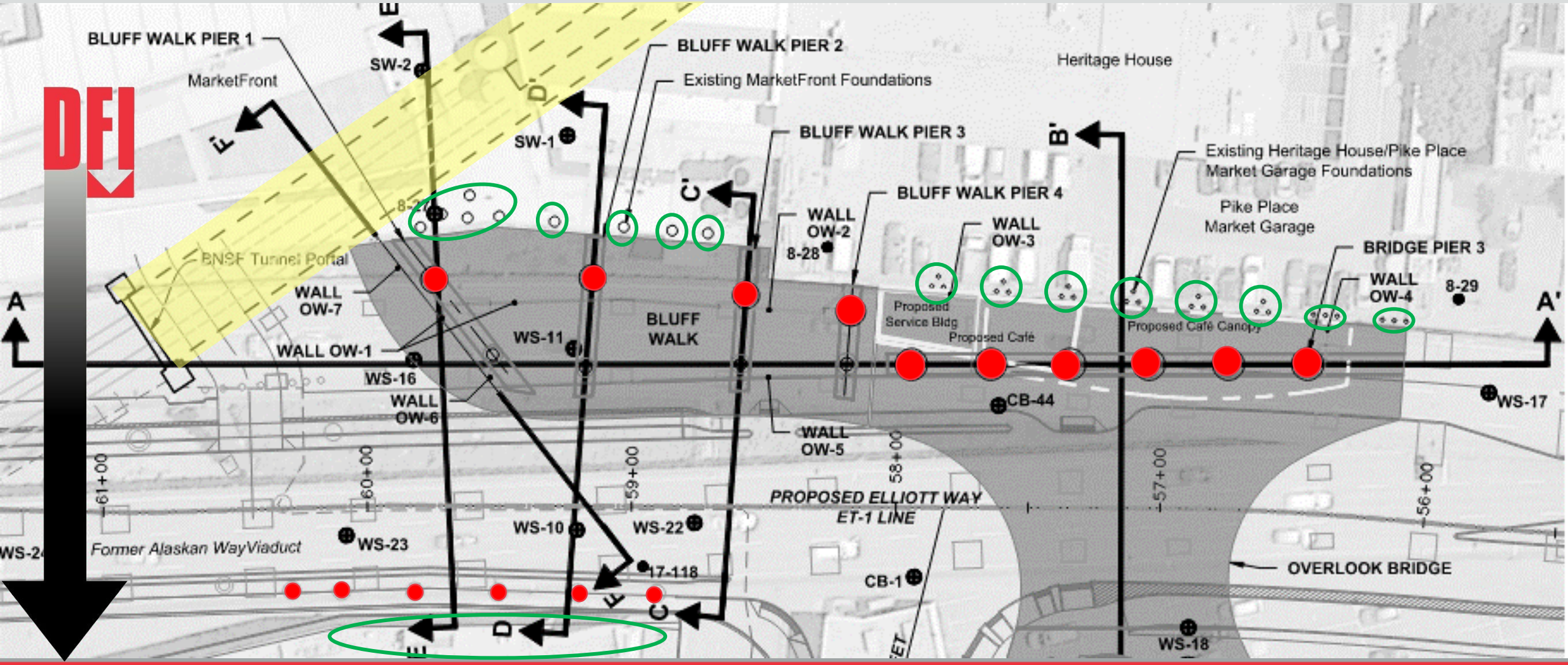


- Up to 40 ft tall
- LDCC to mitigate seismic pressures

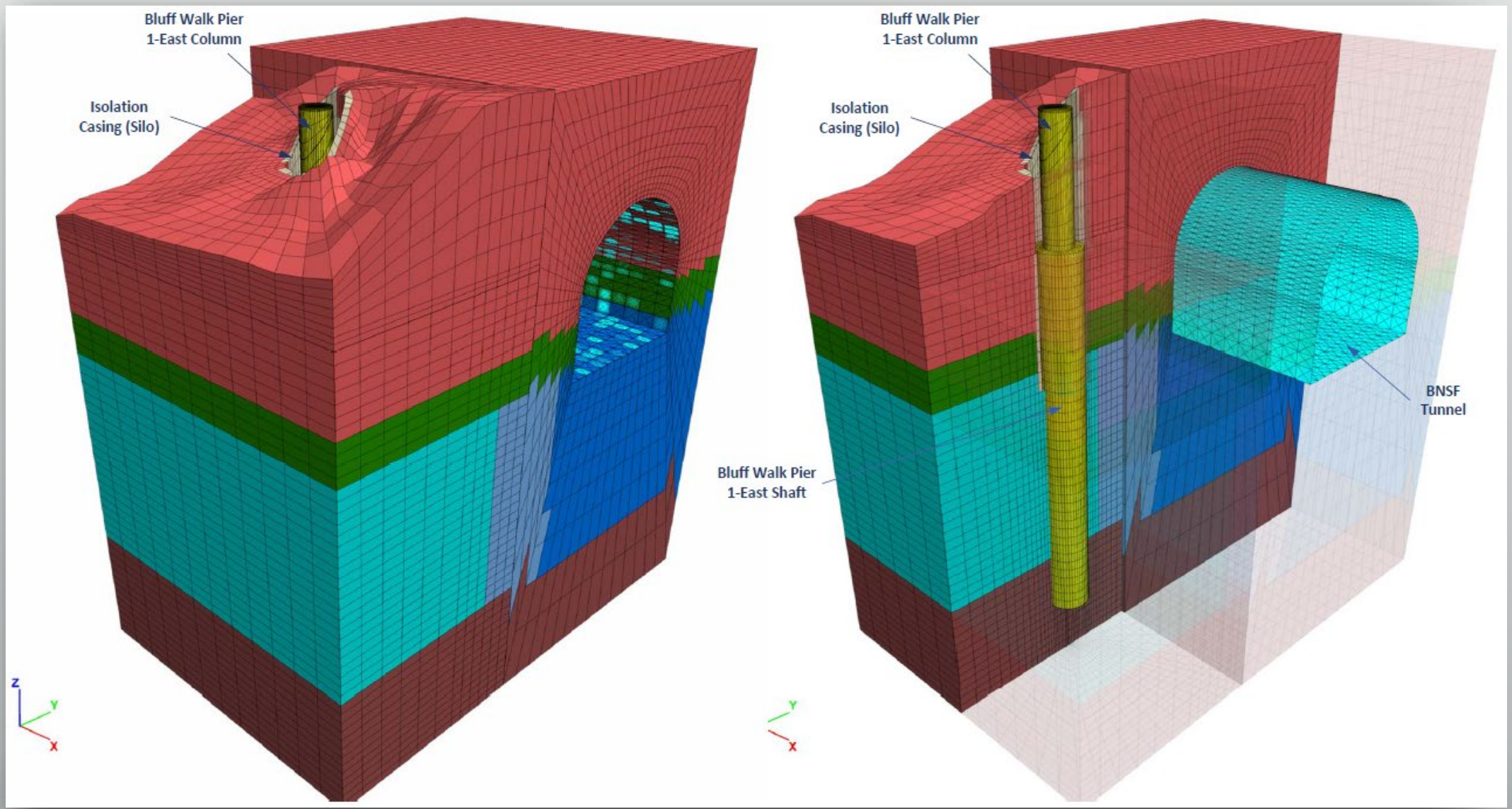
Overlook Walk



Interaction New to Old



Interaction New to Old





Thank You

- Historic Photos and Maps
  - Seattle Municipal Archives
  - Museum of History and Industry
  - Seattle Now and Then
  - University of Washington Collection
- Alaskan Way Viaduct and SR 99 Photos and Videos
  - WSDOT
  - City of Seattle
  - Shannon & Wilson
- Seawall and Waterfront Seattle Photos
  - City of Seattle
  - Shannon & Wilson
- Aerial Photographs
  - EagleView
- **All of the project teams** – too many to list here