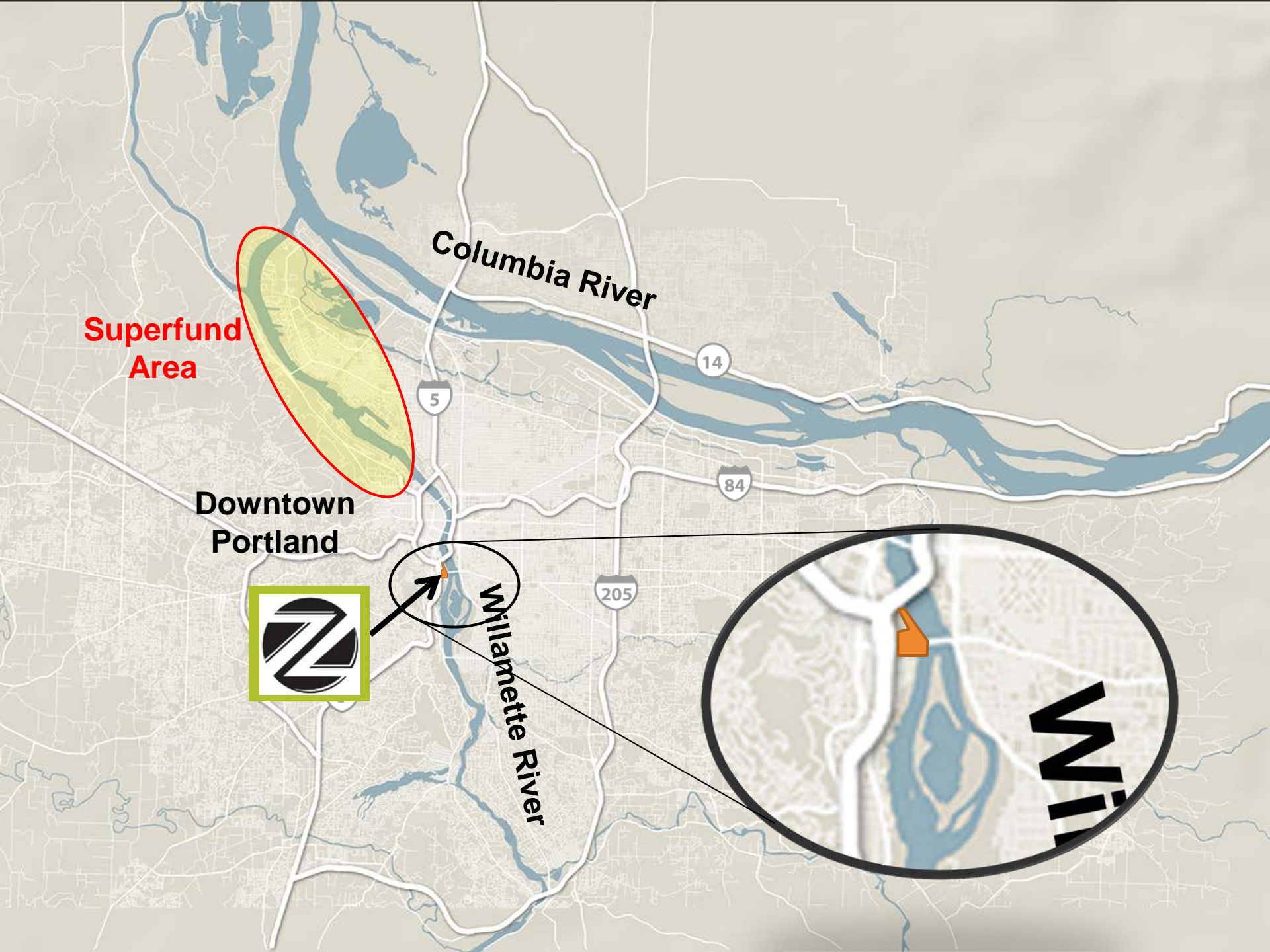


# DESIGN AND IMPLEMENTATION OF A SEDIMENT AND BANK CAP UPSTREAM OF THE PORTLAND HARBOR

Erik Bakkom, P.E.



**Superfund Area**

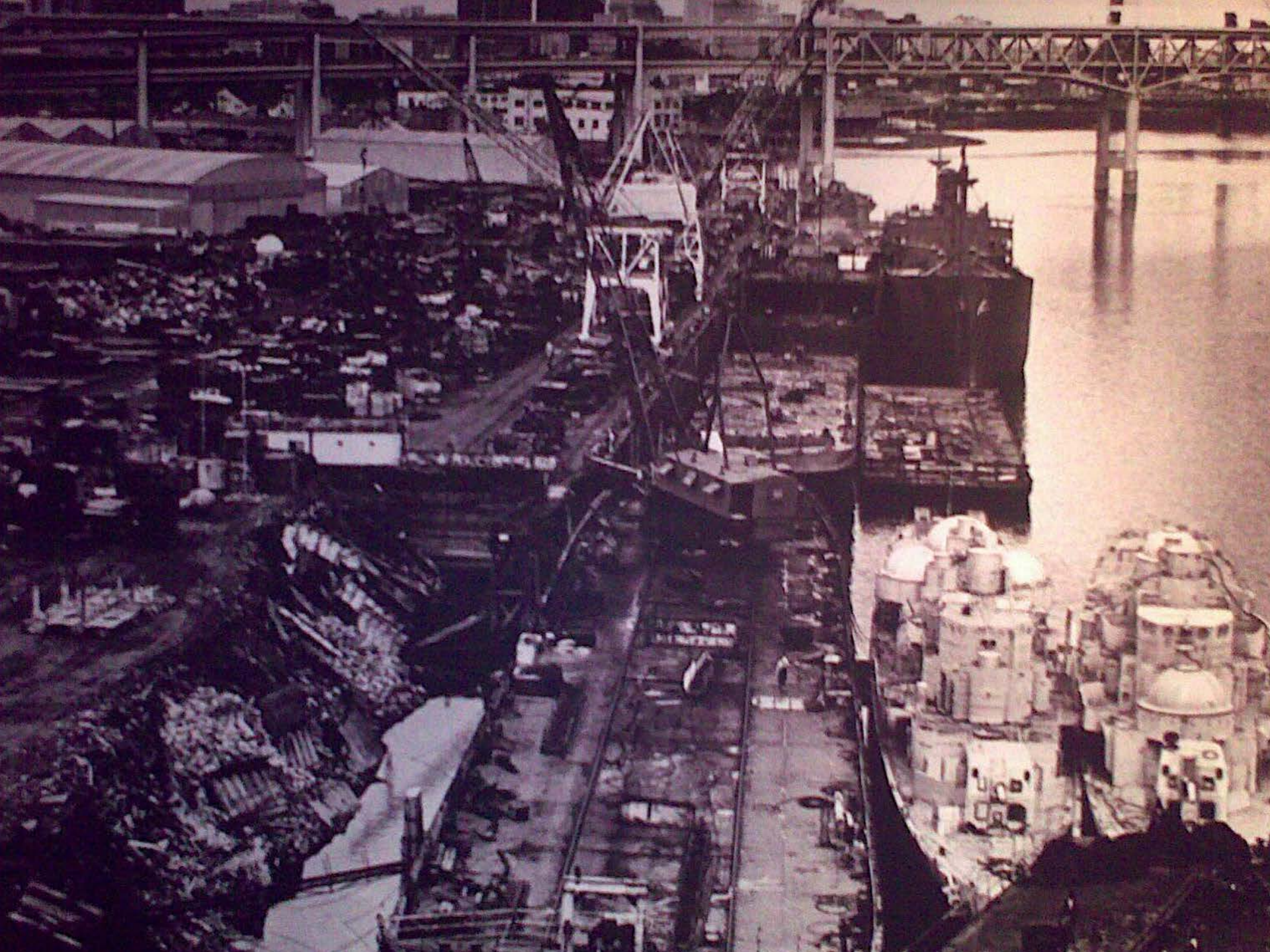
**Columbia River**

**Downtown Portland**



**Willamette River**







## Contaminants of Concern

- PCBs
- Metals
- PAHs
- Butyltins
- Asbestos





SW CURRY ST  
SW BOND AVE  
SW RIVER PKWY  
SW WHITAKER ST

SW MOODY AVE

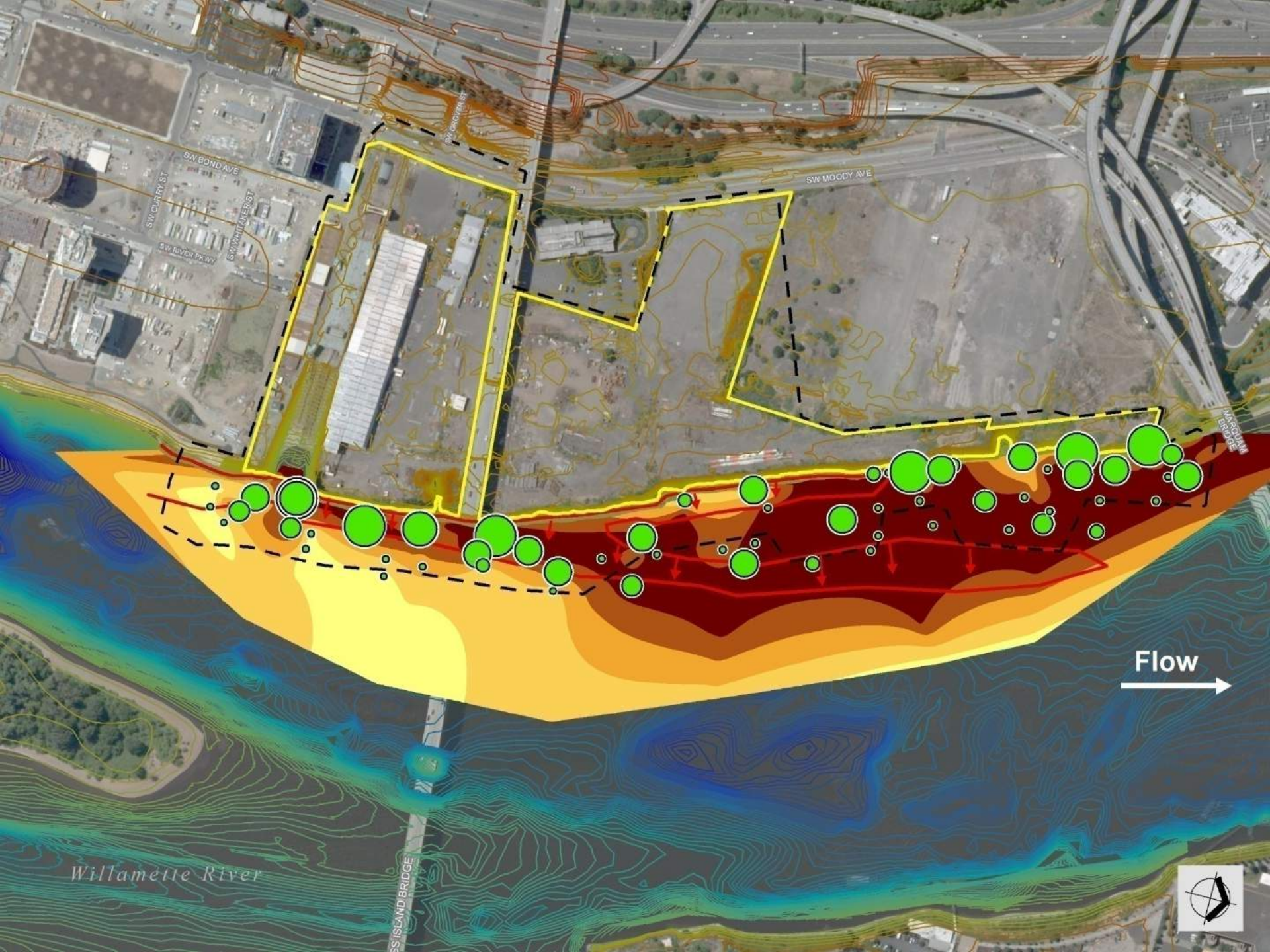
MAROON BRIDGE

SW ISLAND BRIDGE

Willamette River

Flow  
→





SW CURRY ST  
SW BOND AVE  
SW RIVER PKWY  
SW WHITAKER ST

SW MOODY AVE

MARCOLETTA BRIDGE

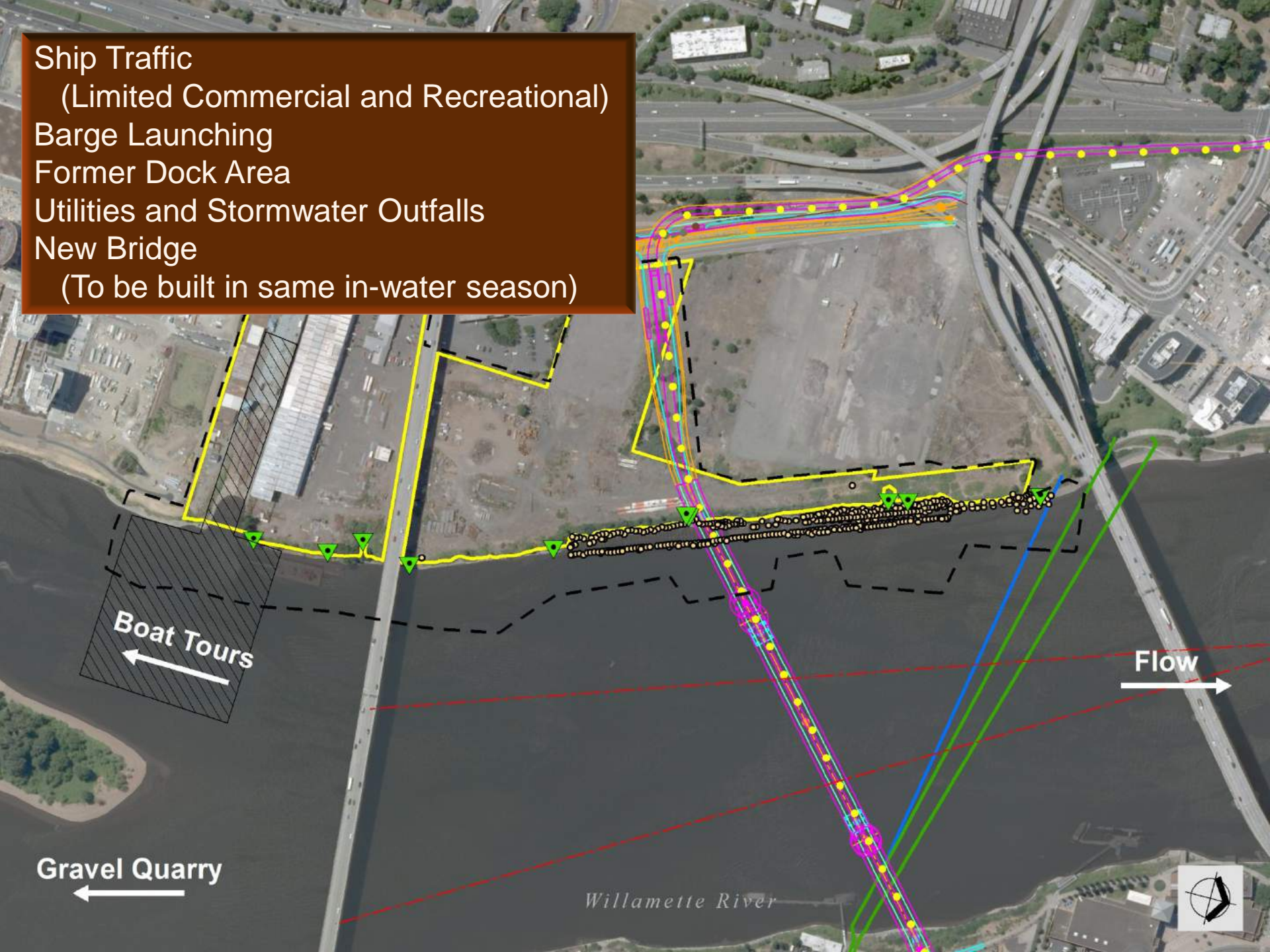
SW ISLAND BRIDGE

Willamette River

Flow  
→



Ship Traffic  
(Limited Commercial and Recreational)  
Barge Launching  
Former Dock Area  
Utilities and Stormwater Outfalls  
New Bridge  
(To be built in same in-water season)



Boat Tours  
←

Gravel Quarry  
←

Flow  
→

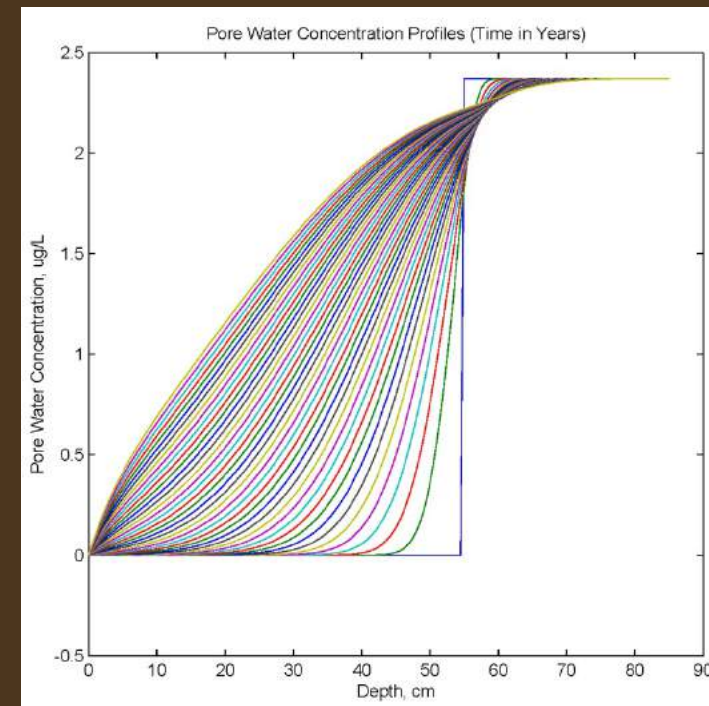
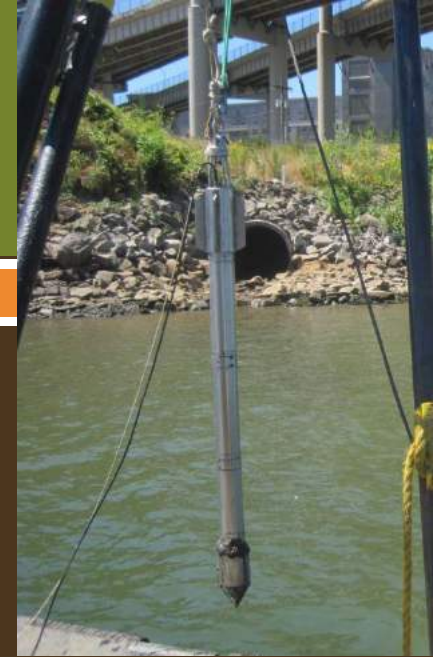
Willamette River





# Design Evaluation

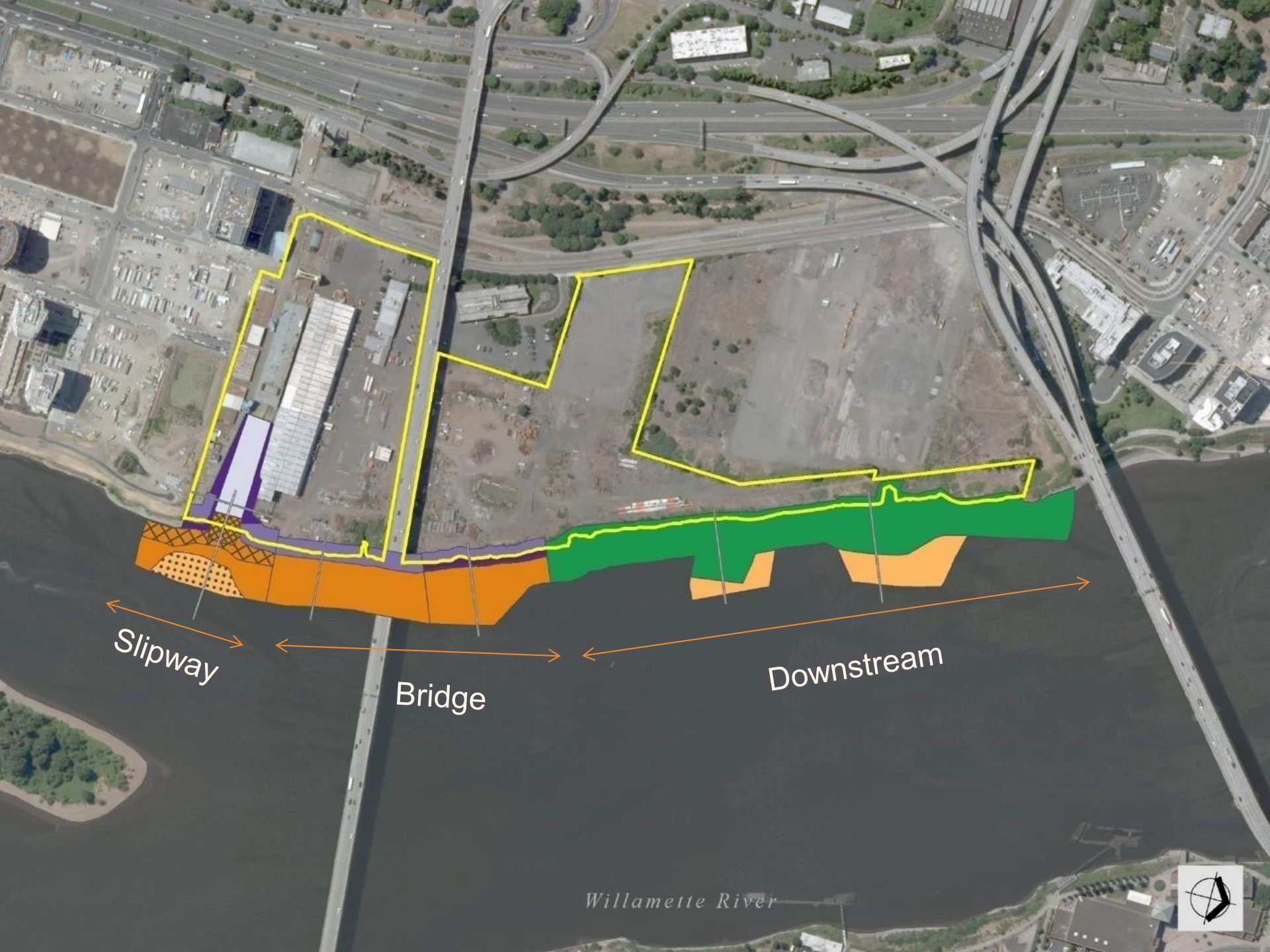
- Bank & Sediment Stability
- Cap Configurations
- Contaminant Isolation Modeling
- Hydraulic Analysis
- Permitting
  - ▣ Cleanup Approval
  - ▣ 404 Permit/ESA
  - ▣ 401 Certification



# Other Design Considerations

- Cut/Fill Exemption
- HEC-RAS Model Information
- Local Master Plans
  - Greenway and Habitat Emphasis
- Minimize Project Impacts (ESA)
  - Riparian Vegetation
  - Bioengineering
  - Decreasing Slopes





Slipway

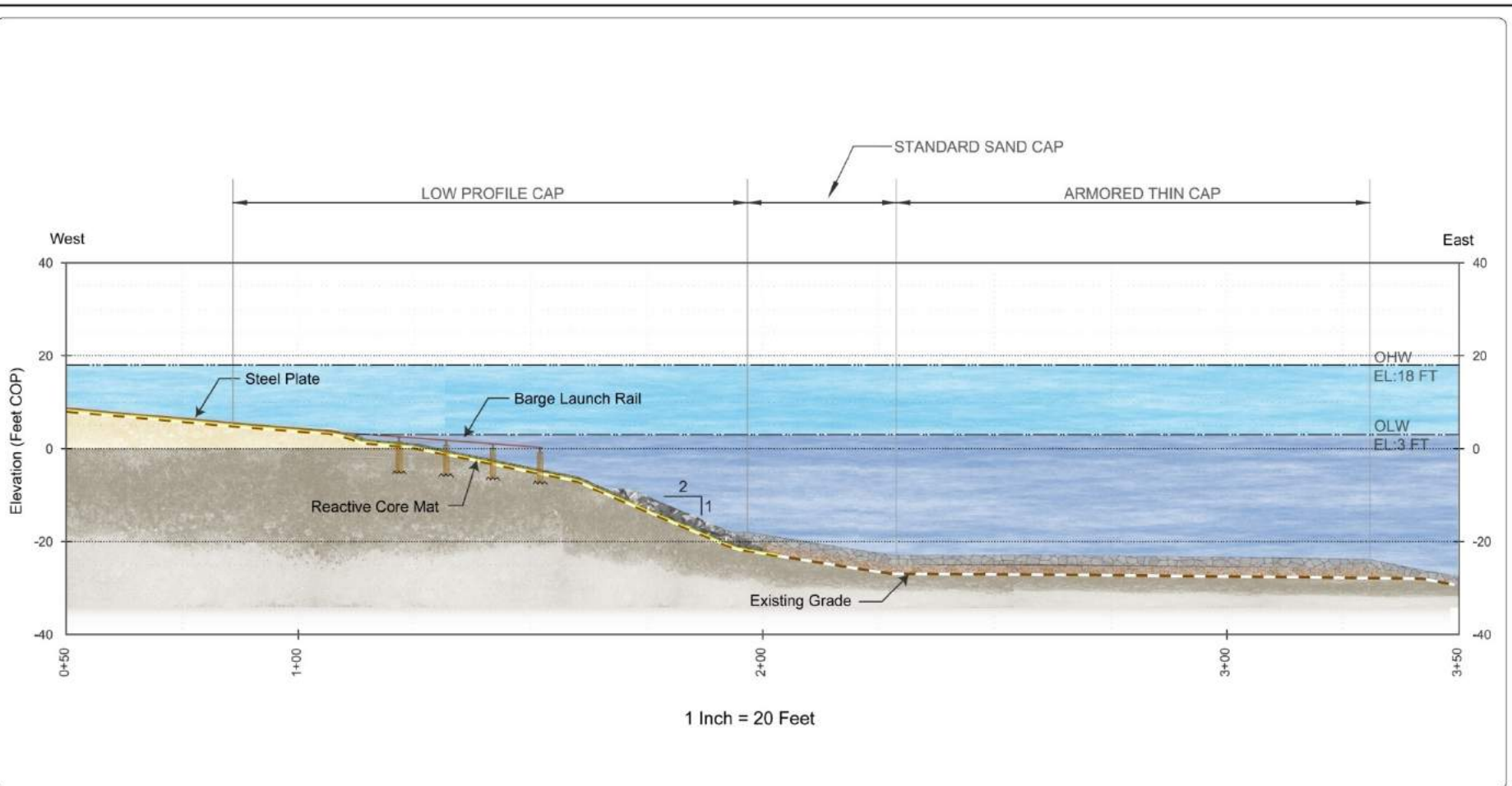
Bridge

Downstream

Willamette River



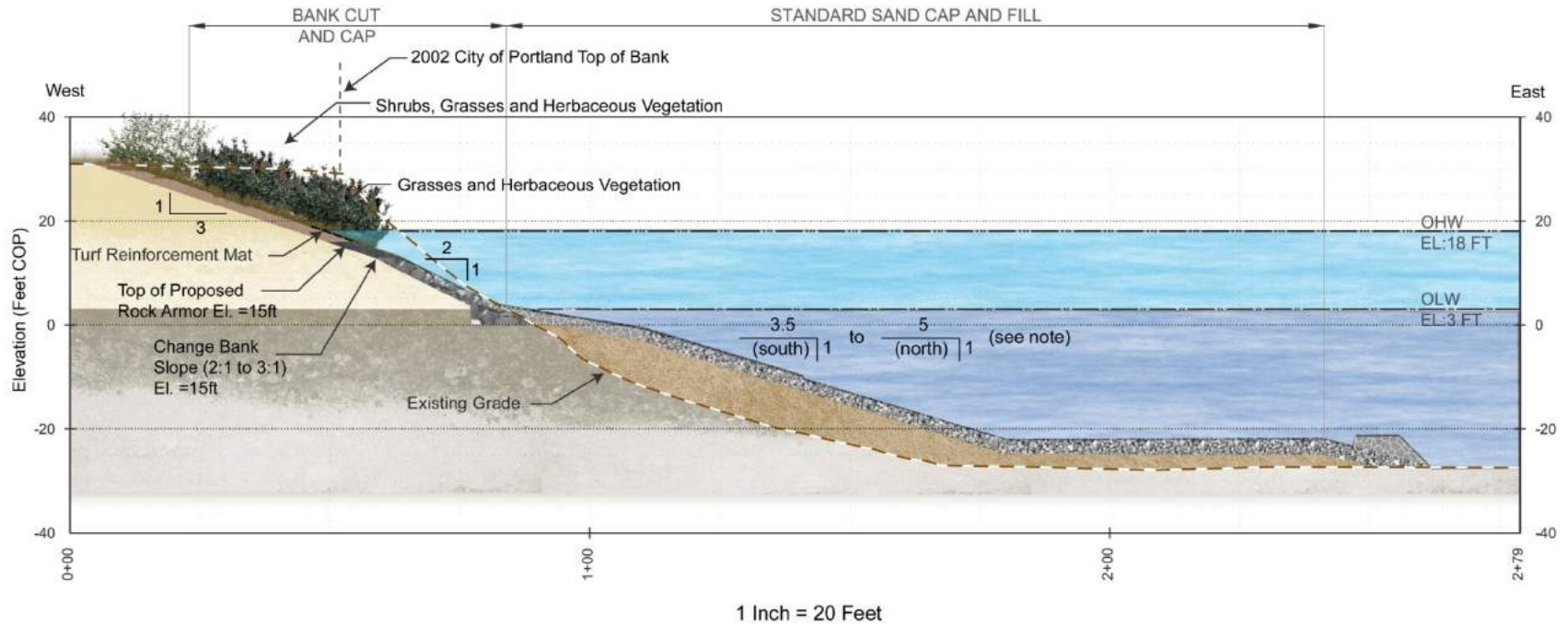
# Slipway Reach



- |                   |   |  |
|-------------------|---|--|
| Reactive Core Mat | Type C Rock Armor   | Seasonally Variable River Level (OLW to OHW)   |
| Existing Grade    | Type D Rock Armor (with Gravel)   | Minimum River Level (Below OLW)  |
| Barge Launch Rail | Type E Rock Armor (with Gravel)   | Proposed Sand (Minimum Thickness is 2 Feet for Standard Cap and 10 Inches for Thin Cap - Armored Thin Cap may be between 10 and 24 inches) |
| Steel Plate       | Operationally Impacted Existing Fill (Silt, Sands, Gravel, and/or Debris) |  |
| Alluvium          |   |  |

**Figure 3-2**  
**Slipway Reach**  
**Typical Cross Section**  
 Pre-Final Bank and Sediment  
 Remedial Design Report  
 ZRZ Realty Company  
 Portland, Oregon

# Bridge Reach



Note: At the south end (upstream) of the reach the water slope is 3.5H:1V and transitions to 5H:1V at the north end (downstream) of the reach.

- Turf Reinforcement Mat
- - - Existing Grade
- Proposed Soil Cap
- Proposed Sand (Minimum Thickness is 2 Feet for Standard Cap)

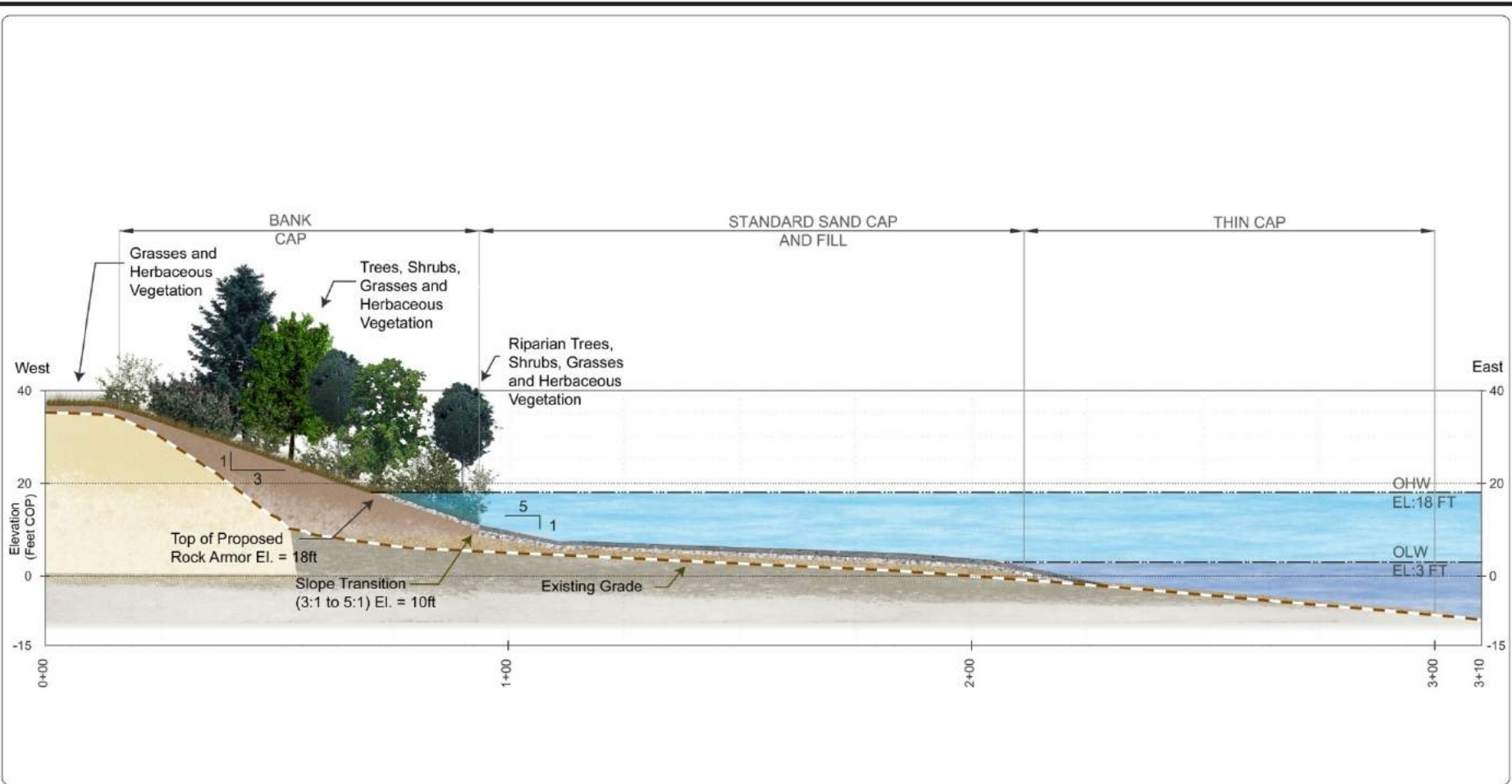
- Type B Rock Armor
- Type D Rock Armor (with Gravel - in-water only)
- Type E Rock Armor
- Operationally Impacted Existing Fill (Silt, Sands, Gravel, and/or Debris)

- Alluvium
- Seasonally Variable River Level (OLW to OHW)
- Minimum River Level (Below OLW)

Note: Vegetation illustrated at mature size approximately 30 years past planting.

**Figure 3-4**  
**South Bridge Reach**  
**Typical Cross Section**  
 ZRZ Realty Company  
 Portland, Oregon

# Downstream Reach



- Existing Grade
  - Proposed General Fill / Soil Cap
  - Proposed Sand (Minimum Thickness is 2 Feet for Standard Cap and 10 Inches for Thin Cap)
  - 2.5 Inch Minus Rounded Gravel
  - Type A Rock Armor
  - Operationally Impacted Existing Fill (Silts, Sands, Gravel, and/or Debris)
  - Alluvium
  - Seasonally Variable River Level (OLW to OHW)
  - Minimum River Level (Below OLW)
- Note: Vegetation illustrated at mature size approximately 30 years past planting.

**Figure A10'**  
**Section 6'**  
**Downstream Reach**  
ZRZ Realty Company  
Portland, Oregon

# May/June 2011 Hotspot Removal



# July 1 to July 15 Dock Removal



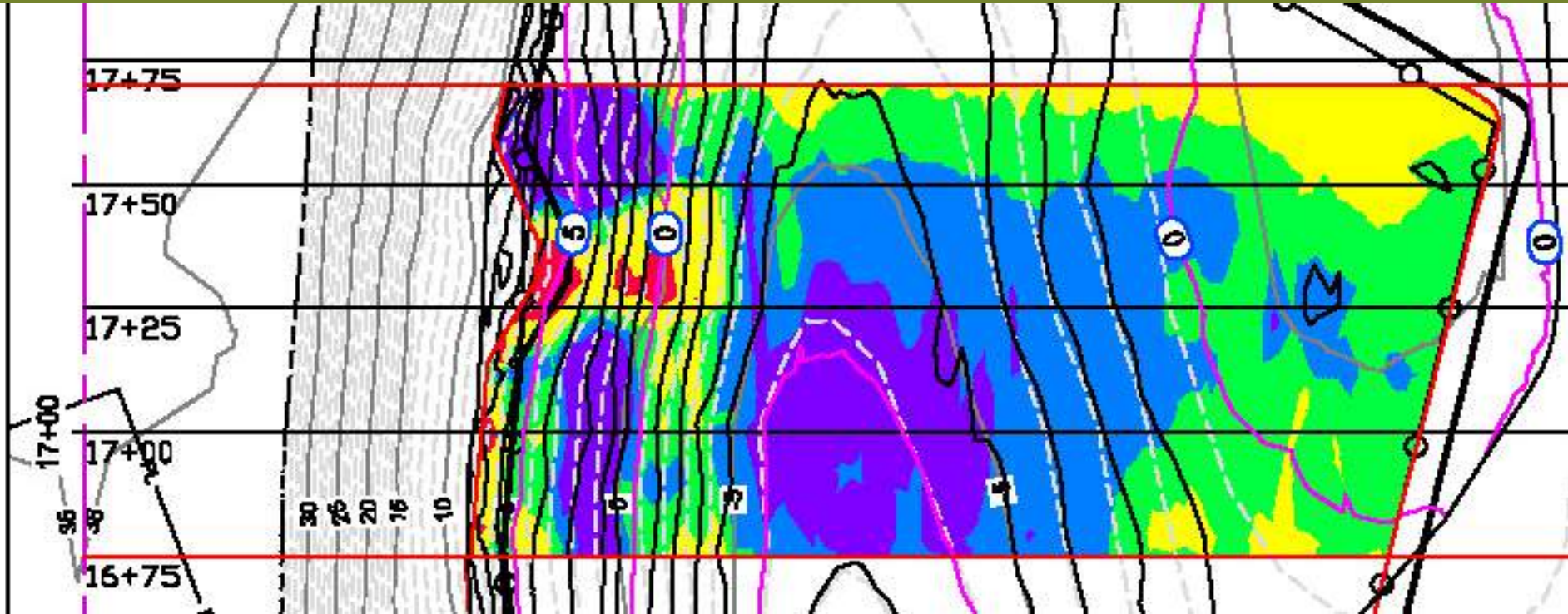




Low Profile Cap



August to October  
Sediment Cap



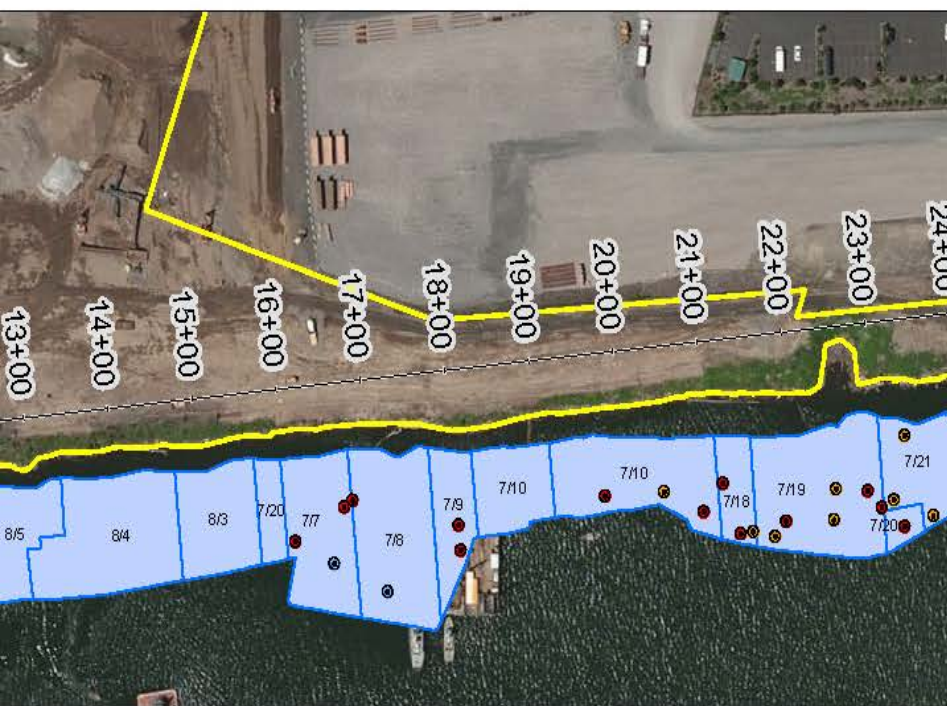
**Figure 2**  
**First Lift**  
**Placement Extents**

ZRZ Realty Company  
 Portland, Oregon



**Legend**

- Two-Foot Cap Confirmation Sample Location (2011)
- First Lift Sample Location (2011)
- First Lift and Two-Foot Cap Confirmation Sample Location (2011)
- Incident Verification
- Slipway Sample Location
- Baseline for Stationing
- First Lift Placement Extents
- ▨ Steel Plate
- ▭ Zidell Property Boundary



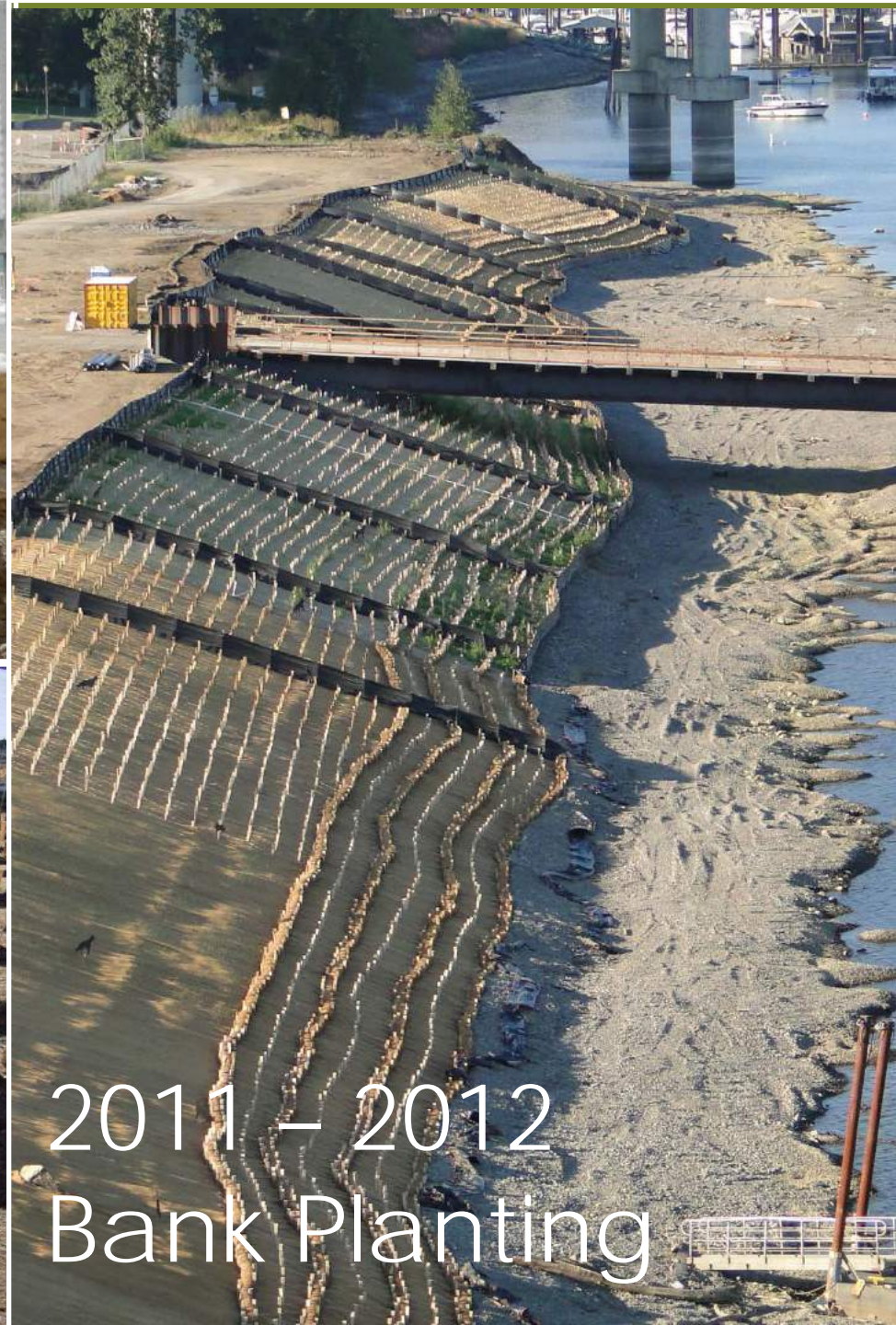


July 15 to Aug 15  
TriMet Acceleration



# September/October TriMet Containment Cell





FEB 17 2012

2011 – 2012  
Bank Planting

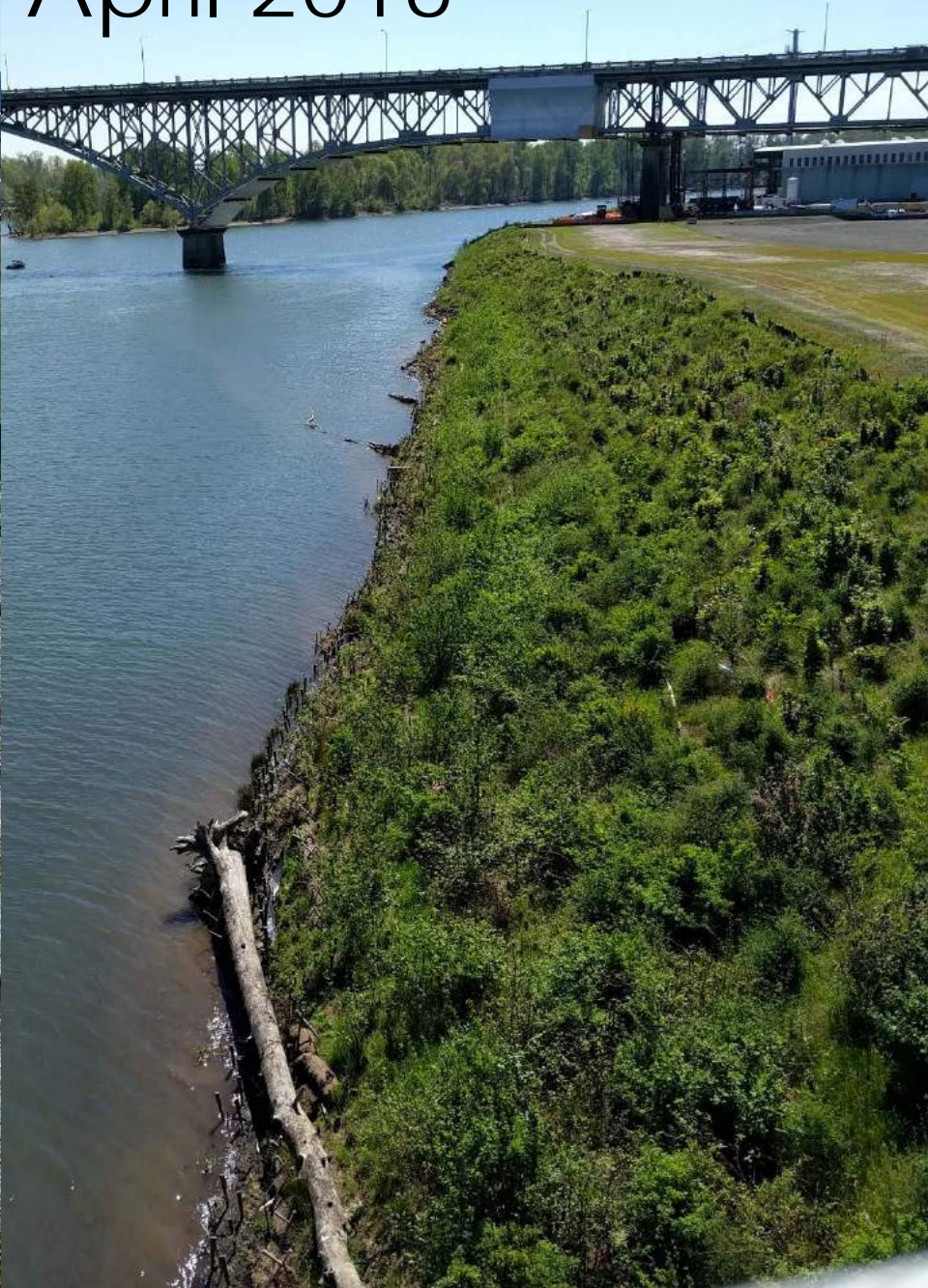




August 2012



April 2016



# Conclusion

- Cleanup
- Fluvial Environment
- Navigation & Site Operations
- Habitat
- Permitting
- Public Opinion
- Experienced Contractor & Operators
- Team Communications
- Plan to Adapt



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# Questions





MAUL  
FOSTER  
ALONG

# Bathymetry



# Incremental Sampling

