A Tale of Two Cleanups:
East Waterway and Gas Works Park

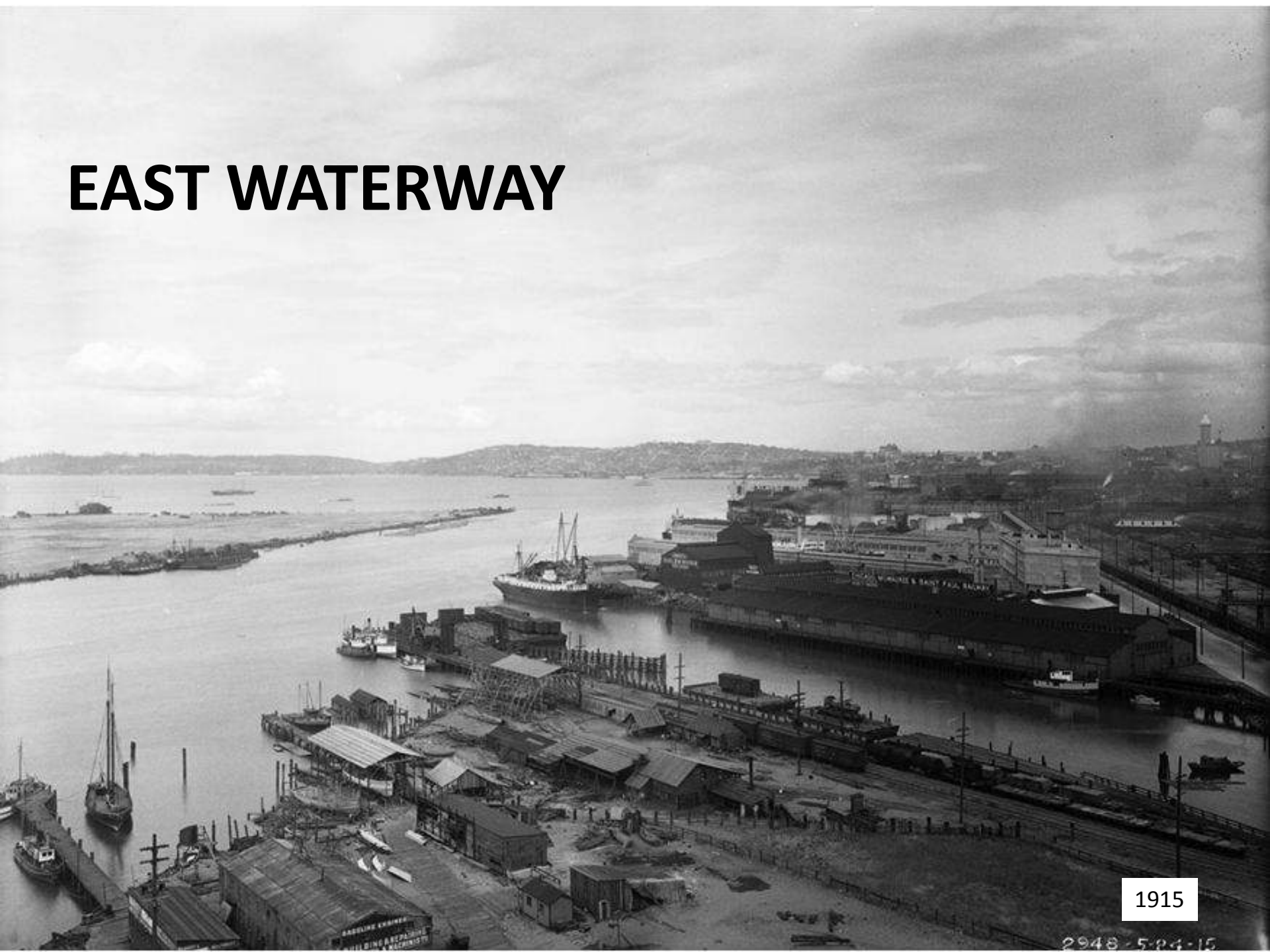
Pete Rude
Seattle Public Utilities

Seattle Public Utilities

WEDA Pacific Chapter
October 2014


Gas Works Park
East Waterway
Lower Duwamish Waterway

EAST WATERWAY



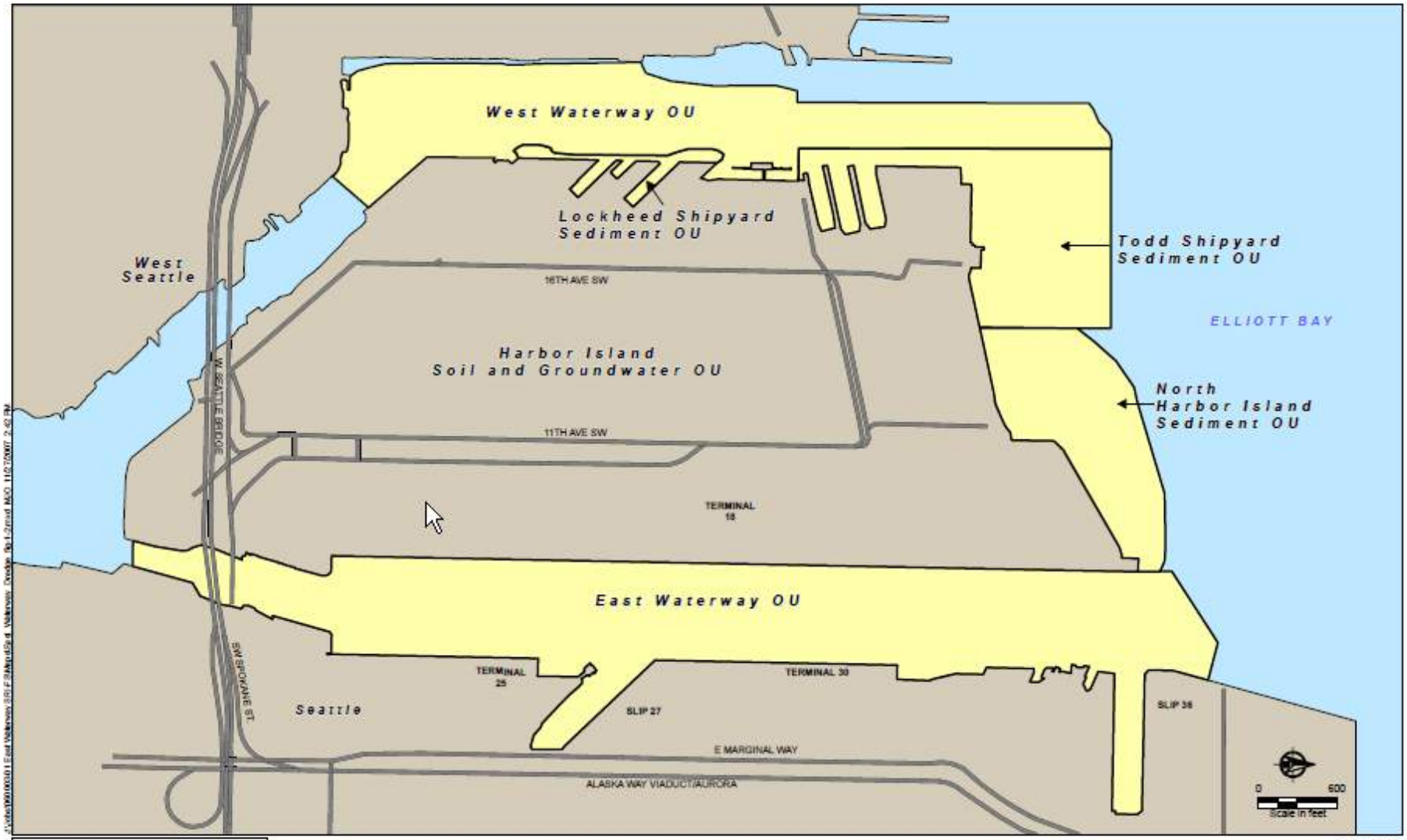
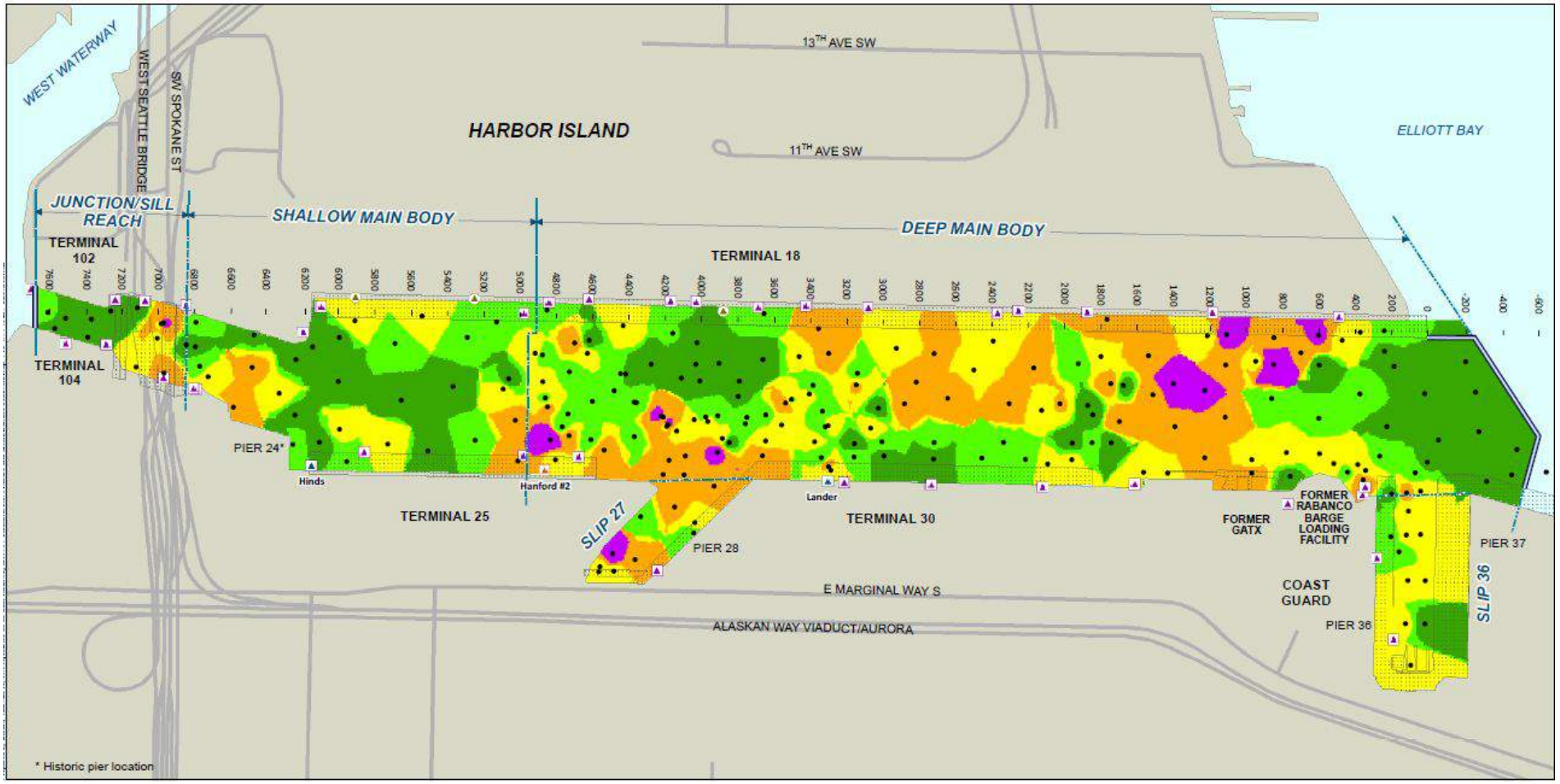


Figure 1-2
Harbor Island Superfund Site Operable Units
Existing Information Summary Report
East Waterway Operable Unit

PCBs in Surface Sediment



Interpolated Total PCB Concentration*
µg/kg dw

- > 1,800 (> 95th percentile)
- > 590 and ≤ 1,800 (≤ 95th percentile)
- > 270 and ≤ 590 (≤ 75th percentile)
- > 110 and ≤ 270 (≤ 50th percentile)
- ≤ 110 (≤ 25th percentile)
- Surface Sediment Sampling Location

- CSO
- Storm Drain
- CSO/Storm Drain
- Unknown Outfall
- Dock/Pier/Bridge
- Road
- East Waterway Study Area Boundary

* The percentiles are all numeric percentiles of the surface sediment dataset.

0 600
Scale in feet

Map 4-18
Inverse Distance Weighted Interpolation of
Total PCB Concentrations in Surface Sediment
Supplemental Remedial Investigation
East Waterway Study Area

Organization

- 2006 – Port of Seattle signed EPA order
  - Covers RI/FS
- 2006 – Port/City/King County agreement
  - Share costs
  - Review documents
  - Meet
- Ecology role
- Stakeholders

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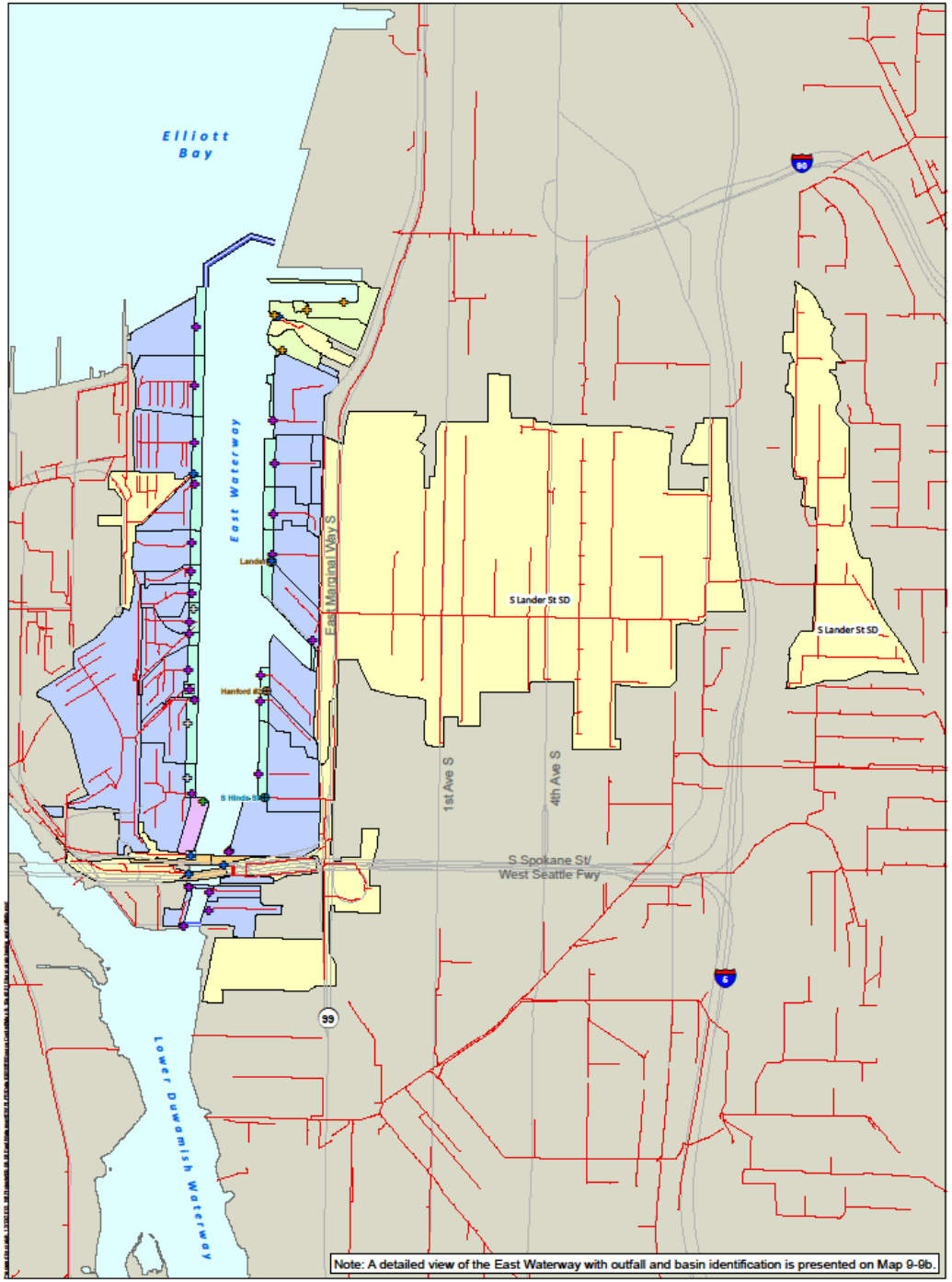
The Waterway

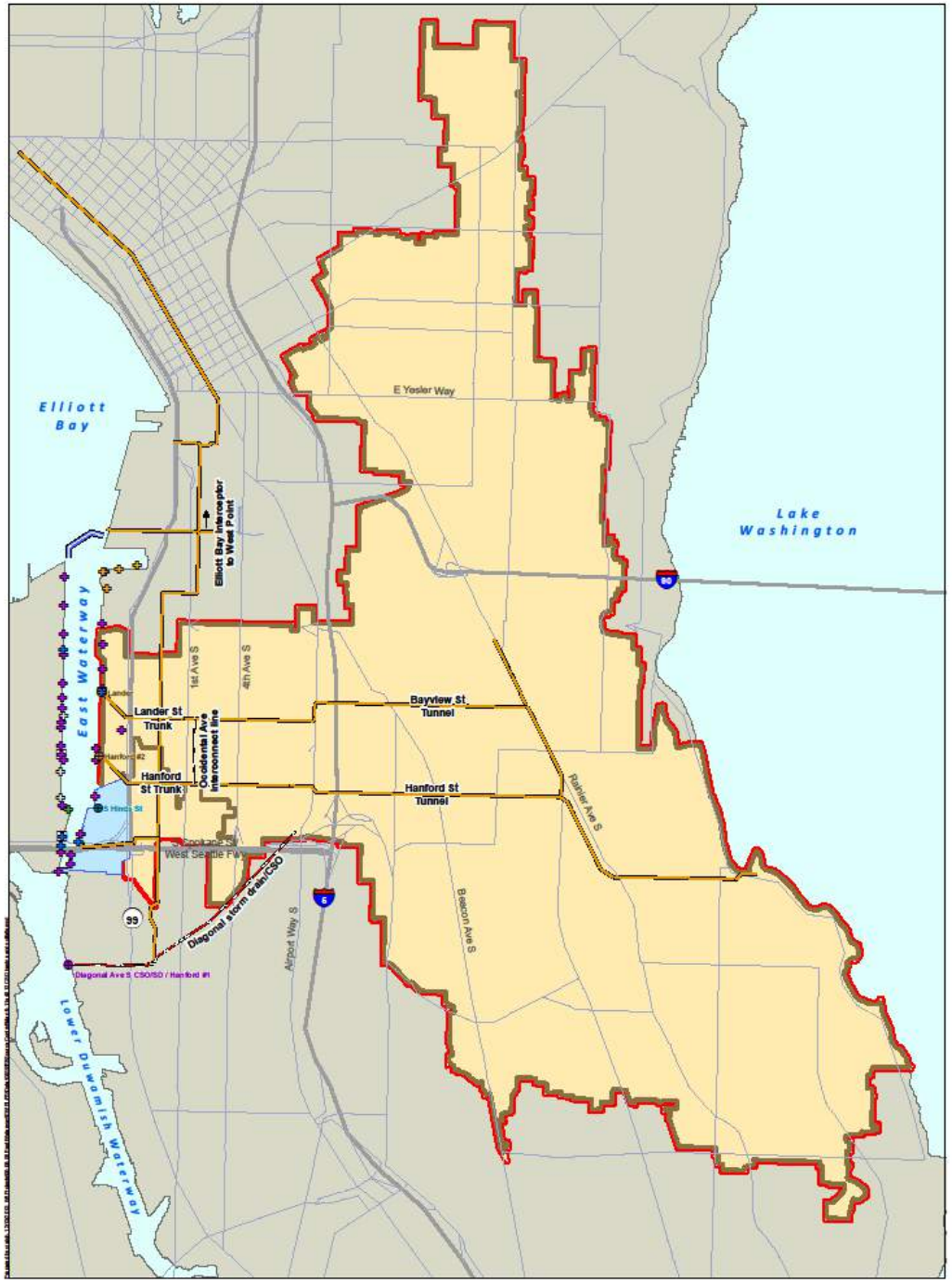
Stormwater Drainage and outfalls:

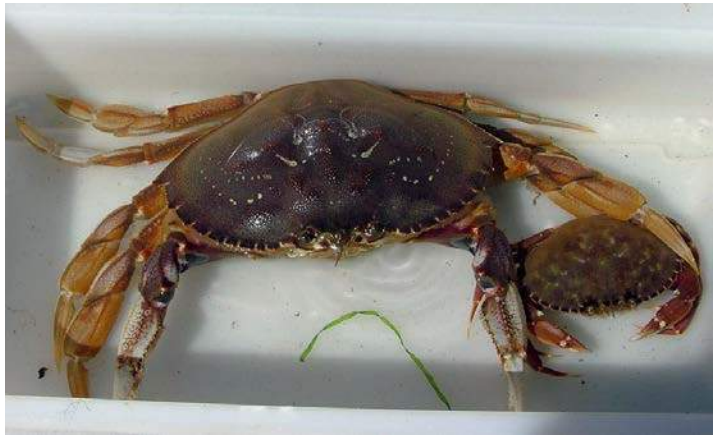
- City – Yellow
- Port - Blue



Combined Sewers

- **County:**
  - Hanford
  - Lander
- **City**
  - Hinds (small)





Rock Crab

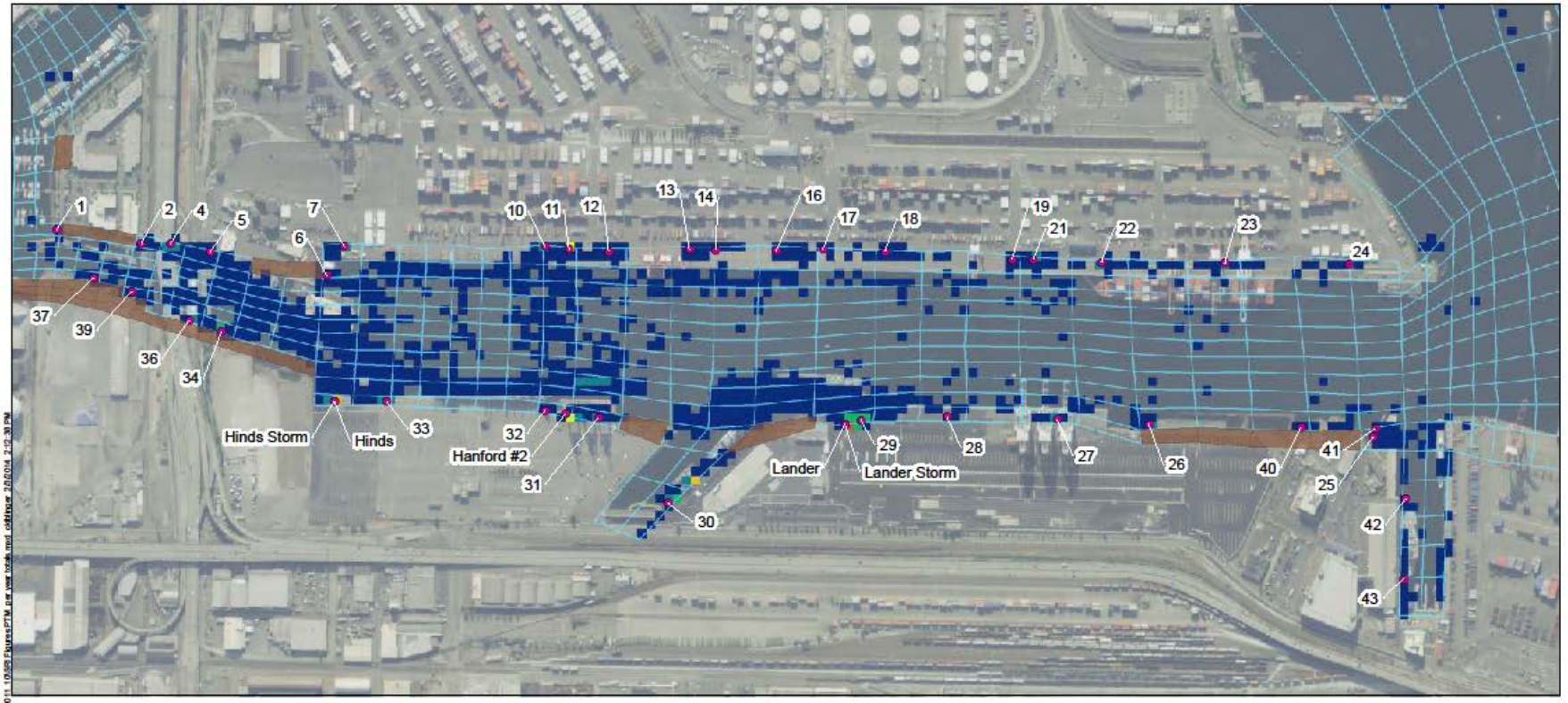
Brown Rockfish

English Sole and Starry Flounder

Coonstripe Shrimp

Shiner Perch

Sediment Dynamics



PTM Outfall Locations

EFDC Hydrodynamic Model Grid

Land

Water

Deposition in cm/year

< 0.1 | 0.11 - 0.25 | 0.26 - 0.5 | 0.51 - 0.75 | 0.76 - 1 | 1.01 - 2 | 2.01 - 4 | 4.01 - 7

Areas with no color shading had no deposition during the model simulation period.

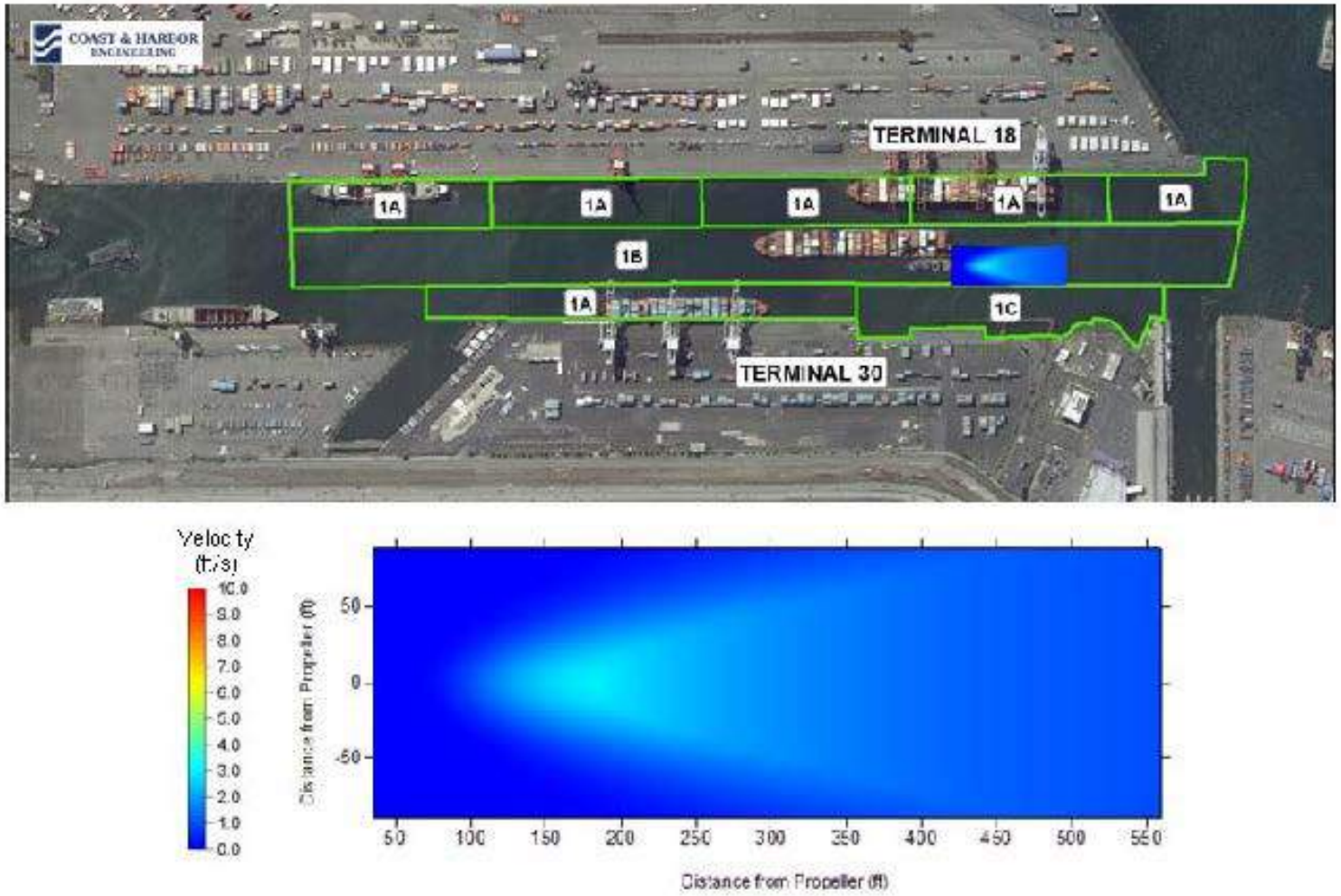
Feet

0 250 500 750 1,000

NOTES:

1. Deposition data (points) output from PTM model simulation has been represented by a 50 ft x 50 ft resolution raster map of mass accumulation per square foot (lb/sq foot)
2. Mass accumulation represents deposition over one year (extrapolated from a 28 day simulation time).
4. Lander, Hanford, and Hines are CSOs.
5. Outfall numbers (names) correspond to drainage basins.
6. Deposition pattern shown does not account for re-suspension of particles due to prop wash.

Map 3-15
Predicted Annual Deposition (cm/yr) due to Lateral Loads, Base Case
Draft Supplemental Remedial Investigation Report
East Waterway Operable Unit



ANCHOR QEA

Figure 5-15
Scenario 13: Tug Assisting a Ship in Area 1
Sediment Transport Evaluation Report
East Waterway Operable Unit

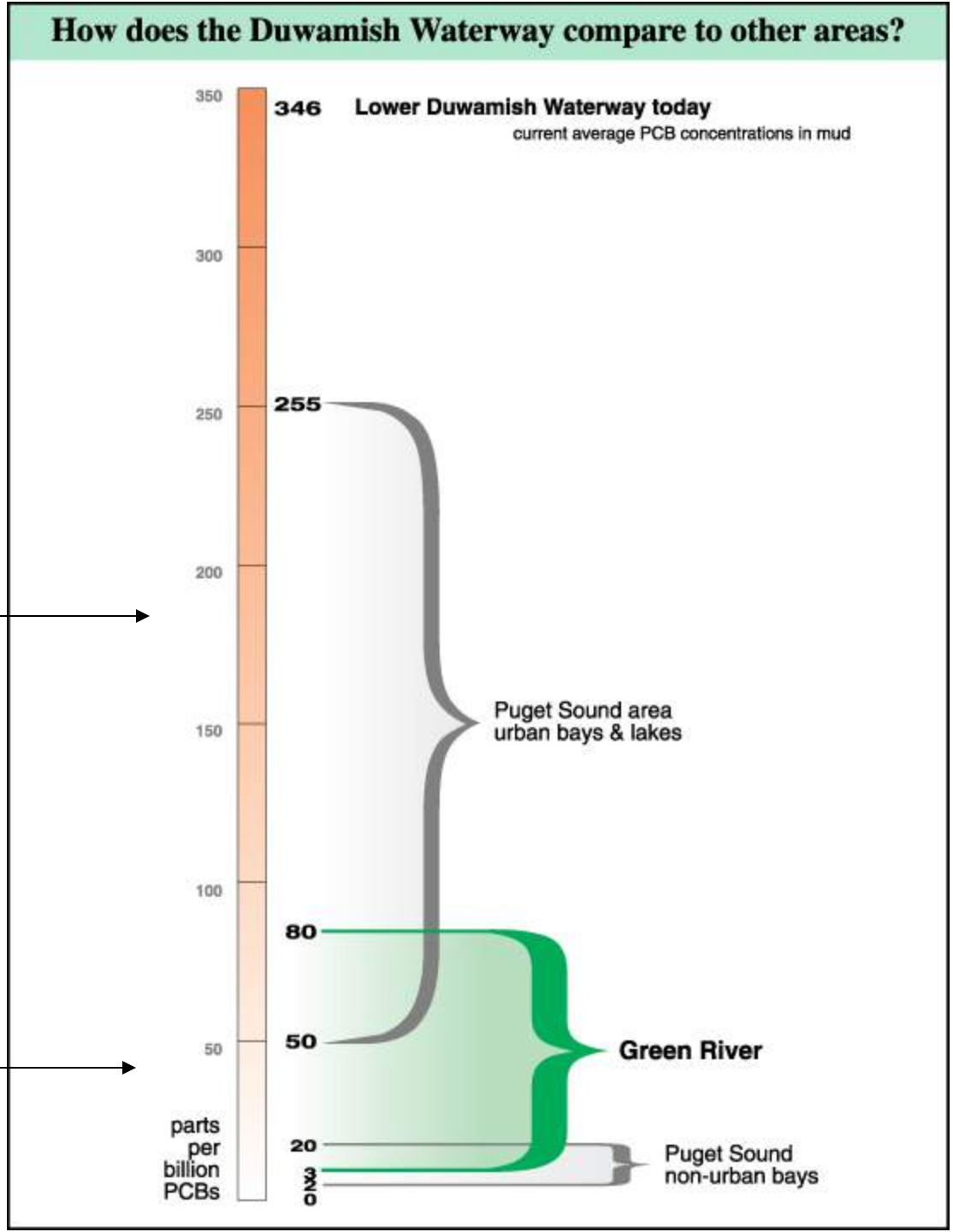
Risk from Contamination

Human Health:

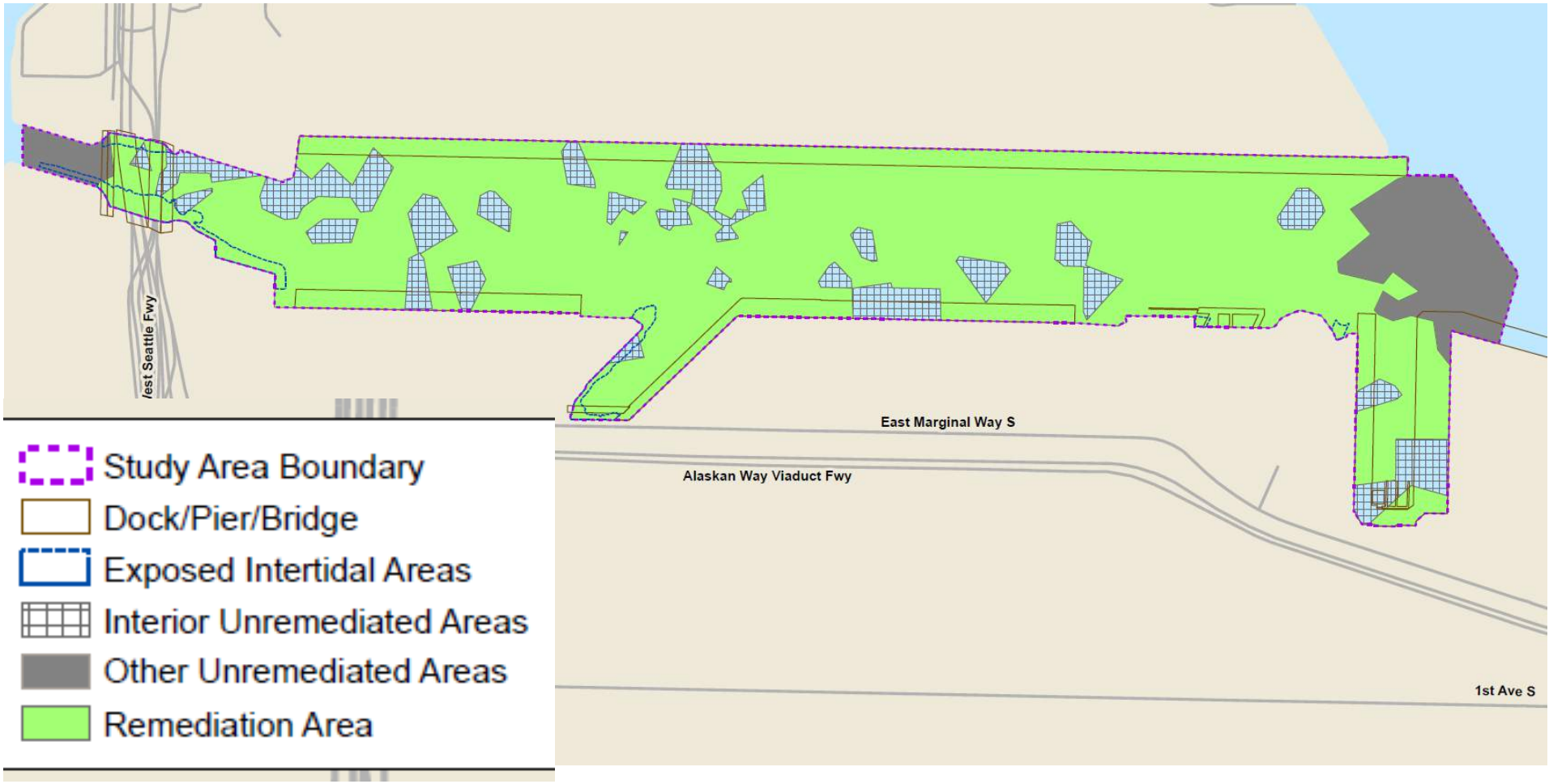
- PCBs, arsenic, cPAHs, and dioxins/furans
- Highest risk: consumption of fish, crabs, and clams
- Also risks from direct contact from clamming and netfishing

Early Action predicted to get Waterway to this level

All alternatives in Feasibility Study predicted to get Waterway to this level



Preliminary Remediation Area



City Source Control Work

- Business inspections
- Source tracing
- Line cleaning

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Project Milestones

- January 2014 – Final SRI
- January 2014 – Draft FS delivered to EPA
- 2015 – Finish FS
- 2015/2016 – Proposed Plan and ROD
- 2018/2019 – **Cleanup Begins**
- 2029 – Cleanup complete

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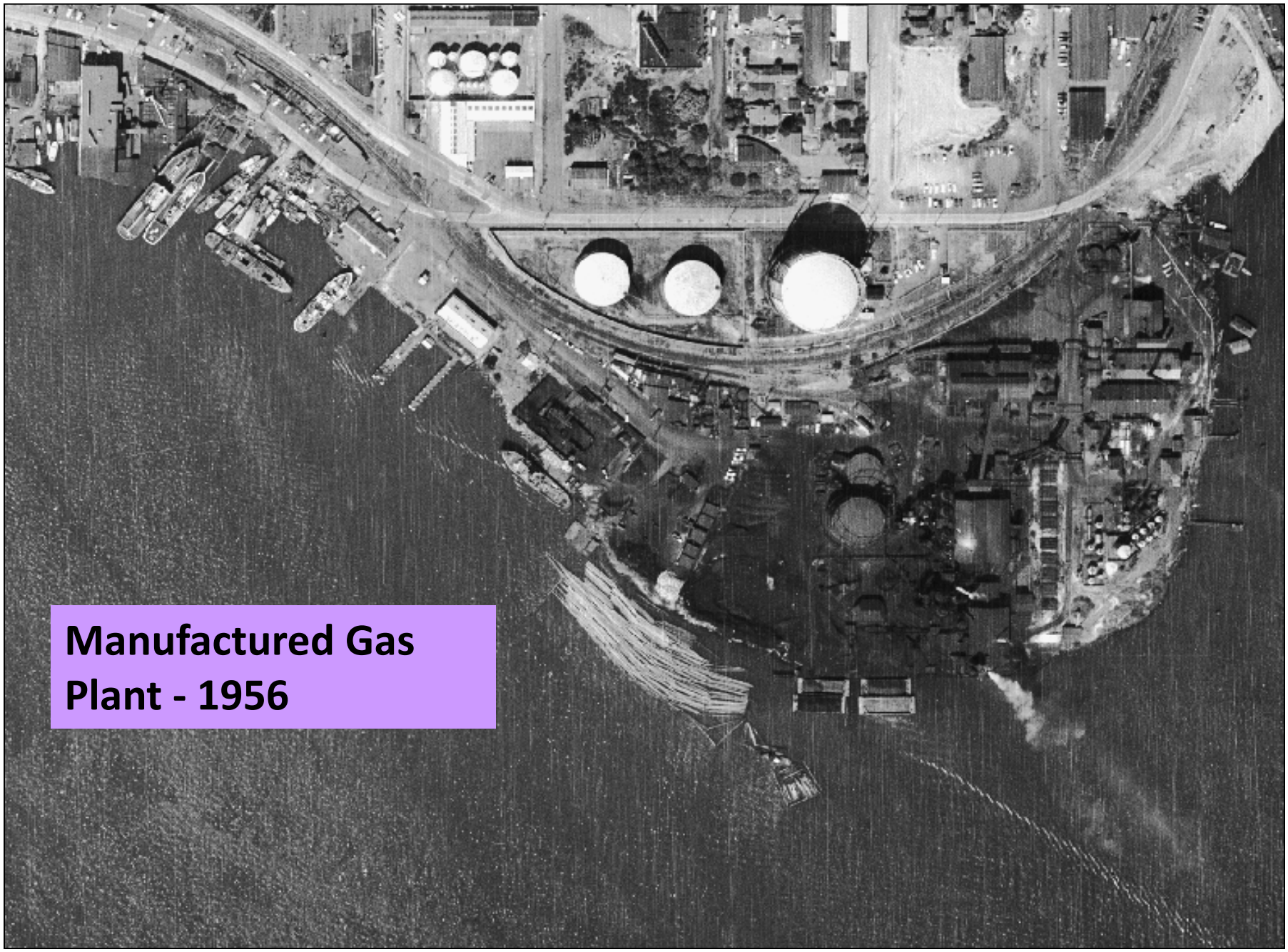
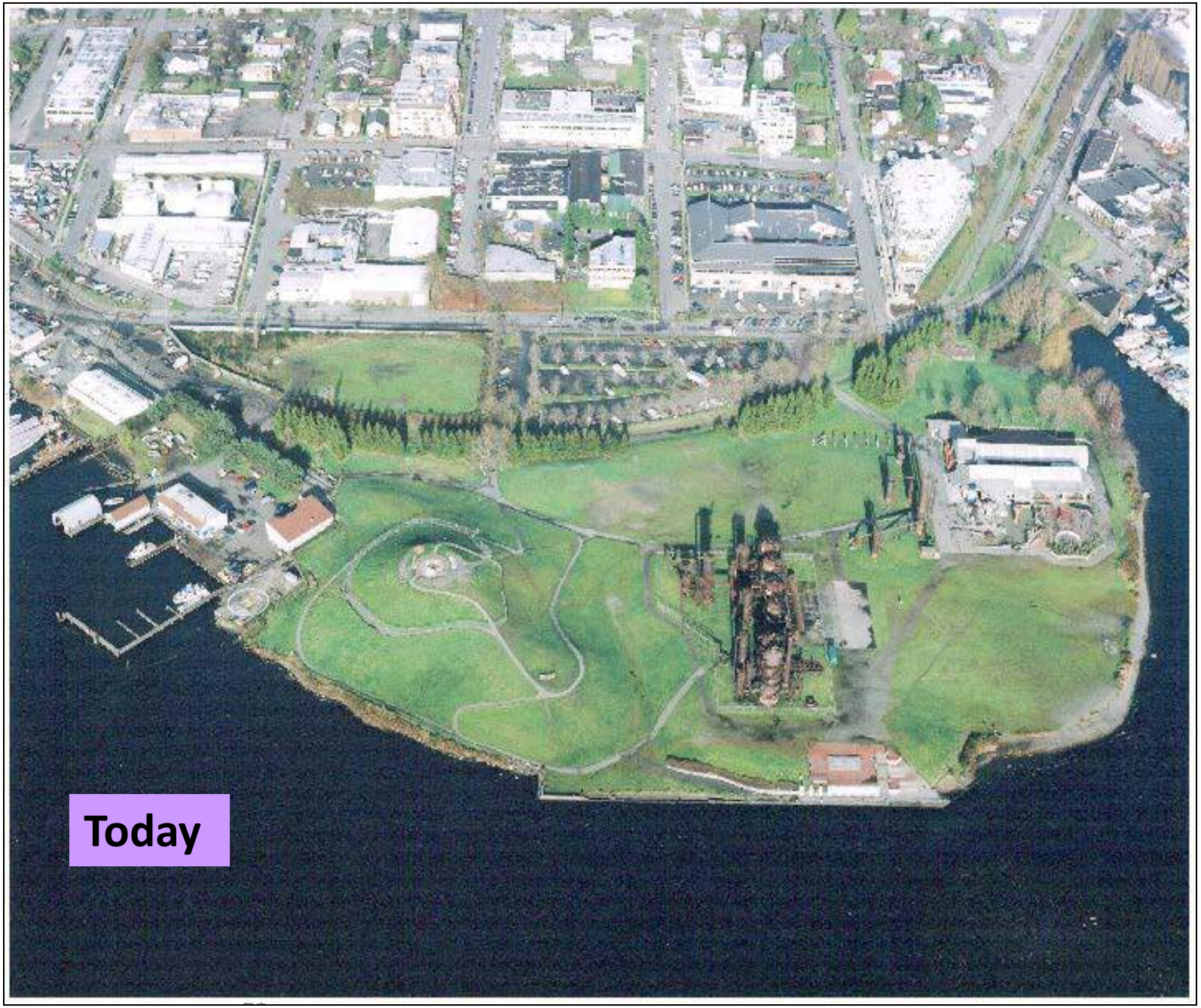
Gas Works Park
East Waterway
Lower Duwamish Waterway


Manufactured Gas
Plant - 1956


Today

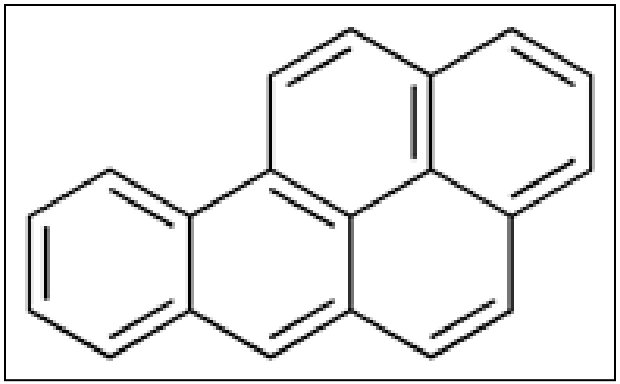
Contamination

Dense Non-Aqueous Phase Liquids

- Tars and Oils

Polycyclic Aromatic Hydrocarbons (PAHs)

- Example: Benzo(a)pyrene



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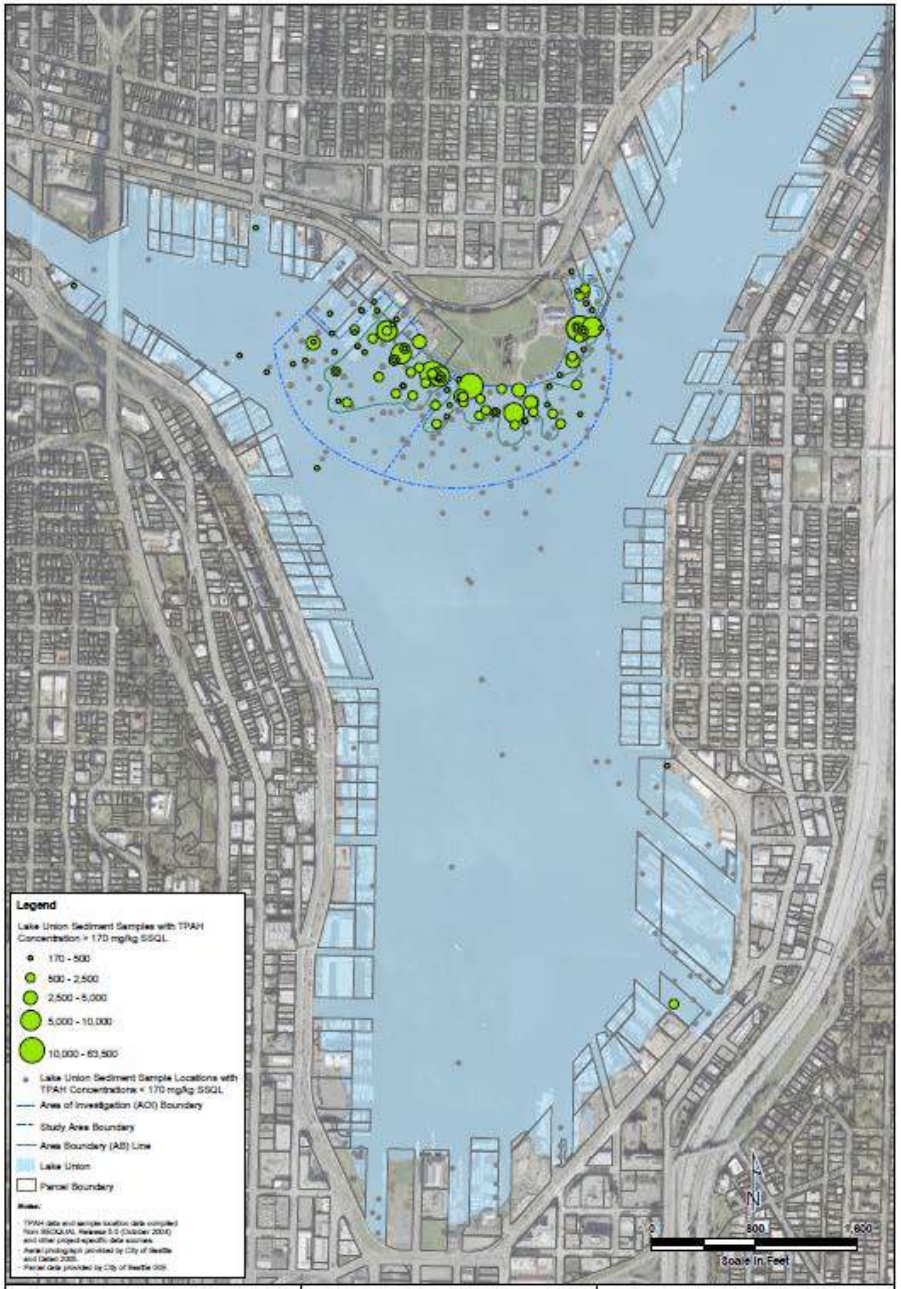

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Joint Source Control Evaluation
Gas Works Sediment Area
City of Seattle

Figure 6.1
TPAH Concentrations in
Lake Union Sediment Samples

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Background

- State-lead site (MTCA and SMS)
- U.S. EPA deferred site to State
- **1999** – City and Puget Sound Energy sign Consent Decree for upland cleanup
- **2001** – Upland cleanup complete; sediments a subsequent phase
- **2005** – City and PSE sign Agreed Order for sediments RI/FS

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Legend

- Area of Investigation (AOI)
- 1984: Approximate area of 1-foot-thick soil cover
- 1997: Approximate location of tar removal
- 2006-2011: Approximate location of minor tar removal
- 2001: Vegetative soil cap and geotextile layer placed over the unpaved areas
- 2005: Soil cap consisting of grass turf, 1 foot of topsoil, and a geotextile layer
- 2012: Area covered with a 1-foot-thick vegetated soil cap
- 2014: Planned vegetative soil cap maintenance
- 1998-1999: LNAPL Recovery Wells
- 2001-2006: Air Sparging Area
- 1999: Decommissioned UST
- 2000-2010: Monitored Natural Attenuation

Notes:
1. References: Evaluation of Available Data by Sabol et al. 1988. Focused Feasibility Study by Parametrix and Key 1998. Police Harbor Patrol UST Site Assessment Report by G.S. Associates 1999. Final Engineering Design Report by ThermoRETEC 2000. Construction Completion Report by ThermoRETEC 2001. As Built Set of Drawings by Seattle Parks and Recreation 2005. Tar Seep Investigation 2008. NE Corner Capping Project by Hart Crowser 2012.
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Abbreviations
NAPL = nonaqueous phase liquid
UST = underground storage tank

0 100 200
Feet

Remedial Action Areas

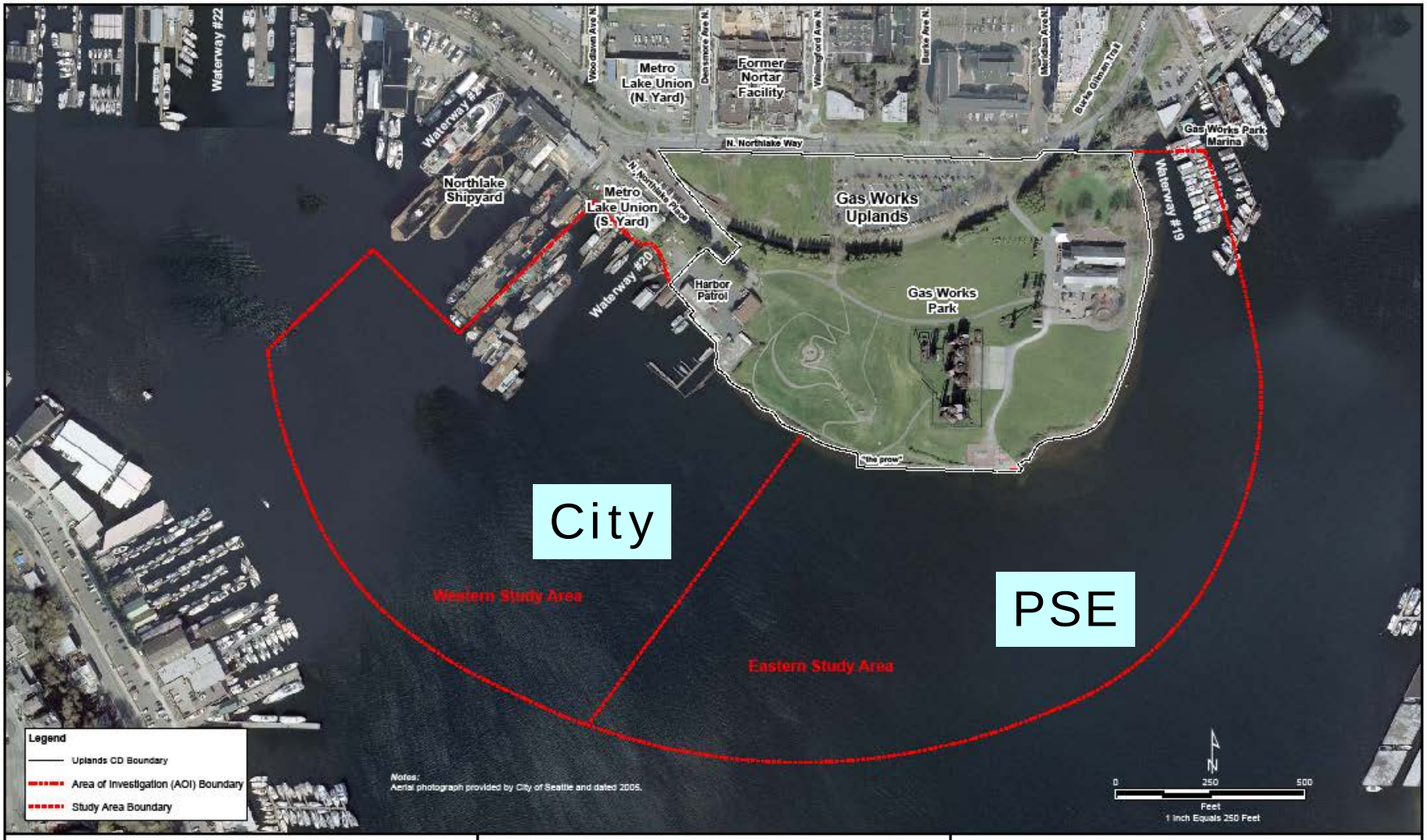
Gas Works Park Site
Seattle, Washington
Remedial Investigation Report

GEOENGINEERS **Figure 4-1**

Agency Review Draft

Path: \\seattle\projects\0\0186846\GIS\MXD\Phase01\T1300\018684601_Previous_Remedial_Action_Areas.mxd Map Revised: 13 May 2014 mangel

Two-Part Sediment Site



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Gas Works Sediment Area
City of Seattle

Figure 1.1
Site Map

New Approach

2012 – City and PSE sign agreement:

- PSE leads all cleanup work at site
- No more split site
- Simple and equitable cost sharing
- City still involved

2013 –Sediment agreed order modification

- Site-wide approach
- “Pathways to sediment”

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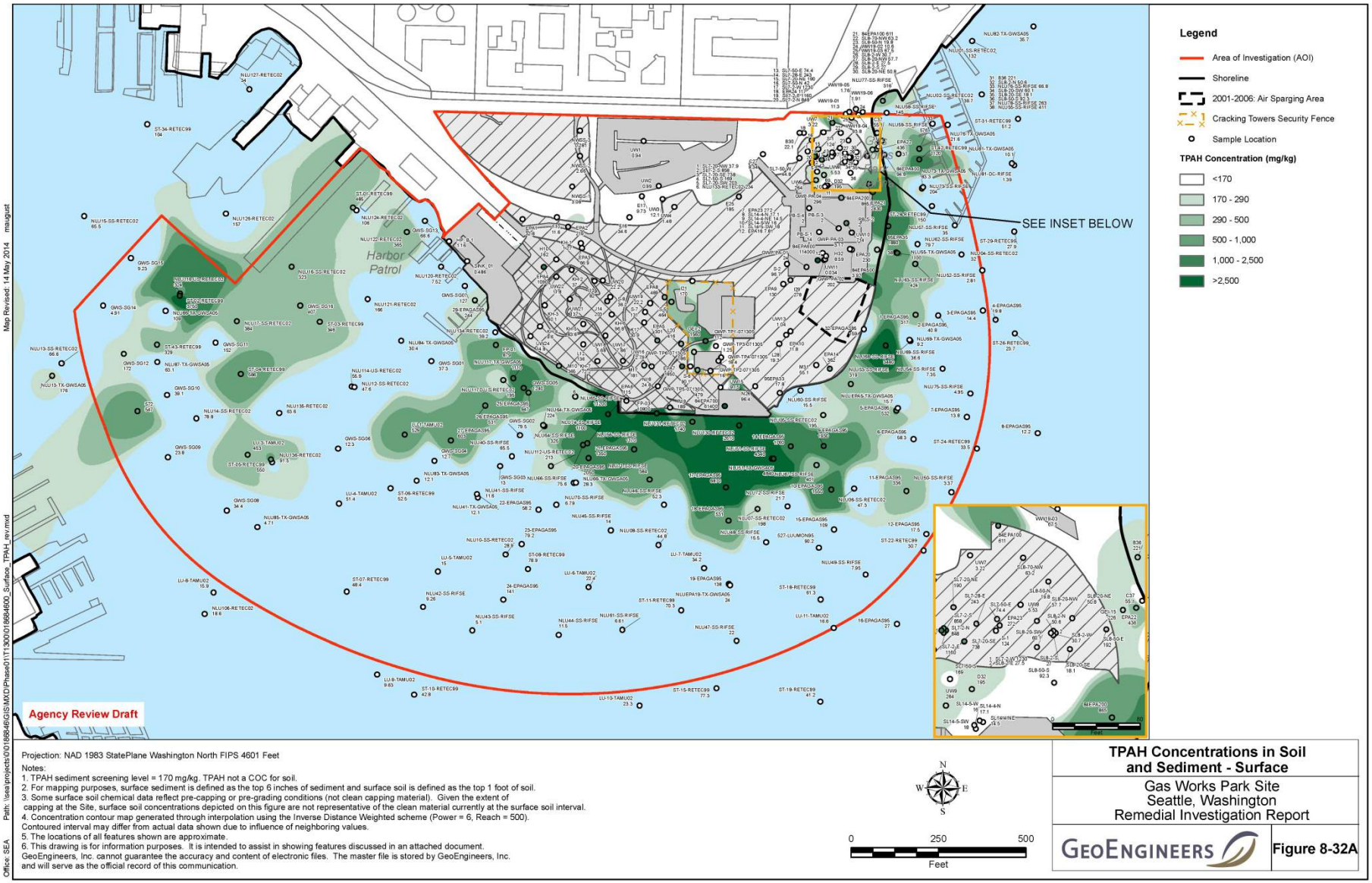
Draft RI Results – TPAH



Draft RI Results - Arsenic

Notes:
1. Arsenic soil screening level = 20 mg/kg.
   Arsenic sediment screening level = 3 mg/kg.
2. For mapping purposes, surface sediment is defined as the top 6 inches of sediment and surface soil is defined as the top 1 foot of soil.
3. Some surface soil chemical data reflect pre-capping or pre-grading conditions (not clean capping material). Given the extent of capping at the Site, surface soil concentrations depicted on this figure are not representative of the clean material currently at the surface soil interval.
4. Concentration contour map generated through interpolation using the Inverse Distance Weighted scheme (Power = 6, Reach = 500). Contoured interval may differ from actual data shown due to influence of neighboring values.
5. The locations of all features shown are approximate.
6. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Map Revised: 13 May 2014 maugust
Path: \\sea\projects\0\018684\GIS\MXD\Phase01\T1300\018684600_Surface_Arsenic.mxd
Office: SEA

Arsenic Concentrations in Soil and Sediment - Surface

Gas Works Park Site
Seattle, Washington
Remedial Investigation Report

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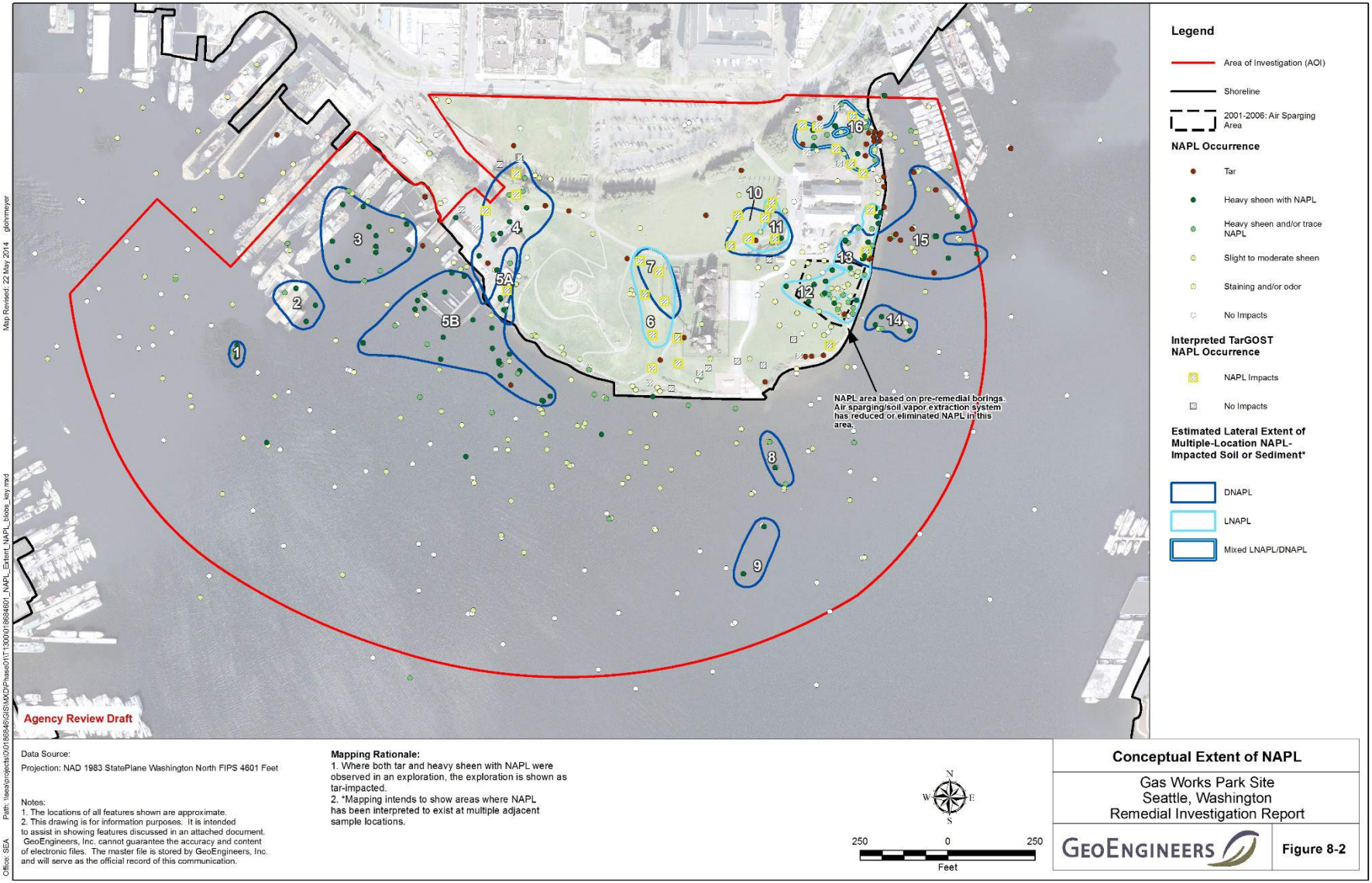
Figure 8-25A

Draft RI Results - NAPL



Data Source:
Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Mapping Rationale:
1. Where both tar and heavy sheen with NAPL were observed in an exploration, the exploration is shown as tar-impacted.
2. *Mapping intends to show areas where NAPL has been interpreted to exist at multiple adjacent sample locations.

250 0 250
Feet

Conceptual Extent of NAPL

Gas Works Park Site
Seattle, Washington
Remedial Investigation Report

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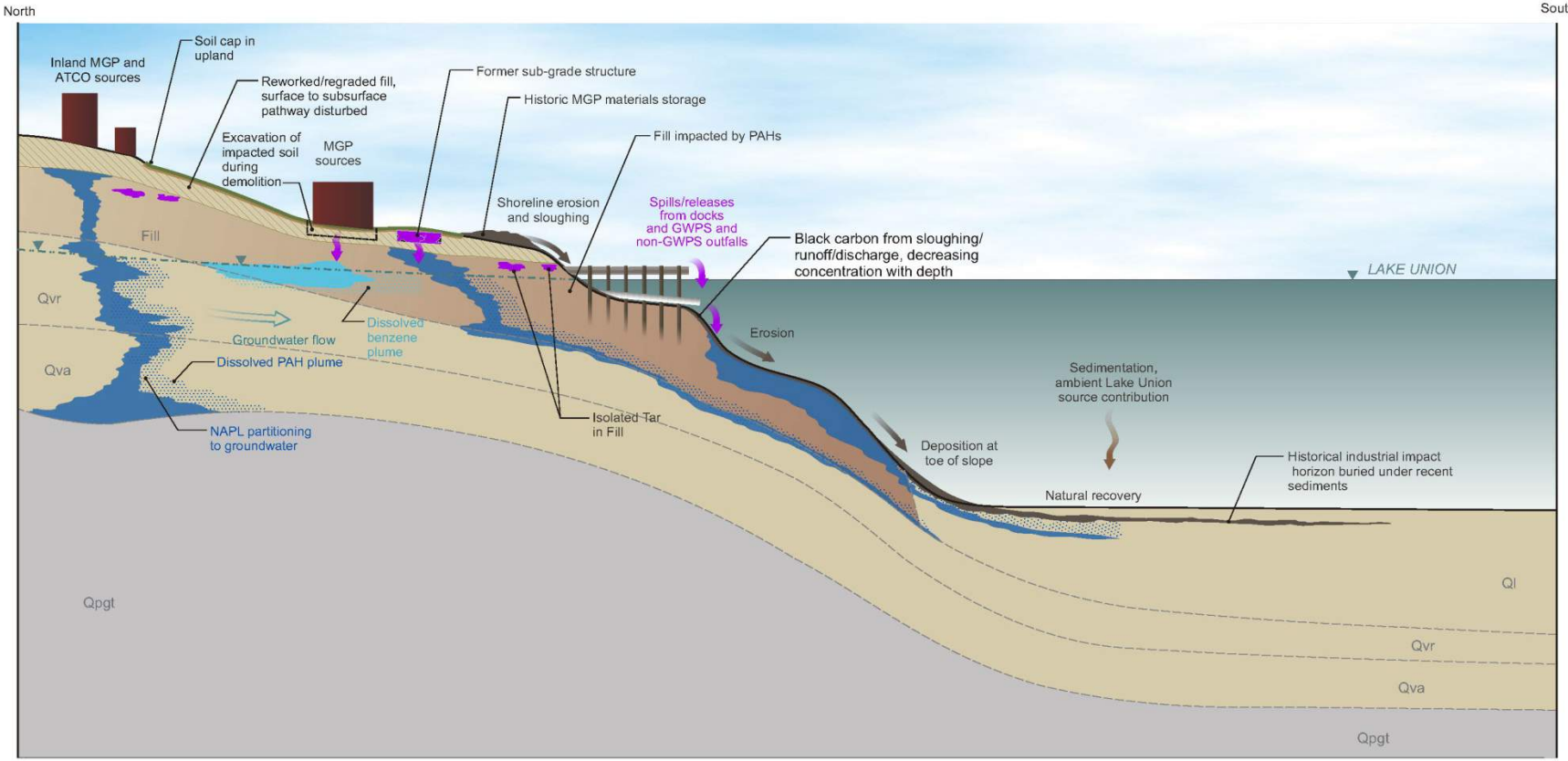
Figure 8-2

Conceptual Site Model



Composite CSM Cross Section

Gas Works Park Site
Seattle, Washington
Remedial Investigation Report

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Agency Review DRAFT

Risk Exposure Pathways

Risk Exposure CSM

Gas Works Park Site
Seattle, Washington
Remedial Investigation Report

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Agency Review DRAFT

Remedial Challenges

- **Very soft sediments with low solids content**
  - Water quality and dredge residuals
- **Presence of DNAPL**
  - Water quality
  - Very difficult to “get to clean”.
- **TPAH Concentrations**
  - Increase with depth
  - Elevated TPAH levels up to 12 ft deep
- **Steep slopes**
  - Geotechnical challenges

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Remedial Approaches Under Consideration

- Multiple capping technologies
- Targeted and limited dredging
- Enhanced Natural Recovery

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Project Milestones

- May 2014 – Draft RI
- 2015 – Complete RI
- 2015/2016 – Feasibility Study
- 2016/2017 Cleanup Action Plan and Consent Decree
- 2017/2018 – **Sediment Cleanup Begins**
- 2020 – Cleanup complete

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