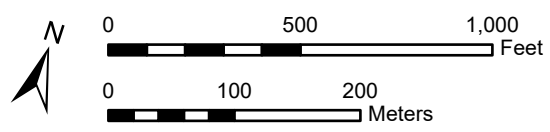


- Recovery Category 1
- Early Action Area
- Middle reach bathymetry<sup>a</sup>**
  - Intertidal area
  - Potential vessel scour area
  - Shoal area
  - Below the navigation depth in the FNC and below potential vessel scour depth outside the FNC
  - Not covered by bathymetric survey
  - Bridge footing
- FNC shoal segment (authorized depth)<sup>b</sup>**
  - RM 0 to RM 2 (-30 ft)
  - RM 2 to RM 2.8 (-20 ft)
  - RM 2.8 to 4.7 (-15 ft)
- LDW middle reach
- King Co tax parcel
- River mile

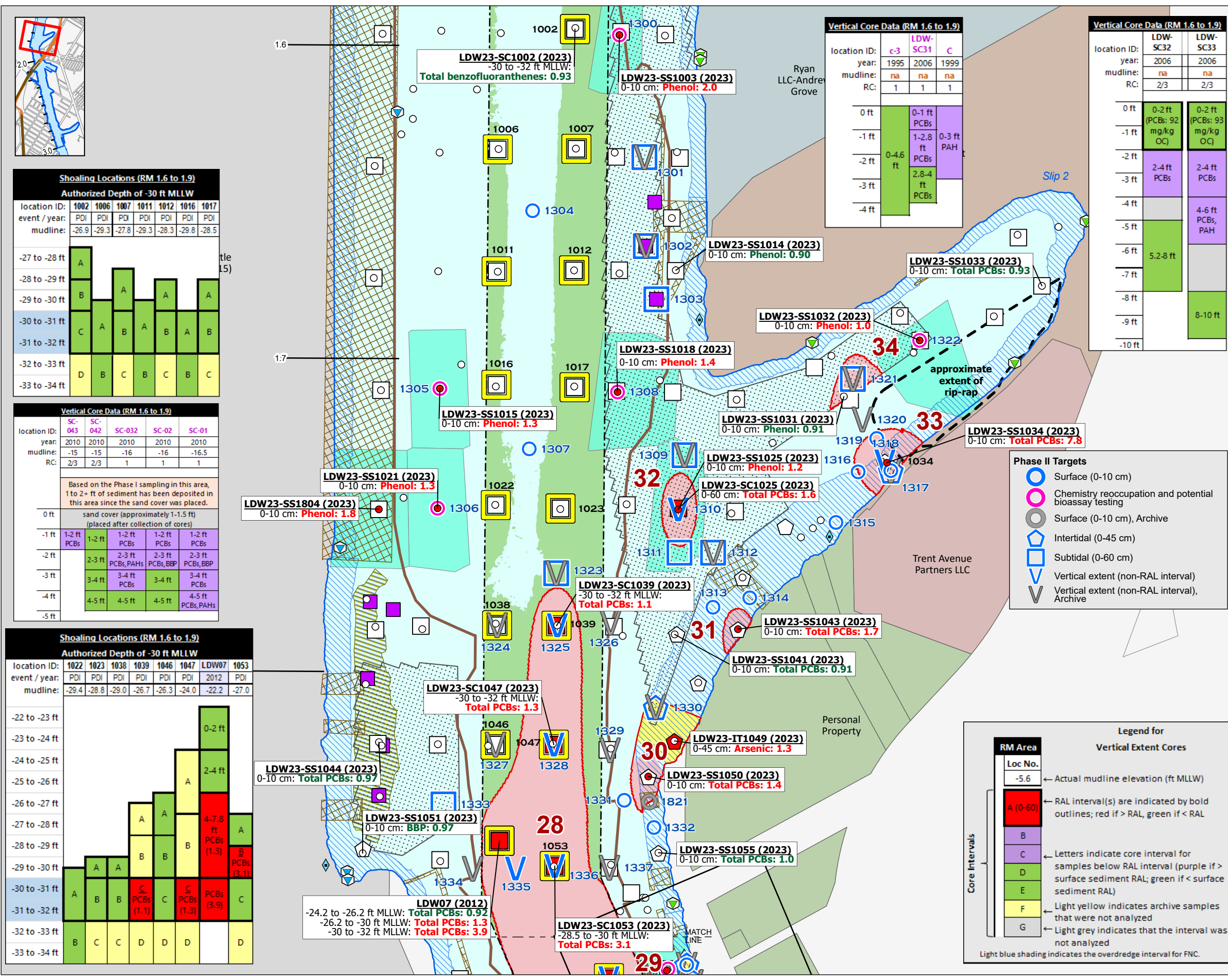
<sup>a</sup> Source: 2021 and 2023 gap-fill middle reach bathymetric survey; 2018 Inlet at RM 2.2W Feasibility Study bathymetry survey; and 2024 River St Shore Protection/bathymetry survey. For the intertidal area, the area between the survey extent and the LDW Superfund Site boundary is inferred.

<sup>b</sup> The USACE Federal Navigation Channel partitioned according to the 2014 ROD.

Prepared by craigh, 6/13/2024, W:\Projects\Duwamish\AC05\GIS\Maps and Analyses\Phase 2\QAPP\Addendum.aprx\Map\_1-1\_7419\_Middle\_reach\_vicinity







**1** RAL exceedance area boundary

Combined sediment PCB indicator kriging RAL exceedance area

Additional Thiessen polygon RAL exceedance area for other COCs

Additional Thiessen polygon RAL exceedance area for phenol-only exceedances

**Surface (0-10 cm) sampling location**

- Exceeds RAL
- Does not exceed RAL

**Intertidal (0-45 cm) core location**

- Exceeds RAL
- Does not exceed RAL

**Subtidal (0-60 cm) core location**

- Exceeds RAL
- Does not exceed RAL

**Other sampling locations**

- Core without appropriate RAL interval
- Shoaling core
- Sample above MHHW<sup>a</sup>
- Private storm drain<sup>b</sup>
- Public storm drain<sup>b</sup>
- Abandoned/inactive outfall<sup>b</sup>
- Recovery Category 1
- Historical USACE overdrudge extent
- Dock/pier
- Sand cover placement
- Intertidal area
- Shoal area
- LDW Superfund Boundary (MHHW)<sup>c</sup>
- King Co tax parcel
- Federal Navigation Channel
- River mile

**Phase II Targets**

- Surface (0-10 cm)
- Chemistry reoccupation and potential bioassay testing
- Surface (0-10 cm), Archive
- Intertidal (0-45 cm)
- Subtidal (0-60 cm)
- Vertical extent (non-RAL interval)
- Vertical extent (non-RAL interval), Archive

**Legend for Vertical Extent Cores**

RM Area	Loc No.	Description
-5.6	-5.6	Actual mudline elevation (ft MLLW)
A (0-60)	A	RAL interval(s) are indicated by bold outlines; red if > RAL, green if < RAL
B	B	Letters indicate core interval for samples below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
C	C	
D	D	
E	E	
F	F	Light yellow indicates archive samples that were not analyzed
G	G	Light grey indicates that the interval was not analyzed

Light blue shading indicates the overdrudge interval for FNC.

**location ID year RAL exceedance**  
**LDW23-SS1003 (2023)**  
 0-10 cm: Phenol: 2.0  
 depth interval chemical factor

<sup>a</sup> Samples collected above the MHHW boundary are not included in the design dataset. The exceedance boxes for these locations have been shaded brown to indicate that they are classified as soil samples, but are shown on these maps for informational purposes.  
<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as updated by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.  
<sup>c</sup> The 2010 MHHW boundary has been updated based on 2021 LIDAR data collected by King County.

0 100 200 Feet  
 0 25 50 Meters

**Map 4-1a. Phase II Sample Locations, RAL Exceedances, and RAL Exceedance Areas Based on the Design Dataset, RM 1.6 to RM 1.85**

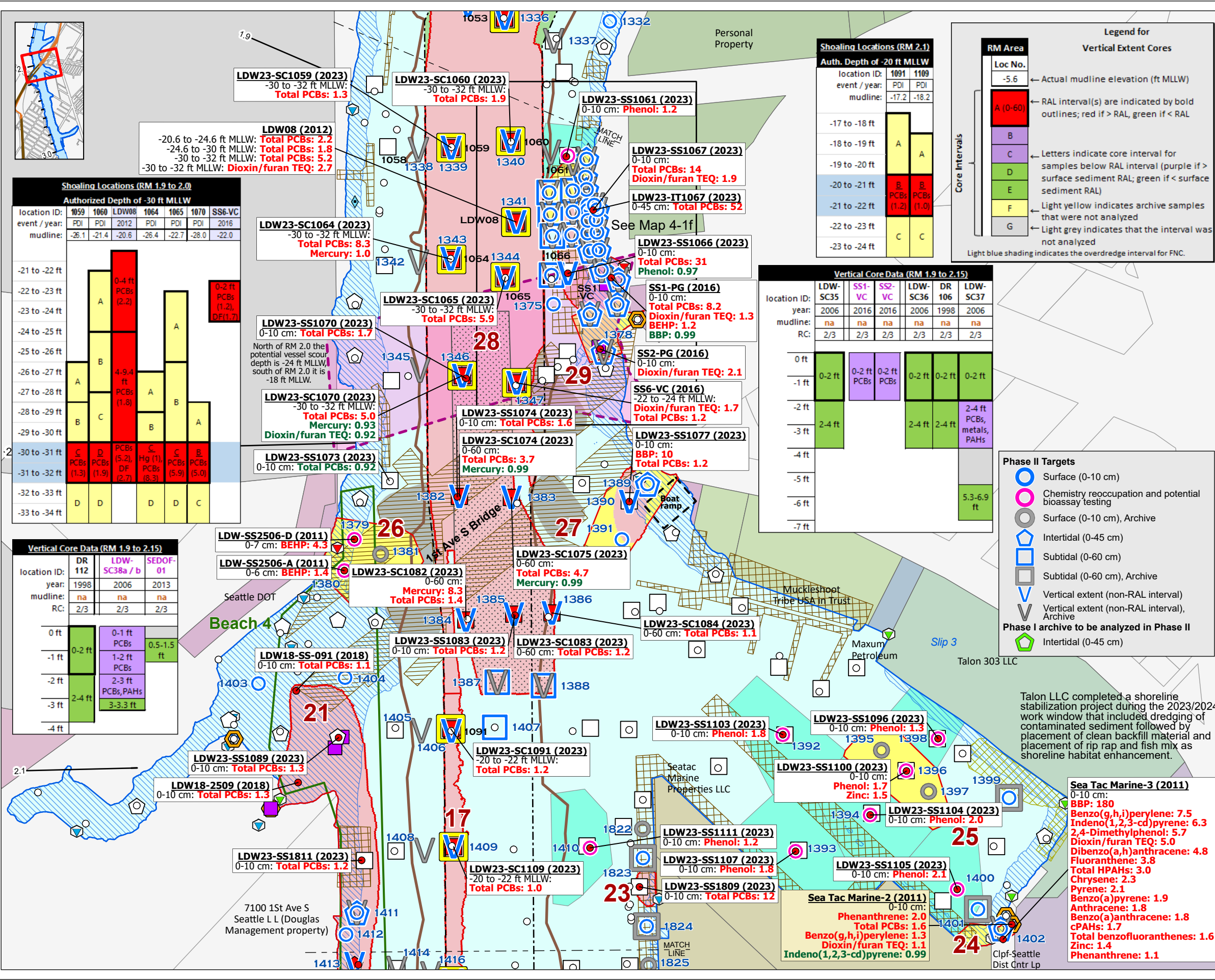
QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH JUNE 12, 2024

**Windward** environmental LLC

**ANCHOR** QEA

**Lower Duwamish Waterway Group**  
 City of Seattle / King County / The Boeing Company





**Legend for Vertical Extent Cores**

- 1 RAL exceedance area boundary
- Combined sediment PCB indicator kriging RAL exceedance area
- Additional Thiessen polygon RAL exceedance area for other COCs
- Additional Thiessen polygon RAL exceedance area for phenol-only exceedances

**Surface (0-10 cm) sampling location**

- Exceeds RAL
- Does not exceed RAL

**Intertidal (0-45 cm) core location**

- Exceeds RAL
- Does not exceed RAL

**Subtidal (0-60 cm) core location**

- Exceeds RAL
- Does not exceed RAL

**Other sampling locations**

- Core without appropriate RAL interval
- Shoaling core
- Sample above MHHW<sup>a</sup>
- CSO<sup>b</sup>
- Private storm drain<sup>b</sup>
- Public storm drain<sup>b</sup>
- Abandoned/inactive outfall<sup>b</sup>
- Pipe of unresolved origin and/or use<sup>b</sup>
- Recovery Category 1
- Utility uncertainty area
- Historical USACE overdrudge extent
- Beach play area
- Bridge
- Dock/pier
- Talon Shoreline Stabilization Project
- Intertidal area
- Shoal area
- Bridge footing
- LDW Superfund Boundary (MHHW)<sup>c</sup>
- King Co tax parcel
- Federal Navigation Channel
- River mile

**Phase II Targets**

- Surface (0-10 cm)
- Chemistry reoccupation and potential bioassay testing
- Surface (0-10 cm), Archive
- Intertidal (0-45 cm)
- Subtidal (0-60 cm)
- Subtidal (0-60 cm), Archive
- Vertical extent (non-RAL interval)
- Vertical extent (non-RAL interval), Archive
- Phase I archive to be analyzed in Phase II
- Intertidal (0-45 cm)

**location ID year RAL exceedance factor**

LDW23-SS1003 (2023) 0-10 cm: Phenol: 2.0

<sup>a</sup> Samples collected above the MHHW boundary are not included in the design dataset. The exceedance boxes for these locations have been shaded brown to indicate that they are classified as soil samples, but are shown on these maps for informational purposes.

<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as updated by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.

<sup>c</sup> The 2010 MHHW boundary has been updated based on 2021 LIDAR data collected by King County.

**Map 4-1b. Phase II Sample Locations, RAL Exceedances, and RAL Exceedance Areas Based on the Design Dataset, RM 1.85 to RM 2.15**

QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH JUNE 12, 2024

**Sea Tac Marine-3 (2011)**

0-10 cm:

- BBP: 180
- Benzo(g,h,i)perylene: 7.5
- Indeno(1,2,3-cd)pyrene: 6.3
- 2,4-Dimethylphenol: 5.7
- Dioxin/furan TEQ: 5.0
- Dibenzo(a,h)anthracene: 4.8
- Fluoranthene: 3.8
- Total HPAHs: 3.0
- Chrysene: 2.3
- Pyrene: 2.1
- Benzo(a)pyrene: 1.9
- Anthracene: 1.8
- Benzo(a)anthracene: 1.8
- cPAHs: 1.7
- Total benzo(a)fluoranthenes: 1.6
- Zinc: 1.4
- Phenanthrene: 1.1

**Sea Tac Marine-2 (2011)**

0-10 cm:

- Phenanthrene: 2.0
- Total PCBs: 1.6
- Benzo(g,h,i)perylene: 1.3
- Dioxin/furan TEQ: 1.1
- Indeno(1,2,3-cd)pyrene: 0.99

**LDW23-SS1096 (2023)**

0-10 cm: Phenol: 1.3

**LDW23-SS1100 (2023)**

0-10 cm: Phenol: 1.7

Zinc: 1.5

**LDW23-SS1104 (2023)**

0-10 cm: Phenol: 2.0

**LDW23-SS1111 (2023)**

0-10 cm: Phenol: 1.2

**LDW23-SS1107 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1809 (2023)**

0-10 cm: Total PCBs: 12

**LDW23-SS1105 (2023)**

0-10 cm: Phenol: 2.1

**LDW23-SS1103 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1091 (2023)**

-20 to -22 ft MLLW: Total PCBs: 1.2

**LDW23-SS1084 (2023)**

0-60 cm: Total PCBs: 1.1

**LDW23-SS1083 (2023)**

0-60 cm: Total PCBs: 1.2

**LDW23-SS1083 (2023)**

0-10 cm: Total PCBs: 1.2

**LDW23-SS1082 (2023)**

0-60 cm: Mercury: 8.3

Total PCBs: 1.4

**LDW23-SS1077 (2023)**

0-10 cm: BBP: 10

Total PCBs: 1.2

**LDW23-SS1074 (2023)**

0-60 cm: Total PCBs: 3.7

Mercury: 0.99

**LDW23-SS1070 (2023)**

0-10 cm: Total PCBs: 1.6

**LDW23-SS1070 (2023)**

0-10 cm: Total PCBs: 1.7

**LDW23-SS1067 (2023)**

0-10 cm: Total PCBs: 14

Dioxin/furan TEQ: 1.9

**LDW23-IT1067 (2023)**

0-45 cm: Total PCBs: 52

**LDW23-SS1061 (2023)**

0-10 cm: Phenol: 1.2

**LDW23-SS1060 (2023)**

-30 to -32 ft MLLW: Total PCBs: 1.9

**LDW23-SS1059 (2023)**

-30 to -32 ft MLLW: Total PCBs: 1.3

**LDW08 (2012)**

-20.6 to -24.6 ft MLLW: Total PCBs: 2.2

-24.6 to -30 ft MLLW: Total PCBs: 1.8

-30 to -32 ft MLLW: Total PCBs: 5.2

-30 to -32 ft MLLW: Dioxin/furan TEQ: 2.7

**LDW23-SS2506-D (2011)**

0-7 cm: BEHP: 4.3

**LDW23-SS2506-A (2011)**

0-6 cm: BEHP: 1.4

**LDW18-SS-091 (2018)**

0-10 cm: Total PCBs: 1.1

**LDW23-SS1089 (2023)**

0-10 cm: Total PCBs: 1.3

**LDW18-2509 (2018)**

0-10 cm: Total PCBs: 1.3

**LDW23-SS1811 (2023)**

0-10 cm: Total PCBs: 1.2

**LDW23-SS1103 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1100 (2023)**

0-10 cm: Phenol: 1.7

Zinc: 1.5

**LDW23-SS1104 (2023)**

0-10 cm: Phenol: 2.0

**LDW23-SS1111 (2023)**

0-10 cm: Phenol: 1.2

**LDW23-SS1107 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1809 (2023)**

0-10 cm: Total PCBs: 12

**LDW23-SS1105 (2023)**

0-10 cm: Phenol: 2.1

**LDW23-SS1103 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1091 (2023)**

-20 to -22 ft MLLW: Total PCBs: 1.2

**LDW23-SS1084 (2023)**

0-60 cm: Total PCBs: 1.1

**LDW23-SS1083 (2023)**

0-60 cm: Total PCBs: 1.2

**LDW23-SS1082 (2023)**

0-60 cm: Mercury: 8.3

Total PCBs: 1.4

**LDW23-SS1077 (2023)**

0-10 cm: BBP: 10

Total PCBs: 1.2

**LDW23-SS1074 (2023)**

0-60 cm: Total PCBs: 3.7

Mercury: 0.99

**LDW23-SS1070 (2023)**

0-10 cm: Total PCBs: 1.6

**LDW23-SS1070 (2023)**

0-10 cm: Total PCBs: 1.7

**LDW23-SS1067 (2023)**

0-10 cm: Total PCBs: 14

Dioxin/furan TEQ: 1.9

**LDW23-IT1067 (2023)**

0-45 cm: Total PCBs: 52

**LDW23-SS1061 (2023)**

0-10 cm: Phenol: 1.2

**LDW23-SS1060 (2023)**

-30 to -32 ft MLLW: Total PCBs: 1.9

**LDW23-SS1059 (2023)**

-30 to -32 ft MLLW: Total PCBs: 1.3

**LDW08 (2012)**

-20.6 to -24.6 ft MLLW: Total PCBs: 2.2

-24.6 to -30 ft MLLW: Total PCBs: 1.8

-30 to -32 ft MLLW: Total PCBs: 5.2

-30 to -32 ft MLLW: Dioxin/furan TEQ: 2.7

**LDW23-SS2506-D (2011)**

0-7 cm: BEHP: 4.3

**LDW23-SS2506-A (2011)**

0-6 cm: BEHP: 1.4

**LDW18-SS-091 (2018)**

0-10 cm: Total PCBs: 1.1

**LDW23-SS1089 (2023)**

0-10 cm: Total PCBs: 1.3

**LDW18-2509 (2018)**

0-10 cm: Total PCBs: 1.3

**LDW23-SS1811 (2023)**

0-10 cm: Total PCBs: 1.2

**LDW23-SS1103 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1100 (2023)**

0-10 cm: Phenol: 1.7

Zinc: 1.5

**LDW23-SS1104 (2023)**

0-10 cm: Phenol: 2.0

**LDW23-SS1111 (2023)**

0-10 cm: Phenol: 1.2

**LDW23-SS1107 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1809 (2023)**

0-10 cm: Total PCBs: 12

**LDW23-SS1105 (2023)**

0-10 cm: Phenol: 2.1

**LDW23-SS1103 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1091 (2023)**

-20 to -22 ft MLLW: Total PCBs: 1.2

**LDW23-SS1084 (2023)**

0-60 cm: Total PCBs: 1.1

**LDW23-SS1083 (2023)**

0-60 cm: Total PCBs: 1.2

**LDW23-SS1082 (2023)**

0-60 cm: Mercury: 8.3

Total PCBs: 1.4

**LDW23-SS1077 (2023)**

0-10 cm: BBP: 10

Total PCBs: 1.2

**LDW23-SS1074 (2023)**

0-60 cm: Total PCBs: 3.7

Mercury: 0.99

**LDW23-SS1070 (2023)**

0-10 cm: Total PCBs: 1.6

**LDW23-SS1070 (2023)**

0-10 cm: Total PCBs: 1.7

**LDW23-SS1067 (2023)**

0-10 cm: Total PCBs: 14

Dioxin/furan TEQ: 1.9

**LDW23-IT1067 (2023)**

0-45 cm: Total PCBs: 52

**LDW23-SS1061 (2023)**

0-10 cm: Phenol: 1.2

**LDW23-SS1060 (2023)**

-30 to -32 ft MLLW: Total PCBs: 1.9

**LDW23-SS1059 (2023)**

-30 to -32 ft MLLW: Total PCBs: 1.3

**LDW08 (2012)**

-20.6 to -24.6 ft MLLW: Total PCBs: 2.2

-24.6 to -30 ft MLLW: Total PCBs: 1.8

-30 to -32 ft MLLW: Total PCBs: 5.2

-30 to -32 ft MLLW: Dioxin/furan TEQ: 2.7

**LDW23-SS2506-D (2011)**

0-7 cm: BEHP: 4.3

**LDW23-SS2506-A (2011)**

0-6 cm: BEHP: 1.4

**LDW18-SS-091 (2018)**

0-10 cm: Total PCBs: 1.1

**LDW23-SS1089 (2023)**

0-10 cm: Total PCBs: 1.3

**LDW18-2509 (2018)**

0-10 cm: Total PCBs: 1.3

**LDW23-SS1811 (2023)**

0-10 cm: Total PCBs: 1.2

**LDW23-SS1103 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1100 (2023)**

0-10 cm: Phenol: 1.7

Zinc: 1.5

**LDW23-SS1104 (2023)**

0-10 cm: Phenol: 2.0

**LDW23-SS1111 (2023)**

0-10 cm: Phenol: 1.2

**LDW23-SS1107 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1809 (2023)**

0-10 cm: Total PCBs: 12

**LDW23-SS1105 (2023)**

0-10 cm: Phenol: 2.1

**LDW23-SS1103 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1091 (2023)**

-20 to -22 ft MLLW: Total PCBs: 1.2

**LDW23-SS1084 (2023)**

0-60 cm: Total PCBs: 1.1

**LDW23-SS1083 (2023)**

0-60 cm: Total PCBs: 1.2

**LDW23-SS1082 (2023)**

0-60 cm: Mercury: 8.3

Total PCBs: 1.4

**LDW23-SS1077 (2023)**

0-10 cm: BBP: 10

Total PCBs: 1.2

**LDW23-SS1074 (2023)**

0-60 cm: Total PCBs: 3.7

Mercury: 0.99

**LDW23-SS1070 (2023)**

0-10 cm: Total PCBs: 1.6

**LDW23-SS1070 (2023)**

0-10 cm: Total PCBs: 1.7

**LDW23-SS1067 (2023)**

0-10 cm: Total PCBs: 14

Dioxin/furan TEQ: 1.9

**LDW23-IT1067 (2023)**

0-45 cm: Total PCBs: 52

**LDW23-SS1061 (2023)**

0-10 cm: Phenol: 1.2

**LDW23-SS1060 (2023)**

-30 to -32 ft MLLW: Total PCBs: 1.9

**LDW23-SS1059 (2023)**

-30 to -32 ft MLLW: Total PCBs: 1.3

**LDW08 (2012)**

-20.6 to -24.6 ft MLLW: Total PCBs: 2.2

-24.6 to -30 ft MLLW: Total PCBs: 1.8

-30 to -32 ft MLLW: Total PCBs: 5.2

-30 to -32 ft MLLW: Dioxin/furan TEQ: 2.7

**LDW23-SS2506-D (2011)**

0-7 cm: BEHP: 4.3

**LDW23-SS2506-A (2011)**

0-6 cm: BEHP: 1.4

**LDW18-SS-091 (2018)**

0-10 cm: Total PCBs: 1.1

**LDW23-SS1089 (2023)**

0-10 cm: Total PCBs: 1.3

**LDW18-2509 (2018)**

0-10 cm: Total PCBs: 1.3

**LDW23-SS1811 (2023)**

0-10 cm: Total PCBs: 1.2

**LDW23-SS1103 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1100 (2023)**

0-10 cm: Phenol: 1.7

Zinc: 1.5

**LDW23-SS1104 (2023)**

0-10 cm: Phenol: 2.0

**LDW23-SS1111 (2023)**

0-10 cm: Phenol: 1.2

**LDW23-SS1107 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1809 (2023)**

0-10 cm: Total PCBs: 12

**LDW23-SS1105 (2023)**

0-10 cm: Phenol: 2.1

**LDW23-SS1103 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1091 (2023)**

-20 to -22 ft MLLW: Total PCBs: 1.2

**LDW23-SS1084 (2023)**

0-60 cm: Total PCBs: 1.1

**LDW23-SS1083 (2023)**

0-60 cm: Total PCBs: 1.2

**LDW23-SS1082 (2023)**

0-60 cm: Mercury: 8.3

Total PCBs: 1.4

**LDW23-SS1077 (2023)**

0-10 cm: BBP: 10

Total PCBs: 1.2

**LDW23-SS1074 (2023)**

0-60 cm: Total PCBs: 3.7

Mercury: 0.99

**LDW23-SS1070 (2023)**

0-10 cm: Total PCBs: 1.6

**LDW23-SS1070 (2023)**

0-10 cm: Total PCBs: 1.7

**LDW23-SS1067 (2023)**

0-10 cm: Total PCBs: 14

Dioxin/furan TEQ: 1.9

**LDW23-IT1067 (2023)**

0-45 cm: Total PCBs: 52

**LDW23-SS1061 (2023)**

0-10 cm: Phenol: 1.2

**LDW23-SS1060 (2023)**

-30 to -32 ft MLLW: Total PCBs: 1.9

**LDW23-SS1059 (2023)**

-30 to -32 ft MLLW: Total PCBs: 1.3

**LDW08 (2012)**

-20.6 to -24.6 ft MLLW: Total PCBs: 2.2

-24.6 to -30 ft MLLW: Total PCBs: 1.8

-30 to -32 ft MLLW: Total PCBs: 5.2

-30 to -32 ft MLLW: Dioxin/furan TEQ: 2.7

**LDW23-SS2506-D (2011)**

0-7 cm: BEHP: 4.3

**LDW23-SS2506-A (2011)**

0-6 cm: BEHP: 1.4

**LDW18-SS-091 (2018)**

0-10 cm: Total PCBs: 1.1

**LDW23-SS1089 (2023)**

0-10 cm: Total PCBs: 1.3

**LDW18-2509 (2018)**

0-10 cm: Total PCBs: 1.3

**LDW23-SS1811 (2023)**

0-10 cm: Total PCBs: 1.2

**LDW23-SS1103 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1100 (2023)**

0-10 cm: Phenol: 1.7

Zinc: 1.5

**LDW23-SS1104 (2023)**

0-10 cm: Phenol: 2.0

**LDW23-SS1111 (2023)**

0-10 cm: Phenol: 1.2

**LDW23-SS1107 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1809 (2023)**

0-10 cm: Total PCBs: 12

**LDW23-SS1105 (2023)**

0-10 cm: Phenol: 2.1

**LDW23-SS1103 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1091 (2023)**

-20 to -22 ft MLLW: Total PCBs: 1.2

**LDW23-SS1084 (2023)**

0-60 cm: Total PCBs: 1.1

**LDW23-SS1083 (2023)**

0-60 cm: Total PCBs: 1.2

**LDW23-SS1082 (2023)**

0-60 cm: Mercury: 8.3

Total PCBs: 1.4

**LDW23-SS1077 (2023)**

0-10 cm: BBP: 10

Total PCBs: 1.2

**LDW23-SS1074 (2023)**

0-60 cm: Total PCBs: 3.7

Mercury: 0.99

**LDW23-SS1070 (2023)**

0-10 cm: Total PCBs: 1.6

**LDW23-SS1070 (2023)**

0-10 cm: Total PCBs: 1.7

**LDW23-SS1067 (2023)**

0-10 cm: Total PCBs: 14

Dioxin/furan TEQ: 1.9

**LDW23-IT1067 (2023)**

0-45 cm: Total PCBs: 52

**LDW23-SS1061 (2023)**

0-10 cm: Phenol: 1.2

**LDW23-SS1060 (2023)**

-30 to -32 ft MLLW: Total PCBs: 1.9

**LDW23-SS1059 (2023)**

-30 to -32 ft MLLW: Total PCBs: 1.3

**LDW08 (2012)**

-20.6 to -24.6 ft MLLW: Total PCBs: 2.2

-24.6 to -30 ft MLLW: Total PCBs: 1.8

-30 to -32 ft MLLW: Total PCBs: 5.2

-30 to -32 ft MLLW: Dioxin/furan TEQ: 2.7

**LDW23-SS2506-D (2011)**

0-7 cm: BEHP: 4.3

**LDW23-SS2506-A (2011)**

0-6 cm: BEHP: 1.4

**LDW18-SS-091 (2018)**

0-10 cm: Total PCBs: 1.1

**LDW23-SS1089 (2023)**

0-10 cm: Total PCBs: 1.3

**LDW18-2509 (2018)**

0-10 cm: Total PCBs: 1.3

**LDW23-SS1811 (2023)**

0-10 cm: Total PCBs: 1.2

**LDW23-SS1103 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1100 (2023)**

0-10 cm: Phenol: 1.7

Zinc: 1.5

**LDW23-SS1104 (2023)**

0-10 cm: Phenol: 2.0

**LDW23-SS1111 (2023)**

0-10 cm: Phenol: 1.2

**LDW23-SS1107 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1809 (2023)**

0-10 cm: Total PCBs: 12

**LDW23-SS1105 (2023)**

0-10 cm: Phenol: 2.1

**LDW23-SS1103 (2023)**

0-10 cm: Phenol: 1.8

**LDW23-SS1091 (2023)**

-20 to -22 ft MLLW: Total PCBs: 1.2

**LDW23-SS1084 (2023)**

0-60 cm: Total PCBs: 1.1

**LDW23-SS1083 (2023)**

0-60 cm: Total PCBs: 1.2

**LDW23-SS1082 (2023)**

0-60 cm: Mercury: 8.3

Total PCBs: 1.4

**LDW23-SS1077 (2023)**

0-10 cm: BBP: 10

Total PCBs: 1.2

**LDW23-SS1074 (2023)**

0-60 cm: Total PCBs: 3.7

Mercury: 0.99

**LDW23-SS1070 (2023)**

0-10 cm: Total PCBs: 1.6

**LDW23-SS1070 (2023)**

0-10 cm: Total PCBs: 1.7

**LDW23-SS1067 (2023)**

0-10 cm: Total PCBs: 14

Dioxin/furan TEQ: 1.9

**LDW23-IT1067 (2023)**

0-45 cm: Total PCBs: 52

**LDW23-SS1061 (2023)**

0-10 cm: Phenol: 1.2

**LDW23-SS1060 (2023)**

-30 to -32 ft MLLW: Total PCBs: 1.9

**LDW23-SS1059 (2023)**

-30 to -32 ft MLLW: Total PCBs: 1.3

**LDW08 (2012)**

-20.6 to -24.6 ft MLLW: Total PCBs: 2.2

-24.6 to -30 ft MLLW: Total PCBs: 1.8

-30 to -32 ft MLLW: Total PCBs: 5.2

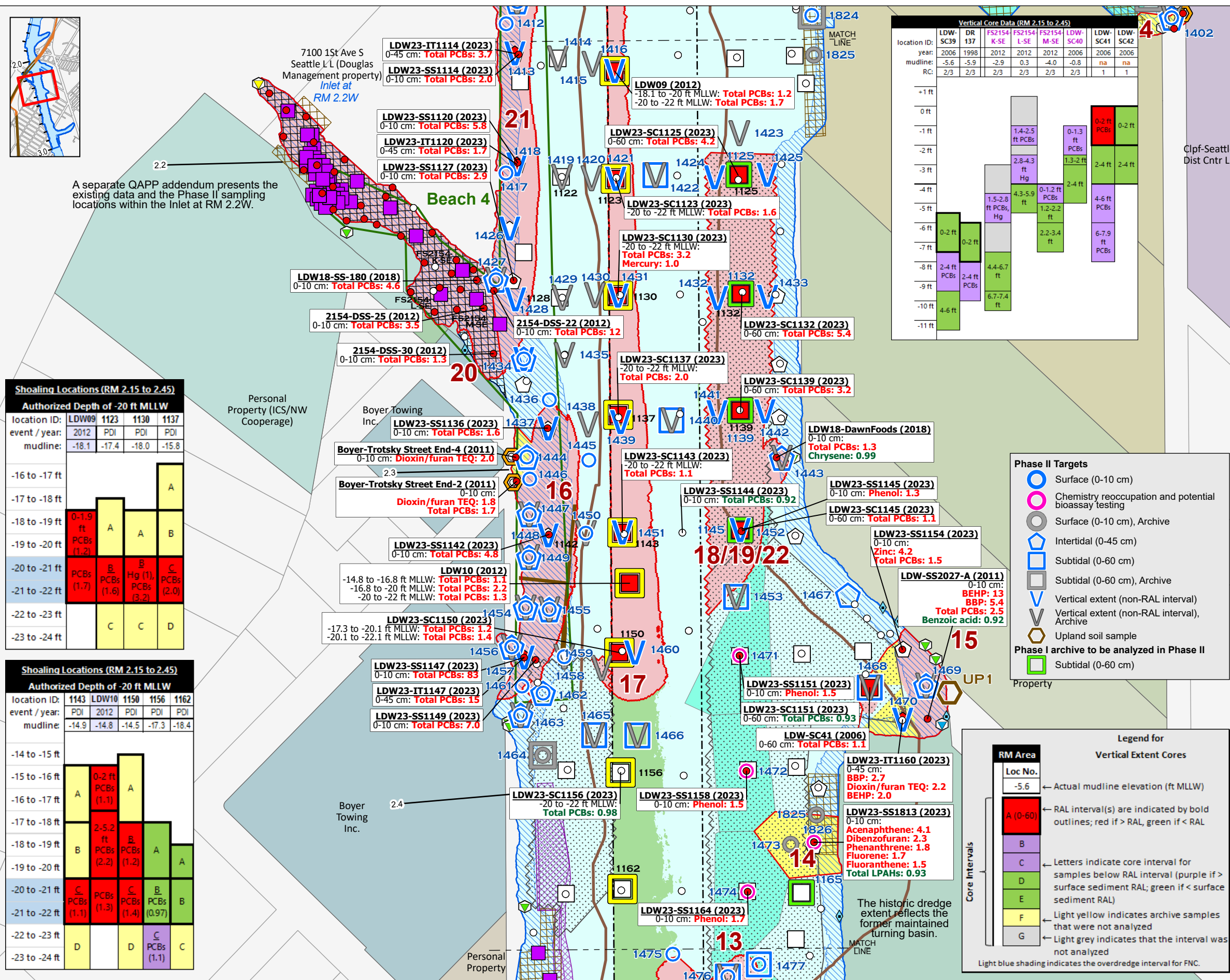
-30 to -32 ft MLLW: Dioxin/furan TEQ: 2.7

**LDW23-SS2506-D (2011)**

0-7 cm: BEHP: 4.3

**LDW23-SS2506-A (2011)**





**Vertical Core Data (RM 2.15 to 2.45)**

location ID:	LDW-SC39	DR 137	FS2154 K-SE	FS2154 L-SE	FS2154 M-SE	LDW-SC40	LDW-SC41	LDW-SC42
year:	2006	1998	2012	2012	2012	2006	2006	2006
mudline:	-5.6	-5.9	-2.9	0.3	-4.0	-0.8	na	na
RC:	2/3	2/3	2/3	2/3	2/3	2/3	1	1

**Surface (0-10 cm) sampling location**

- Exceeds RAL
- Does not exceed RAL

**Intertidal (0-45 cm) core location**

- ⬠ Exceeds RAL
- ⬡ Does not exceed RAL

**Subtidal (0-60 cm) core location**

- Exceeds RAL
- Does not exceed RAL

**Other sampling locations**

- ⬢ Core without appropriate RAL interval
- ⬣ Shoaling core
- ⬤ Sample above MHHW<sup>a</sup>
- ⬥ Private storm drain<sup>b</sup>
- ⬦ Public storm drain<sup>b</sup>
- ⬧ Reservoir overflow<sup>b</sup>
- ⬨ Abandoned/inactive outfall<sup>b</sup>
- ⬩ Pipe of unresolved origin and/or use<sup>b</sup>
- ⬪ Recovery Category 1
- ⬫ Historical USACE overdrudge extent
- ⬬ Beach play area
- ⬭ Dock/pier
- ⬮ Marina
- ⬯ Boyer maintenance dredging (2012)
- ⬰ Intertidal area
- ⬱ Shoal area
- ⬲ LDW Superfund Boundary (MHHW)<sup>c</sup>
- ⬳ King Co tax parcel
- ⬴ Federal Navigation Channel
- ⬵ River mile

**Phase II Targets**

- Surface (0-10 cm)
- ⬢ Chemistry reoccupation and potential bioassay testing
- Surface (0-10 cm), Archive
- ⬢ Intertidal (0-45 cm)
- ⬢ Subtidal (0-60 cm)
- Surface (0-10 cm), Archive
- ⬢ Subtidal (0-60 cm), Archive
- ⬢ Vertical extent (non-RAL interval)
- ⬢ Vertical extent (non-RAL interval), Archive
- ⬢ Upland soil sample
- ⬢ Subtidal (0-60 cm)

**Phase I archive to be analyzed in Phase II**

- ⬢ Subtidal (0-60 cm)

**Legend for Vertical Extent Cores**

RM Area	Loc No.	Actual mudline elevation (ft MLLW)
A (0-60)	-5.6	← Actual mudline elevation (ft MLLW)
	A (0-60)	← RAL interval(s) are indicated by bold outlines; red if > RAL, green if < RAL
	B	← Letters indicate core interval for samples below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
	C	← Letters indicate core interval for samples below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
	D	← Letters indicate core interval for samples below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
	E	← Letters indicate core interval for samples below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
	F	← Letters indicate core interval for samples below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
G	← Letters indicate core interval for samples below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)	

**Legend for Core Intervals**

- Light yellow indicates archive samples that were not analyzed
- Light grey indicates that the interval was not analyzed
- Light blue shading indicates the overdrudge interval for FNC.

**Scale**

0 100 200 Feet

0 25 50 Meters

**Map 4-1c. Phase II Sample Locations, RAL Exceedances, and RAL Exceedance Areas Based on the Design Dataset, RM 2.15 to RM 2.45**

**QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH**      JUNE 12, 2024

**Windward environmental LLC**      **ANCHOR QEA**

**Lower Duwamish Waterway Group**

City of Seattle / King County / The Boeing Company

**Footnote:** <sup>a</sup> Samples collected above the MHHW boundary are not included in the design dataset. The exceedance boxes for these locations have been shaded brown to indicate that they are classified as soil samples, but are shown on these maps for informational purposes. <sup>b</sup> Outfalls are based on the Ecology 2020 survey, as updated by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology. <sup>c</sup> The 2010 MHHW boundary has been updated based on 2021 LIDAR data collected by King County.

**Shoaling Locations (RM 2.15 to 2.45)**

Authorized Depth of -20 ft MLLW

location ID:	LDW09	1123	1130	1137
event / year:	2012	2012	2012	2012
mudline:	-18.1	-17.4	-18.0	-15.8

-16 to -17 ft				A
-17 to -18 ft		A	A	B
-18 to -19 ft	0-1.9 ft PCBs (1.2)	A	A	B
-19 to -20 ft	PCBs (1.7)	B	B	C
-20 to -21 ft	PCBs (1.7)	B	B	C
-21 to -22 ft	PCBs (1.7)	B	B	C
-22 to -23 ft		C	C	D
-23 to -24 ft		C	C	D

**Shoaling Locations (RM 2.15 to 2.45)**

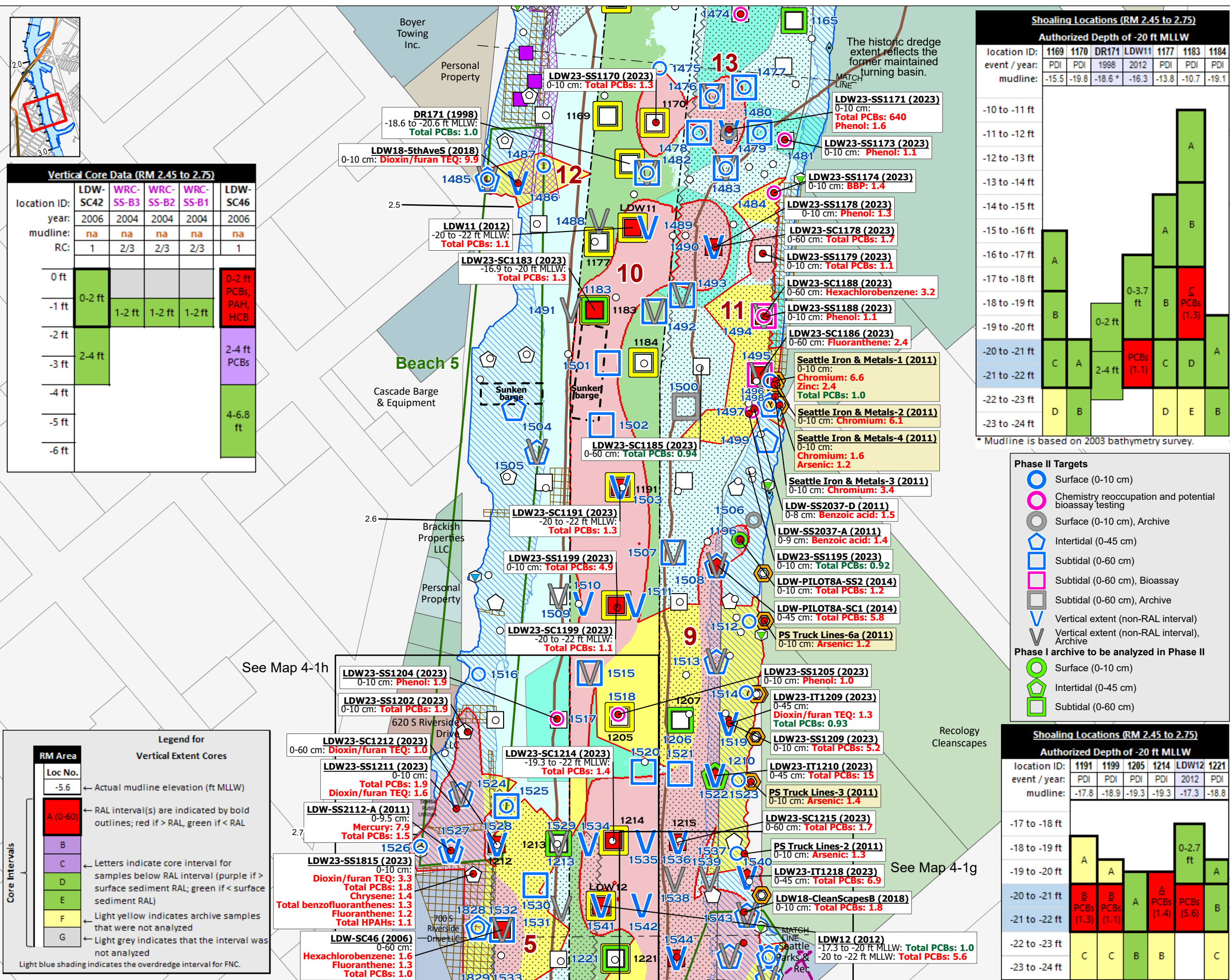
Authorized Depth of -20 ft MLLW

location ID:	1143	LDW10	1150	1156	1162
event / year:	2012	2012	2012	2012	2012
mudline:	-14.9	-14.8	-14.5	-17.3	-18.4

-14 to -15 ft					
-15 to -16 ft	A	0-2 ft PCBs (1.1)	A		
-16 to -17 ft	A	2-5.2 ft PCBs (2.2)	B	A	A
-17 to -18 ft	B	PCBs (1.2)	A	A	
-18 to -19 ft	B	PCBs (1.4)	A	A	
-19 to -20 ft	B	PCBs (1.3)	B	B	B
-20 to -21 ft	C	PCBs (1.1)	B	B	B
-21 to -22 ft	C	PCBs (1.3)	B	B	B
-22 to -23 ft	D	PCBs (1.1)	C	C	C
-23 to -24 ft	D	PCBs (1.1)	C	C	C



Prepared by craigh, 6/13/2024, W:\Projects\Duwamish ACCS\GIS\Maps and Analyses\Phase II QAPP Addendum.aprx\Map 4-1a-e 7549 Phase II Targets.wpcB and Th.poly



**Vertical Core Data (RM 2.45 to 2.75)**

location ID:	LDW-SC42	WRC-SS-B3	WRC-SS-B2	WRC-SS-B1	LDW-SC46
year:	2006	2004	2004	2004	2006
mudline:	na	na	na	na	na
RC:	1	2/3	2/3	2/3	1
0 ft					0-2 ft PCBs, PAH, HCB
-1 ft	0-2 ft	1-2 ft	1-2 ft	1-2 ft	
-2 ft					2-4 ft PCBs
-3 ft	2-4 ft				
-4 ft					4-6.8 ft
-5 ft					
-6 ft					

**Shoaling Locations (RM 2.45 to 2.75)**

Authorized Depth of -20 ft MLLW

location ID:	1169	1170	DR171	LDW11	1177	1183	1184
event / year:	PDI	PDI	1998	2012	PDI	PDI	PDI
mudline:	-15.5	-19.8	-18.6*	-16.3	-13.8	-10.7	-19.1

**Phase II Targets**

- Surface (0-10 cm)
- Chemistry reoccupation and potential bioassay testing
- Surface (0-10 cm), Archive
- Intertidal (0-45 cm)
- Subtidal (0-60 cm)
- Subtidal (0-60 cm), Bioassay
- Subtidal (0-60 cm), Archive
- Vertical extent (non-RAL interval)
- Vertical extent (non-RAL interval), Archive

**Phase I archive to be analyzed in Phase II**

- Surface (0-10 cm)
- Intertidal (0-45 cm)
- Subtidal (0-60 cm)

**Legend**

- 1 RAL exceedance area boundary
- Combined sediment PCB indicator kriging RAL exceedance area
- Additional Thiessen polygon RAL exceedance area for other COCs
- Additional Thiessen polygon RAL exceedance area for phenol-only exceedances

**Surface (0-10 cm) sampling location**

- Exceeds RAL
- Does not exceed RAL

**Intertidal (0-45 cm) core location**

- Exceeds RAL
- Does not exceed RAL

**Subtidal (0-60 cm) core location**

- Exceeds RAL
- Does not exceed RAL

**Other sampling locations**

- Core without appropriate RAL interval
- Shoaling core
- Sample above MHHW<sup>a</sup>
- Private storm drain<sup>b</sup>
- Public storm drain<sup>b</sup>
- Stream, channel, or ditch<sup>b</sup>
- Abandoned/inactive outfall<sup>b</sup>
- Recovery Category 1
- Utility uncertainty area
- Historical USACE over dredge extent
- Beach play area
- Dock/pier
- Boyer maintenance dredging (2012)
- Intertidal area
- Shoal area
- LDW Superfund Boundary (MHHW)<sup>c</sup>
- King Co tax parcel
- Federal Navigation Channel
- River mile

**Legend for Vertical Extent Cores**

RM Area	Loc No.
-5.6	-5.6
A (0-60)	A (0-60)
B	B
C	C
D	D
E	E
F	F
G	G

Actual mudline elevation (ft MLLW)

RAL interval(s) are indicated by bold outlines; red if > RAL, green if < RAL

Letters indicate core interval for samples below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)

Light yellow indicates archive samples that were not analyzed

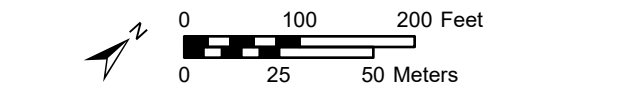
Light grey indicates that the interval was not analyzed

Light blue shading indicates the over dredge interval for FNC.

<sup>a</sup> Samples collected above the MHHW boundary are not included in the design dataset. The exceedance boxes for these locations have been shaded brown to indicate that they are classified as soil samples, but are shown on these maps for informational purposes.

<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as updated by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.

<sup>c</sup> The 2010 MHHW boundary has been updated based on 2021 LIDAR data collected by King County.



**Map 4-1d. Phase II Sample Locations, RAL Exceedances, and RAL Exceedance Areas Based on the Design Dataset, RM 2.45 to RM 2.75**

QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH JUNE 12, 2024

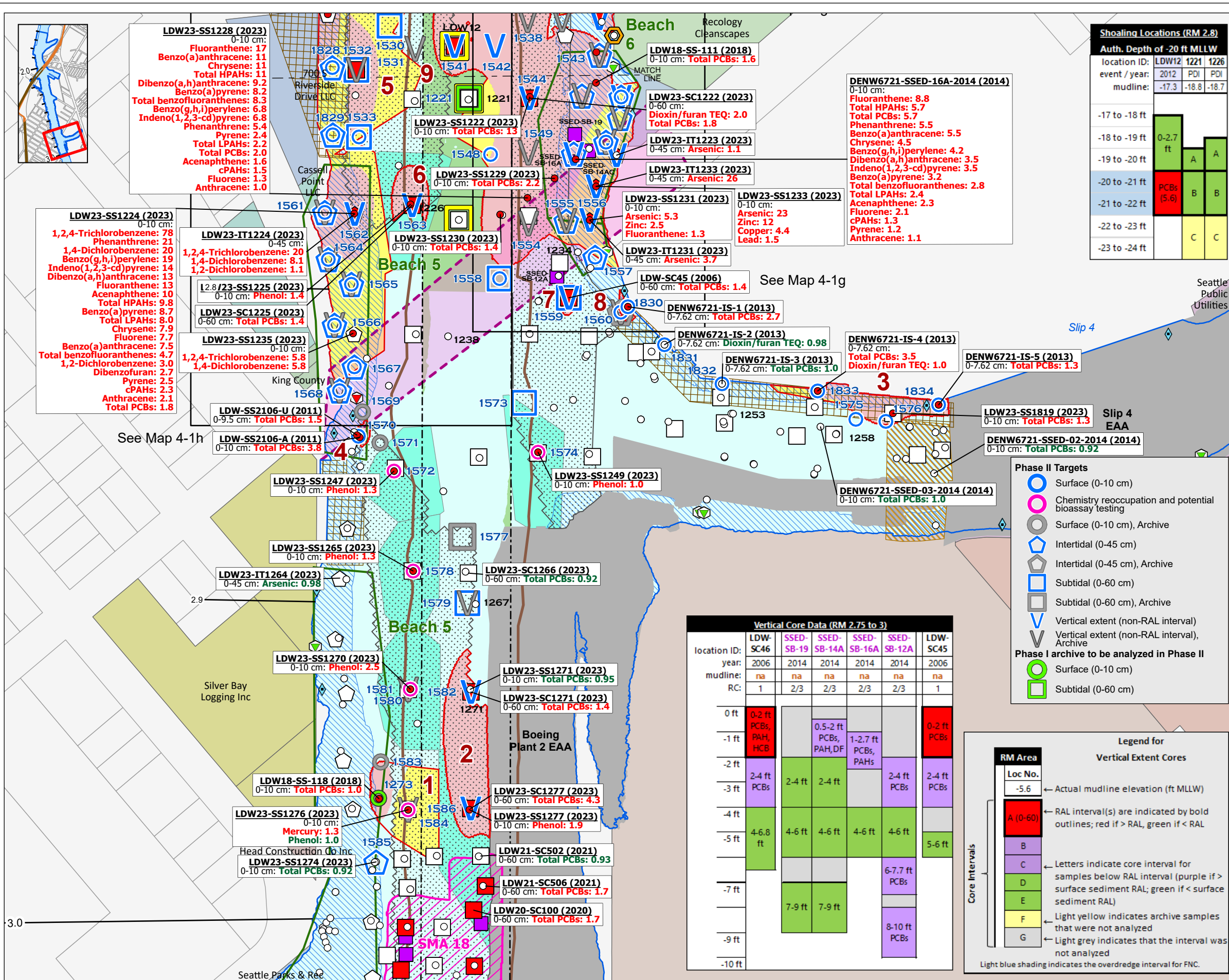
**Windward environmental LLC**

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**Lower Duwamish Waterway Group**

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**Shoaling Locations (RM 2.8)**

location ID:	LDW12	1221	1226
Auth. Depth of -20 ft MLLW			
event / year:	2012	PDI	PDI
mudline:	-17.3	-18.8	-18.7

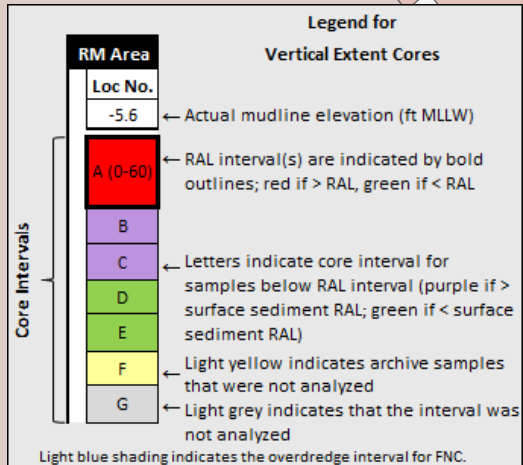
-17 to -18 ft			
-18 to -19 ft	0-2.7 ft	A	A
-19 to -20 ft		B	B
-20 to -21 ft	PCBs (5.6)		
-21 to -22 ft		C	C
-22 to -23 ft			
-23 to -24 ft			

**Vertical Core Data (RM 2.75 to 3)**

location ID:	LDW-SC46	SSED-SB-19	SSED-SB-14A	SSED-SB-16A	SSED-SB-12A	LDW-SC45
year:	2006	2014	2014	2014	2014	2006
mudline:	na	na	na	na	na	na
RC:	1	2/3	2/3	2/3	2/3	1

0 ft	0-2 ft PCBs, PAH, HCB		0.5-2 ft PCBs, PAH, DF	1-2.7 ft PCBs, PAHs		0-2 ft PCBs
-1 ft						
-2 ft	2-4 ft PCBs	2-4 ft	2-4 ft	2-4 ft PCBs	2-4 ft PCBs	2-4 ft PCBs
-3 ft						
-4 ft	4-6 ft	4-6 ft	4-6 ft	4-6 ft	4-6 ft	4-6 ft
-5 ft						5-6 ft
-6 ft						
-7 ft						6-7.7 ft PCBs
-8 ft						
-9 ft						8-10 ft PCBs
-10 ft						



**1** RAL exceedance area boundary

Combined sediment PCB indicator kriging RAL exceedance area

Additional Thiessen polygon RAL exceedance area for other COCs

Additional Thiessen polygon RAL exceedance area for phenol-only exceedances

**Surface (0-10 cm) sampling location**

- Exceeds RAL
- Does not exceed RAL

**Intertidal (0-45 cm) core location**

- Exceeds RAL
- Does not exceed RAL

**Subtidal (0-60 cm) core location**

- Exceeds RAL
- Does not exceed RAL

**Other sampling locations**

- Core without appropriate RAL interval
- Shoaling core
- Sample above MHHW<sup>a</sup>
- CSO<sup>b</sup>
- Private storm drain<sup>b</sup>
- Abandoned/inactive outfall<sup>b</sup>
- Recovery Category 1
- Utility uncertainty area
- Historical USACE overdredge extent
- Upper reach SMA Boundary
- Beach play area
- Dock/pier
- Early Action Area
- Boundary area thin-layer placement
- Intertidal area
- Shoal area
- LDW Superfund Boundary (MHHW)<sup>c</sup>
- King Co tax parcel
- Federal Navigation Channel
- River mile

**Phase II Targets**

- Surface (0-10 cm)
- Chemistry reoccupation and potential bioassay testing
- Surface (0-10 cm), Archive
- Intertidal (0-45 cm)
- Intertidal (0-45 cm), Archive
- Subtidal (0-60 cm)
- Subtidal (0-60 cm), Archive
- Vertical extent (non-RAL interval)
- Vertical extent (non-RAL interval), Archive

**Phase I archive to be analyzed in Phase II**

- Surface (0-10 cm)
- Subtidal (0-60 cm)

location ID year RAL exceedance factor  
LDW23-SS1003 (2023) 0-10 cm: Phenol: 2.0  
depth interval chemical

<sup>a</sup> Samples collected above the MHHW boundary are not included in the design dataset. The exceedance boxes for these locations have been shaded brown to indicate that they are classified as soil samples, but are shown on these maps for informational purposes.  
<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as updated by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.  
<sup>c</sup> The 2010 MHHW boundary has been updated based on 2021 LIDAR data collected by King County.

0 100 200 Feet  
0 25 50 Meters

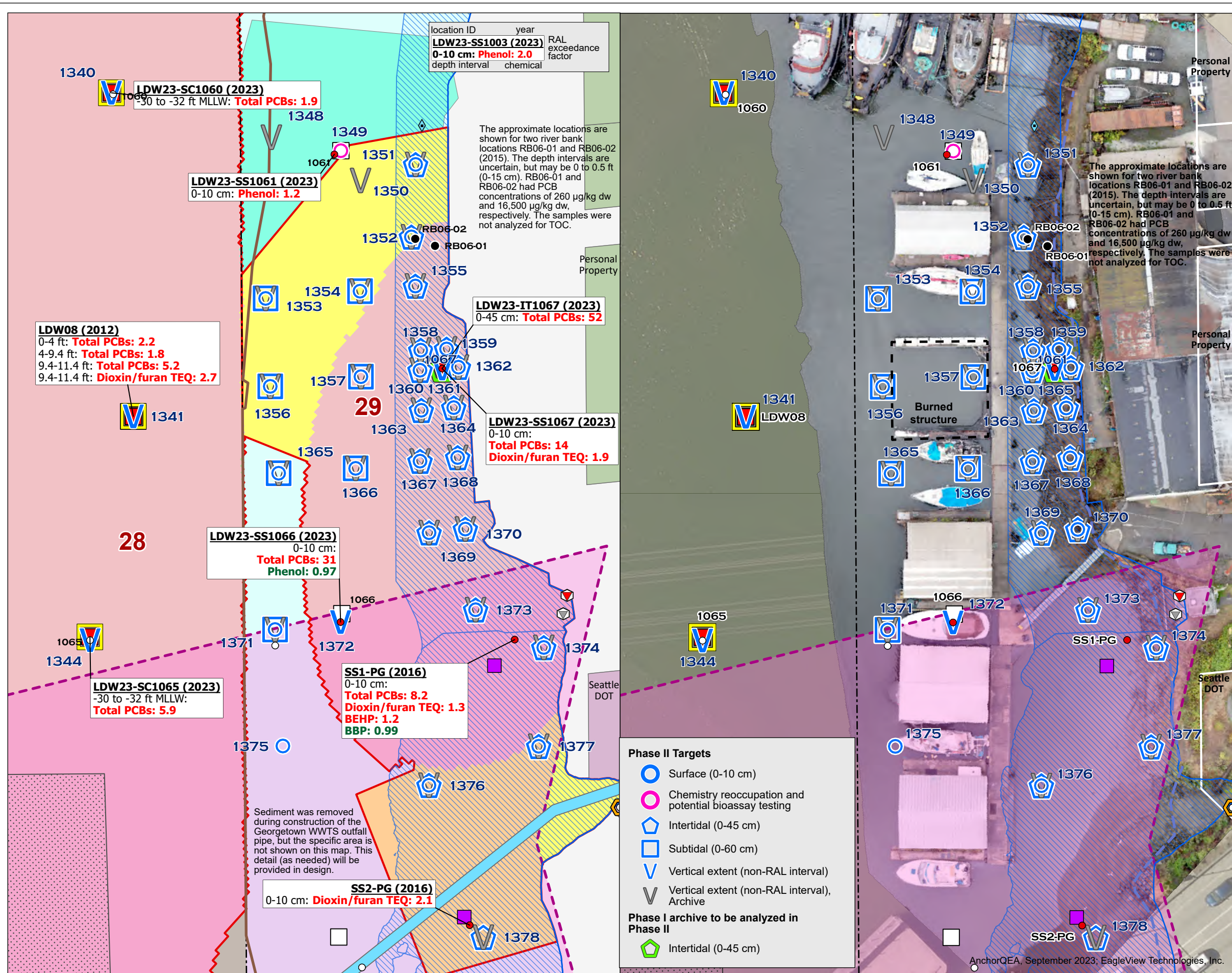
**Map 4-1e. Phase II Sample Locations, RAL Exceedances, and RAL Exceedance Areas Based on the Design Dataset, RM 2.75 to RM 3.0**

QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH JUNE 12, 2024

**Windward environmental LLC** **ANCHOR QEA**

**Lower Duwamish Waterway Group**  
City of Seattle / King County / The Boeing Company





**1** RAL exceedance area boundary

Combined sediment PCB indicator kriging RAL exceedance area

Additional Thiessen polygon RAL exceedance area for other COCs

Additional Thiessen polygon RAL exceedance area for phenol-only exceedances

**Surface (0-10 cm) sampling location**

- Exceeds RAL
- Does not exceed RAL

**Intertidal (0-45 cm) core location**

- ◆ Exceeds RAL
- Does not exceed RAL

**Subtidal (0-60 cm) core location**

- Exceeds RAL
- Does not exceed RAL

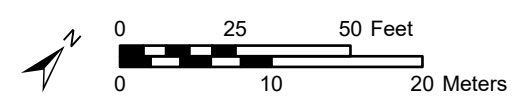
**Other sampling locations**

- Core without appropriate RAL interval
- Shoaling core
- Sample above MHHW<sup>a</sup>
- Ecology surface sediment sampling location
- ▼ CSO<sup>b</sup>
- ◆ Abandoned/inactive outfall<sup>b</sup>
- Pipe of unresolved origin and/or use<sup>b</sup>
- Georgetown WWTS diffuser pipe
- Recovery Category 1
- Utility uncertainty area
- Historical USACE overdrudge extent
- ▨ Intertidal area
- ▨ Shoal area
- ▨ LDW Superfund Boundary (MHHW)<sup>c</sup>
- King Co tax parcel
- Federal Navigation Channel

<sup>a</sup> Samples collected above the MHHW boundary are not included in the design dataset. The exceedance boxes for these locations have been shaded brown to indicate that they are classified as soil samples, but are shown on these maps for informational purposes.

<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as updated by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.

<sup>c</sup> The 2010 MHHW boundary has been updated based on 2021 LIDAR data collected by King County.



**Map 4-1f. Phase II Sample Locations, RAL Exceedances, and RAL Exceedance Areas Based on the Design Dataset, near RM 1.9**

QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH JUNE 12, 2024

**Phase II Targets**

- Surface (0-10 cm)
- Chemistry reoccupation and potential bioassay testing
- ◆ Intertidal (0-45 cm)
- Subtidal (0-60 cm)
- ∨ Vertical extent (non-RAL interval)
- ∇ Vertical extent (non-RAL interval), Archive

**Phase I archive to be analyzed in Phase II**

- ◆ Intertidal (0-45 cm)

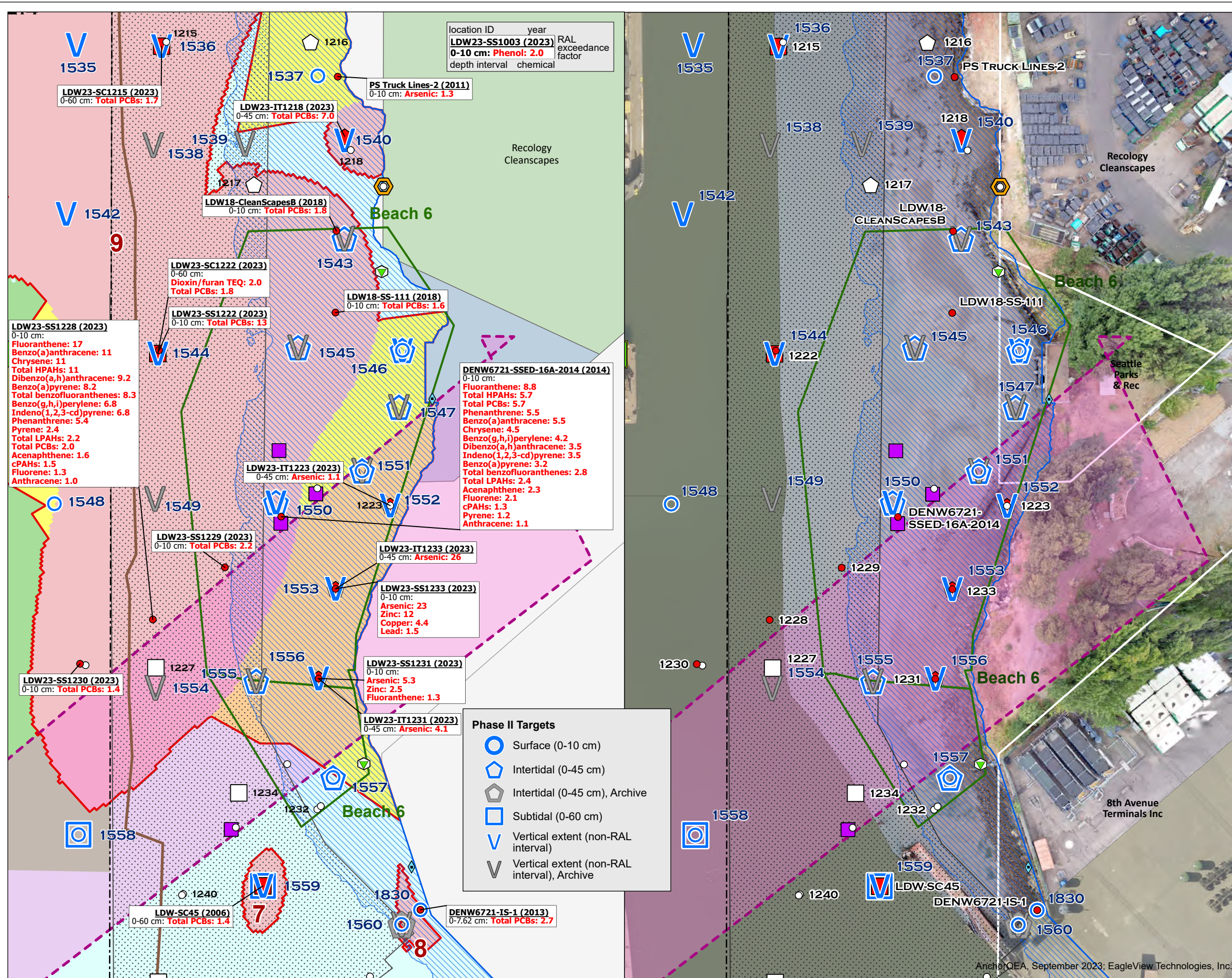
Sediment was removed during construction of the Georgetown WWTS outfall pipe, but the specific area is not shown on this map. This detail (as needed) will be provided in design.

The approximate locations are shown for two river bank locations RB06-01 and RB06-02 (2015). The depth intervals are uncertain, but may be 0 to 0.5 ft (0-15 cm). RB06-01 and RB06-02 had PCB concentrations of 260 µg/kg dw and 16,500 µg/kg dw, respectively. The samples were not analyzed for TOC.

The approximate locations are shown for two river bank locations RB06-01 and RB06-02 (2015). The depth intervals are uncertain, but may be 0 to 0.5 ft (0-15 cm). RB06-01 and RB06-02 had PCB concentrations of 260 µg/kg dw and 16,500 µg/kg dw, respectively. The samples were not analyzed for TOC.



Prepared by craigh, 6/13/2024, W:\Projects\Duwamish AOCSS\GIS\Maps and Analyses\Phase II QAPP Addendum.aprx\Map 4-1g 7555 Phase II design data Ph II Targets Beach 6



location ID	year	depth interval	chemical	RAL exceedance factor
LDW23-SS1003	2023	0-10 cm	Phenol	2.0

Symbol	Description
Blue circle	Surface (0-10 cm)
Blue pentagon	Intertidal (0-45 cm)
Grey pentagon	Intertidal (0-45 cm), Archive
Blue square	Subtidal (0-60 cm)
Blue inverted triangle	Vertical extent (non-RAL interval)
Grey inverted triangle	Vertical extent (non-RAL interval), Archive

**1** RAL exceedance area boundary

Combined sediment PCB indicator kriging RAL exceedance area

Additional Thiessen polygon RAL exceedance area for other COCs

**Surface (0-10 cm) sampling location**

- Exceeds RAL
- Does not exceed RAL

**Intertidal (0-45 cm) core location**

- Exceeds RAL
- Does not exceed RAL

**Subtidal (0-60 cm) core location**

- Exceeds RAL
- Does not exceed RAL

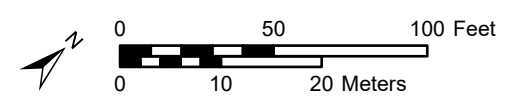
**Other sampling locations**

- Core without appropriate RAL interval
- Shoaling core
- Sample above MHHW<sup>a</sup>
- ◇ Private storm drain<sup>b</sup>
- ◇ Abandoned/inactive outfall<sup>b</sup>
- ▨ Recovery Category 1
- ▨ Utility uncertainty area
- ▨ Historical USACE overdredge extent
- ▨ Beach play area
- ▨ Shoal area
- ▨ LDW Superfund Boundary (MHHW)<sup>c</sup>
- ▨ King Co tax parcel
- Federal Navigation Channel

<sup>a</sup> Samples collected above the MHHW boundary are not included in the design dataset. The exceedance boxes for these locations have been shaded brown to indicate that they are classified as soil samples, but are shown on these maps for informational purposes.

<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as updated by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.

<sup>c</sup> The 2010 MHHW boundary has been updated based on 2021 LIDAR data collected by King County.



**Map 4-1g. Phase II Sample Locations, RAL Exceedances, and RAL Exceedance Areas Based on the Design Dataset, near Beach 6**

QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH JUNE 12, 2024

Windward environmental LLC

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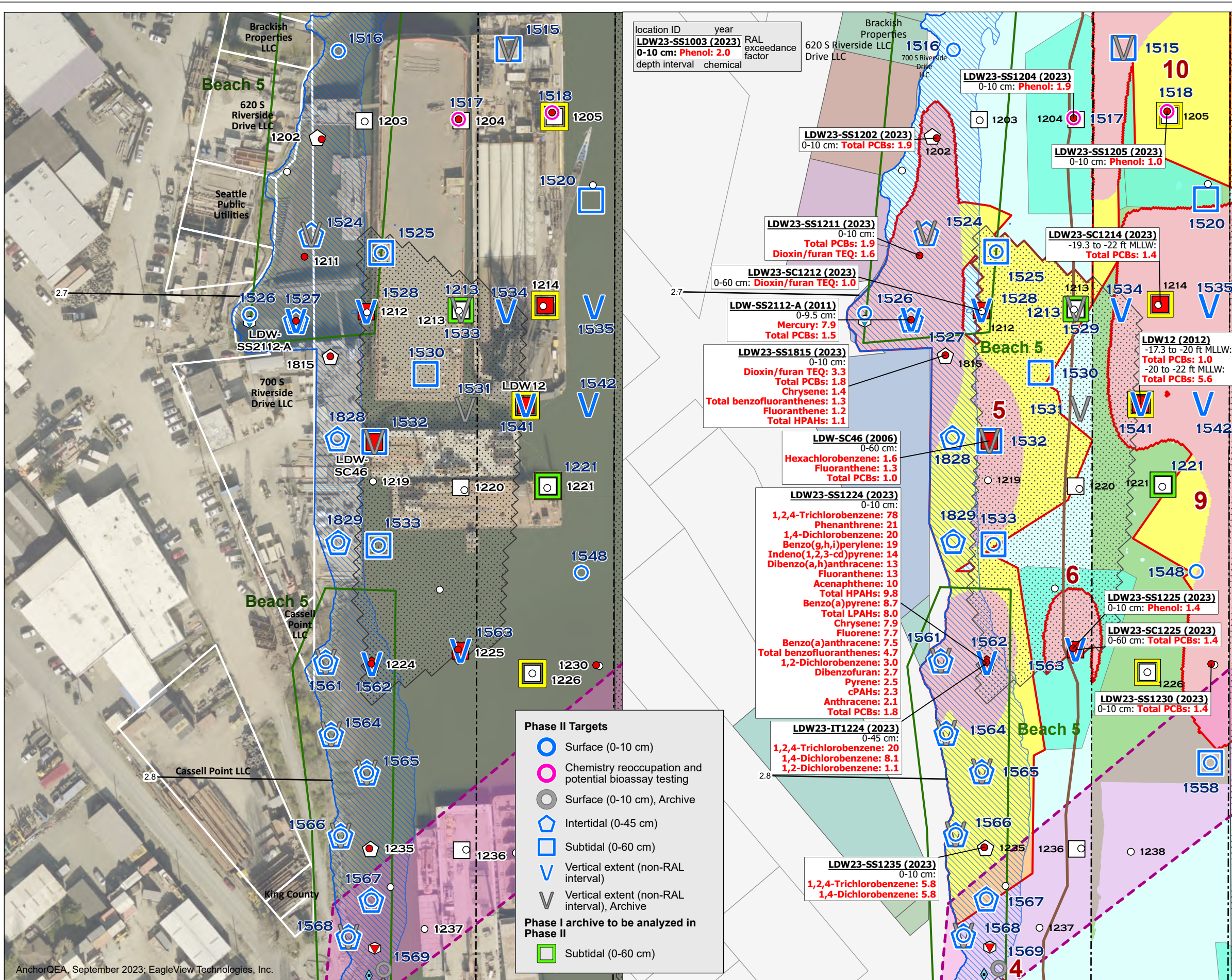
Lower Duwamish Waterway Group

City of Seattle / King County / The Boeing Company

AnchorQEA, September 2023; EagleView Technologies, Inc.



Prepared by cnaigh, 6/13/2024, W:\Projects\Duwamish AOC\GIS\Maps and Analyses\Phase II QAPP Addendum.aprx\Map 4-1h 7555 Phase I design data Ph II Targets PacFile



location ID	year	RAL exceedance factor	chemical
LDW23-SS1003	(2023)	0-10 cm: Phenol: 2.0	

LDW23-SS1204 (2023)	0-10 cm: Phenol: 1.9
LDW23-SS1202 (2023)	0-10 cm: Total PCBs: 1.9
LDW23-SS1205 (2023)	0-10 cm: Phenol: 1.0
LDW23-SS1211 (2023)	0-10 cm: Total PCBs: 1.9 Dioxin/furan TEQ: 1.6
LDW23-SC1212 (2023)	0-60 cm: Dioxin/furan TEQ: 1.0
LDW-SS2112-A (2011)	0-9.5 cm: Mercury: 7.9 Total PCBs: 1.5
LDW23-SS1815 (2023)	0-10 cm: Dioxin/furan TEQ: 3.3 Total PCBs: 1.8 Chrysene: 1.4 Total benzofluoranthenes: 1.3 Fluoranthene: 1.2 Total HPAHs: 1.1
LDW-SC46 (2006)	0-60 cm: Hexachlorobenzene: 1.6 Fluoranthene: 1.3 Total PCBs: 1.0
LDW23-SS1224 (2023)	0-10 cm: 1,2,4-Trichlorobenzene: 78 Phenanthrene: 21 1,4-Dichlorobenzene: 20 Benzo(g,h,i)perylene: 19 Indeno(1,2,3-cd)pyrene: 14 Dibenzo(a,h)anthracene: 13 Fluoranthene: 13 Acenaphthene: 10 Total HPAHs: 9.8 Benzo(a)pyrene: 8.7 Chrysene: 7.9 Total LPAHs: 8.0 Fluorene: 7.7 Benzo(a)anthracene: 7.5 Total benzofluoranthenes: 4.7 1,2-Dichlorobenzene: 3.0 Dibenzofuran: 2.7 Pyrene: 2.5 cPAHs: 2.3 Anthracene: 2.1 Total PCBs: 1.8
LDW23-IT1224 (2023)	0-45 cm: 1,2,4-Trichlorobenzene: 20 1,4-Dichlorobenzene: 8.1 1,2-Dichlorobenzene: 1.1
LDW23-SS1235 (2023)	0-10 cm: 1,2,4-Trichlorobenzene: 5.8 1,4-Dichlorobenzene: 5.8

**1** RAL exceedance area boundary

Combined sediment PCB indicator kriging RAL exceedance area

Additional Thiessen polygon RAL exceedance area for other COCs

Additional Thiessen polygon RAL exceedance area for phenol-only exceedances

**Surface (0-10 cm) sampling location**

- Exceeds RAL
- Does not exceed RAL

**Intertidal (0-45 cm) core location**

- Exceeds RAL
- Does not exceed RAL

**Subtidal (0-60 cm) core location**

- Exceeds RAL
- Does not exceed RAL

**Other sampling locations**

- Core without appropriate RAL interval
- Shoaling core
- CSO<sup>a</sup>
- Public storm drain<sup>a</sup>
- Abandoned/inactive outfall<sup>a</sup>
- Recovery Category 1
- Utility uncertainty area
- Historical USACE overdrage extent
- Beach play area
- Intertidal area
- Shoal area
- LDW Superfund Boundary (MHHW)<sup>b</sup>
- King Co tax parcel
- Federal Navigation Channel
- River mile

<sup>a</sup> Outfalls are based on the Ecology 2020 survey, as updated by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.

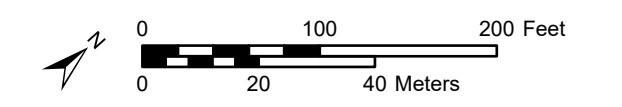
<sup>b</sup> The 2010 MHHW boundary has been updated based on 2021 LIDAR data collected by King County.

**Phase II Targets**

- Surface (0-10 cm)
- Chemistry reoccupation and potential bioassay testing
- Surface (0-10 cm), Archive
- Intertidal (0-45 cm)
- Subtidal (0-60 cm)
- Vertical extent (non-RAL interval)
- Vertical extent (non-RAL interval), Archive

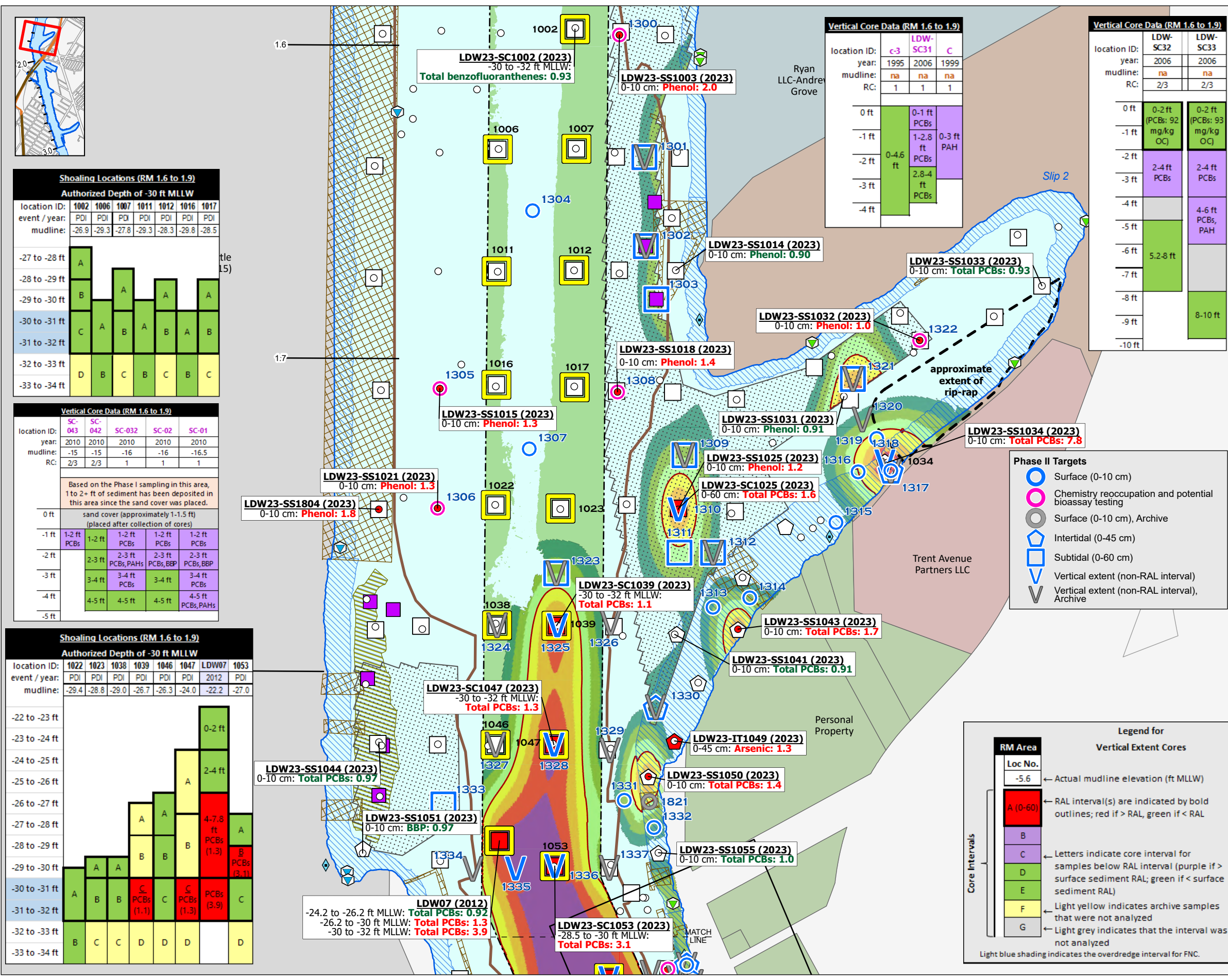
**Phase I archive to be analyzed in Phase II**

- Subtidal (0-60 cm)



**Map 4-1h. Phase II Sample Locations, RAL Exceedances, and RAL Exceedance Areas Based on the Design Dataset, near RM 2.7 to RM 2.8**  
QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH  
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Shoaling Locations (RM 1.6 to 1.9)							
Authorized Depth of -30 ft MLLW							
location ID:	1002	1006	1007	1011	1012	1016	1017
event / year:	PDI	PDI	PDI	PDI	PDI	PDI	PDI
mudline:	-26.9	-29.3	-27.8	-29.3	-28.3	-29.8	-28.5
-27 to -28 ft	A						
-28 to -29 ft	B	A					
-29 to -30 ft	C	A	B	A	B	A	B
-30 to -31 ft	D	B	C	B	C	B	C
-32 to -33 ft							
-33 to -34 ft							

Vertical Core Data (RM 1.6 to 1.9)					
location ID:	SC-043	SC-042	SC-032	SC-02	SC-01
year:	2010	2010	2010	2010	2010
mudline:	-15	-15	-16	-16	-16.5
RC:	2/3	2/3	1	1	1
Based on the Phase I sampling in this area, 1 to 2+ ft of sediment has been deposited in this area since the sand cover was placed.					
sand cover (approximately 1-1.5 ft) (placed after collection of cores)					
0 ft					
-1 ft	1-2 ft PCBs	1-2 ft PCBs	1-2 ft PCBs	1-2 ft PCBs	1-2 ft PCBs
-2 ft	2-3 ft PCBs, PAHs	2-3 ft PCBs, PAHs	2-3 ft PCBs, BBP	2-3 ft PCBs, BBP	2-3 ft PCBs, BBP
-3 ft	3-4 ft PCBs	3-4 ft PCBs	3-4 ft PCBs	3-4 ft PCBs	3-4 ft PCBs
-4 ft	4-5 ft PCBs, PAHs	4-5 ft PCBs, PAHs	4-5 ft PCBs, PAHs	4-5 ft PCBs, PAHs	4-5 ft PCBs, PAHs
-5 ft					

Shoaling Locations (RM 1.6 to 1.9)							
Authorized Depth of -30 ft MLLW							
location ID:	1022	1023	1038	1039	1046	1047	LDW07
event / year:	PDI	PDI	PDI	PDI	PDI	PDI	2012
mudline:	-29.4	-28.8	-29.0	-26.7	-26.3	-24.0	-22.2
1053							
mudline:							-27.0
-22 to -23 ft							0-2 ft
-23 to -24 ft							2-4 ft
-24 to -25 ft							
-25 to -26 ft							
-26 to -27 ft							
-27 to -28 ft							4-7.8 ft PCBs (1.3)
-28 to -29 ft							PCBs (3.1)
-29 to -30 ft							
-30 to -31 ft	A	B	B	C	C	C	PCBs (3.9)
-31 to -32 ft	A	B	B	C	C	C	
-32 to -33 ft	B	C	C	D	D	D	
-33 to -34 ft							

Vertical Core Data (RM 1.6 to 1.9)			
location ID:	c-3	LDW-SC31	C
year:	1995	2006	1999
mudline:	na	na	na
RC:	1	1	1
0 ft		0-1 ft PCBs	0-3 ft PAH
-1 ft		1-2.8 ft PCBs	
-2 ft	0-4.6 ft	2.8-4 ft PCBs	
-3 ft			
-4 ft			

Vertical Core Data (RM 1.6 to 1.9)			
location ID:	LDW-SC32	LDW-SC33	
year:	2006	2006	
mudline:	na	na	
RC:	2/3	2/3	
0 ft	0-2 ft (PCBs: 92 mg/kg OC)	0-2 ft (PCBs: 93 mg/kg OC)	
-1 ft			
-2 ft	2-4 ft PCBs	2-4 ft PCBs	
-3 ft			
-4 ft			
-5 ft			4-6 ft PCBs, PAH
-6 ft	5.2-8 ft		
-7 ft			
-8 ft			
-9 ft			8-10 ft
-10 ft			

**PCB indicator kriging probability of RAL exceedance in combined surface and subsurface sediment**

- 20% - 30%
- 30% - 40%
- 40% - 50%
- 50% - 60%
- 60% - 70%
- 70% - 80%
- > 80%

— 50% probability of RAL exceedance boundary

**Surface sediment (0-10 cm) sampling location**

- Exceeds RAL
- Does not exceed RAL

**Intertidal (0-45 cm) core location**

- ⬠ Exceeds RAL
- ⬡ Does not exceed RAL

**Subtidal (0-60 cm) core location**

- Exceeds RAL
- Does not exceed RAL

**Other sampling locations**

- Core without appropriate RAL interval
- Shoaling core
- Sample above MHHW<sup>a</sup>
- ◇ Private storm drain<sup>b</sup>
- ◇ Public storm drain<sup>b</sup>
- ◇ Abandoned/inactive outfall<sup>b</sup>
- ▨ Recovery Category 1
- ▨ Historical USACE overdrudge extent
- ▨ Dock/pier
- ▨ Intertidal area
- ▨ LDW Superfund Boundary
- ▨ King Co tax parcel
- Federal Navigation Channel
- River mile

**Phase II Targets**

- Surface (0-10 cm)
- Chemistry reoccupation and potential bioassay testing
- Surface (0-10 cm), Archive
- Intertidal (0-45 cm)
- Subtidal (0-60 cm)
- Vertical extent (non-RAL interval)
- Vertical extent (non-RAL interval), Archive

**Legend for Vertical Extent Cores**

RM Area	Loc No.	Description
	-5.6	Actual mudline elevation (ft MLLW)
A (0-60)		RAL interval(s) are indicated by bold outlines; red if > RAL, green if < RAL
B		Letters indicate core interval for samples below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
C		
D		
E		
F		Light yellow indicates archive samples that were not analyzed
G		Light grey indicates that the interval was not analyzed

Light blue shading indicates the overdrudge interval for FNC.

<sup>a</sup>The 2010 Remedial Investigation MHHW boundary has been updated based on more recent 2021 LIDAR data by King County. Samples collected above the MHHW boundary will not be included in the Phase II interpolation dataset. The exceedance boxes for these locations have been shaded brown to indicate that they will be classified as soil samples in the Phase II DER. <sup>b</sup>Outfalls are based on the Ecology 2020 survey, as amended by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.

0 100 200 Feet  
0 25 50 Meters

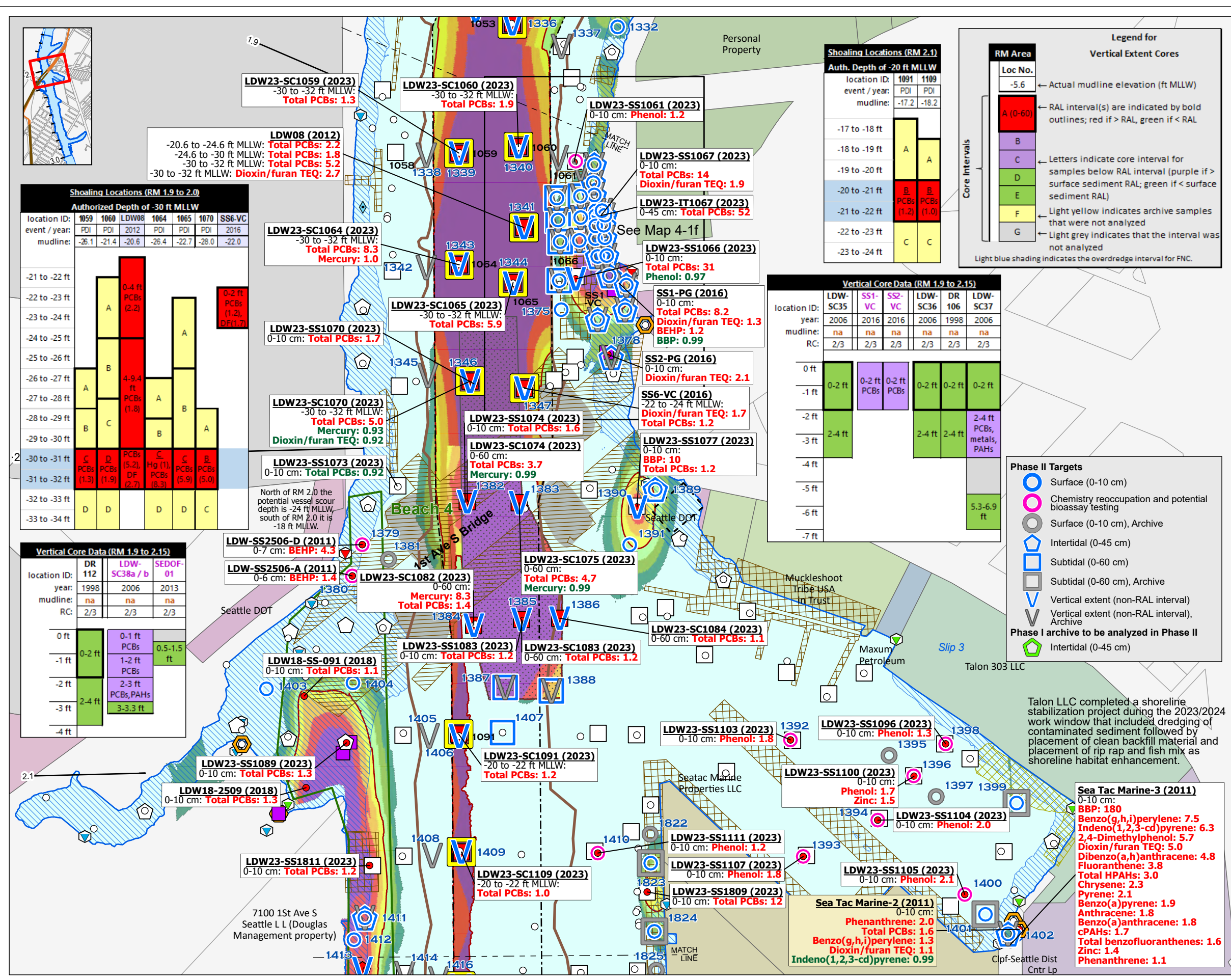
**Map 4-2a. Phase II Sample Locations, RAL Exceedances, and PCB Interpolation Uncertainty Bands Based on the Design Dataset, RM 1.6 to RM 1.85**

QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH JUNE 12, 2024

**Windward environmental LLC** **ANCHOR QEA**

**Lower Duwamish Waterway Group**  
City of Seattle / King County / The Boeing Company





**PCB indicator kriging probability of RAL exceedance in combined surface and subsurface sediment**

20% - 30%	50% - 60%
30% - 40%	60% - 70%
40% - 50%	70% - 80%
	> 80%

— 50% probability of RAL exceedance boundary

**Surface sediment (0-10 cm) sampling location**

- Exceeds RAL
- Does not exceed RAL

**Intertidal (0-45 cm) core location**

- ⬠ Exceeds RAL
- ⬡ Does not exceed RAL

**Subtidal (0-60 cm) core location**

- ⬢ Exceeds RAL
- ⬣ Does not exceed RAL

**Other sampling locations**

- ⬤ Core without appropriate RAL interval
- ⬥ Shoaling core
- ⬦ Sample above MHHW<sup>a</sup>
- ⬧ CSO<sup>b</sup>
- ⬨ Private storm drain<sup>b</sup>
- ⬩ Public storm drain<sup>b</sup>
- ⬪ Abandoned/inactive outfall<sup>b</sup>
- ⬫ Pipe of unresolved origin and/or use<sup>b</sup>
- ⬬ Recovery Category 1
- ⬭ Historical USACE overdrudge extent
- ⬮ Talon Shoreline Stabilization Project
- ⬯ Beach play area
- ⬰ Bridge
- ⬱ Dock/pier
- ⬲ Intertidal area
- ⬳ LDW Superfund Boundary
- ⬴ King Co tax parcel
- ⬵ Federal Navigation Channel
- ⬶ River mile

**Legend for Vertical Extent Cores**

RM Area	Loc No.
-5.6	← Actual mudline elevation (ft MLLW)
A (0-60)	← RAL interval(s) are indicated by bold outlines; red if > RAL, green if < RAL
B	← Letters indicate core interval for samples below RAL interval (purple if > surface sediment RAL; green if < surface sediment RAL)
C	← Light yellow indicates archive samples that were not analyzed
D	← Light grey indicates that the interval was not analyzed
E	
F	
G	

Light blue shading indicates the overdrudge interval for FNC.

**Phase II Targets**

- ⬠ Surface (0-10 cm)
- ⬡ Chemistry reoccupation and potential bioassay testing
- ⬢ Surface (0-10 cm), Archive
- ⬣ Intertidal (0-45 cm)
- ⬤ Subtidal (0-60 cm)
- ⬥ Subtidal (0-60 cm), Archive
- ⬦ Vertical extent (non-RAL interval)
- ⬧ Vertical extent (non-RAL interval), Archive
- ⬨ Phase I archive to be analyzed in Phase II
- ⬩ Intertidal (0-45 cm)

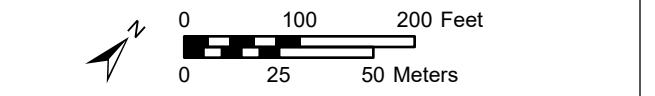
**Map 4-2b. Phase II Sample Locations, RAL Exceedances, and PCB Interpolation Uncertainty Bands Based on the Design Dataset, RM 1.85 to RM 2.15**

QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH JUNE 12, 2024

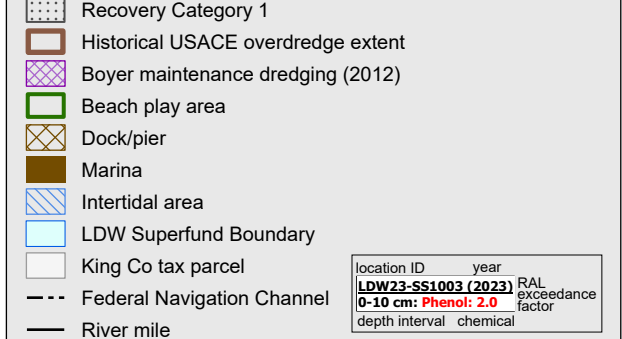
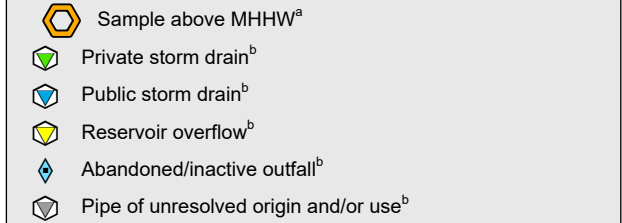
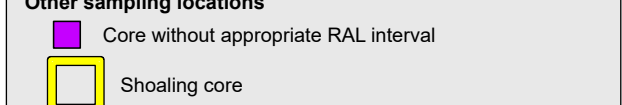
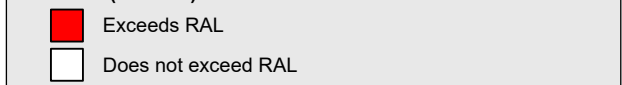
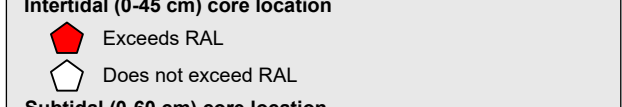
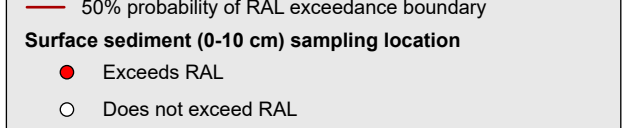
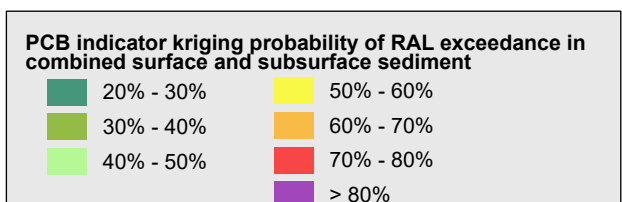
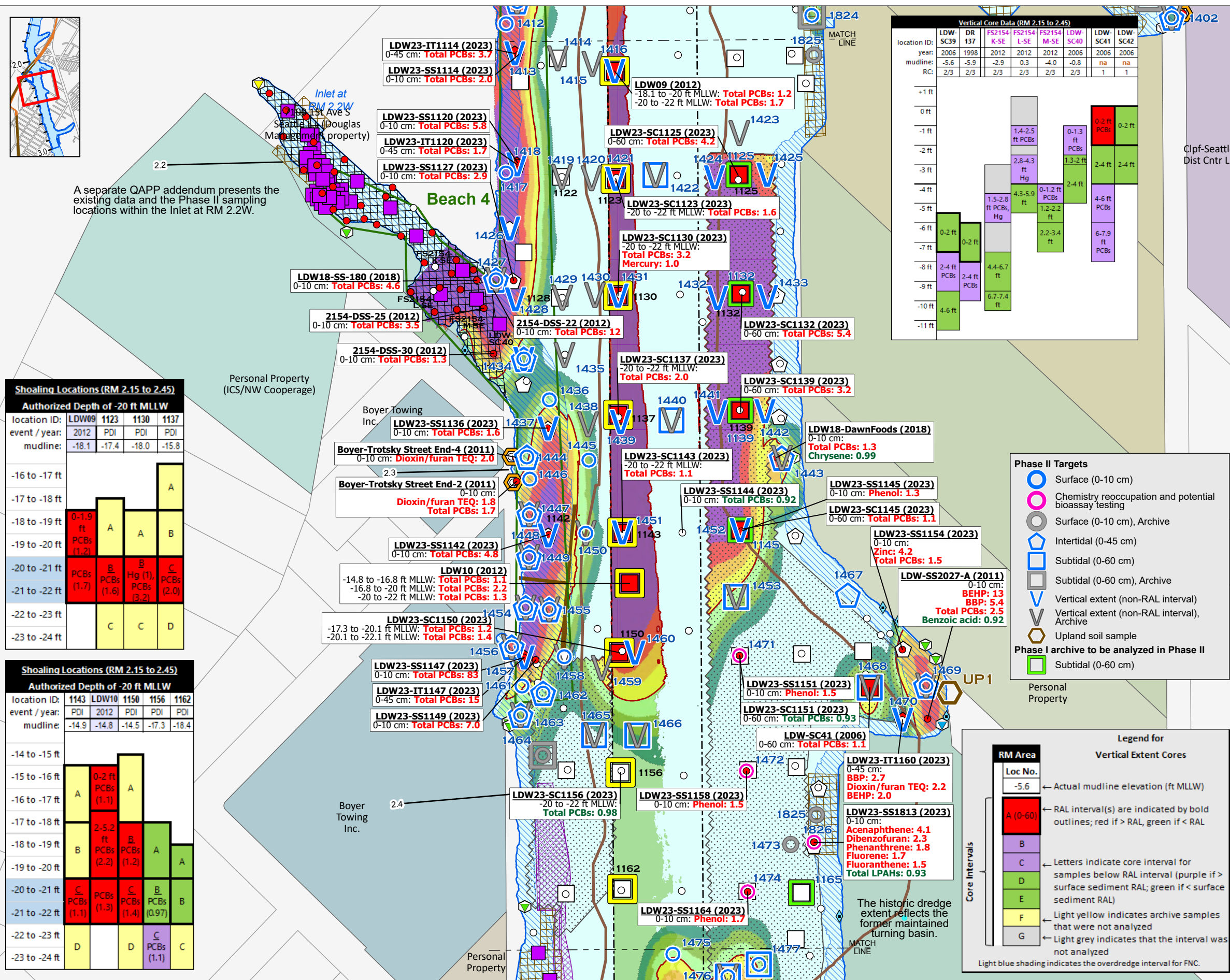
**Windward environmental LLC** **ANCHOR QEA**

**Lower Duwamish Waterway Group**  
City of Seattle / King County / The Boeing Company

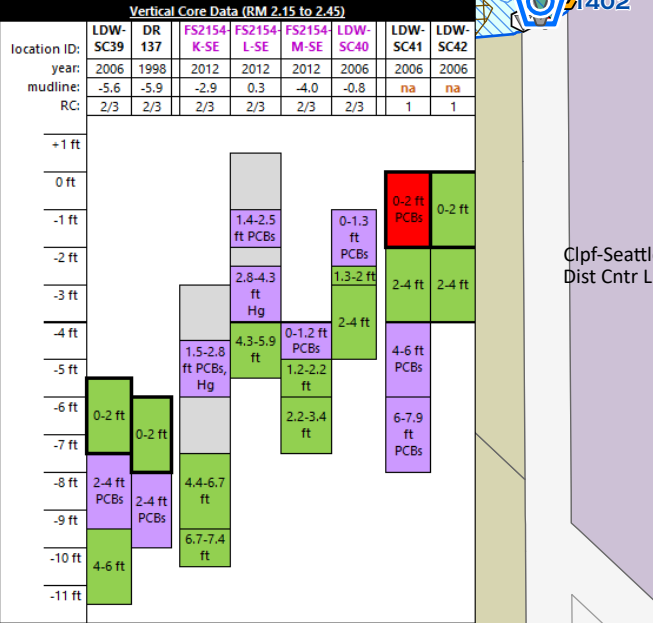
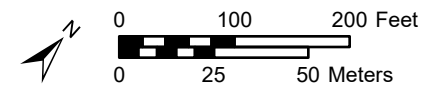
Talon LLC completed a shoreline stabilization project during the 2023/2024 work window that included dredging of contaminated sediment followed by placement of clean backfill material and placement of rip rap and fish mix as shoreline habitat enhancement.







<sup>a</sup>The 2010 Remedial Investigation MHHW boundary has been updated based on more recent 2021 LIDAR data by King County. Samples collected above the MHHW boundary will not be included in the Phase II interpolation dataset. The exceedance boxes for these locations have been shaded brown to indicate that they will be classified as soil samples in the Phase II DER.  
<sup>b</sup>Outfalls are based on the Ecology 2020 survey, as amended by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.



### Shoaling Locations (RM 2.15 to 2.45)

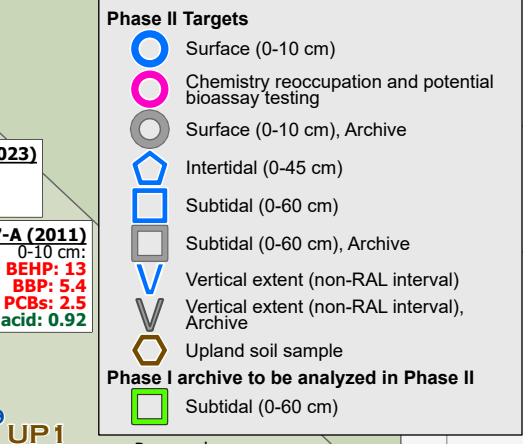
Authorized Depth of -20 ft MLLW				
location ID:	LDW09	1123	1130	1137
event / year:	2012	POI	POI	POI
mudline:	-18.1	-17.4	-18.0	-15.8

-16 to -17 ft				A
-17 to -18 ft		A	A	B
-18 to -19 ft	0-1.9 ft PCBs (1.2)	A	A	B
-19 to -20 ft	PCBs (1.7)	B	B	C
-20 to -21 ft	PCBs (1.7)	B	Hg (1), PCBs (3.2)	C
-21 to -22 ft		C	C	D
-22 to -23 ft		C	C	D
-23 to -24 ft		C	C	D

### Shoaling Locations (RM 2.15 to 2.45)

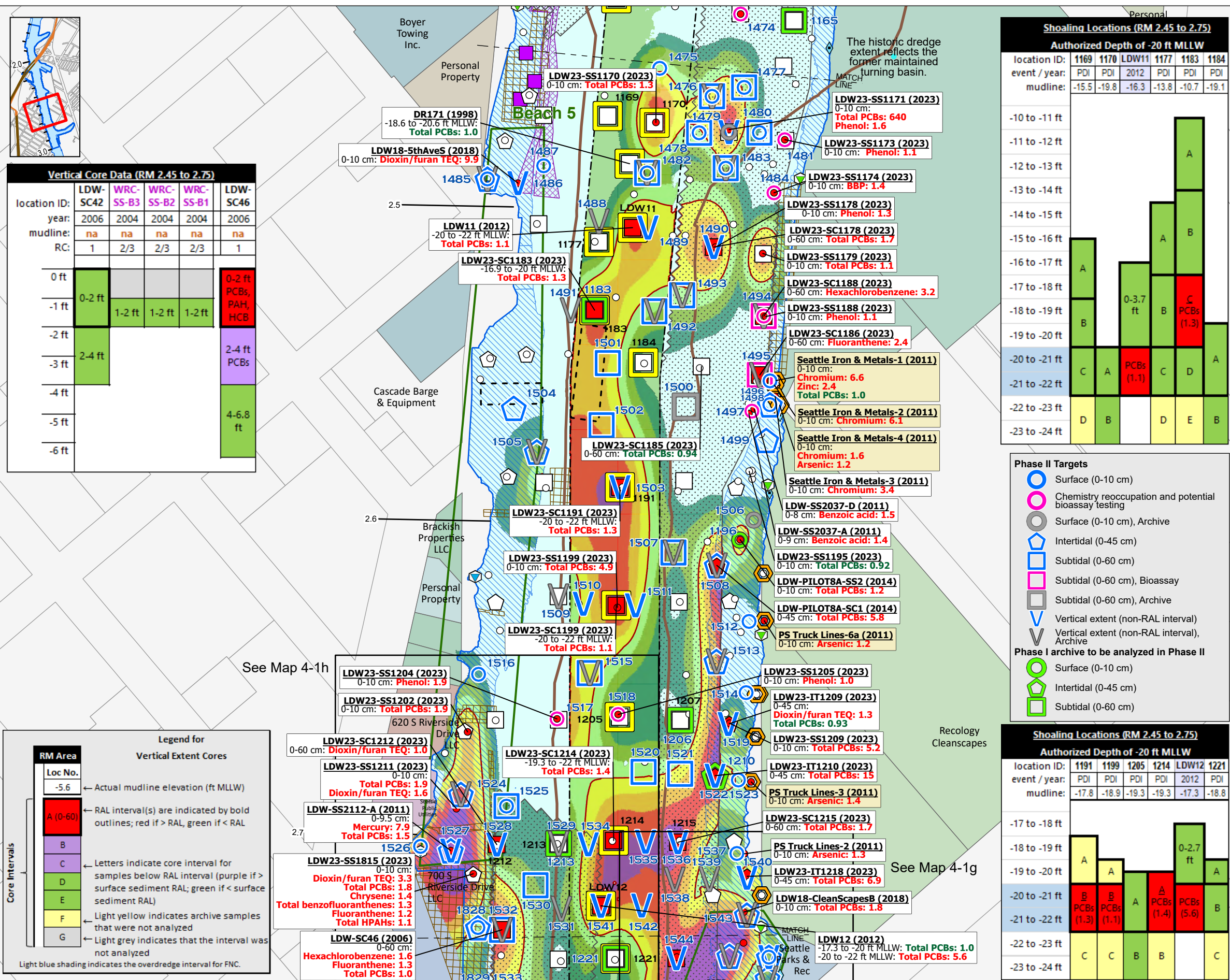
Authorized Depth of -20 ft MLLW					
location ID:	1143	LDW10	1150	1156	1162
event / year:	POI	2012	POI	POI	POI
mudline:	-14.9	-14.8	-14.5	-17.3	-18.4

-14 to -15 ft				
-15 to -16 ft	A	0-2 ft PCBs (1.1)	A	
-16 to -17 ft	A			
-17 to -18 ft	B	2-5.2 ft PCBs (2.2)	B	A
-18 to -19 ft	B	PCBs (1.2)	A	A
-19 to -20 ft	B	PCBs (2.2)	A	A
-20 to -21 ft	C	PCBs (1.3)	B	B
-21 to -22 ft	C	PCBs (1.4)	B	B
-22 to -23 ft	C	PCBs (1.1)	C	C
-23 to -24 ft	D		C	C



**Map 4-2c. Phase II Sample Locations, RAL Exceedances, and PCB Interpolation Uncertainty Bands Based on the Design Dataset, RM 2.15 to RM 2.45**  
 QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH JUNE 12, 2024



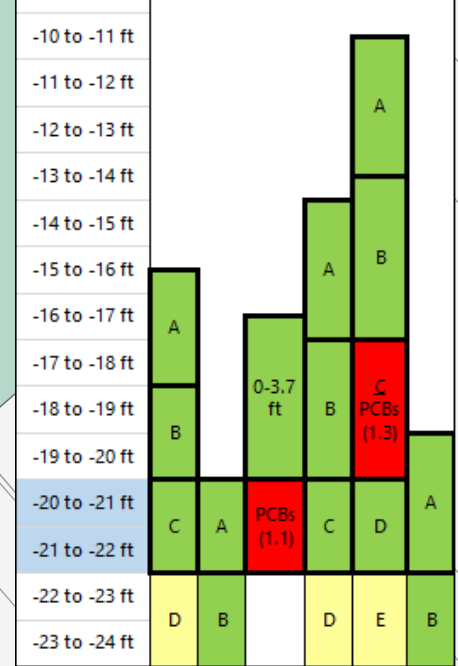


**Vertical Core Data (RM 2.45 to 2.75)**

location ID:	LDW-SC42	WRC-SS-B3	WRC-SS-B2	WRC-SS-B1	LDW-SC46
year:	2006	2004	2004	2004	2006
mudline:	na	na	na	na	na
RC:	1	2/3	2/3	2/3	1
0 ft					0-2 ft PCBs, PAH, HCB
-1 ft	0-2 ft	1-2 ft	1-2 ft	1-2 ft	
-2 ft					2-4 ft PCBs
-3 ft	2-4 ft				
-4 ft					
-5 ft					4-6.8 ft
-6 ft					

**Shoaling Locations (RM 2.45 to 2.75)**

location ID:	1169	1170	LDW11	1177	1183	1184
event / year:	PDI	PDI	2012	PDI	PDI	PDI
mudline:	-15.5	-19.8	-16.3	-13.8	-10.7	-19.1



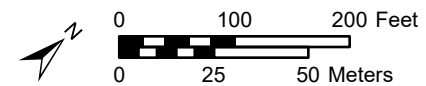
- Phase II Targets**
- Surface (0-10 cm)
  - Chemistry reoccupation and potential bioassay testing
  - Surface (0-10 cm), Archive
  - Intertidal (0-45 cm)
  - Subtidal (0-60 cm)
  - Subtidal (0-60 cm), Bioassay
  - Subtidal (0-60 cm), Archive
  - Vertical extent (non-RAL interval)
  - Vertical extent (non-RAL interval), Archive
- Phase I archive to be analyzed in Phase II**
- Surface (0-10 cm)
  - Intertidal (0-45 cm)
  - Subtidal (0-60 cm)

- PCB indicator kriging probability of RAL exceedance in combined surface and subsurface sediment**
- 20% - 30%
  - 30% - 40%
  - 40% - 50%
  - 50% - 60%
  - 60% - 70%
  - 70% - 80%
  - > 80%

- Surface sediment (0-10 cm) sampling location**
- Exceeds RAL
  - Does not exceed RAL
- Intertidal (0-45 cm) core location**
- Exceeds RAL
  - Does not exceed RAL
- Subtidal (0-60 cm) core location**
- Exceeds RAL
  - Does not exceed RAL
- Other sampling locations**
- Core without appropriate RAL interval
  - Shoaling core
  - Sample above MHHW<sup>a</sup>
  - Private storm drain<sup>b</sup>
  - Public storm drain<sup>b</sup>
  - Stream, channel, or ditch<sup>b</sup>
  - Abandoned/inactive outfall<sup>b</sup>
  - Recovery Category 1
  - Historical USACE overdredge extent
  - Boyer maintenance dredging (2012)
  - Beach play area
  - Dock/pier
  - Intertidal area
  - LDW Superfund Boundary
  - King Co tax parcel
  - Federal Navigation Channel
  - River mile

<sup>a</sup>The 2010 Remedial Investigation MHHW boundary has been updated based on more recent 2021 LIDAR data by King County. Samples collected above the MHHW boundary will not be included in the Phase II interpolation dataset. The exceedance boxes for these locations have been shaded brown to indicate that they will be classified as soil samples in the Phase II DER.

<sup>b</sup>Outfalls are based on the Ecology 2020 survey, as amended by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.

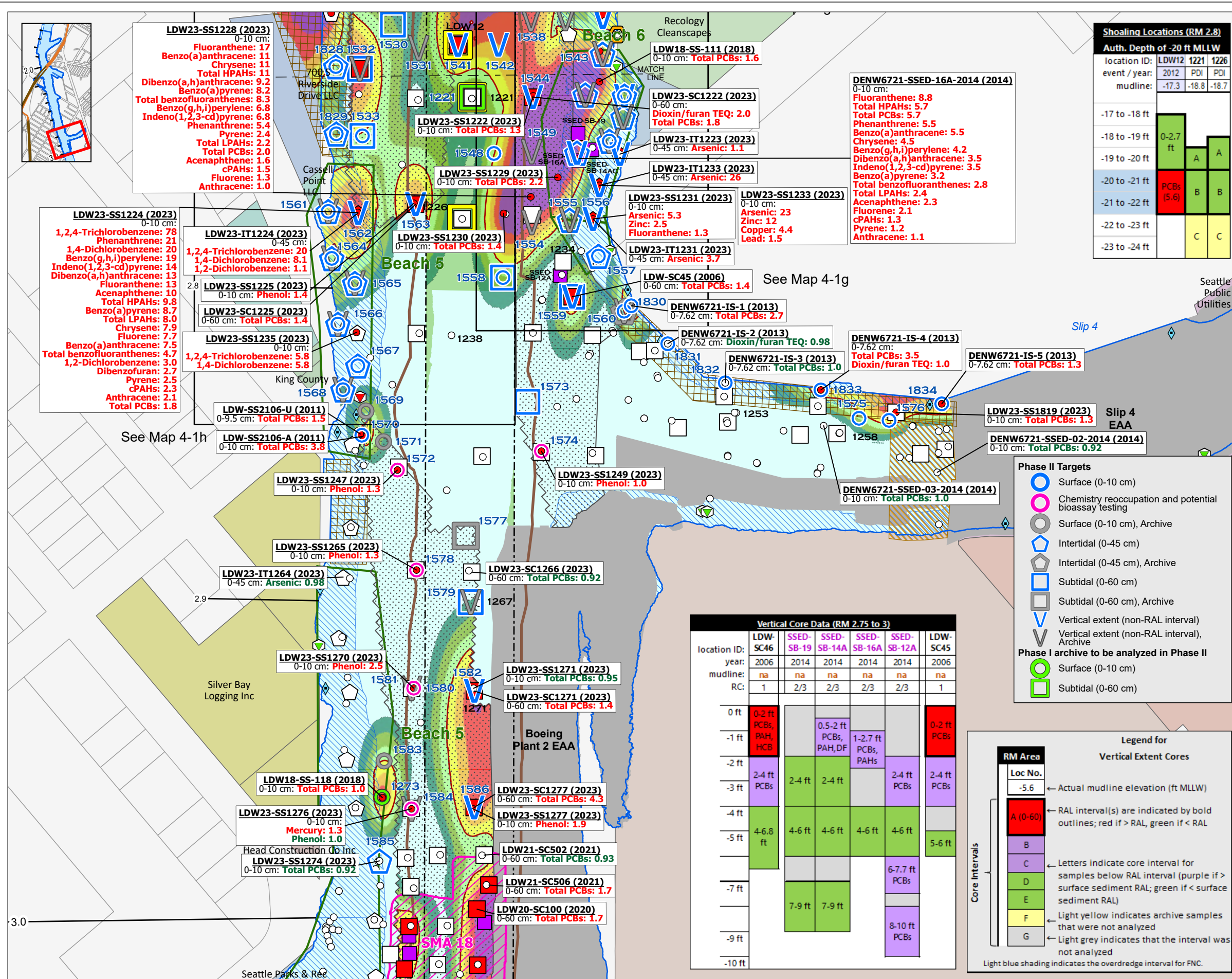


**Map 4-2d. Phase II Sample Locations, RAL Exceedances, and PCB Interpolation Uncertainty Bands Based on the Design Dataset, RM 2.45 to RM 2.75**

QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH

JUNE 12, 2024

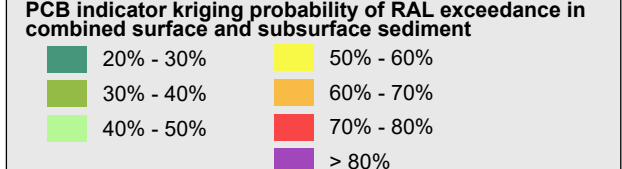




**Shoaling Locations (RM 2.8)**

Auth. Depth of -20 ft MLLW	location ID:	LDW12	1221	1226
event / year:	2012	PDI		
mudline:	-17.3	-18.8	-18.7	

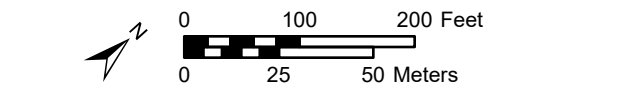
0-10 cm:  
Fluoranthene: 8.8  
Total HPAHs: 5.7  
Total PCBs: 5.7  
Phenanthrene: 5.5  
Benzo(a)anthracene: 5.5  
Chrysene: 4.5  
Benzo(g,h,i)perylene: 4.2  
Dibenzo(a,h)anthracene: 3.5  
Indeno(1,2,3-cd)pyrene: 3.5  
Benzo(a)pyrene: 3.2  
Total benzofluoranthenes: 2.8  
Acenaphthene: 2.3  
Fluorene: 2.1  
cPAHs: 1.3  
Pyrene: 1.2  
Anthracene: 1.1



- Surface sediment (0-10 cm) sampling location**
- Exceeds RAL
  - Does not exceed RAL
- Intertidal (0-45 cm) core location**
- ⬠ Exceeds RAL
  - ⬠ Does not exceed RAL
- Subtidal (0-60 cm) core location**
- ⬠ Exceeds RAL
  - ⬠ Does not exceed RAL
- Other sampling locations**
- ⬠ Core without appropriate RAL interval
  - ⬠ Shoaling core
  - ⬠ Sample above MHHW<sup>a</sup>
  - ⬠ CSO<sup>b</sup>
  - ⬠ Private storm drain<sup>b</sup>
  - ⬠ Abandoned/inactive outfall<sup>b</sup>
  - ⬠ Recovery Category 1
  - ⬠ Historical USACE overdrudge extent
  - ⬠ Upper reach SMA Boundary
  - ⬠ Beach play area
  - ⬠ Dock/pier
  - ⬠ Early Action Area
  - ⬠ Intertidal area
  - ⬠ LDW Superfund Boundary
  - ⬠ King Co tax parcel
  - ⬠ Federal Navigation Channel
  - ⬠ River mile
- Phase II Targets**
- ⬠ Surface (0-10 cm)
  - ⬠ Chemistry reoccupation and potential bioassay testing
  - ⬠ Surface (0-10 cm), Archive
  - ⬠ Intertidal (0-45 cm)
  - ⬠ Intertidal (0-45 cm), Archive
  - ⬠ Subtidal (0-60 cm)
  - ⬠ Subtidal (0-60 cm), Archive
  - ⬠ Vertical extent (non-RAL interval)
  - ⬠ Vertical extent (non-RAL interval), Archive
- Phase I archive to be analyzed in Phase II**
- ⬠ Surface (0-10 cm)
  - ⬠ Subtidal (0-60 cm)
- location ID year RAL exceedance factor  
LDW23-SS1003 (2023) Phenol: 2.0  
depth interval chemical

<sup>a</sup>The 2010 Remedial Investigation MHHW boundary has been updated based on more recent 2021 LIDAR data by King County. Samples collected above the MHHW boundary will not be included in the Phase II interpolation dataset. The exceedance boxes for these locations have been shaded brown to indicate that they will be classified as soil samples in the Phase II DER.

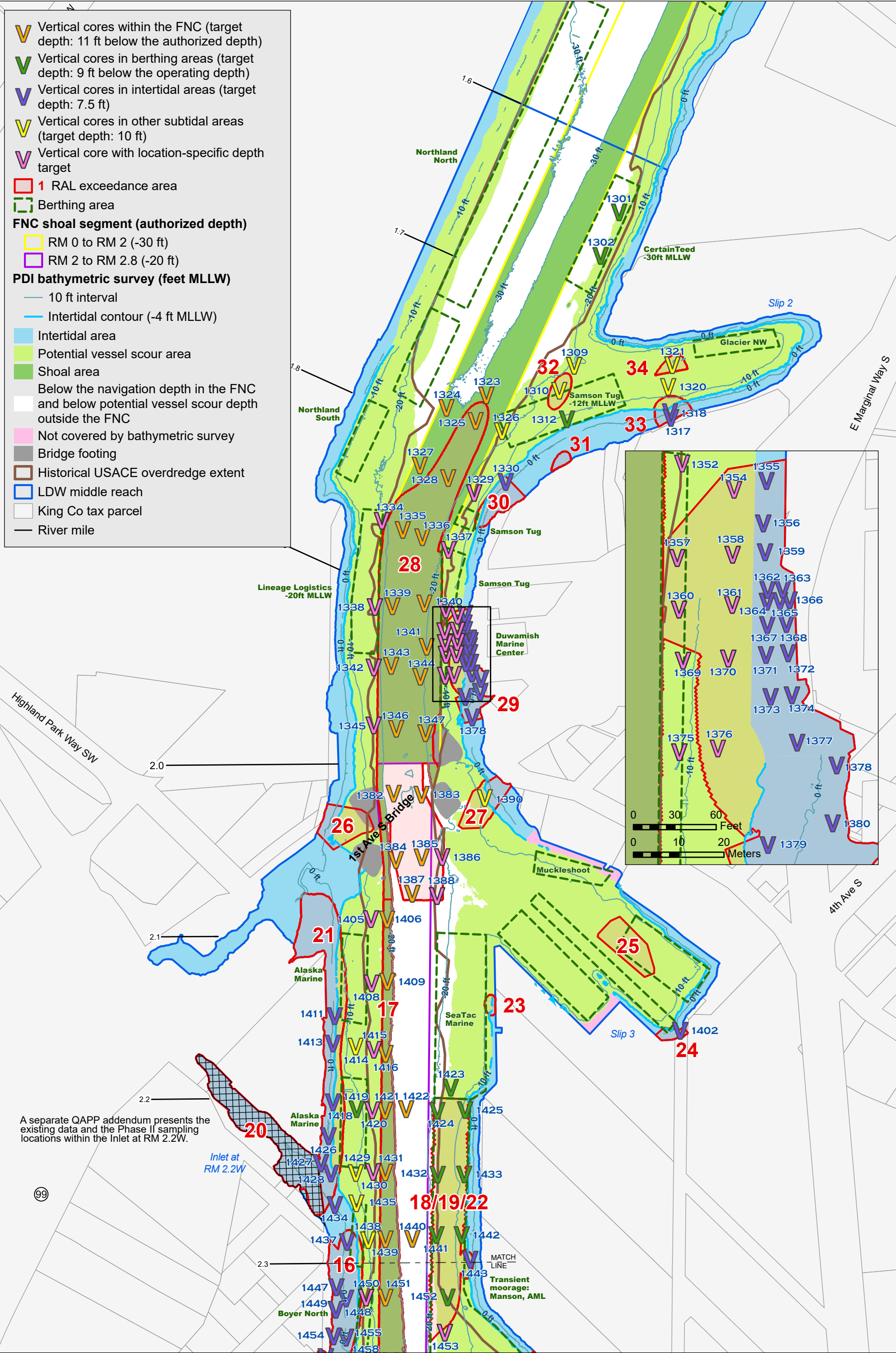
<sup>b</sup>Outfalls are based on the Ecology 2020 survey, as amended by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.



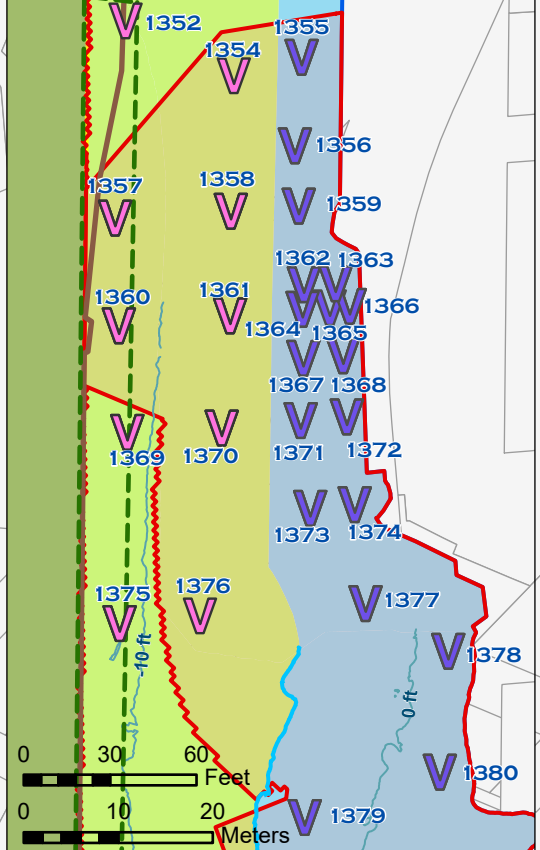
**Map 4-2e. Phase II Sample Locations, RAL Exceedances, and PCB Interpolation Uncertainty Bands Based on the Design Dataset, RM 2.75 to RM 3.0**

QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH JUNE 12, 2024

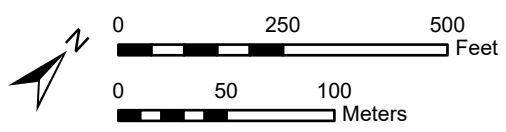




- V Vertical cores within the FNC (target depth: 11 ft below the authorized depth)
- V Vertical cores in berthing areas (target depth: 9 ft below the operating depth)
- V Vertical cores in intertidal areas (target depth: 7.5 ft)
- V Vertical cores in other subtidal areas (target depth: 10 ft)
- V Vertical core with location-specific depth target
- 1 RAL exceedance area
- Berthing area
- FNC shoal segment (authorized depth)**
- RM 0 to RM 2 (-30 ft)
- RM 2 to RM 2.8 (-20 ft)
- PDI bathymetric survey (feet MLLW)**
- 10 ft interval
- Intertidal contour (-4 ft MLLW)
- Intertidal area
- Potential vessel scour area
- Shoal area
- Below the navigation depth in the FNC and below potential vessel scour depth outside the FNC
- Not covered by bathymetric survey
- Bridge footing
- Historical USACE overdredge extent
- LDW middle reach
- King Co tax parcel
- River mile



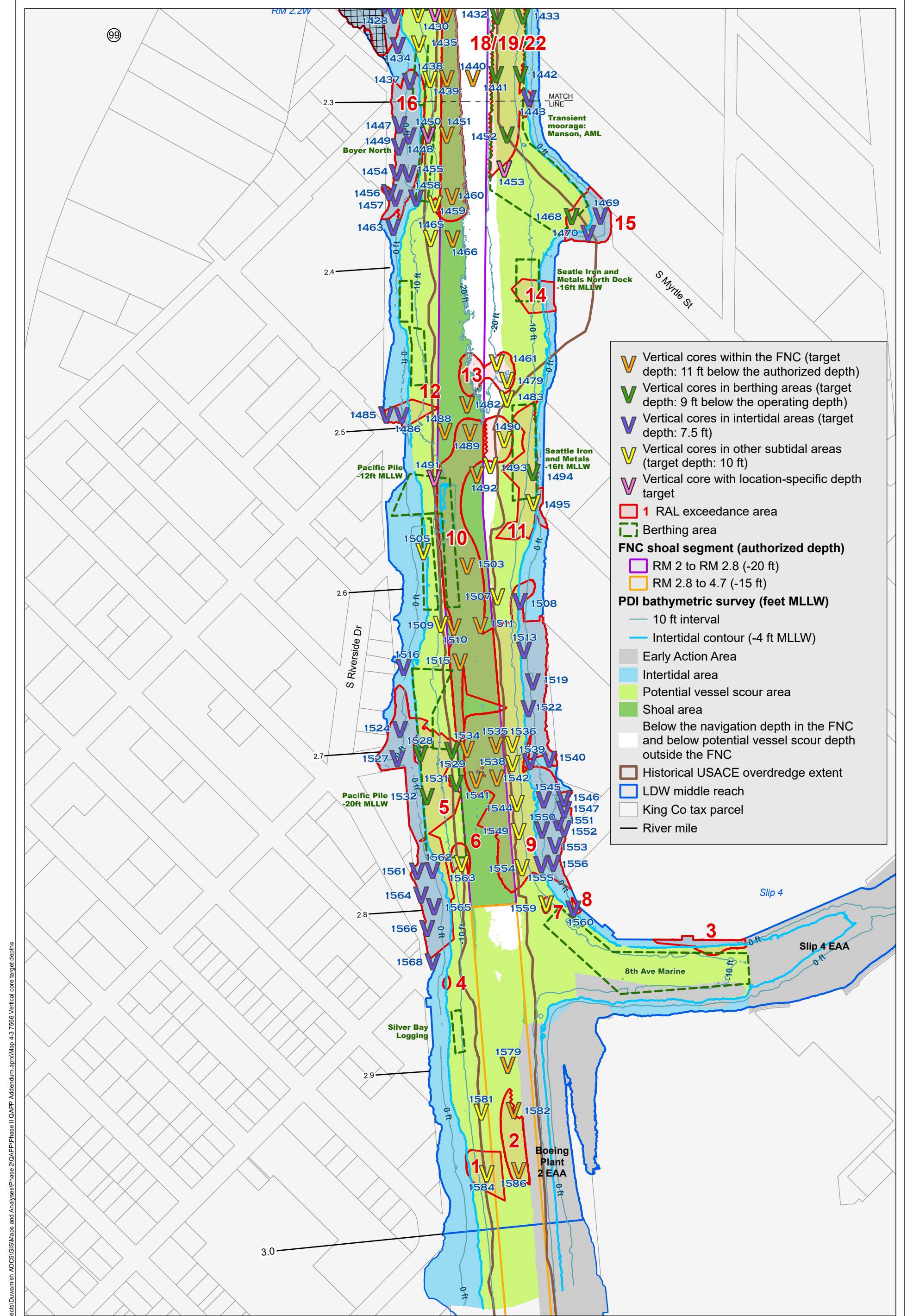
A separate QAPP addendum presents the existing data and the Phase II sampling locations within the Inlet at RM 2.2W.



**Map 4-3a. Categories of Vertical Extent Cores, RM 1.6 to RM 2.3**

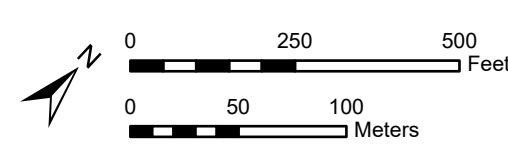
Prepared by craigh, 6/13/2024, W:\Projects\Duwamish\_AOC5\GIS\Maps and Analyses\Phase 2\QAPP\Phase II\QAPP Addendum.aprx\Map\_4-3\_7566\_Veritical core target depths





- V Vertical cores within the FNC (target depth: 11 ft below the authorized depth)
- V Vertical cores in berthing areas (target depth: 9 ft below the operating depth)
- V Vertical cores in intertidal areas (target depth: 7.5 ft)
- V Vertical cores in other subtidal areas (target depth: 10 ft)
- V Vertical core with location-specific depth target
- 1 RAL exceedance area
- Berthing area
- FNC shoal segment (authorized depth)**
- RM 2 to RM 2.8 (-20 ft)
- RM 2.8 to 4.7 (-15 ft)
- PDI bathymetric survey (feet MLLW)**
- 10 ft interval
- Intertidal contour (-4 ft MLLW)
- Early Action Area
- Intertidal area
- Potential vessel scour area
- Shoal area
- Below the navigation depth in the FNC and below potential vessel scour depth outside the FNC
- Historical USACE overdrudge extent
- LDW middle reach
- King Co tax parcel
- River mile

Prepared by craigh, 6/13/2024, W:\Projects\Duwamish\_AOC\GIS\Maps and Analyses\Phase 2\QAPP\Phase II QAPP Addendum.aprx\Map\_4-3\_7566\_Verical core target depths





**Phase I PDI sediment samples analyzed for dioxin/furan**

- 0-10 cm sediment grab
- ◡ 0-45 cm sediment core
- ◻ 0-60 cm sediment core

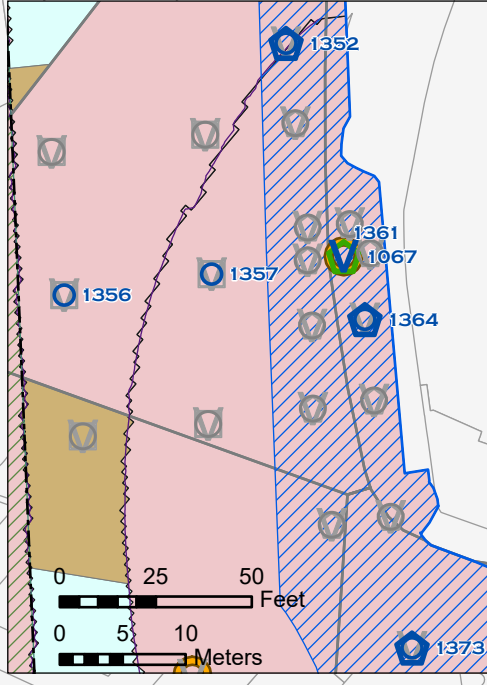
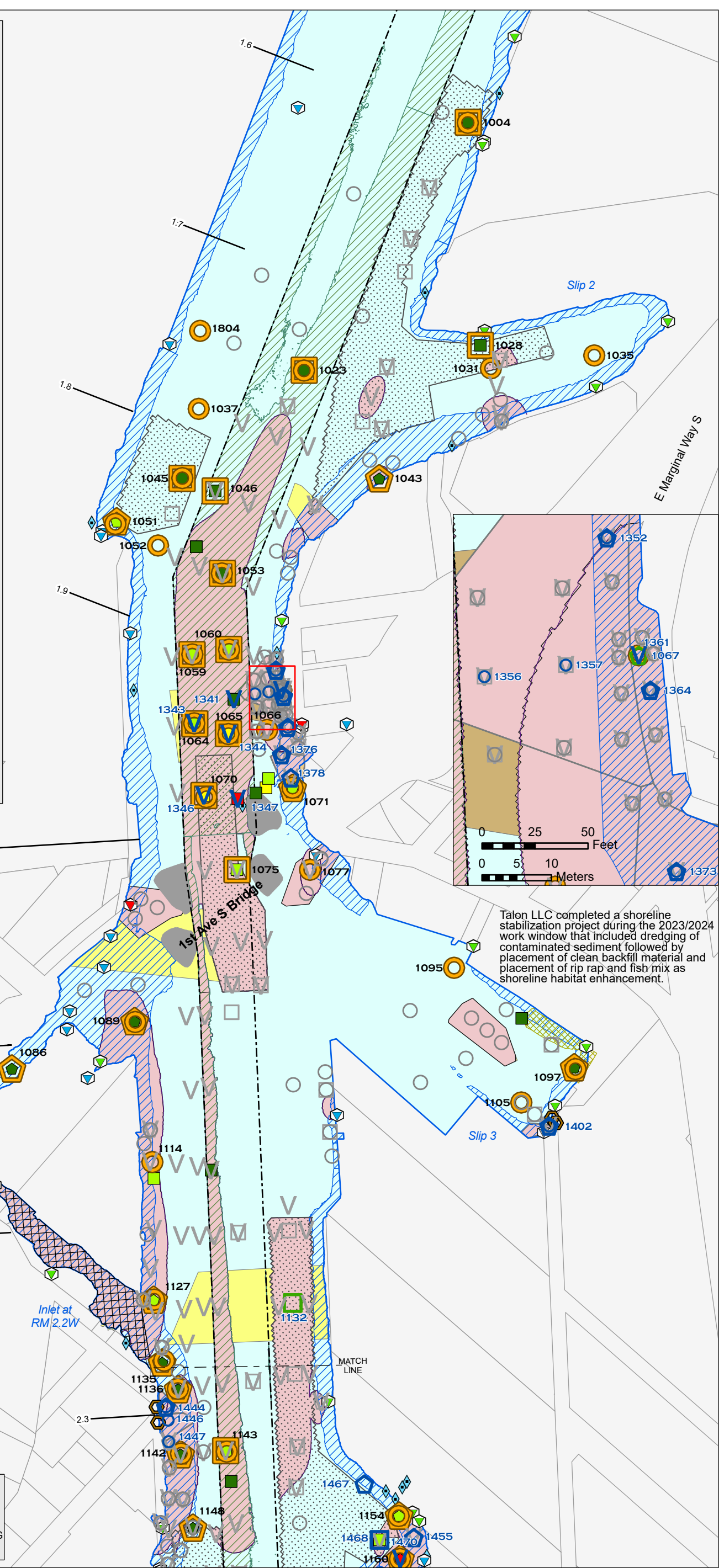
**Proposed Phase II locations**

Tier 1 Phase II	Phase I archive to be analyzed in Phase II	Tier 2 Phase II	
○	○	○	0-10 cm sediment grab
◡	◡	◡	0-45 cm sediment core
◻	◻	◻	0-60 cm sediment core
∇		∇	Vertical extent core (non-RAL interval)

**Dioxin/furan sediment sampling location in the design dataset (ng/kg TEQ)**

0-10 cm	0-45 cm	0-60 cm	
●	●	●	≤ 10
●	●	●	> 10 and ≤ 20
●	●	●	> 20 and ≤ 25
●	●	●	> 25

- ◡ Sample above MHHW<sup>a</sup>
- ◻ Total PCB 50% probability of RAL exceedance area
- ◻ Additional Thiessen polygon RAL exceedance area for dioxin/furan in surface sediment
- ◻ Additional Thiessen polygon RAL exceedance area for dioxin/furan in subsurface sediment
- ◻ Additional Thiessen polygon RAL exceedance area for other COCs excluding phenol
- ◡ CSO<sup>b</sup>
- ◡ Private storm drain<sup>b</sup>
- ◡ Public storm drain<sup>b</sup>
- ◡ Abandoned/inactive outfall<sup>b</sup>
- ◡ Pope of unresolved origin and/or use<sup>b</sup>
- ◡ Reservoir overflow<sup>b</sup>
- ◡ Recovery Category 1
- ◡ Intertidal area
- ◡ Shoal area
- ◡ Talon Shoreline Stabilization and Restoration Project
- ◡ Bridge footing
- ◡ King Co tax parcel
- ◡ Federal Navigation Channel
- ◡ River mile



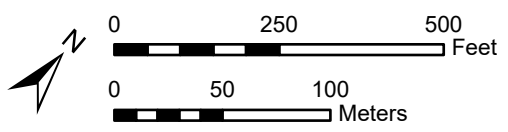
Talon LLC completed a shoreline stabilization project during the 2023/2024 work window that included dredging of contaminated sediment followed by placement of clean backfill material and placement of rip rap and fish mix as shoreline habitat enhancement.

A separate QAPP addendum presents the existing data and the Phase II sampling locations within the Inlet at RM 2.2W.

location ID	year	RAL exceedance factor
LDW23-SS1003	(2023)	Phenol: 2.0
0-10 cm		
depth interval		chemical

<sup>a</sup> The 2010 Remedial Investigation MHHW boundary has been updated based on more recent 2021 LIDAR data by King County. Samples collected above the MHHW boundary will not be included in the Phase II interpolation dataset. The exceedance boxes for these locations have been shaded brown to indicate that they will be classified as soil samples in the Phase II DER.

<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as amended by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.



**Map 4-4a. Phase II Sample Locations for Dioxin/Furan Analysis, RM 1.6 to RM 2.3**



location ID	year	RAL
LDW23-SS1003	(2023)	exceedance factor
0-10 cm: Phenol: 2.0		
depth interval	chemical	

**Phase I PDI sediment samples analyzed for dioxin/furan**

- 0-10 cm sediment grab
- 0-45 cm sediment core
- 0-60 cm sediment core

**Proposed Phase II locations**

- |  |  |  |   |
|--|--|--|---|
|  |  |  | 0-10 cm sediment grab                   |
|  |  |  | 0-45 cm sediment core                   |
|  |  |  | 0-60 cm sediment core                   |
|  |  |  | Vertical extent core (non-RAL interval) |

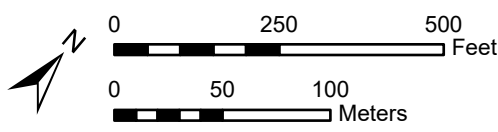
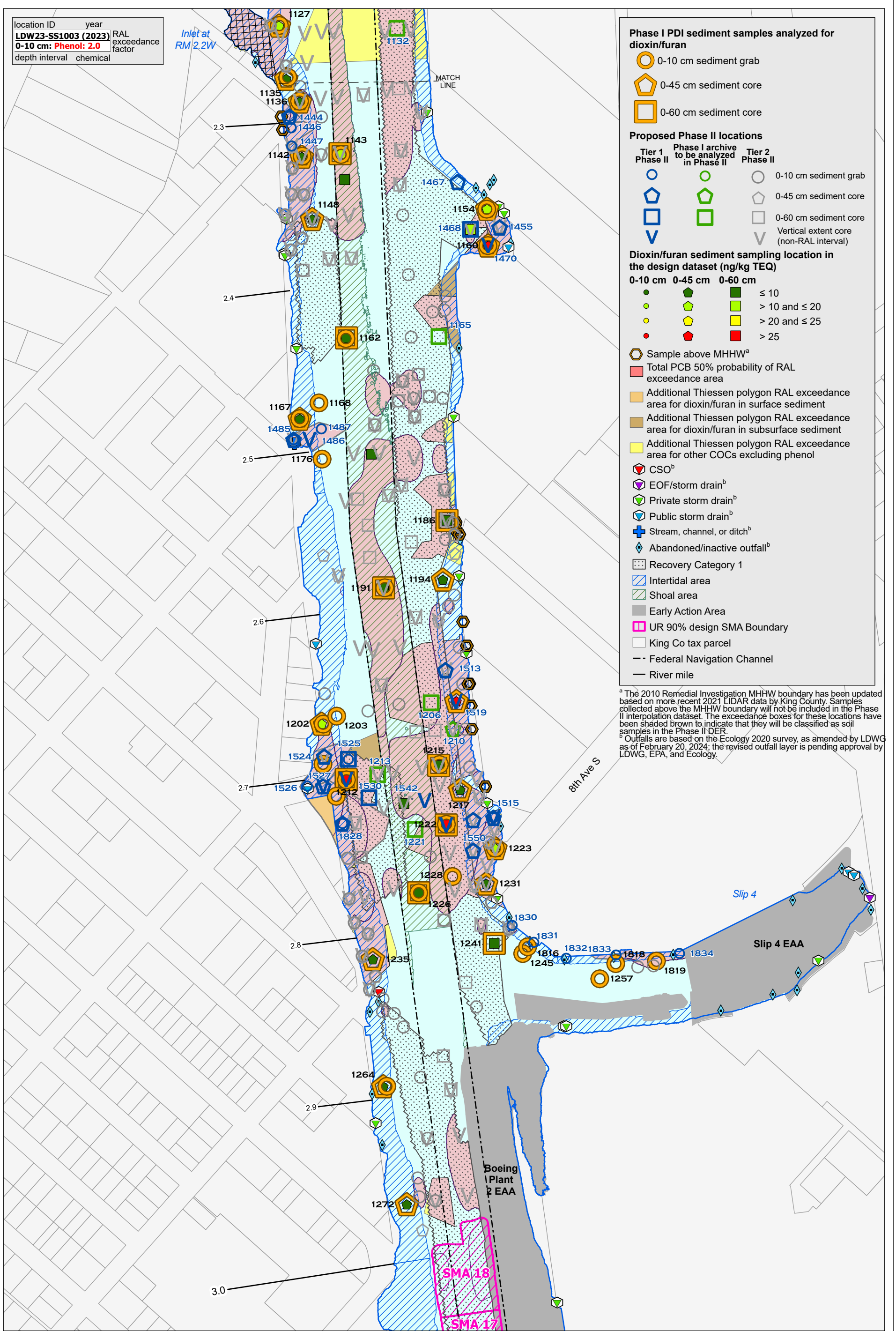
**Dioxin/furan sediment sampling location in the design dataset (ng/kg TEQ)**

- | 0-10 cm | 0-45 cm | 0-60 cm |               |
|---------|---------|---------|---------------|
|         |         |         | ≤ 10          |
|         |         |         | > 10 and ≤ 20 |
|         |         |         | > 20 and ≤ 25 |
|         |         |         | > 25          |

- Sample above MHHW<sup>a</sup>
- Total PCB 50% probability of RAL exceedance area
- Additional Thiessen polygon RAL exceedance area for dioxin/furan in surface sediment
- Additional Thiessen polygon RAL exceedance area for dioxin/furan in subsurface sediment
- Additional Thiessen polygon RAL exceedance area for other COCs excluding phenol
- CSO<sup>b</sup>
- EOF/storm drain<sup>b</sup>
- Private storm drain<sup>b</sup>
- Public storm drain<sup>b</sup>
- Stream, channel, or ditch<sup>b</sup>
- Abandoned/inactive outfall<sup>b</sup>
- Recovery Category 1
- Intertidal area
- Shoal area
- Early Action Area
- UR 90% design SMA Boundary
- King Co tax parcel
- Federal Navigation Channel
- River mile

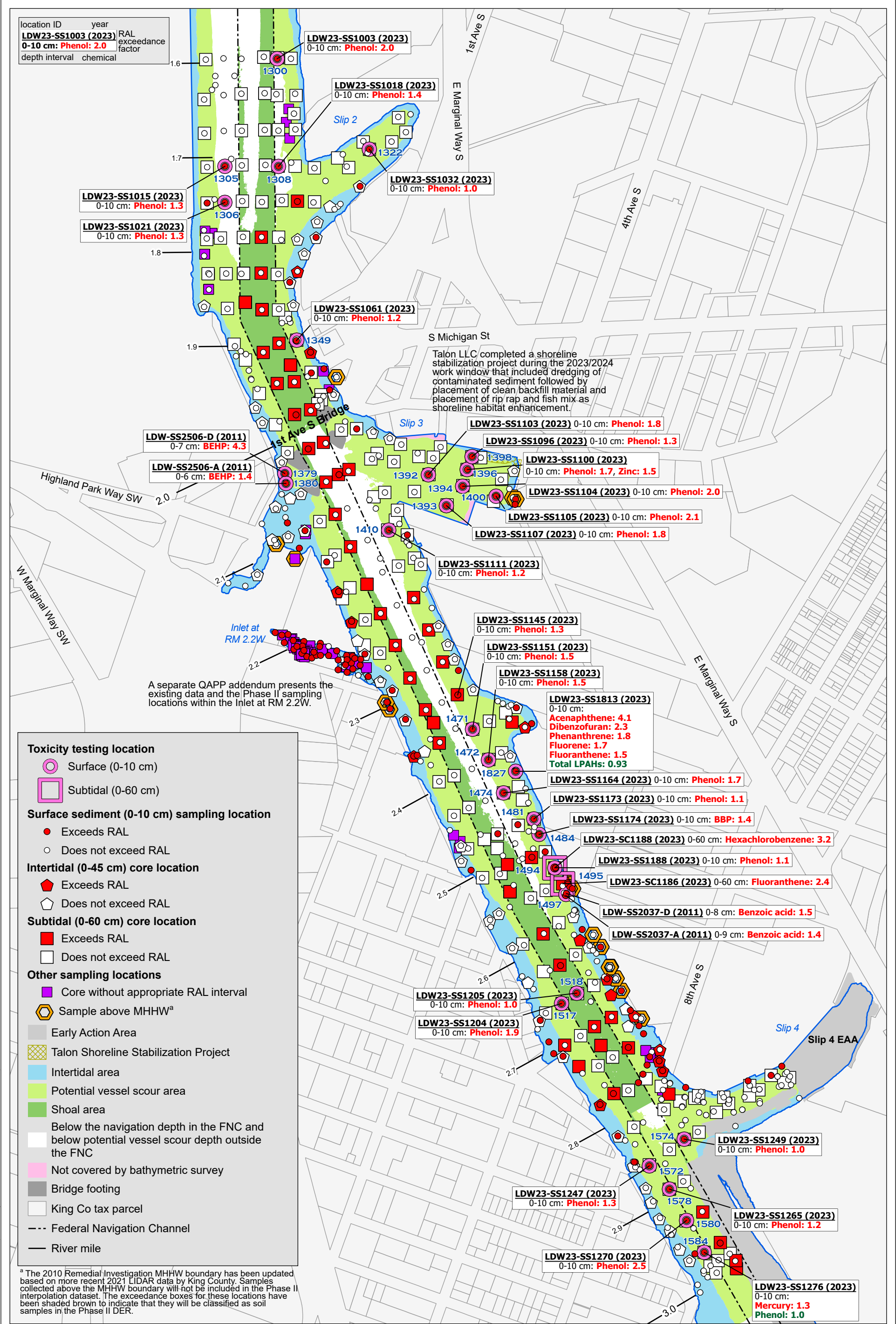
<sup>a</sup> The 2010 Remedial Investigation MHHW boundary has been updated based on more recent 2021 LIDAR data by King County. Samples collected above the MHHW boundary will not be included in the Phase II interpolation dataset. The exceedance boxes for these locations have been shaded brown to indicate that they will be classified as soil samples in the Phase II DER.

<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as amended by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.



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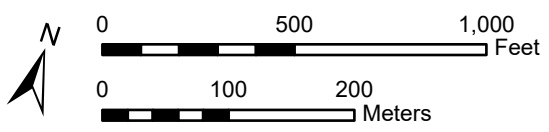




location ID	year	RAL
LDW23-SS1003	2023	exceedance factor
0-10 cm:	Phenol:	2.0
depth interval	chemical	

- Toxicity testing location**
- Surface (0-10 cm)
  - Subtidal (0-60 cm)
- Surface sediment (0-10 cm) sampling location**
- Exceeds RAL
  - Does not exceed RAL
- Intertidal (0-45 cm) core location**
- ◆ Exceeds RAL
  - ◇ Does not exceed RAL
- Subtidal (0-60 cm) core location**
- Exceeds RAL
  - Does not exceed RAL
- Other sampling locations**
- Core without appropriate RAL interval
  - ⬡ Sample above MHHW<sup>a</sup>
- Other features**
- Early Action Area
  - ▨ Talon Shoreline Stabilization Project
  - Intertidal area
  - Potential vessel scour area
  - Shoal area
  - Below the navigation depth in the FNC and below potential vessel scour depth outside the FNC
  - Not covered by bathymetric survey
  - Bridge footing
  - King Co tax parcel
  - Federal Navigation Channel
  - River mile

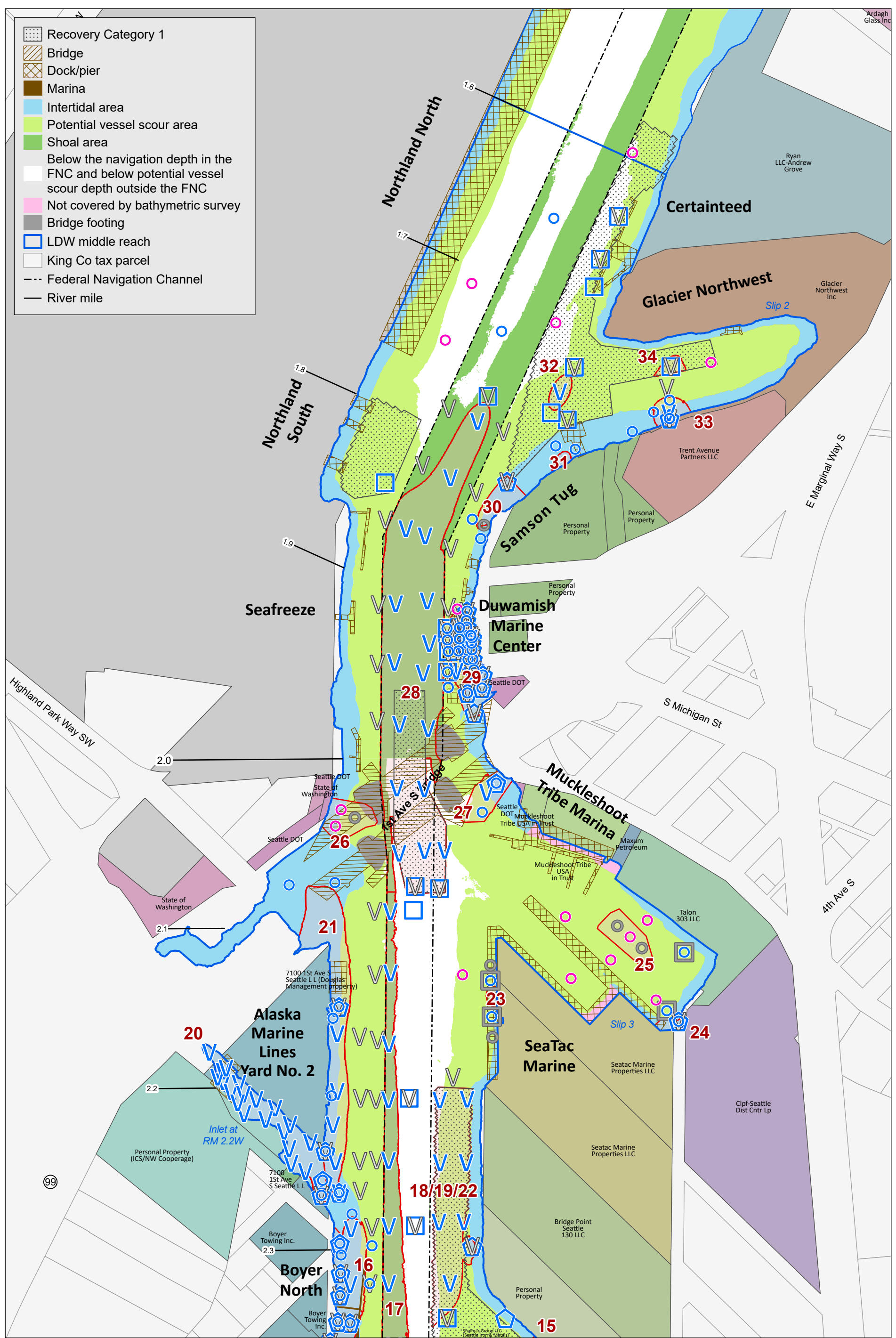
<sup>a</sup> The 2010 Remedial Investigation MHHW boundary has been updated based on more recent 2021 LIDAR data by King County. Samples collected above the MHHW boundary will not be included in the Phase II interpolation dataset. The exceedance boxes for these locations have been shaded brown to indicate that they will be classified as soil samples in the Phase II DER.



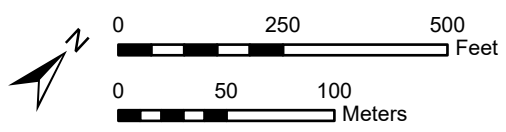
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- Recovery Category 1
- Bridge
- Dock/pier
- Marina
- Intertidal area
- Potential vessel scour area
- Shoal area
- Below the navigation depth in the FNC and below potential vessel scour depth outside the FNC
- Not covered by bathymetric survey
- Bridge footing
- LDW middle reach
- King Co tax parcel
- Federal Navigation Channel
- River mile















Prepared by craigh, 6/13/2024, W:\Projects\Duwamish\_AOC\GIS\Maps and Analyses\Phase II QAPP Addendum.aprx\Map 4-6 7630 Upland Sites

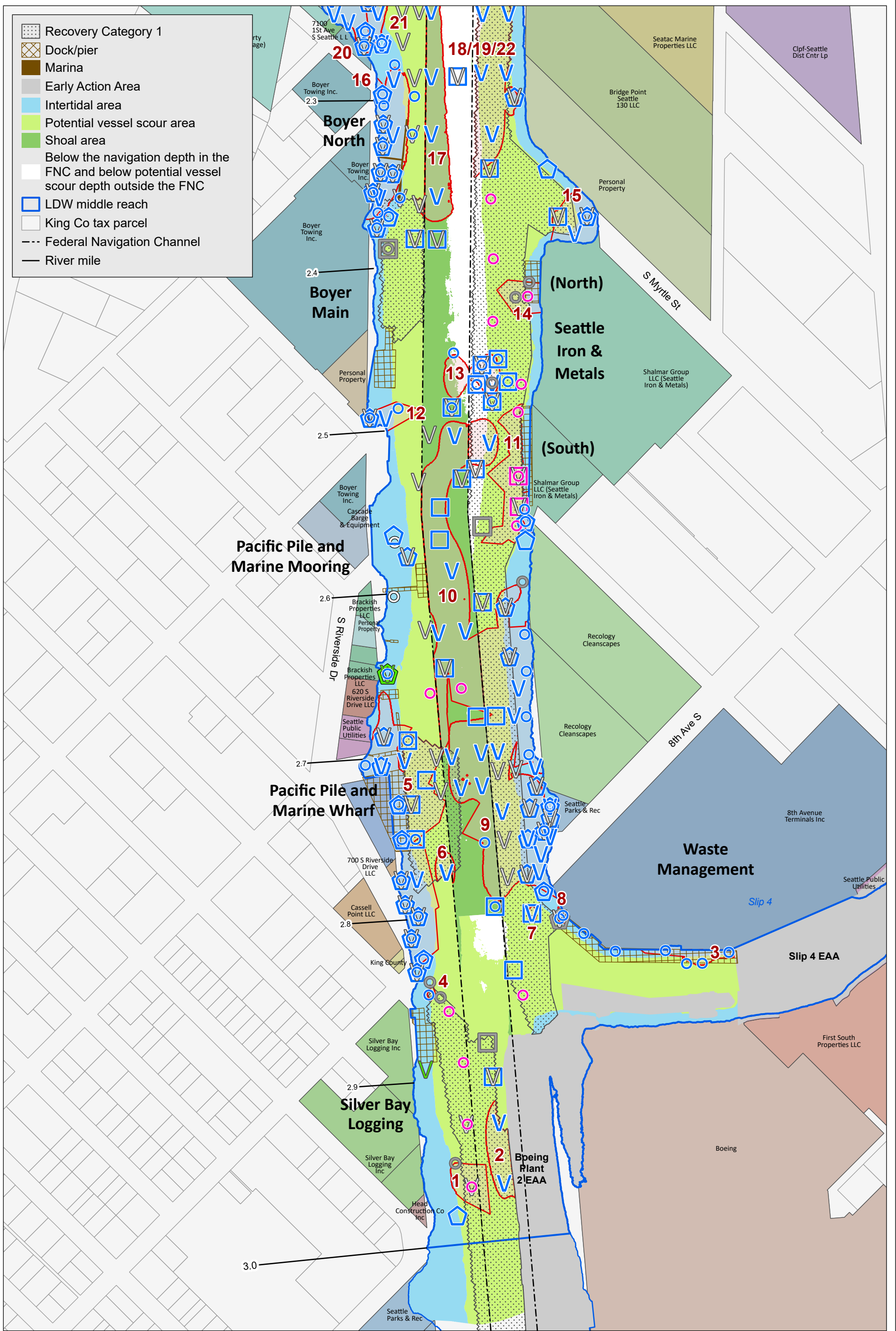


**Map 4-6a. Phase II sample locations, property owners, and waterfront operations, RM 1.6 to RM 2.3**

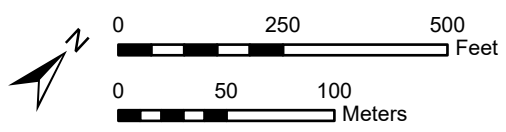
QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH      JUNE 12, 2024



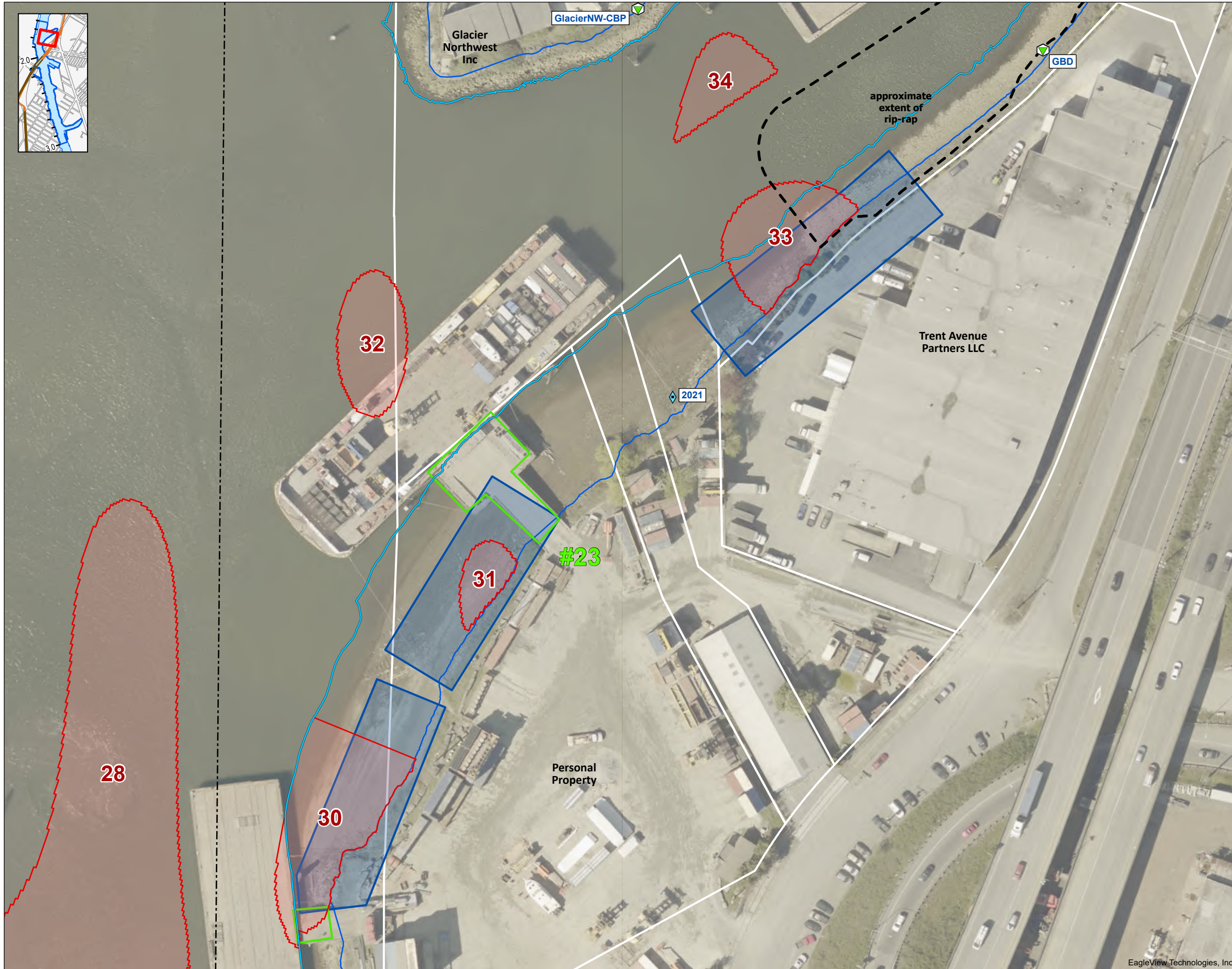
-  Recovery Category 1
-  Dock/pier
-  Marina
-  Early Action Area
-  Intertidal area
-  Potential vessel scour area
-  Shoal area
-  Below the navigation depth in the FNC and below potential vessel scour depth outside the FNC
-  LDW middle reach
-  King Co tax parcel
-  Federal Navigation Channel
-  River mile



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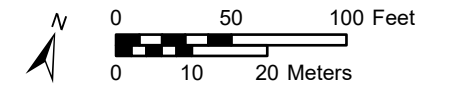






- 1 RAL exceedance area boundary
- Topographic survey area
- Overwater structure to be inspected
- #1 Waterway User Survey structure number<sup>a</sup>
- ▽ Private storm drain<sup>b</sup>
- ◇ Abandoned/inactive outfall<sup>b</sup>
- -4 ft MLLW
- LDW Superfund Boundary
- King Co tax parcel
- Federal Navigation Channel

<sup>a</sup> Waterway User Survey and Assessment of In-Water Structures - Data Report (Integral et al. 2018)  
<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as amended by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.



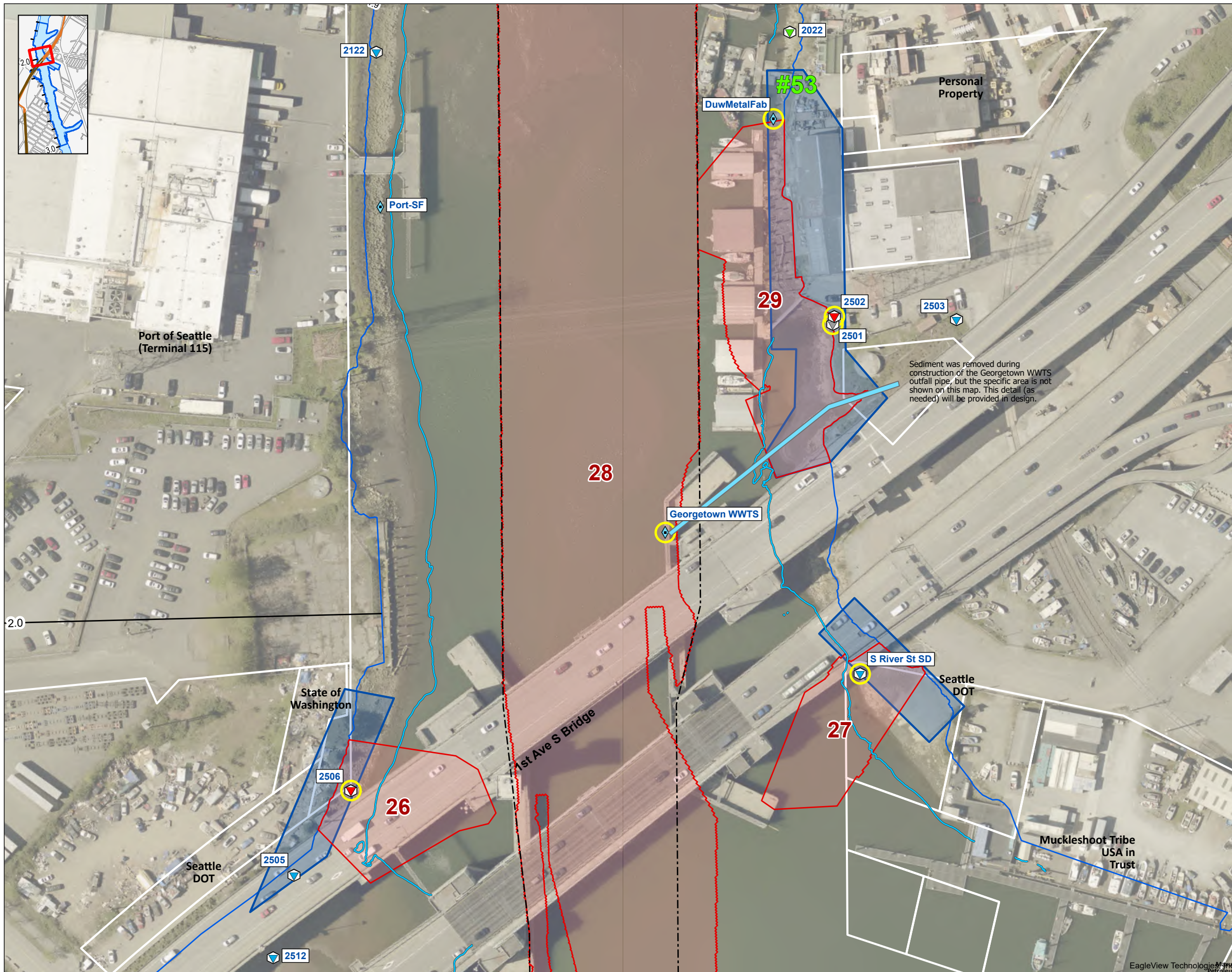
**Map 5-1a. Phase II PDI Shoreline Survey Areas Within and Adjacent to RAL Exceedance Areas 30, 31, and 33**

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**Lower Duwamish Waterway Group**  
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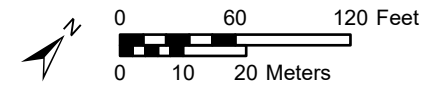


Prepared by craigh, 6/13/2024, W:\Projects\Duwamish AOC\GIS\Maps and Analysis\Phase II QAPP Addendum.aprx\Map 5-1 7969 Shoreline Survey areas - landscape



- - - 1 RAL exceedance area boundary
- Topographic survey area
- #1 Waterway User Survey structure number<sup>a</sup>
- ◆ CSO<sup>b</sup>
- ◆ Private storm drain<sup>b</sup>
- ◆ Public storm drain<sup>b</sup>
- ◆ Abandoned/inactive outfall<sup>b</sup>
- Pipe of unresolved origin and/or use<sup>b</sup>
- Outfall to be inspected<sup>b</sup>
- Georgetown WWTS diffuser pipe
- 4 ft MLLW
- LDW Superfund Boundary
- King Co tax parcel
- Federal Navigation Channel
- River mile

<sup>a</sup> Waterway User Survey and Assessment of In-Water Structures - Data Report (Integral et al. 2018)  
<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as amended by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.



**Map 5-1b. Phase II PDI Shoreline Survey Areas Within and Adjacent to RAL Exceedance Areas 26, 27, and 29**

QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH JUNE 12, 2024

Windward  
environmental LLC

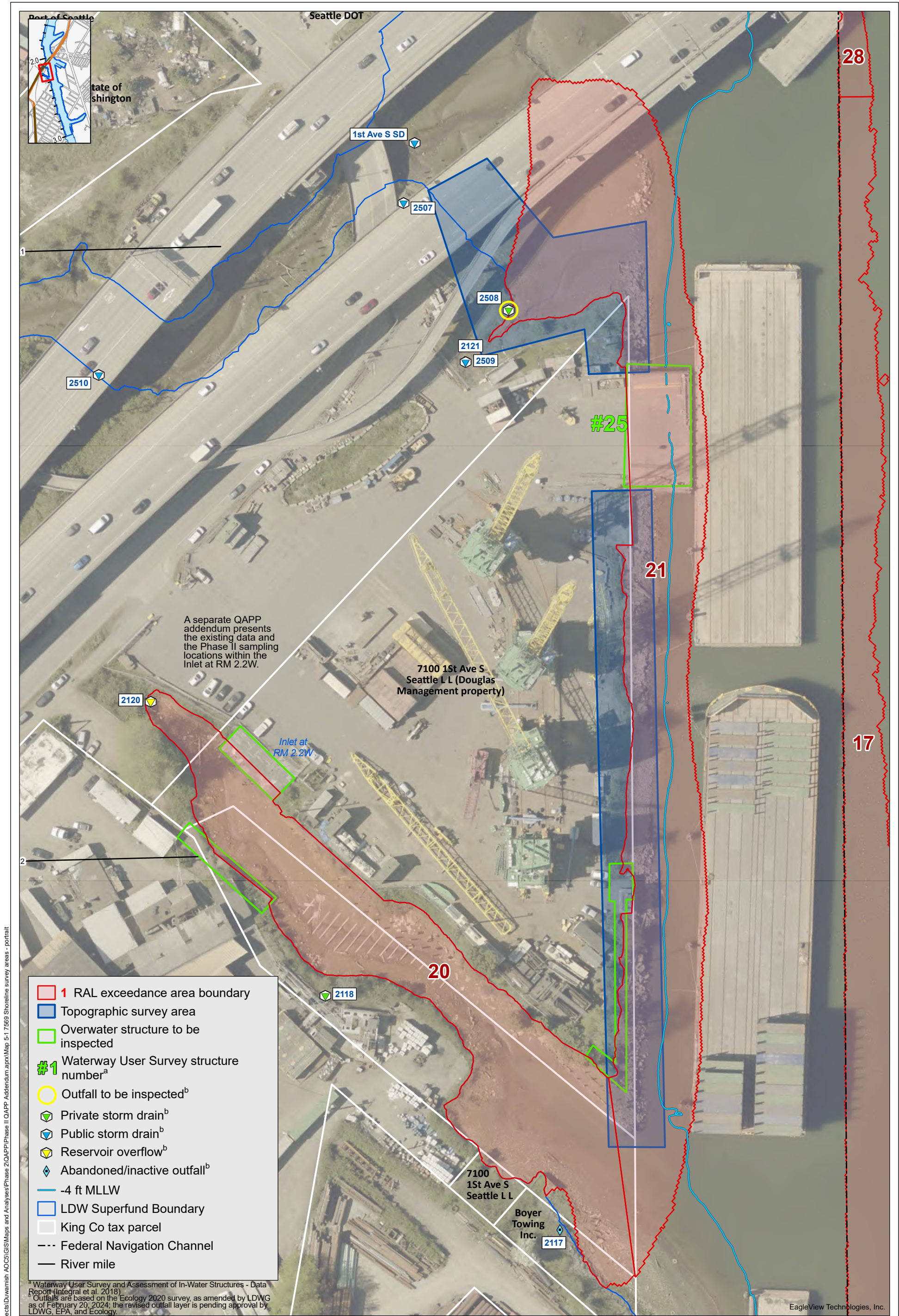
ANCHOR  
QEA

Lower Duwamish Waterway Group

City of Seattle / King County / The Boeing Company

EagleView Technologies





A separate QAPP addendum presents the existing data and the Phase II sampling locations within the Inlet at RM 2.2W.

7100 1st Ave S  
Seattle L L (Douglas Management property)

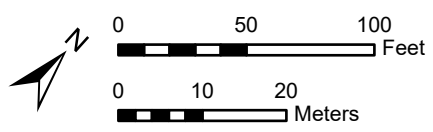
7100  
1st Ave S  
Seattle L L

Boyer  
Towing  
Inc.

- 1 RAL exceedance area boundary
- Topographic survey area
- Overwater structure to be inspected
- #1 Waterway User Survey structure number<sup>a</sup>
- Outfall to be inspected<sup>b</sup>
- ◇ Private storm drain<sup>b</sup>
- ◇ Public storm drain<sup>b</sup>
- ◇ Reservoir overflow<sup>b</sup>
- ◇ Abandoned/inactive outfall<sup>b</sup>
- -4 ft MLLW
- LDW Superfund Boundary
- King Co tax parcel
- Federal Navigation Channel
- River mile

<sup>a</sup> Waterway User Survey and Assessment of In-Water Structures - Data Report (Integral et al. 2018).  
<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as amended by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.

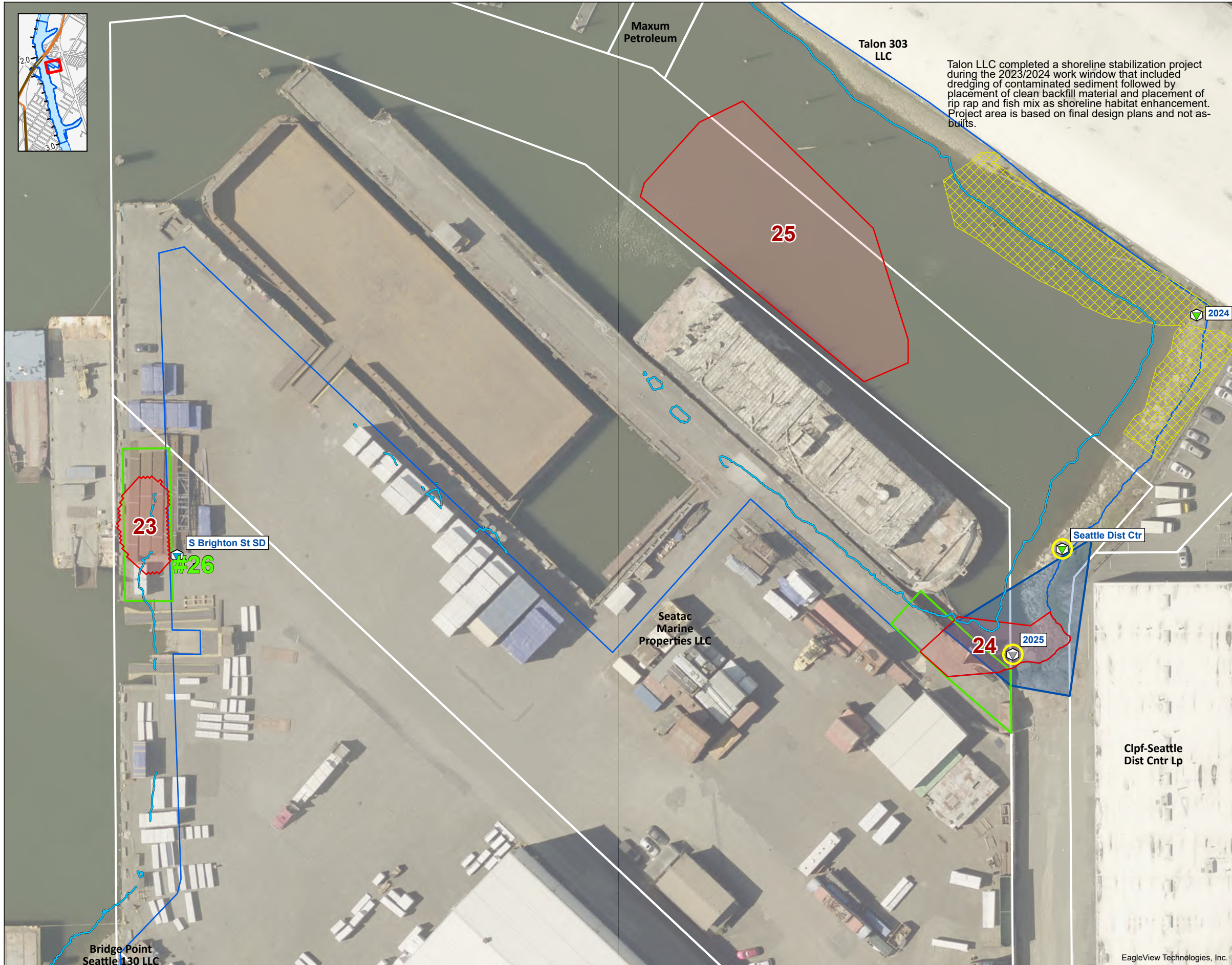
EagleView Technologies, Inc.



**Map 5-1c. Phase II PDI Shoreline Survey Areas Within and Adjacent to RAL Exceedance Area 21**

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- 1 RAL exceedance area boundary
- Topographic survey area
- Overwater structure to be inspected
- #1 Waterway User Survey structure number<sup>a</sup>
- ▼ Private storm drain<sup>b</sup>
- ▼ Public storm drain<sup>b</sup>
- ▼ Pipe of unresolved origin and/or use<sup>b</sup>
- Outfall to be inspected<sup>b</sup>
- Talon Shoreline Stabilization Project
- 4 ft MLLW
- LDW Superfund Boundary
- King Co tax parcel

<sup>a</sup> Waterway User Survey and Assessment of In-Water Structures - Data Report (Integral et al. 2018)  
<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as amended by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.



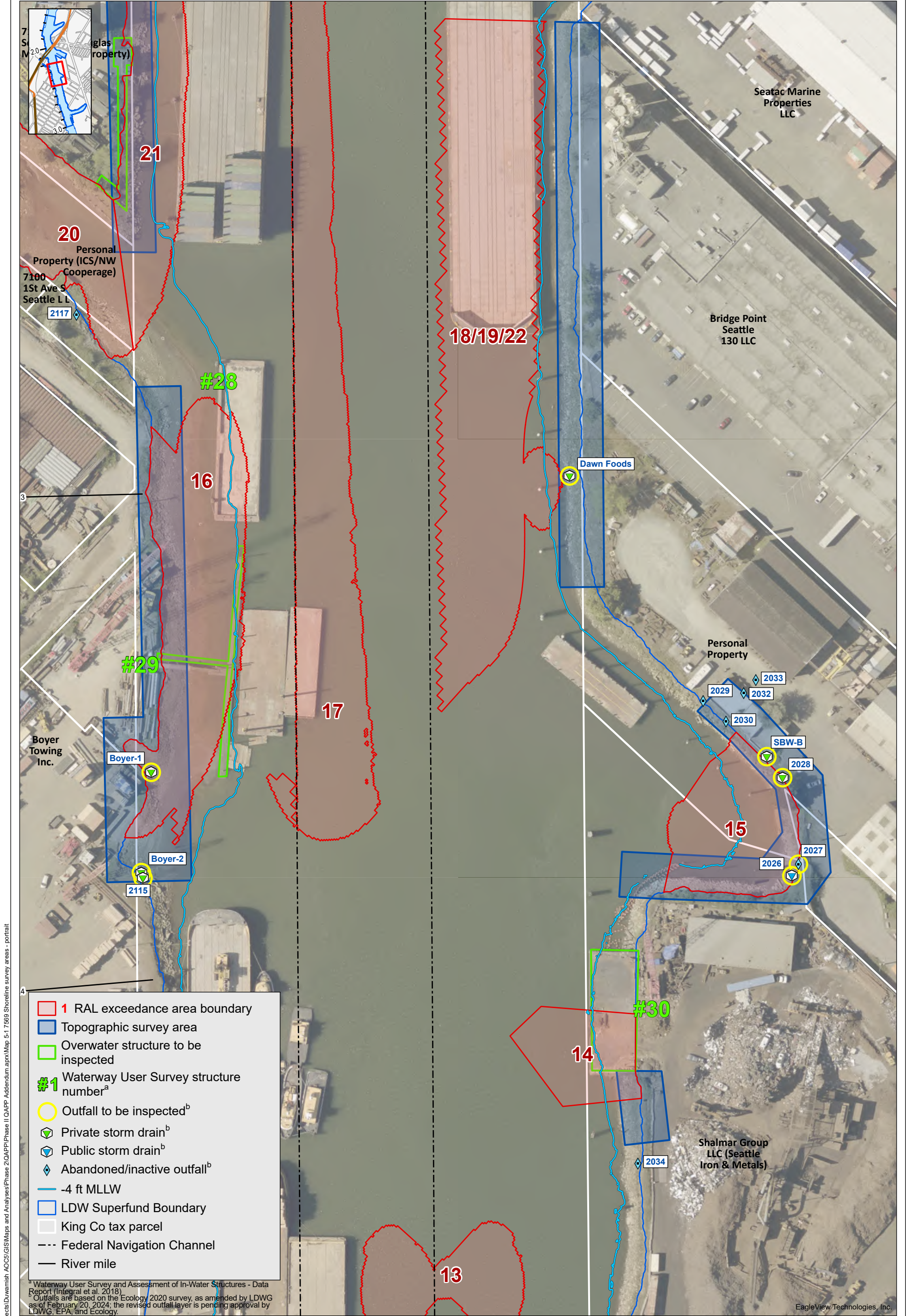
**Map 5-1d. Phase II PDI Shoreline Survey Areas Within and Adjacent to RAL Exceedance Areas 23 and 24**

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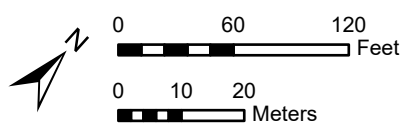


- 1 RAL exceedance area boundary
- Topographic survey area
- Overwater structure to be inspected
- #1 Waterway User Survey structure number<sup>a</sup>
- Outfall to be inspected<sup>b</sup>
- ▽ Private storm drain<sup>b</sup>
- ▽ Public storm drain<sup>b</sup>
- ◇ Abandoned/inactive outfall<sup>b</sup>
- -4 ft MLLW
- LDW Superfund Boundary
- King Co tax parcel
- Federal Navigation Channel
- River mile

<sup>a</sup> Waterway User Survey and Assessment of In-Water Structures - Data Report (Integral et al. 2018)  
<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as amended by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.

EagleView Technologies, Inc.

Prepared by craigh, 6/13/2024, W:\Projects\Duwamish\_AOC5\GIS\Maps and Analyses\Phase 2\QAPP\Phase II QAPP Addendum.aprx\Map 5-1 7569 Shoreline survey areas - portrait

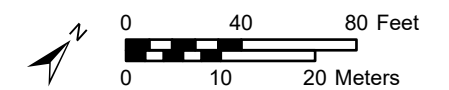






- - - 1 RAL exceedance area boundary
- █ Topographic survey area
- ▭ Overwater structure to be inspected
- #1 Waterway User Survey structure number<sup>a</sup>
- ▽ Private storm drain<sup>b</sup>
- + Stream, channel, or ditch<sup>b</sup>
- ◇ Abandoned/inactive outfall<sup>b</sup>
- Outfall to be inspected<sup>b</sup>
- -4 ft MLLW
- ▭ LDW Superfund Boundary
- ▭ King Co tax parcel
- - - Federal Navigation Channel
- River mile

<sup>a</sup> Waterway User Survey and Assessment of In-Water Structures - Data Report (Integral et al. 2018)  
<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as amended by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.



**Map 5-1f. Phase II PDI Shoreline Survey Areas Within and Adjacent to RAL Exceedance Areas 11 and 12**

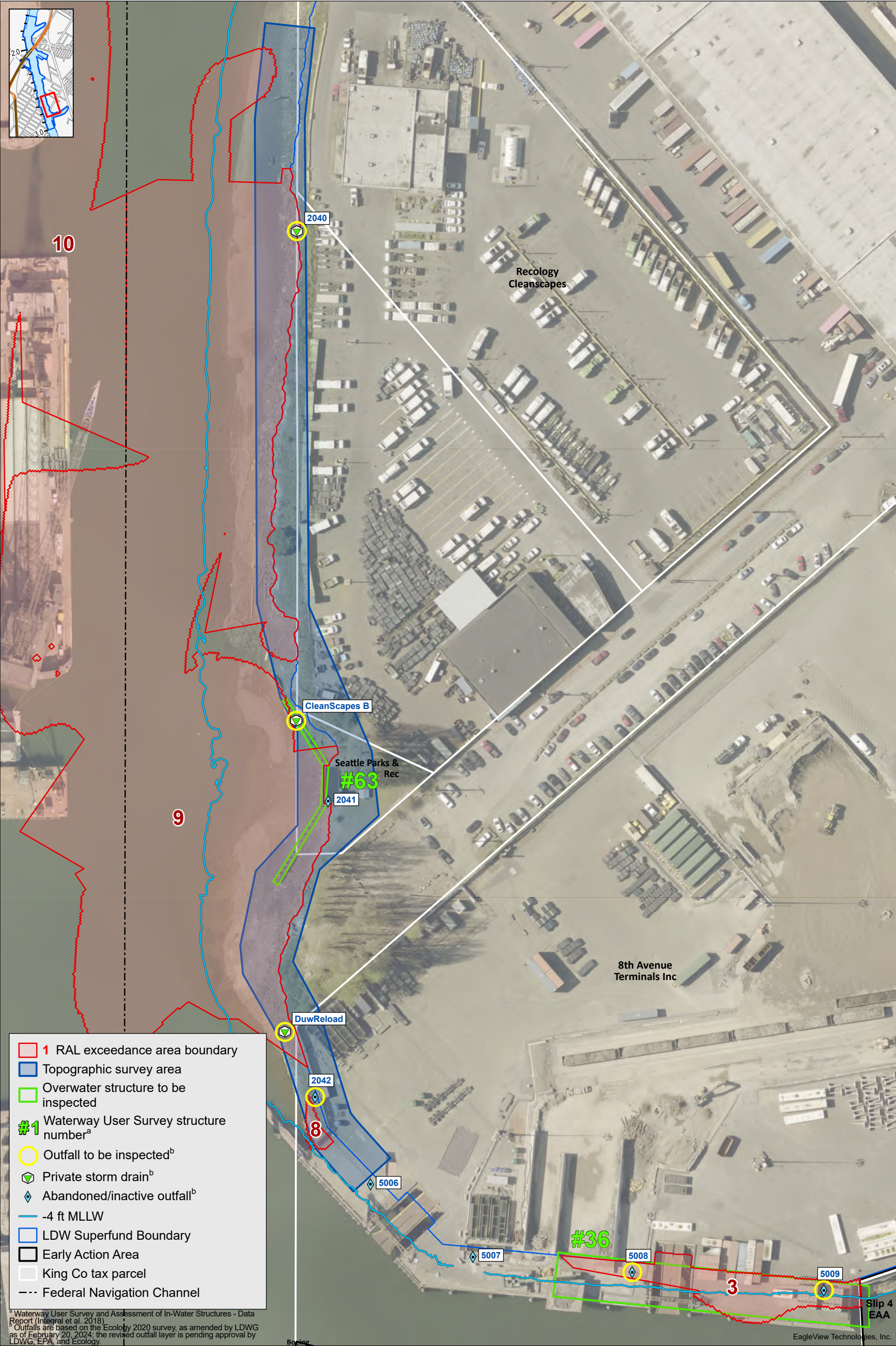
QAPP ADDENDUM FOR PHASE II OF THE PRE-DESIGN INVESTIGATION OF THE LDW MIDDLE REACH JUNE 12, 2024



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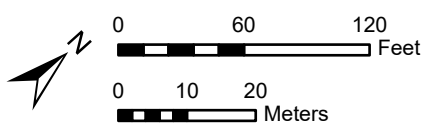


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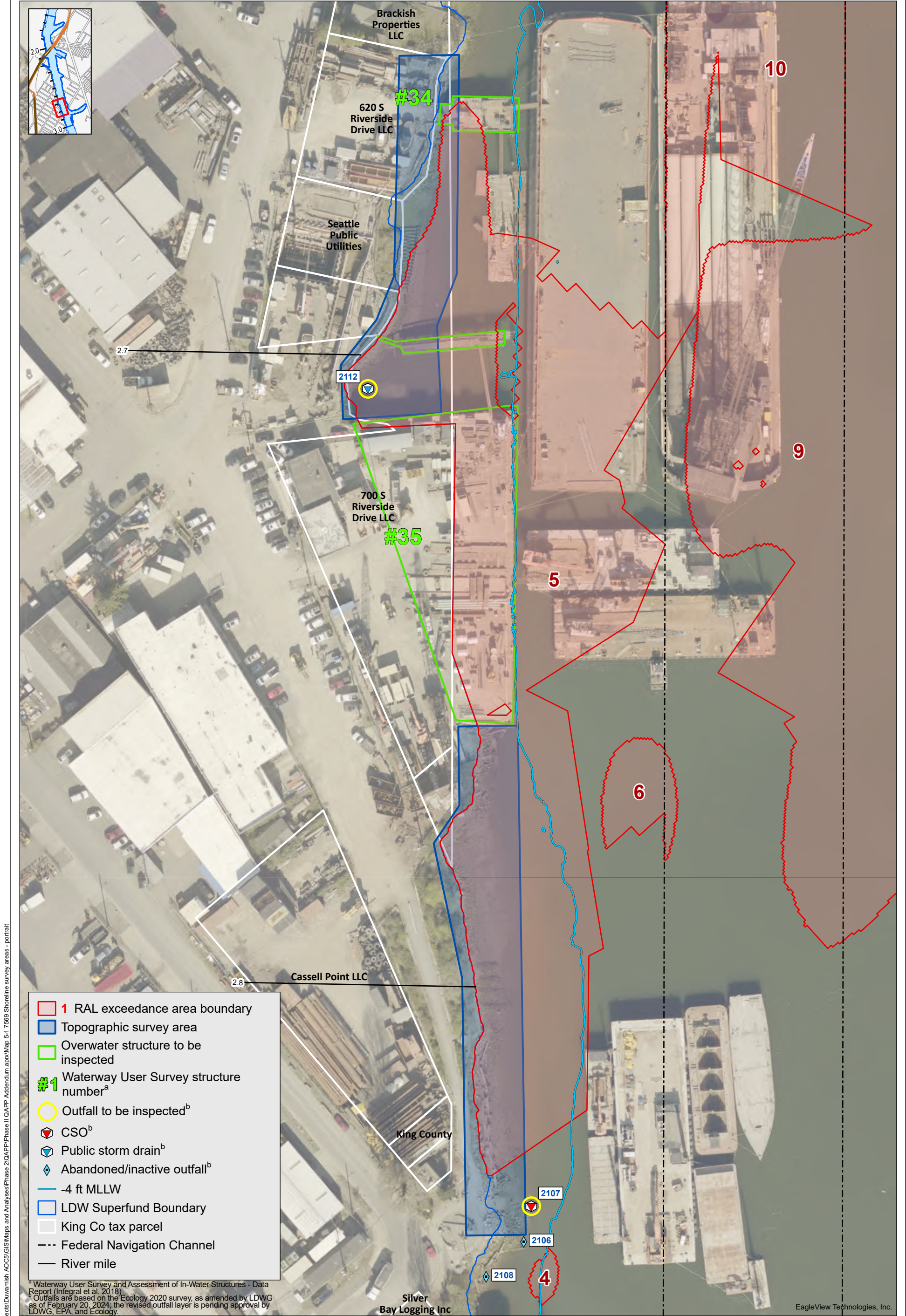
- 1 RAL exceedance area boundary
- Topographic survey area
- Overwater structure to be inspected
- #1 Waterway User Survey structure number<sup>a</sup>
- Outfall to be inspected<sup>b</sup>
- ▽ Private storm drain<sup>b</sup>
- ◇ Abandoned/inactive outfall<sup>b</sup>
- -4 ft MLLW
- LDW Superfund Boundary
- Early Action Area
- King Co tax parcel
- Federal Navigation Channel

<sup>a</sup> Waterway User Survey and Assessment of In-Water Structures - Data Report (Integral et al. 2018)  
<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as amended by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.



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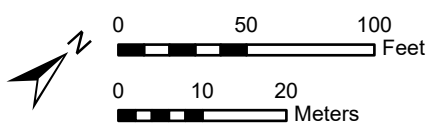




- 1 RAL exceedance area boundary
- Topographic survey area
- Overwater structure to be inspected
- #1 Waterway User Survey structure number<sup>a</sup>
- Outfall to be inspected<sup>b</sup>
- ◆ CSO<sup>b</sup>
- ◆ Public storm drain<sup>b</sup>
- ◆ Abandoned/inactive outfall<sup>b</sup>
- -4 ft MLLW
- LDW Superfund Boundary
- King Co tax parcel
- - - Federal Navigation Channel
- River mile

<sup>a</sup> Waterway User Survey and Assessment of In-Water Structures - Data Report (Integral et al. 2018).  
<sup>b</sup> Outfalls are based on the Ecology 2020 survey, as amended by LDWG as of February 20, 2024; the revised outfall layer is pending approval by LDWG, EPA, and Ecology.

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EagleView Technologies, Inc.



**Phase II PDI geotechnical study**

- CPT/SPT location<sup>a</sup>
- SPT location
- Vane shear location

**Previous geotechnical studies by others<sup>b</sup>**

- ▲ CPT location
- ▲ SPT location

**PDI bathymetric survey (feet MLLW)**

- 5 ft interval
- 1 ft interval

**LiDAR survey (ft MLLW)(King Co 2021)**

- 5 ft interval
- 1 ft interval

- RM 0 to RM 2 (FNC authorized depth -30 ft)
- RM 2 to RM 2.8 (FNC authorized depth -20 ft)

- ▨ Bridge
- ▨ Dock/pier
- Marina
- ▭ LDW middle reach
- ▭ LDW Superfund Site
- ▭ King Co tax parcel
- River mile

<sup>a</sup> Where both SPT and CPT are indicated, the field geologist/geotechnical engineer and lead geotechnical engineer will evaluate the most appropriate investigation method based on field conditions. Only one method will be selected.  
<sup>b</sup> Because previous geotechnical studies were performed by different entities, sample location IDs are duplicated on this summary map.

Authorized navigation channel depth -30 ft MLLW RM 1.6 to 1st Ave S Bridge (RM 2.0)

Authorized navigation channel depth -20 ft MLLW 1st Ave S Bridge (RM 2.0) to RM 2.8

Additional geotechnical investigation locations are included with the QAPP Addendum No. 2.

Highland Park Way SW

S Michigan St

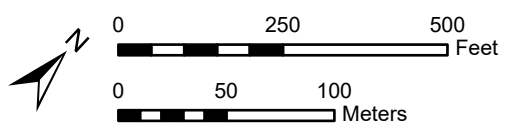
4th Ave S

E Marginal Way S

99



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**Map 5-2a. Phase II Geotechnical Investigation Locations, RM 1.6 to RM 2.3**

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**Phase II PDI geotechnical study**

- CPT/SPT location<sup>a</sup>
- SPT location

**Previous geotechnical studies by others<sup>b</sup>**

- ▲ CPT location
- ▲ SPT location
- 1 RAL exceedance area boundary

**PDI bathymetric survey (feet MLLW)**

- 5 ft interval
- 1 ft interval

**LiDAR survey (ft MLLW)(King Co 2021)**

- 5 ft interval
- 1 ft interval

RM 2 to RM 2.8 (FNC authorized depth -20 ft)

RM 2.8 to 4.7 (FNC authorized depth -15 ft)

□ Dock/pier

■ Marina

■ Early Action Area

■ LDW middle reach

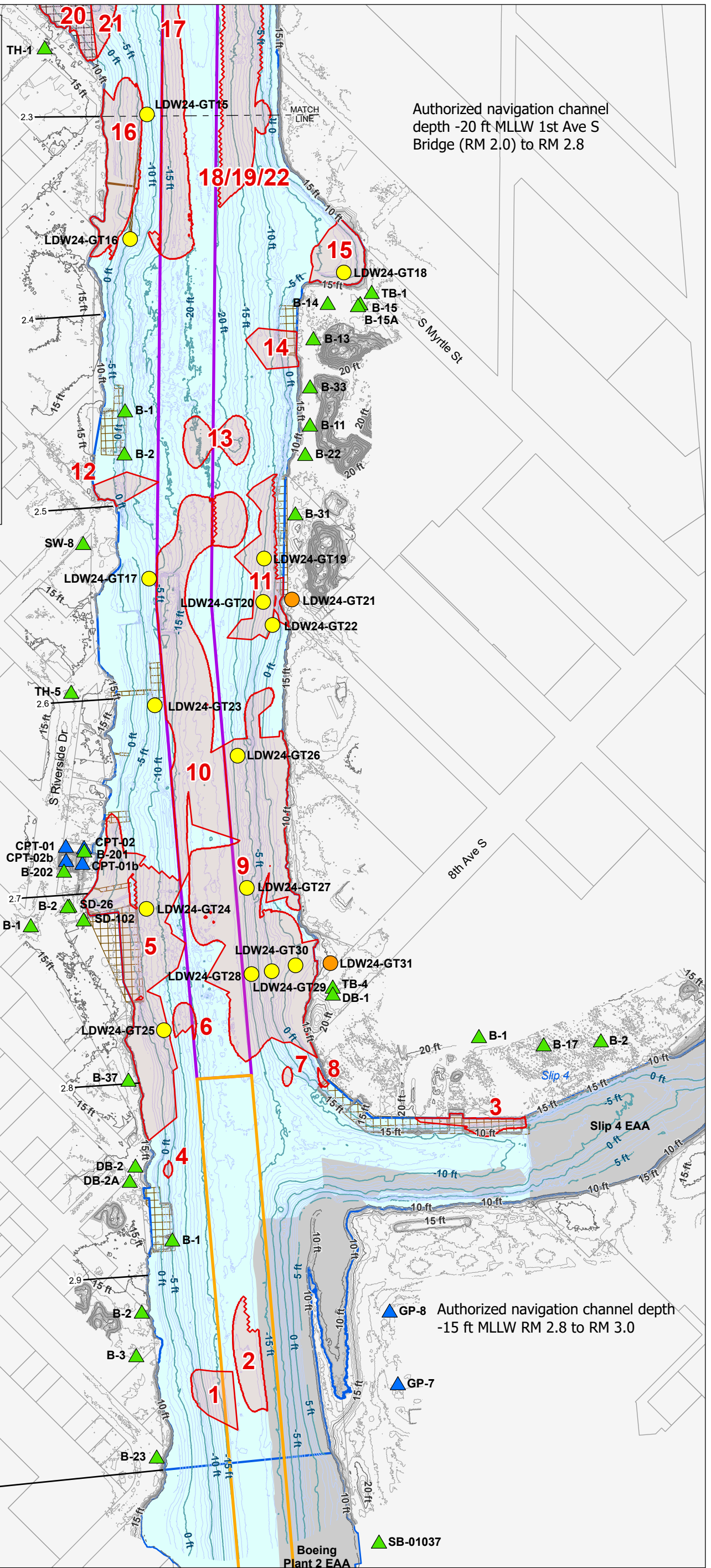
■ LDW Superfund Site

■ King Co tax parcel

— River mile

<sup>a</sup> Where both SPT and CPT are indicated, the field geologist/geotechnical engineer and lead geotechnical engineer will evaluate the most appropriate investigation method based on field conditions. Only one method will be selected.

<sup>b</sup> Because previous geotechnical studies were performed by different entities, sample location IDs are duplicated on this summary map.

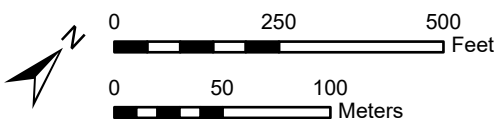


Authorized navigation channel depth -20 ft MLLW 1st Ave S Bridge (RM 2.0) to RM 2.8

GP-8 Authorized navigation channel depth -15 ft MLLW RM 2.8 to RM 3.0



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**Map 5-2b. Phase II Geotechnical Investigation Locations, RM 2.3 to RM 3.0**