Sediment sampling location

Surface sediment chemistry

Locations with multiple chemical groups

- <SQS/SL, detected
- ≥SQS/SL and <CSL/ML, non-detect
- ≥CSL/ML, non-detect
- ≥SQS/SL and <CSL/ML, detected
- ≥CSL/ML, detected

Locations where only PCBs measured

- <SQS/SL, detected
- ≥SQS/SL and <CSL/ML, detected
- ≥CSL/ML, detected

Dredge event

Human access location and activities

- Picnicking
- Fishing
- Crab/clam/mussel harvesting
- Swimming
- Walking
- Birding
- Biking
- Hand boat launch
- Motor boat launch
- Restoration activity site
- Undefined

Sandpiper foraging habitat quality

- None
- Poor
- High

Sandpiper nesting habitat quality

- None
- Poor
- High

Intertidal (a) and subtidal (b) market basket benthic community characterization sampling location

Clam tissue sampling location

Clam habitat quality

- Low
- Medium
- High

Seep survey location with chemistry

Seep reconaissance survey location (Windward 2004)

Study area boundary

Outfalls

- EOF, CSO, or CSO/SD
- Pipe of unknown origin
- Private storm drain
- Publicly-owned storm drain
- City-identified seep
- Stream, channel, or swale

Intertidal conditions

- Marsh
- Mud
- Riprap

Navigation channel

Tax parcel

River mile

BNSF RWY CO
PORT OF SEATTLE
LIPSETT CO LLC
GENERAL RECYCLING OF WASHINGTON
SEATTLE PARKS DEPT
ASH GROVE CEMENT WEST
ASH GROVE CEMENT
UNITED STATES
KELLOGG ISLAND
Slip 1
EAST MAR
KING COUNTY
LAFARGE CORP
B1a
B1b
B2a
B2b
B3a
B3b
C1
C2
C2-1
C2-2
C3-1
C3-2
E1
W17
W18
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
1.1
1.2

Figure 2-2a. Surface sampling locations for Phase 2 RI, historical surface sediment chemistry data, and related data (RM 0.0-1.2)

* King County will collect samples 18 and 20, analyze them for SMS chemicals, and provide LDWG a split to analyze for dioxin and archive for PCB congeners (if needed).

TOC normalization conducted for all samples with TOC concentrations greater than 0.2%. For samples with 0.2% TOC, lower, or missing TOC concentrations, chemical concentrations were compared to lowest AET (equivalent to SQS) and second lowest AET (equivalent to CSL) in dry weight units. If both detected concentrations and detection limits exceed SQS or CSL at a location, only the exceedance associated with the detected concentration is shown.

Historical surface sediment sampling events include: Boeing SiteChar, Duw/Diag-1, Duw/Diag-1.5, Duw/Diag-2, Duw/Diag-Dredge Monitoring, DuwamishShipyards, Ecology-Norfolk, EPA SI, Harbor Island RI, James Hardie Gypsum, KC WQA, NOAA SiteChar, Norfolk-cleanup1, Norfolk-cleanup2, Norfolk-cleanup3, Norfolk-monit2b, Norfolk-monit7, Plant 2 RFI-1, Plant 2 RFI-2a, Plant 2 RFI-2b, Rhone-Poulenc RFI-2, Seaboard-Ph2, T117 BoundaryDefinition, Plant 2-Transformer Phase 1, Slip 4-Early Action.

0 250 500 1,000 Feet

0 75 150 300 Meters

N

Pipes and seeps shown on the map were identified during a City of Seattle survey conducted during May-June 2003. Pipe locations were first identified using drainage maps for many of the waterfront properties obtained from Ecology NPDES industrial stormwater permit files and property owners. Pipe locations exposed during low tides were then surveyed in the field. However, the status of the pipes found during the survey has not been confirmed. Some of the pipes may no longer be active. The city-identified seeps on the map were visible during the survey, but seep identification was not the primary objective of the survey. Other seeps not noted on this map probably do exist. Source information was provided by EPA and Ecology based on a preliminary file search in 2003. Tax parcel information provided by King County Assessor's office, June 2004. Some tax parcel polygons were edited by Windward to conform to the LDW shoreline for the purpose of map presentation.

Windward environmental LLC

Prepared by STS 12/10/04, updated 01/14/05 Map 1463

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Sediment sampling location

Surface sediment chemistry

Locations with multiple chemical groups

- <SQS/SL, detected
- ≥SQS/SL and <CSL/ML, non-detect
- ≥CSL/ML, non-detect
- ≥SQS/SL and <CSL/ML, detected
- ≥CSL/ML, detected

Locations where only PCBs measured

- <SQS/SL, detected
- ≥SQS/SL and <CSL/ML, detected
- ≥CSL/ML, detected

Dredge event

Human access location and activities

- Picnicking
- Fishing
- Crab/clam/mussel harvesting
- Swimming
- Walking
- Birding
- Biking
- Hand boat launch
- Motor boat launch
- Restoration activity site
- Undefined

Sandpiper foraging habitat quality

- None
- Poor
- High

Sandpiper nesting habitat quality

- None
- Poor
- High

Intertidal (a) and subtidal (b) market basket benthic community characterization sampling location

Clam tissue sampling location

Clam habitat quality

- Low
- Medium
- High

Seep survey location with chemistry

Seep reconaissance survey location (Windward 2004)

Outfalls

- EOF, CSO, or CSO/SD
- Pipe of unknown origin
- Private storm drain
- Publicly-owned storm drain
- City-identified seep
- Stream, channel, or swale

Intertidal conditions

- Marsh
- Mud
- Riprap

Navigation channel

Tax parcel

River mile

ALASKA MARINE LINES
DUWAMISH SHIPYARD
GLACIER NORTHWEST
PORT OF SEATTLE
FOSS REDEVELOPMENT
SWAN BAY HOLDINGS
TROTSKY HERMAN AND JACQUALINE
BOYER TOWING
HALVORSEN KIRSTEN
KING COUNTY
SAINT-GOBAIN CONTAINERS
BPB GYPSUM
GLACIER NORTHWEST
Slip 2
LONE STAR INVESTORS
GILMUR JAMES
BURGESS ROBERT S
SEATTLE DOT
RANIER PETROLEUM
SCS HOLDINGS
Slip 3
FOX AVENUE LLC
GUIMONT GEMO/WILLIAM P
HOPKINS FREDERICK J FAM TRS
SHALMAR GROUP

1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4

B4b B4a B5b B5a B6a B6b C4 C5 C6 E2 W15 W16

0 250 500 1,000 Feet

0 50 100 200 Meters

N

Wind Ward environmental LLC

Figure 2-2b. Surface sampling locations for Phase 2 RI, historical surface sediment chemistry data, and related data (RM 1.2-2.4)

TOC normalization conducted for all samples with TOC concentrations greater than 0.2%. For samples with 0.2% TOC, lower, or missing TOC concentrations, chemical concentrations were compared to lowest AET (equivalent to SQS) and second lowest AET (equivalent to CSL) in dry weight units. If both detected concentrations and detection limits exceed SQS or CSL at a location, only the exceedance associated with the detected concentration is shown.

Historical surface sediment sampling events include: Boeing SiteChar, Duw/Diag-1, Duw/Diag-1.5, Duw/Diag-2, Duw/Diag-Dredge Monitoring, DuwamishShipyards, Ecology-Norfolk, EPA SI, Harbor Island RI, James Hardie Gypsum, KC WQA, NOAA SiteChar, Norfolk-cleanup1, Norfolk-cleanup2, Norfolk-cleanup3, Norfolk-monit2b, Norfolk-monit7, Plant 2 RFI-1, Plant 2 RFI-2a, Plant 2 RFI-2b, Rhone-Poulenc RFI-2, Seaboard-Ph2, T117 BoundaryDefinition, Plant 2-Transformer Phase 1, Slip 4-Early Action.

Pipes and seeps shown on the map were identified during a City of Seattle survey conducted during May-June 2003. Pipe locations were first identified using drainage maps for many of the waterfront properties obtained from Ecology NPDES industrial stormwater permit files and property owners. Pipe locations exposed during low tides were then surveyed in the field. However, the status of the pipes found during the survey has not been confirmed. Some of the pipes may no longer be active. The city-identified seeps on the map were visible during the survey, but seep identification was not the primary objective of the survey. Other seeps not noted on this map probably do exist. Source information was provided by EPA and Ecology based on a preliminary file search in 2003. Tax parcel information provided by King County Assessor's office, June 2004. Some tax parcel polygons were edited by Windward to conform to the LDW shoreline for the purpose of map presentation.

Prepared by STS 12/10/04, updated 01/14/05 Map 1464

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Sediment sampling location

Surface sediment chemistry

Locations with multiple chemical groups

- <SQS/SL, detected
- ≥SQS/SL and <CSL/ML, non-detect
- ≥CSL/ML, non-detect
- ≥SQS/SL and <CSL/ML, detected
- ≥CSL/ML, detected

Locations where only PCBs measured

- <SQS/SL, detected
- ≥SQS/SL and <CSL/ML, detected
- ≥CSL/ML, detected
- Results unavailable

Dredge event

Human access location and activities

- Picnicking
- Fishing
- Crab/clam/mussel harvesting
- Swimming
- Walking
- Birding
- Biking
- Hand boat launch
- Motor boat launch
- Restoration activity site
- Undefined

Sandpiper nesting habitat quality

- None
- Poor
- High

Sandpiper foraging habitat quality

- None
- Poor
- High

- Intertidal (a) and subtidal (b) market basket benthic community characterization sampling location
- Clam tissue sampling location

Clam habitat quality

- Low
- Medium
- High

- Seep survey location with chemistry
- Seep reconaissance survey location (Windward 2004)

Outfalls

- EOF, CSO, or CSO/SD
- Pipe of unknown origin
- Private storm drain
- Publicly-owned storm drain
- City-identified seep
- Stream, channel, or swale

Intertidal conditions

- Marsh
- Mud
- Riprap
- Navigation channel
- Tax parcel
- River mile

BOYER TOWING
HALVORSEN BOYER JR
STEINMAN MERLE
HURLEN THOMAS
HURLEN HARALD L
DE ALVA LISA
HURLEN HARALD L
TRIPLETT MYRNA
HURLEN HARALD L
LUKAS BILLIE MACKSENE
LUKAS BILLIE MACKSENE
KING COUNTY
SILVER BAY LOGGING
SILVER BAY LOGGING
CARRIEL WILLIAM D
KING COUNTY
SEATTLE PARKS DEPT
ELM GROVE
CRONN ROBERT S AND DAGMAR R
WOOD ANN R
WISE KALER
TERHUNE KEITH
SLEMKO DANIEL ALAN
HMH
MCNEIL TIMOTHY L AND DEBORAH W
SOUTH PARK MARINA
RENN COMPANY
SOUTH PARK MARINA
SOUTH PARK MARINA
SOUTH PARK MARINA
SHALMAR GROUP
SHALMAR GROUP
R & A PROPERTIES
CAMPBELL SANDRA L
CROWLEY MARINE SERVICES
CROWLEY MARINE SERVICES
EMERALD SERVICES
BOEING
BOEING
BOEING
BOEING
Slip 4
B7b
B7a
B8a
C9
C8
C7-1
C7-2
C10-1
C10-2
E3
E4
E5
W14
W13
W12
W11
W10
W9
W8
W7
W6
2.4
2.5
2.6
2.7
2.8
2.9
3.0
3.1
3.2
3.3
3.4
3.5
3.6

Figure 2-2c. Surface sampling locations for Phase 2 RI, historical surface sediment chemistry data, and related data (RM 2.4-3.6)

TOC normalization conducted for all samples with TOC concentrations greater than 0.2%. For samples with 0.2% TOC, lower, or missing TOC concentrations, chemical concentrations were compared to lowest AET (equivalent to SQS) and second lowest AET (equivalent to CSL) in dry weight units. If both detected concentrations and detection limits exceed SQS or CSL at a location, only the exceedance associated with the detected concentration is shown.

0 250 500 1,000 Feet

0 75 150 300 Meters

Windward environmental LLC

Historical surface sediment sampling events include: Boeing SiteChar, Duw/Diag-1, Duw/Diag-1.5, Duw/Diag-2, Duw/Diag-Dredge Monitoring, DuwamishShipyards, Ecology-Norfolk, EPA SI, Harbor Island RI, James Hardie Gypsum, KC WQA, NOAA SiteChar, Norfolk-cleanup1, Norfolk-cleanup2, Norfolk-cleanup3, Norfolk-monit2b, Norfolk-monit7, Plant 2 RFI-1, Plant 2 RFI-2a, Plant 2 RFI-2b, Rhone-Poulenc RFI-2, Seaboard-Ph2, T117 BoundaryDefinition, Plant 2-Transformer Phase 1, Slip 4-Early Action.

Pipes and seeps shown on the map were identified during a City of Seattle survey conducted during May-June 2003. Pipe locations were first identified using drainage maps for many of the waterfront properties obtained from Ecology NPDES industrial stormwater permit files and property owners. Pipe locations exposed during low tides were then surveyed in the field. However, the status of the pipes found during the survey has not been confirmed. Some of the pipes may no longer be active. The city-identified seeps on the map were visible during the survey, but seep identification was not the primary objective of the survey. Other seeps not noted on this map probably do exist. Source information was provided by EPA and Ecology based on a preliminary file search in 2003. Tax parcel information provided by King County Assessor's office, June 2004. Some tax parcel polygons were edited by Windward to conform to the LDW shoreline for the purpose of map presentation.

Prepared by STS 12/10/04, updated 01/14/05 Map 1465

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Sediment sampling location

Surface sediment chemistry

Locations with multiple chemical groups

- <SQS/SL, detected
- ≥SQS/SL and <CSL/ML, non-detect
- ≥CSL/ML, non-detect
- ≥SQS/SL and <CSL/ML, detected
- ≥CSL/ML, detected

Locations where only PCBs measured

- <SQS/SL, detected
- ≥SQS/SL and <CSL/ML, detected
- ≥CSL/ML, detected
- Results unavailable

Dredge event

Human access location and activities

- Picnicking
- Fishing
- Crab/clam/mussel harvesting
- Swimming
- Walking
- Birding
- Biking
- Hand boat launch
- Motor boat launch
- Restoration activity site
- Undefined

Sandpiper foraging habitat quality

- None
- Poor
- High

Sandpiper nesting habitat quality

- None
- Poor
- High

- Intertidal (a) and subtidal (b) market basket benthic community characterization sampling location
- Clam tissue sampling location

Clam habitat quality

- Low
- Medium
- High

- Seep survey location with chemistry
- Seep reconaissance survey location (Windward 2004)

Outfalls

- EOF, CSO, or CSO/SD
- Pipe of unknown origin
- Private storm drain
- Publicly-owned storm drain
- City-identified seep
- Stream, channel, or swale

Intertidal conditions

- Marsh
- Mud
- Riprap
- Navigation channel
- Tax parcel
- River mile

JORGENSEN FORGE CORP
BOEING
KENWORTH MOTOR CORP
CONTAINER PROPERTIES
Slip 6
DELTA MARINE
SEATTLE CITY LIGHT
PORT OF SEATTLE
EORGE & ASSOC
MISH YACHT CLUB

Figure 2-2d. Surface sampling locations for Phase 2 RI, historical surface sediment chemistry data, and related data (RM 3.6-4.8)

TOC normalization conducted for all samples with TOC concentrations greater than 0.2%. For samples with 0.2% TOC, lower, or missing TOC concentrations, chemical concentrations were compared to lowest AET (equivalent to SQS) and second lowest AET (equivalent to CSL) in dry weight units. If both detected concentrations and detection limits exceed SQS or CSL at a location, only the exceedance associated with the detected concentration is shown.

0 250 500 1,000 Feet

0 75 150 300 Meters

N

Wind Ward environmental LLC

Historical surface sediment sampling events include: Boeing SiteChar, Duw/Diag-1, Duw/Diag-1.5, Duw/Diag-2, Duw/Diag-Dredge Monitoring, DuwamishShipyards, Ecology-Norfolk, EPA SI, Harbor Island RI, James Hardie Gypsum, KC WQA, NOAA SiteChar, Norfolk-cleanup1, Norfolk-cleanup2, Norfolk-cleanup3, Norfolk-monit2b, Norfolk-monit7, Plant 2 RFI-1, Plant 2 RFI-2a, Plant 2 RFI-2b, Rhone-Poulenc RFI-2, Seaboard-Ph2, T117 BoundaryDefinition, Plant 2-Transformer Phase 1, Slip 4-Early Action.

Pipes and seeps shown on the map were identified during a City of Seattle survey conducted during May-June 2003. Pipe locations were first identified using drainage maps for many of the waterfront properties obtained from Ecology NPDES industrial stormwater permit files and property owners. Pipe locations exposed during low tides were then surveyed in the field. However, the status of the pipes found during the survey has not been confirmed. Some of the pipes may no longer be active. The city-identified seeps on the map were visible during the survey, but seep identification was not the primary objective of the survey. Other seeps not noted on this map probably do exist. Source information was provided by EPA and Ecology based on a preliminary file search in 2003. Tax parcel information provided by King County Assessor's office, June 2004. Some tax parcel polygons were edited by Windward to conform to the LDW shoreline for the purpose of map presentation.

Prepared by STS 12/10/04, updated 01/14/05 Map 1466

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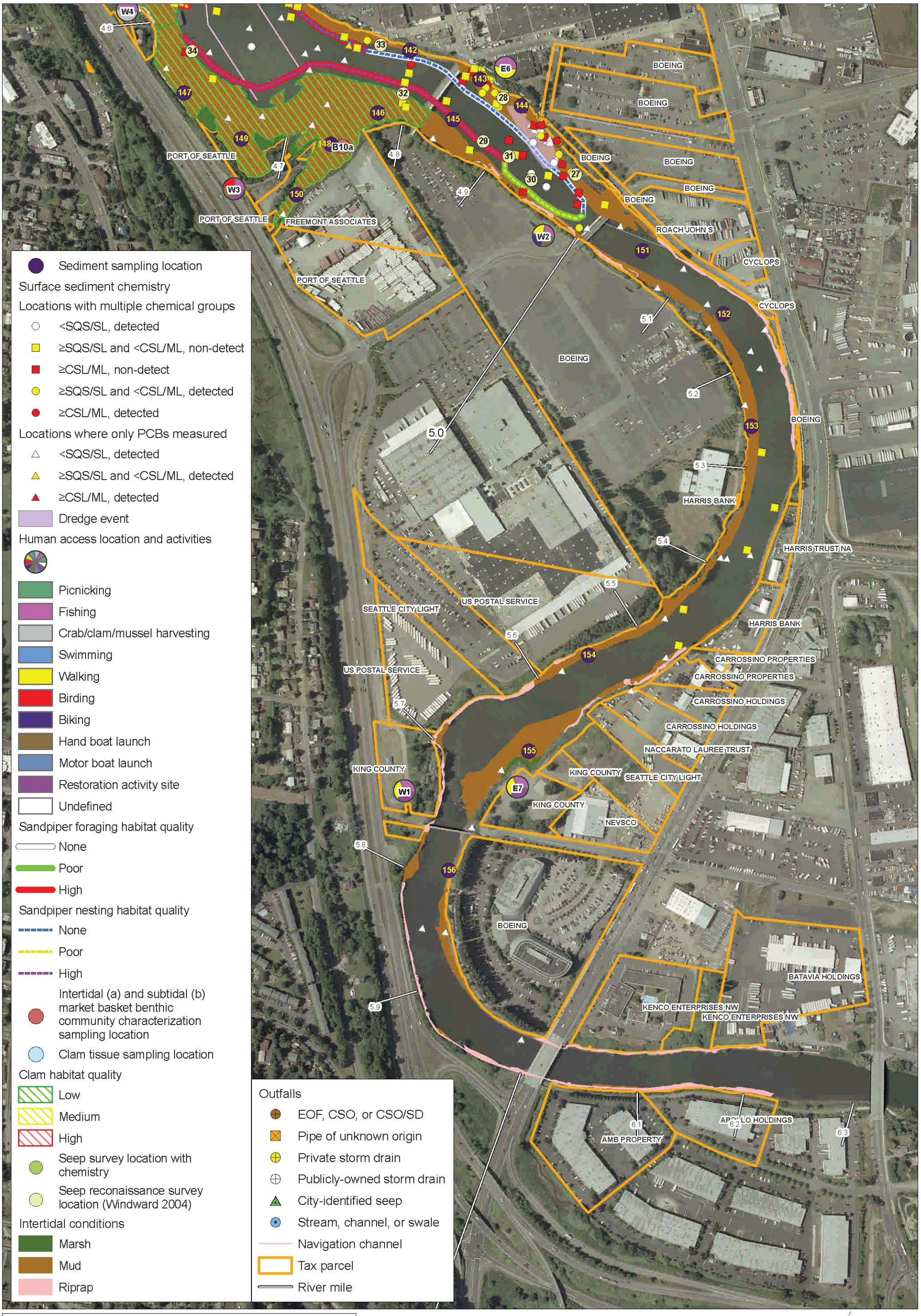

Figure 2-2e. Surface sampling locations for Phase 2 RI, historical surface sediment chemistry data, and related data (RM 4.8-6.0)

TOC normalization conducted for all samples with TOC concentrations greater than 0.2%. For samples with 0.2% TOC, lower, or missing TOC concentrations, chemical concentrations were compared to lowest AET (equivalent to SQS) and second lowest AET (equivalent to CSL) in dry weight units. If both detected concentrations and detection limits exceed SQS or CSL at a location, only the exceedance associated with the detected concentration is shown.

Historical surface sediment sampling events include: Boeing SiteChar, Duw/Diag-1, Duw/Diag-1.5, Duw/Diag-2, Duw/Diag-Dredge Monitoring, DuwamishShipyards, Ecology-Norfolk, EPA SI, Harbor Island RI, James Hardie Gypsum, KC WQA, NOAA SiteChar, Norfolk-cleanup1, Norfolk-cleanup2, Norfolk-cleanup3, Norfolk-monit2b, Norfolk-monit7, Plant 2 RFI-1, Plant 2 RFI-2a, Plant 2 RFI-2b, Rhone-Poulenc RFI-2, Seaboard-Ph2, T117 BoundaryDefinition, Plant 2-Transformer Phase 1, Slip 4-Early Action.

Pipes and seeps shown on the map were identified during a City of Seattle survey conducted during May-June 2003. Pipe locations were first identified using drainage maps for many of the waterfront properties obtained from Ecology NPDES industrial stormwater permit files and property owners. Pipe locations exposed during low tides were then surveyed in the field. However, the status of the pipes found during the survey has not been confirmed. Some of the pipes may no longer be active. The city-identified seeps on the map were visible during the survey, but seep identification was not the primary objective of the survey. Other seeps not noted on this map probably do exist. Source information was provided by EPA and Ecology based on a preliminary file search in 2003. Tax parcel information provided by King County Assessor's office, June 2004. Some tax parcel polygons were edited by Windward to conform to the LDW shoreline for the purpose of map presentation.

Prepared by STS 12/10/04, updated 01/14/05 Map 1467

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KELLOGG ISLAND

Slip 1

Slip 2

Slip 3

Slip 4

Slip 6

Turning Basin 3

- Sediment sampling location

Historical sediment chemistry data

Total DDTs (µg/kg dw, detected)*

- ≤6.9 (≤SL)
- 6.9 - 69 (>SL and ≤ML)
- >69 (>ML)

Total DDTs (µg/kg dw, non-detected)*

- ≤6.9 (≤SL)
- 6.9 - 69 (>SL and ≤ML)

- Intertidal zone
- Navigation channel
- Tax parcel
- Roads

0 750 1,500 3,000 Feet

0 250 500 1,000 Meters

N

Wind Ward environmental LLC

Figure 3-1. Surface sediment chemistry sampling locations for organochlorine pesticide analyses

Prepared by STS 12/10/04, updated 01/14/05 Map 1533

* Total DDT sampling locations are used to represent organochlorine pesticide sampling locations in the historical sediment chemistry database

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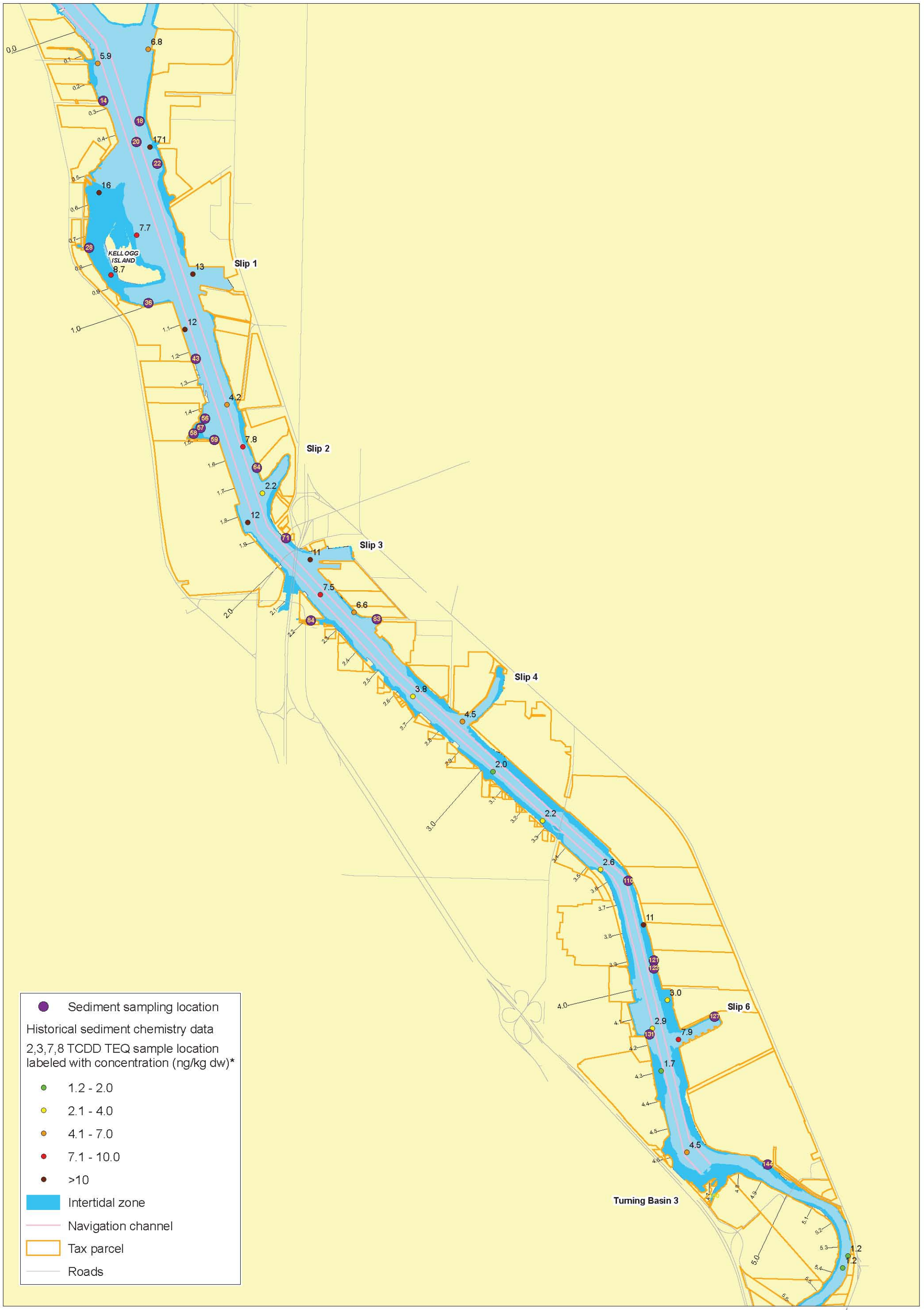

Figure 3-2. Surface sediment chemistry sampling locations for dioxin/furan analyses

* 2,3,7,8 TCDD TEQ concentrations were calculated by setting undetected congeners to 1/2 their detection limit.

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Prepared by STS 12/10/04, updated 01/14/05 Map 1535

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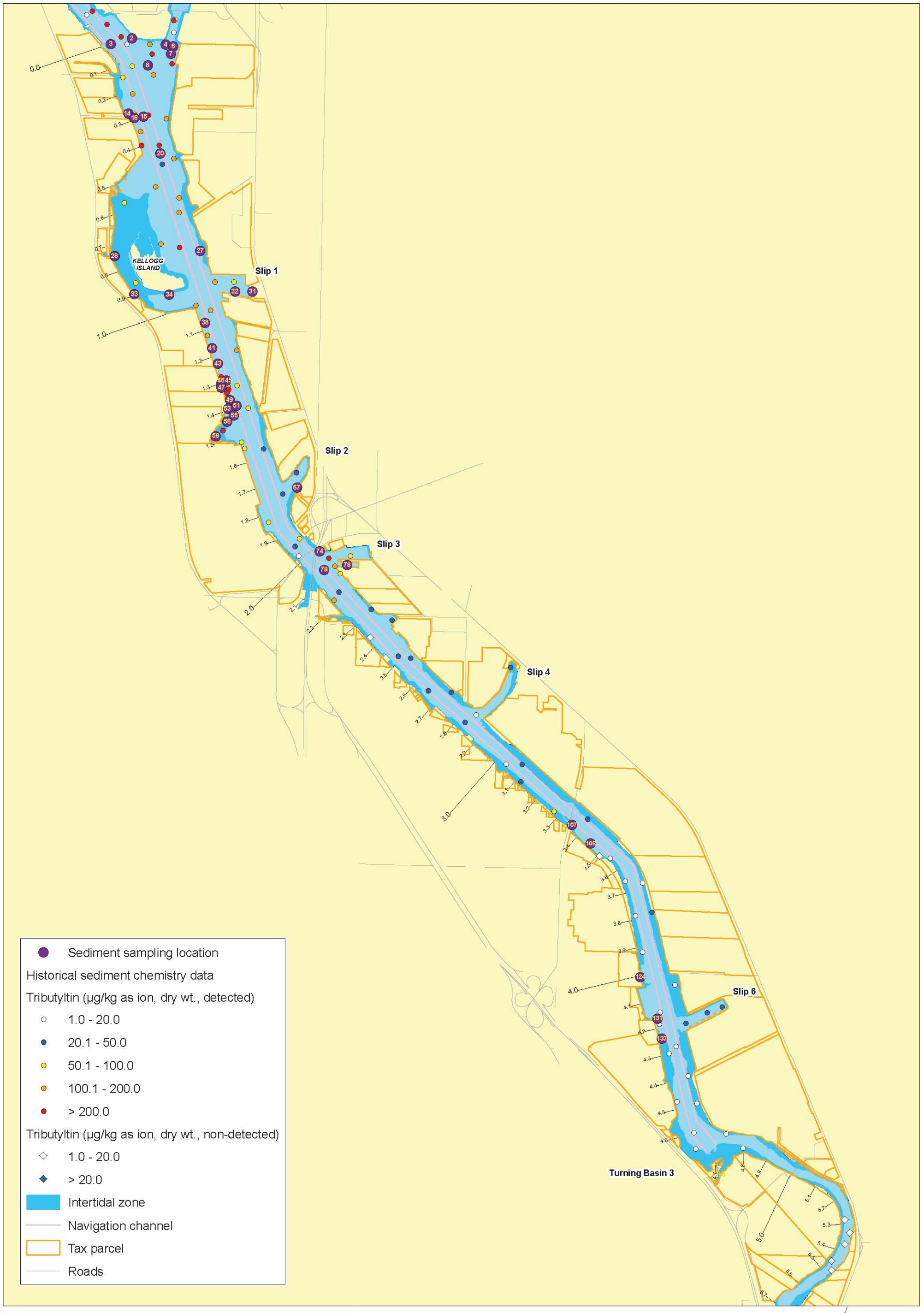

Figure 3-3. Surface sediment chemistry sampling locations for TBT analyses

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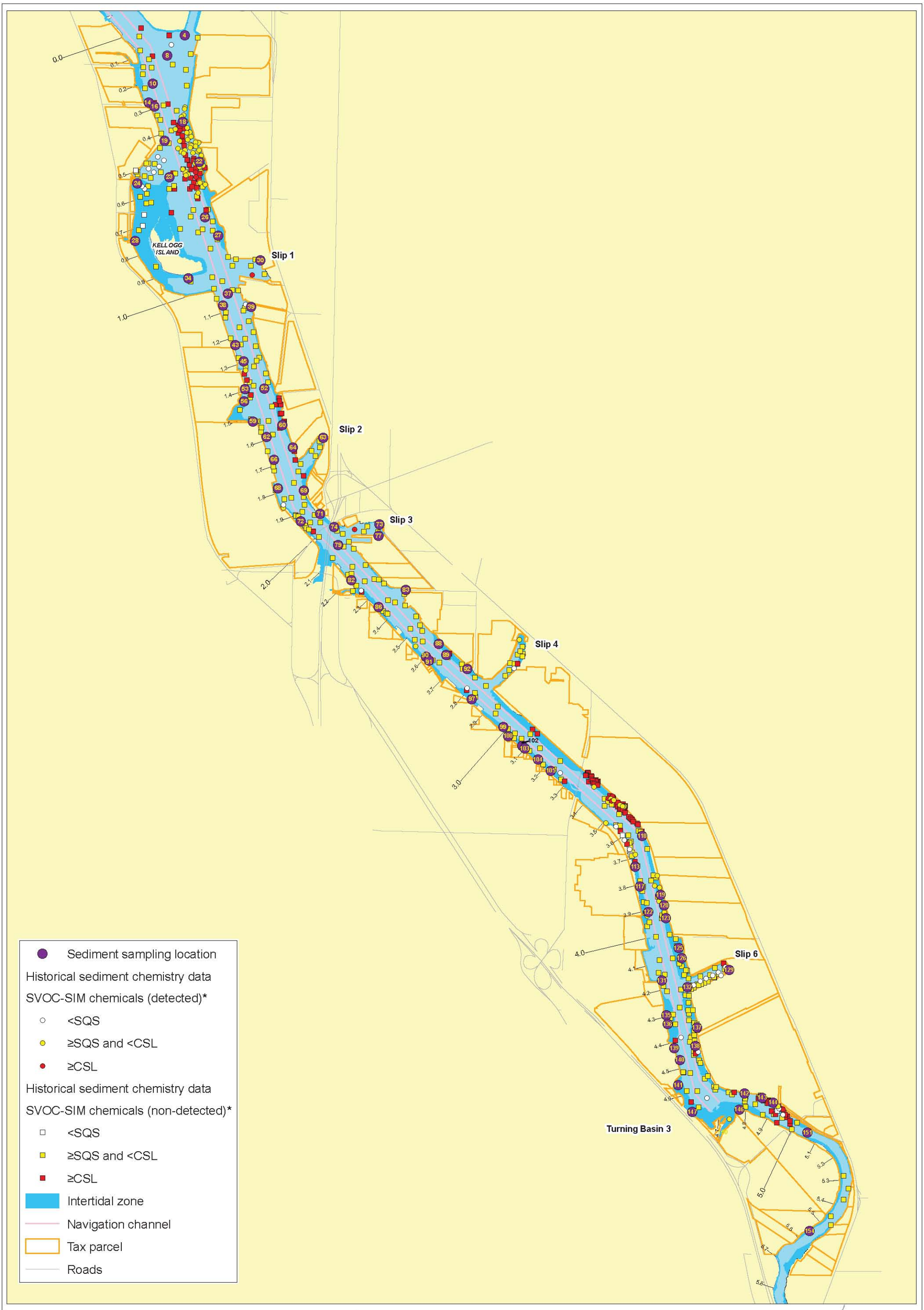

Figure 3-4. Surface sediment chemistry sampling locations for SVOC-SIM analyses

*** 1,2,4-trichlorobenzene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 2,4-dimethylphenol, 2-methylphenol, benzoic acid, benzyl alcohol, butyl benzyl phthalate, diethyl phthalate, dimethyl phthalate, hexachlorobenzene, hexachlorobutadiene, n-nitrosodiphenylamine, and pentachlorophenol**

Wind Ward environmental LLC

Prepared by STS 12/10/04, updated 01/14/05 Map 1610

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3

1a/1b

9a/9b

8

2a/2b

4

7

5a/5b

6

Sediment sampling locations

- New background location
- Existing location proposed for use in Phase 2
- Existing location not proposed for use in Phase 2

Potential dioxin sources

- Cement kiln
- Former wood treating facility
- Medical waste incinerator
- Former pentachlorophenol producer

Confirmed or suspected contaminated (CSC) sites

- CSC site from Ecology's database
- Site with confirmed or suspected presence of PCBs, dioxins or phenols in soils or sediment

Outfalls

- King County CSO
- Treatment plant outfall
- City of Seattle CSO flow monitoring location

Sewer lines

- Wastewater
- Stormwater
- Combined

Figure E-1. Dioxin/furan background surface sediment sampling locations, potential dioxin sources, CSC sites, and outfalls

Note: the Ecology CSC list does not distinguish pentachlorophenol from the phenol group of compounds.

0 0.5 1 2 Miles

0 1 2 4 Kilometers

N

Wind Ward environmental LLC

Prepared by LM 09/13/04, updated by RAC 09/15/04, LM 12/10/04, STS 01/14/05 Map 1507

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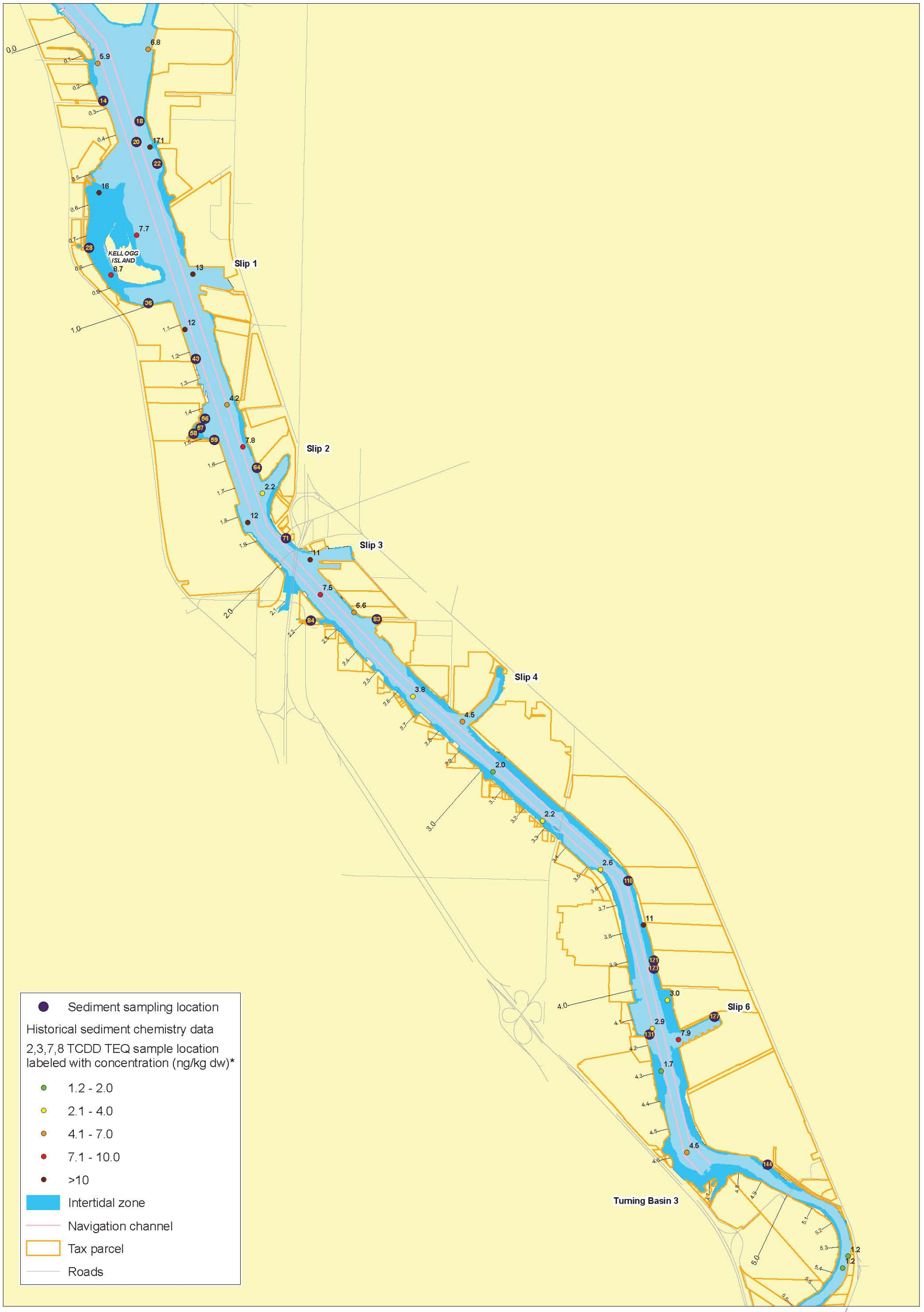

Figure E-2. Surface sediment chemistry sampling locations for dioxin/furan analyses

* 2,3,7,8 TCDD TEQ concentrations were calculated by setting undetected congeners to 1/2 their detection limit.

Wind Ward environmental LLC

Prepared by STS 01/14/05 Map 1632

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Figure E-3. Land use infomation for proposed dioxin/furan background samples.

Industrial
Commercial
Multi-family
Schools
Single-family
Parks/Vacant
Lower Duwamish source area [a]
Basin boundaries
Background station

a. Boundary line depicts areas that discharge to the LDW via either the combined sewer system (19,800 Ac) and/or the storm drain system (9,100 Ac)

0.5 0 0.5 1 Miles

Produced by the City of Seattle
December, 2004.

No guarantee of any sort implied, including accuracy, completeness, or fitness for use.

Sammamish River
3
Lake Washington
1a/1b
9a/9b
8
Union Bay
Lake Union
2a/2b
520
Elliott Bay
90
Mercer Slough
4
7
5a/5b
6
Puget Sound