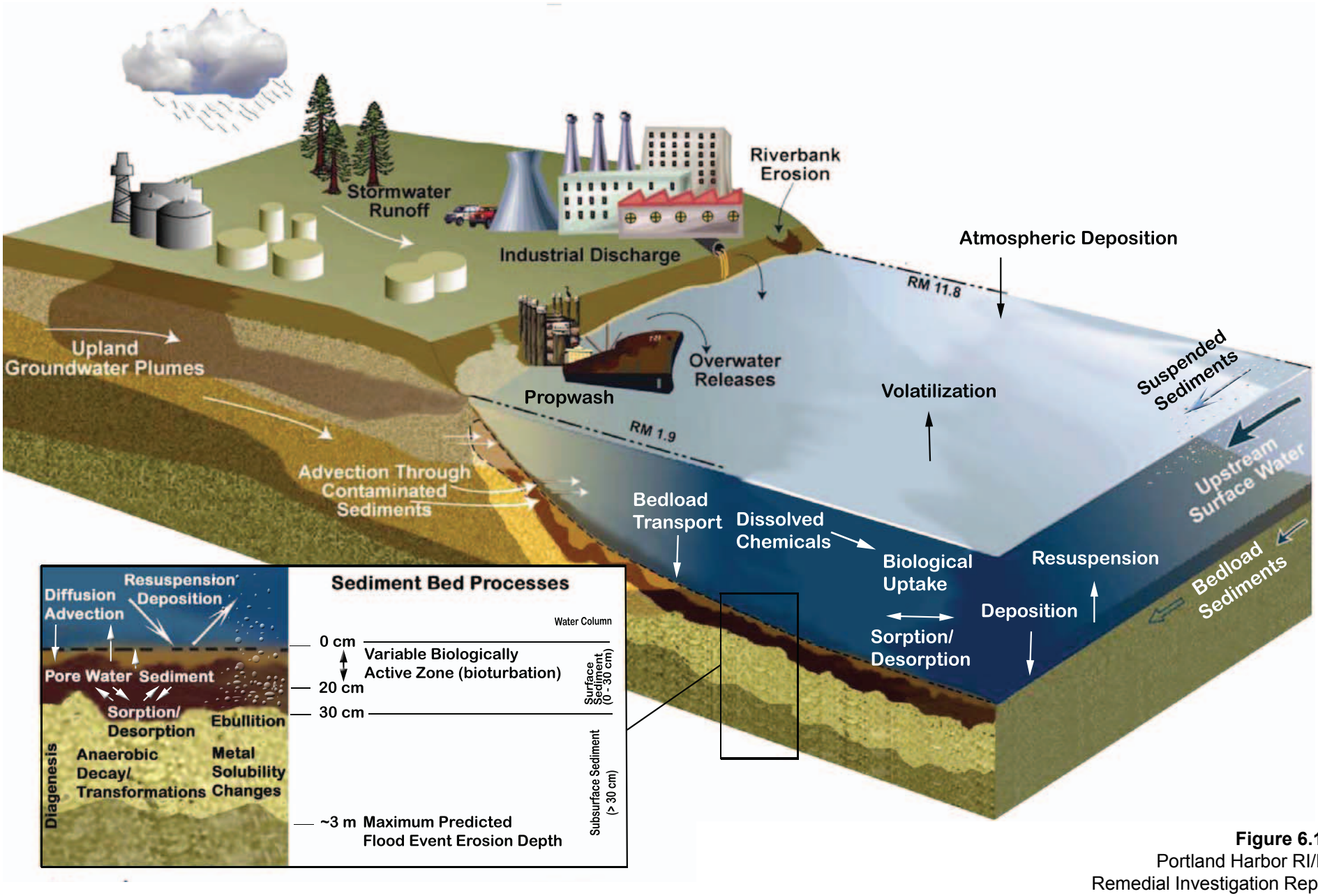
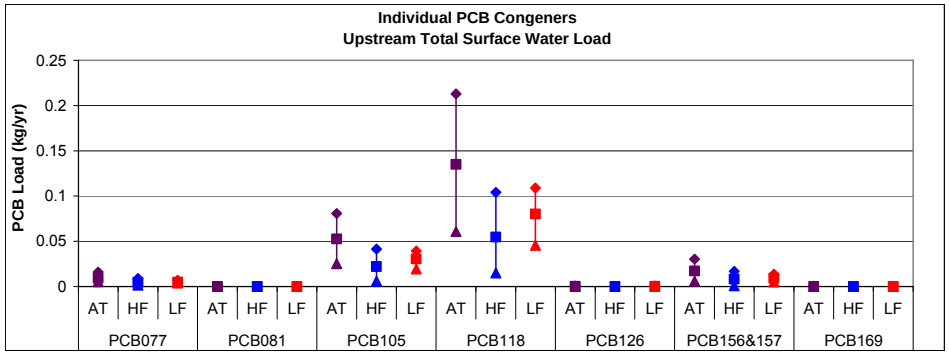
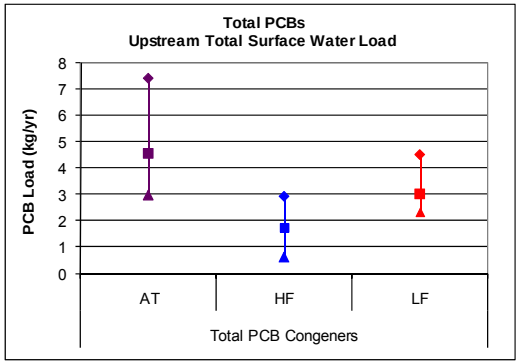
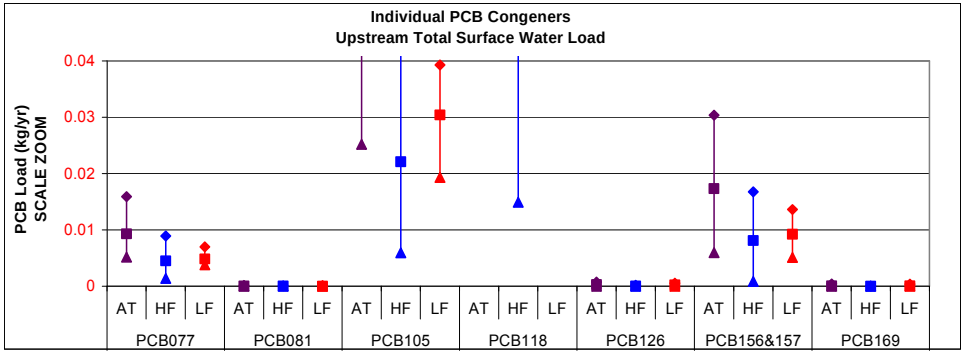


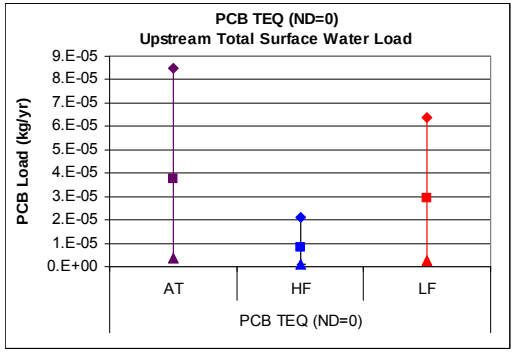
Figure 6.1-1
Portland Harbor RI/FS
Remedial Investigation Report
External and Internal Loading Mechanisms–Conceptualization





(Y-axis Zoom)





Legend

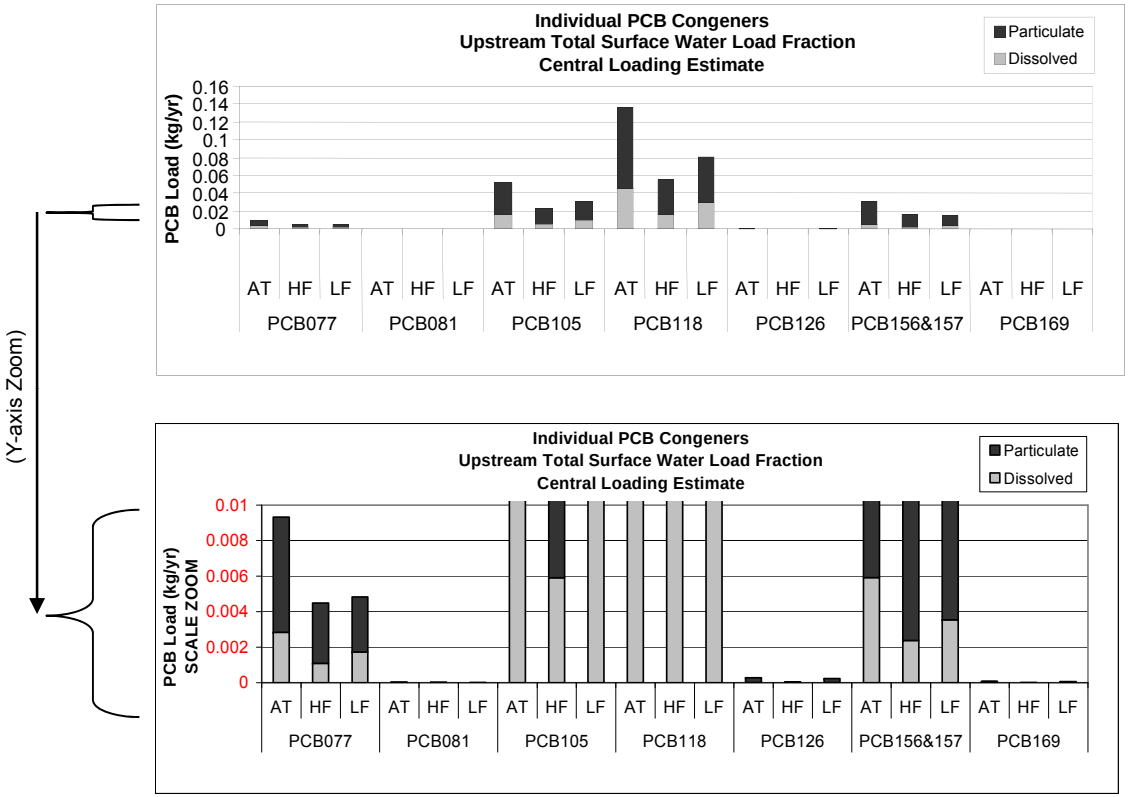
- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

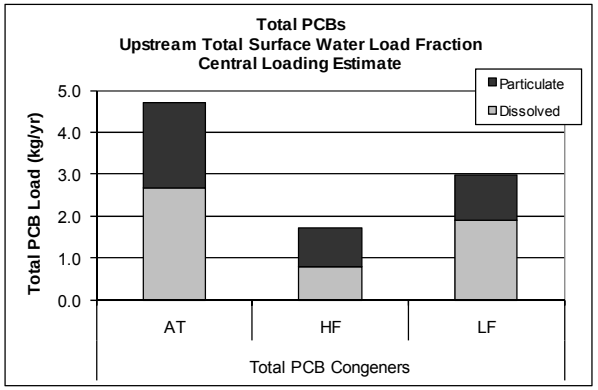
AT: Annual total

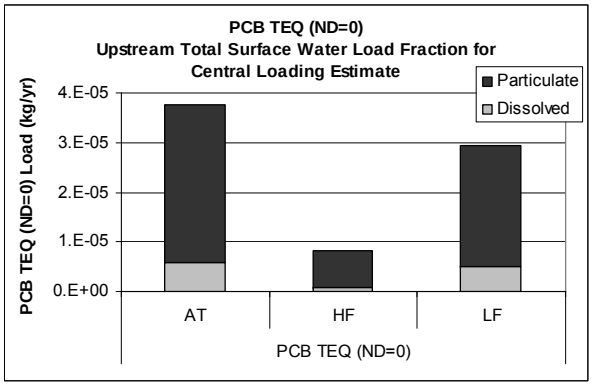
HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-2
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Surface Water Loading Ranges
PCBs – Upstream







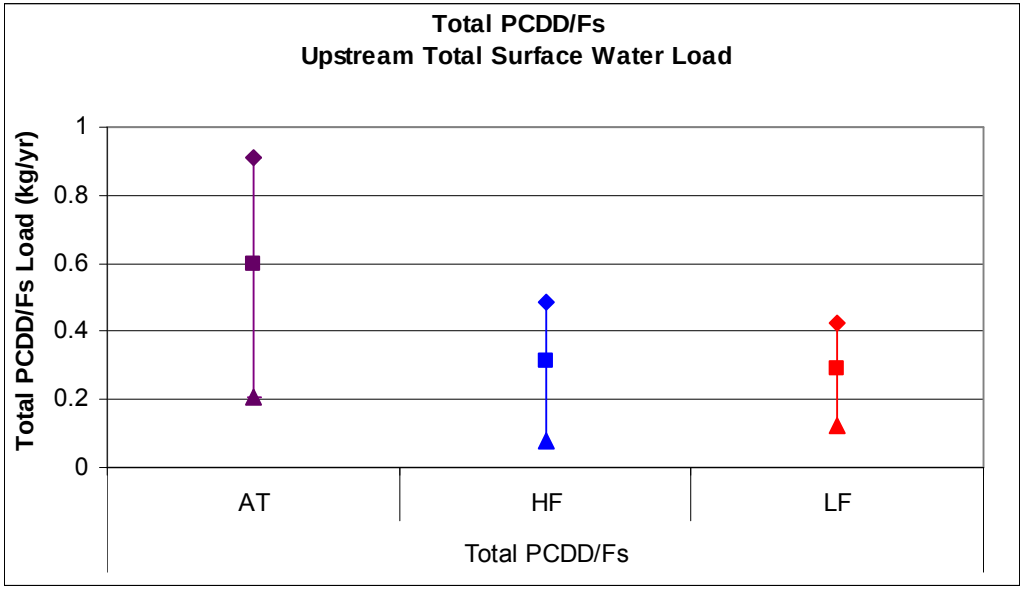
Notes

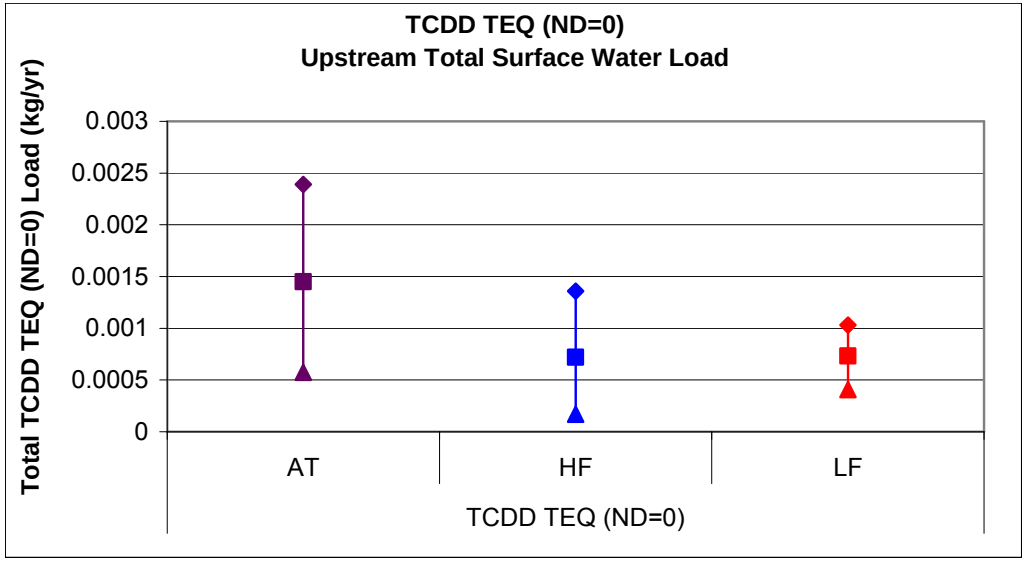
AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-3
Portland Harbor RI/FS
Remedial Investigation Report
Bar Charts of Surface Water Loading Fractions
PCBs – Upstream





Legend

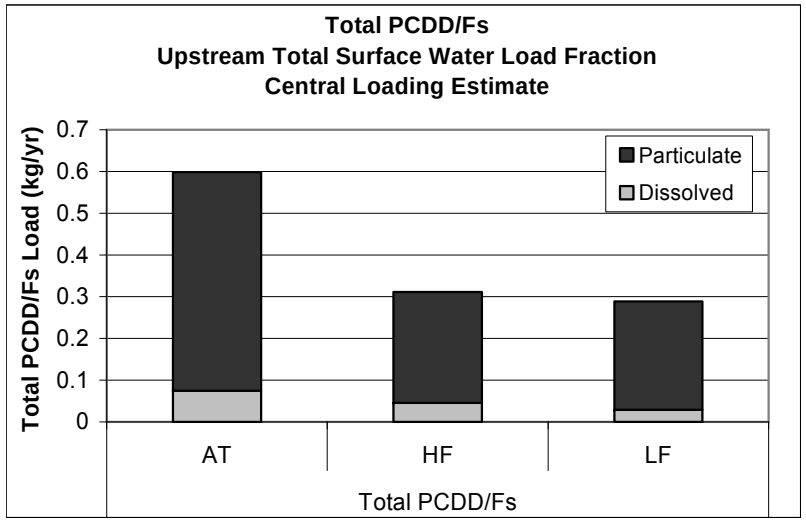
- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

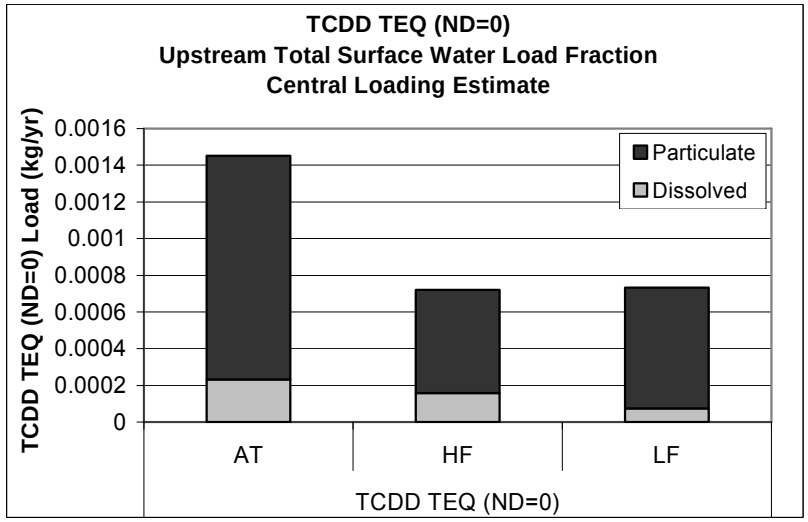
AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-4
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Surface Water Loading Ranges
Total PCDD/Fs and TCDD TEQ (ND=0) – Upstream





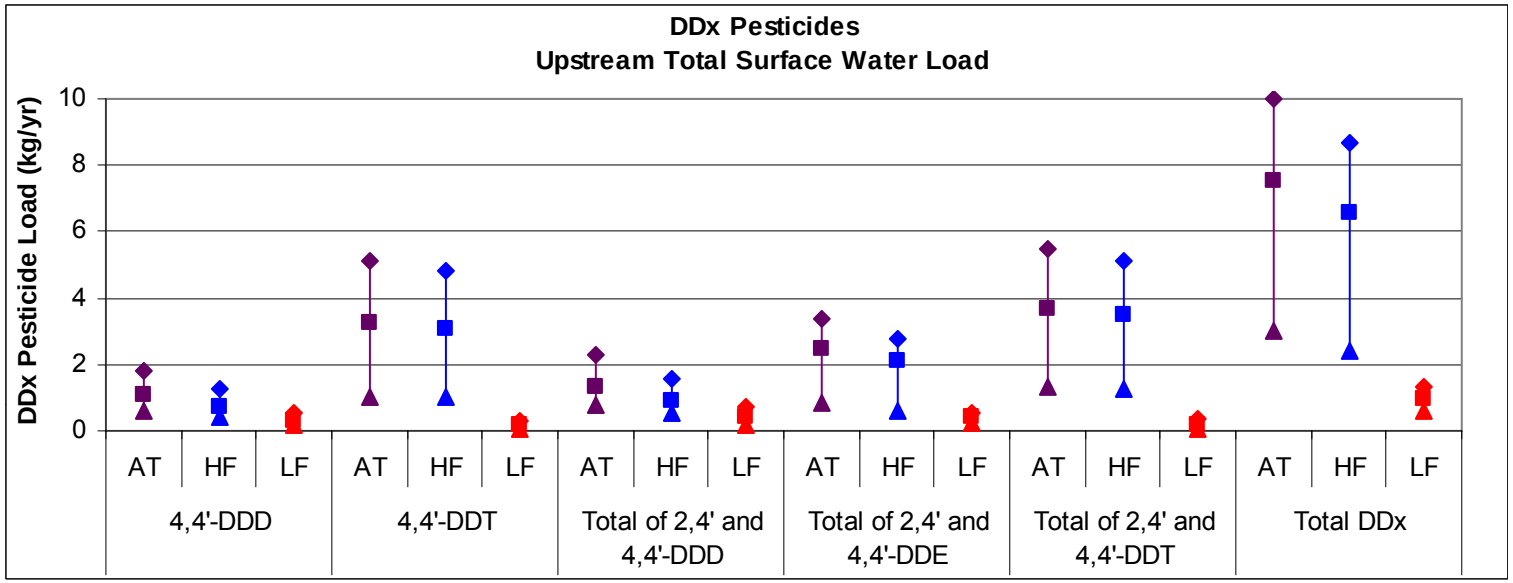
Notes

AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-5
Portland Harbor RI/FS
Remedial Investigation Report
Bar Charts of Surface Water Loading Fractions
Total PCDD/Fs and TCDD TEQ (ND=0) – Upstream



Legend

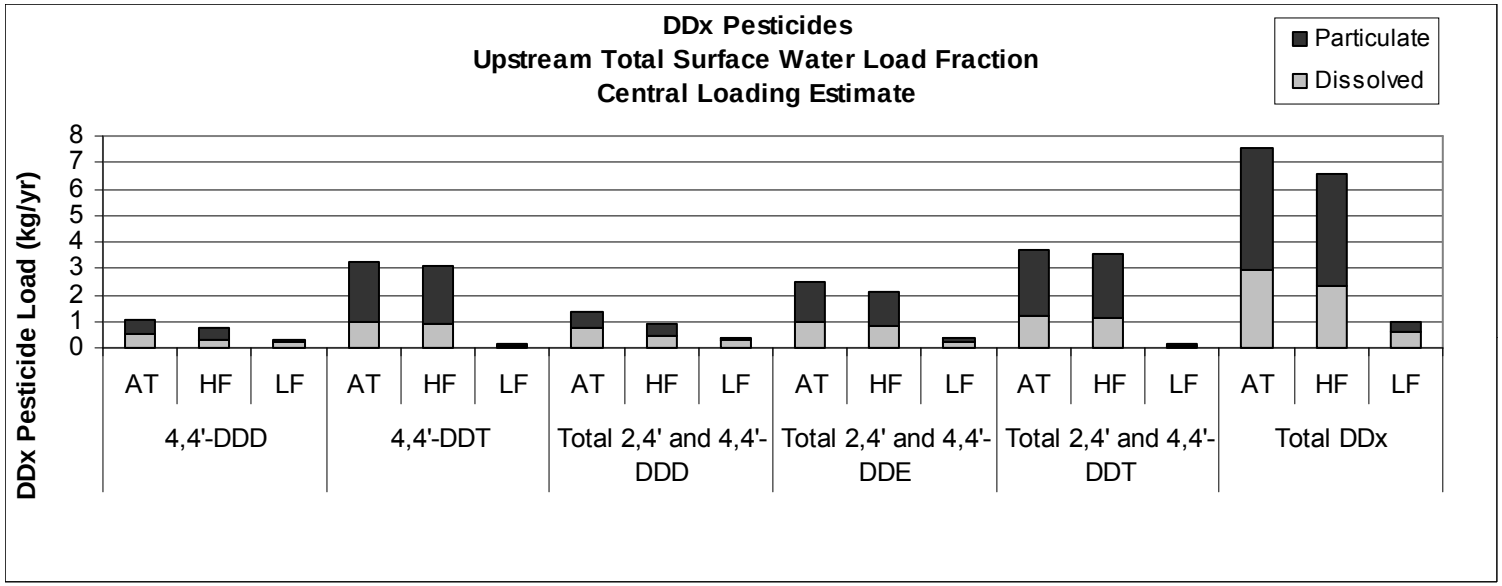
◆ Upper Load Estimate
■ Central Load Estimate
▲ Lower Load Estimate

AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-6
Portland Harbor RI/FS
Remedial Investigation Report
Plot of Surface Water Loading Ranges
DDx Pesticides – Upstream



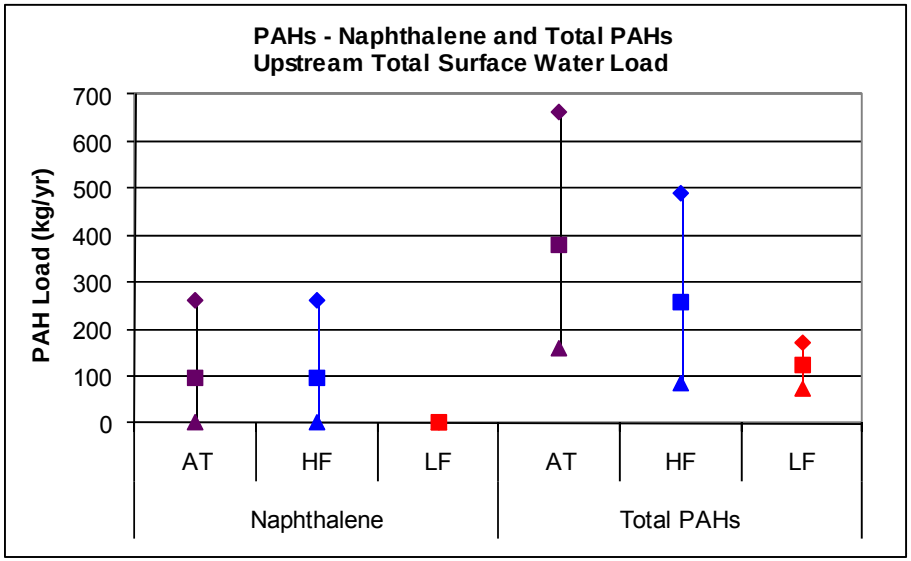
Notes

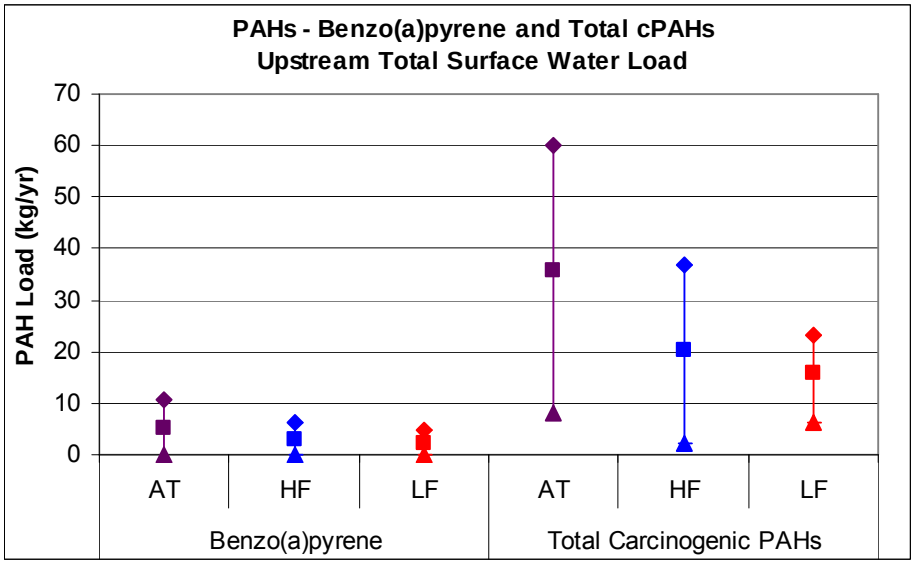
AT: Annual total

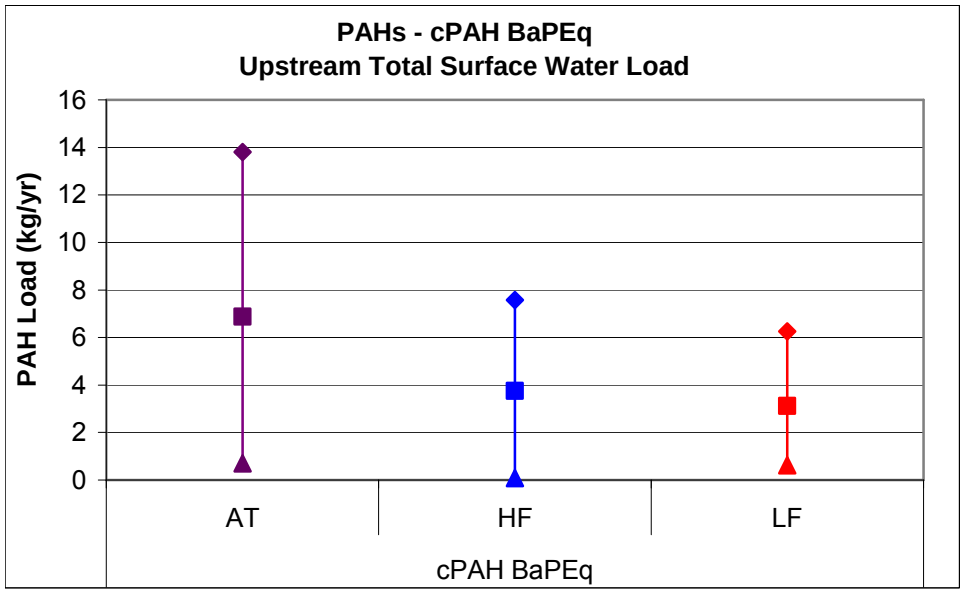
HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-7
Portland Harbor RI/FS
Remedial Investigation Report
Bar Chart of Surface Water Loading Fractions
DDx Pesticides – Upstream







Legend

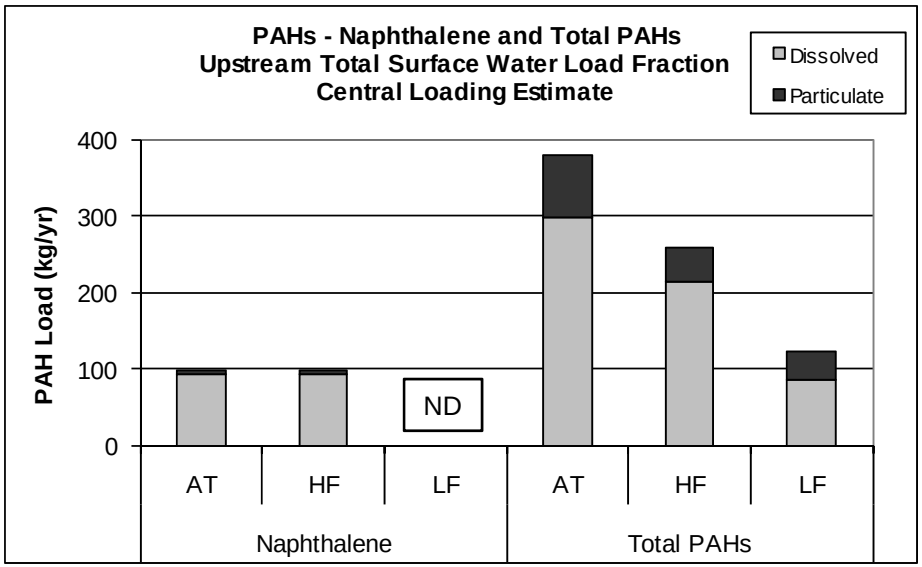
- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

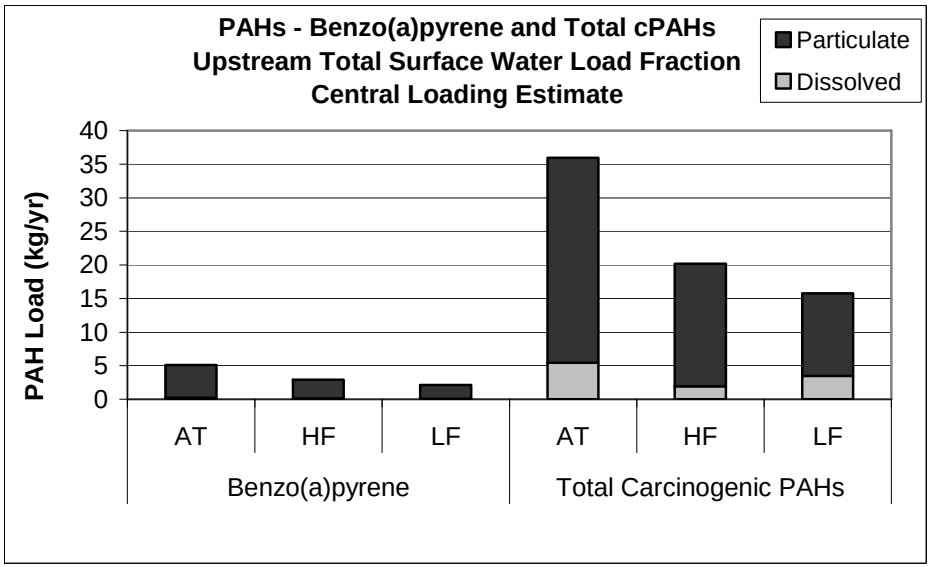
AT: Annual total

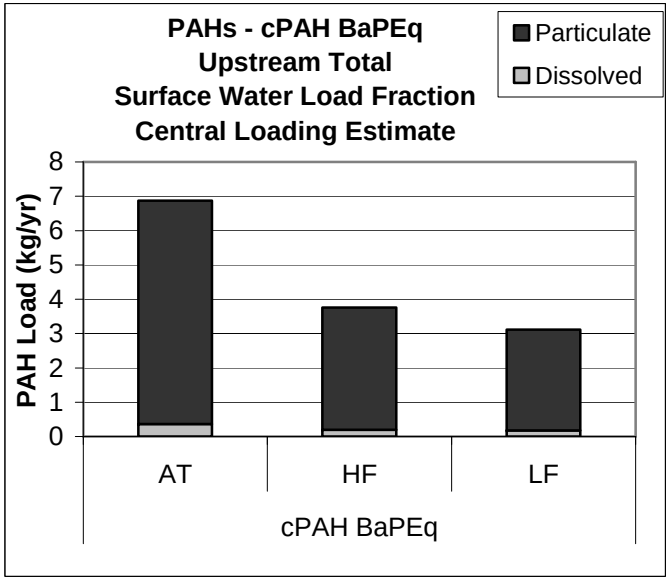
HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-8
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Surface Water Loading Ranges
PAHs – Upstream







Notes

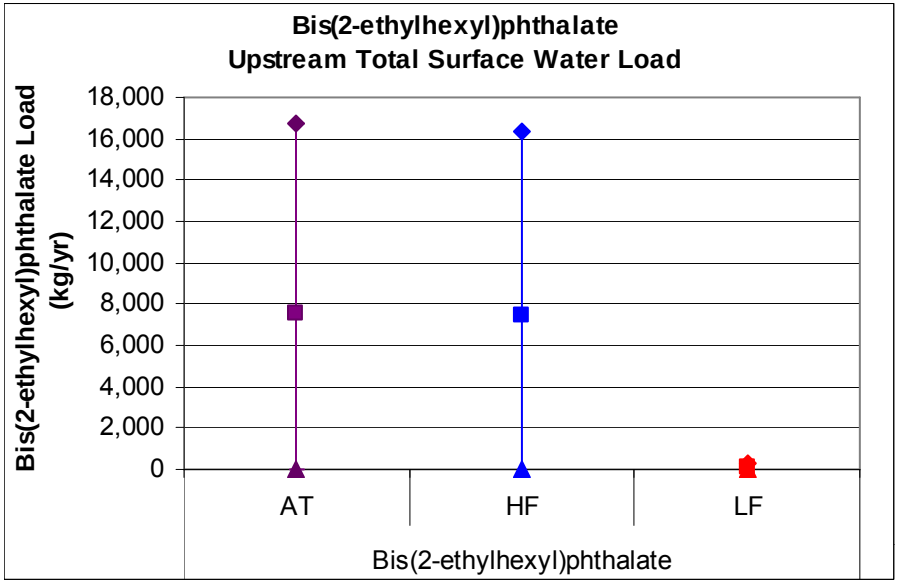
AT: Annual total

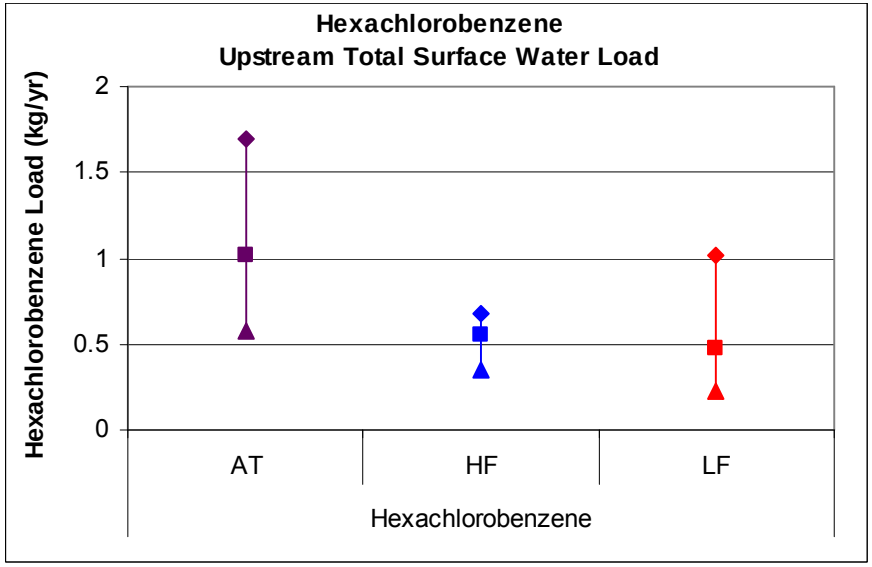
HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

ND: Data below laboratory detection limit. Value set equal to 0 prior to loading calculations

Figure 6.1-9
Portland Harbor RI/FS
Remedial Investigation Report
Bar Charts of Surface Water Loading Fractions
PAHs – Upstream





Legend

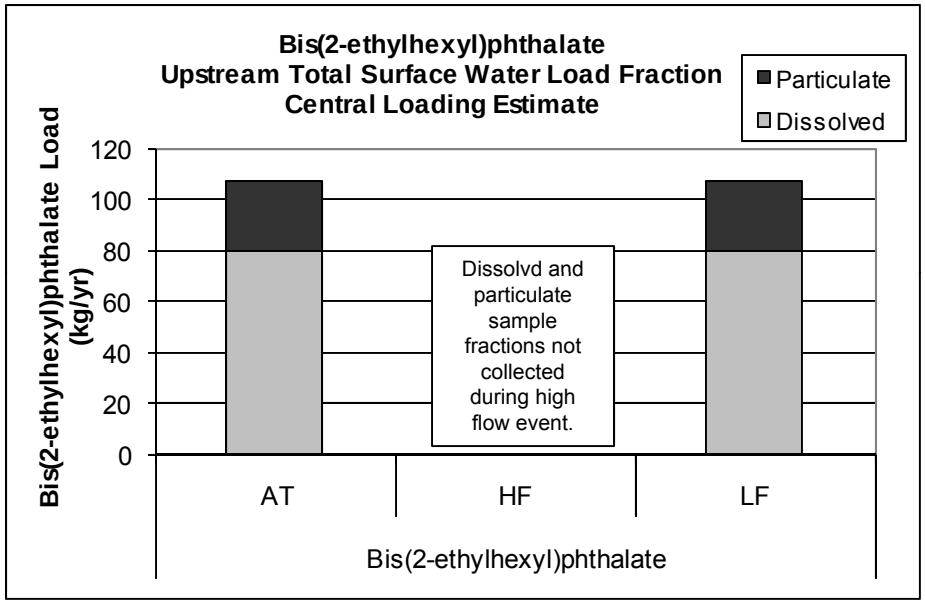
- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

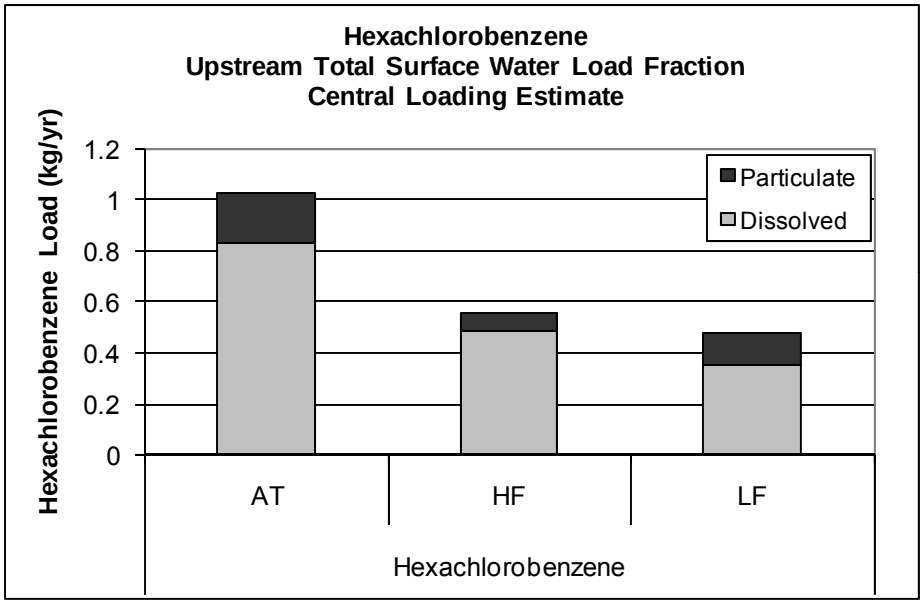
AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-10
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Surface Water Loading Ranges
Bis(2-ethylhexyl)phthalate and Hexachlorobenzene – Upstream





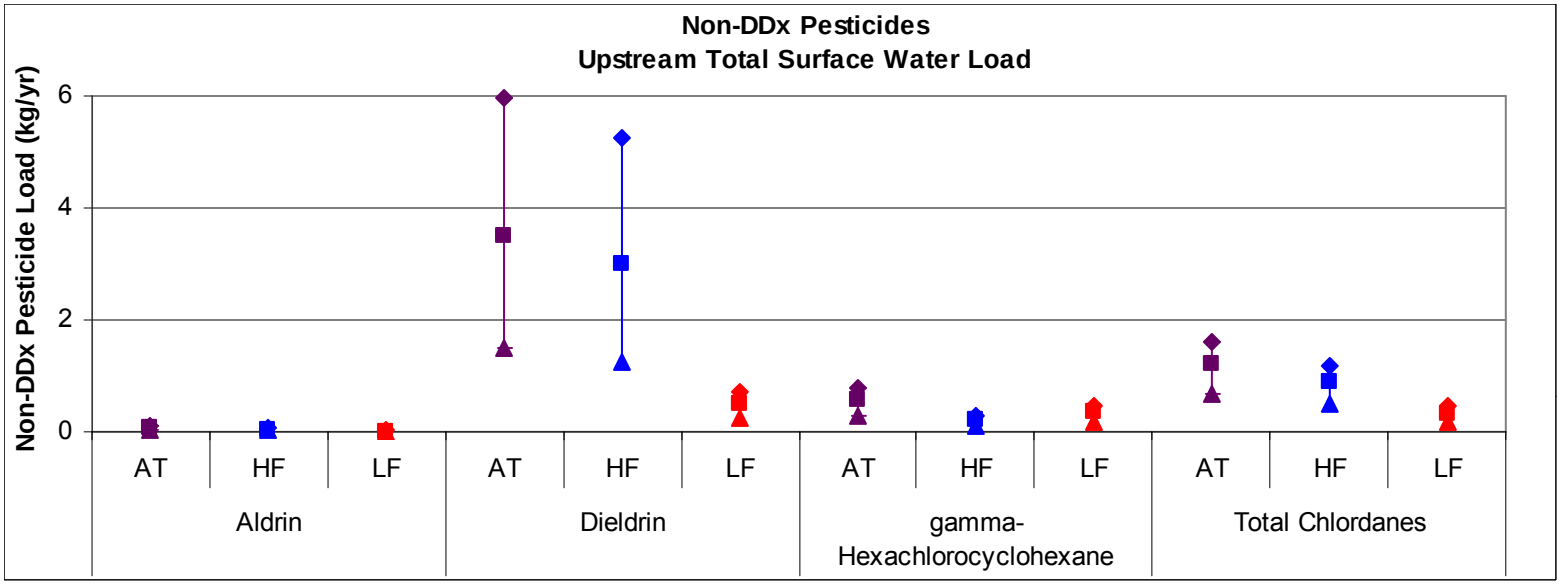
Notes

AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-11
Portland Harbor RI/FS
Remedial Investigation Report
Bar Chart of Surface Water Loading Fractions
Bis(2-ethylhexyl)phthalate and Hexachlorobenzene – Upstream



Legend

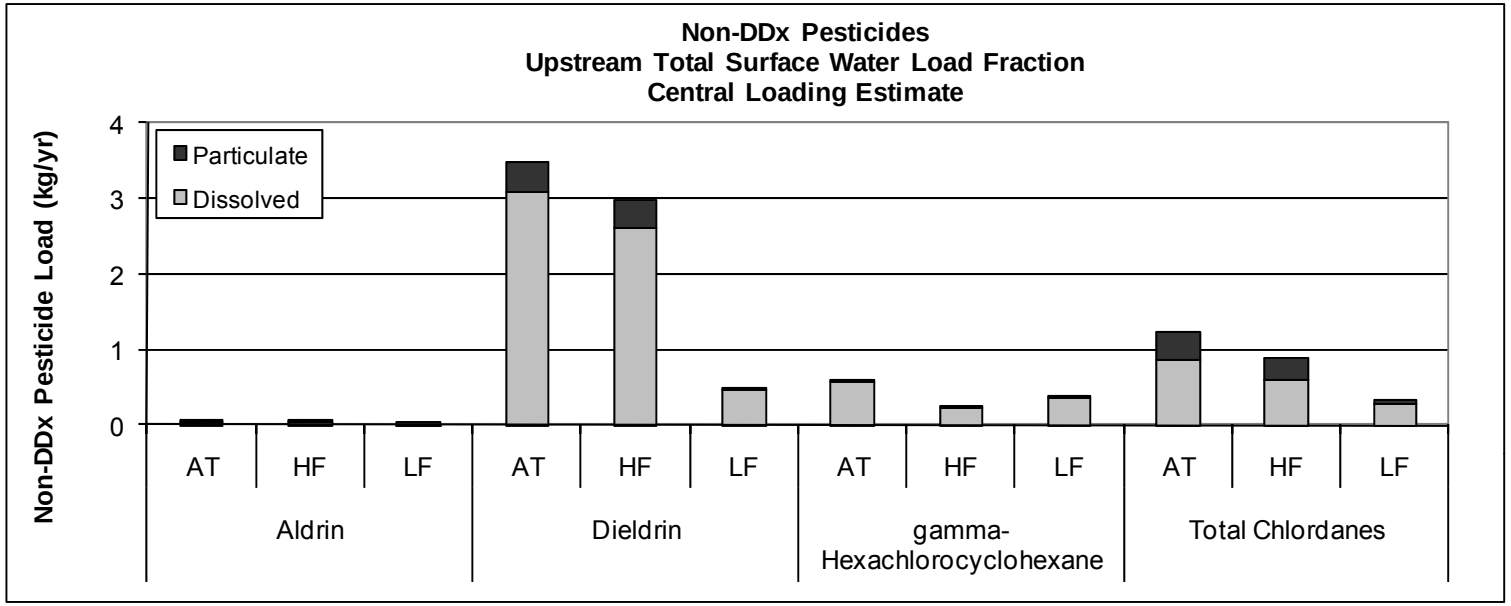
- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-12
Portland Harbor RI/FS
Remedial Investigation Report
Plot of Surface Water Loading Ranges
Non-DDx Pesticides – Upstream



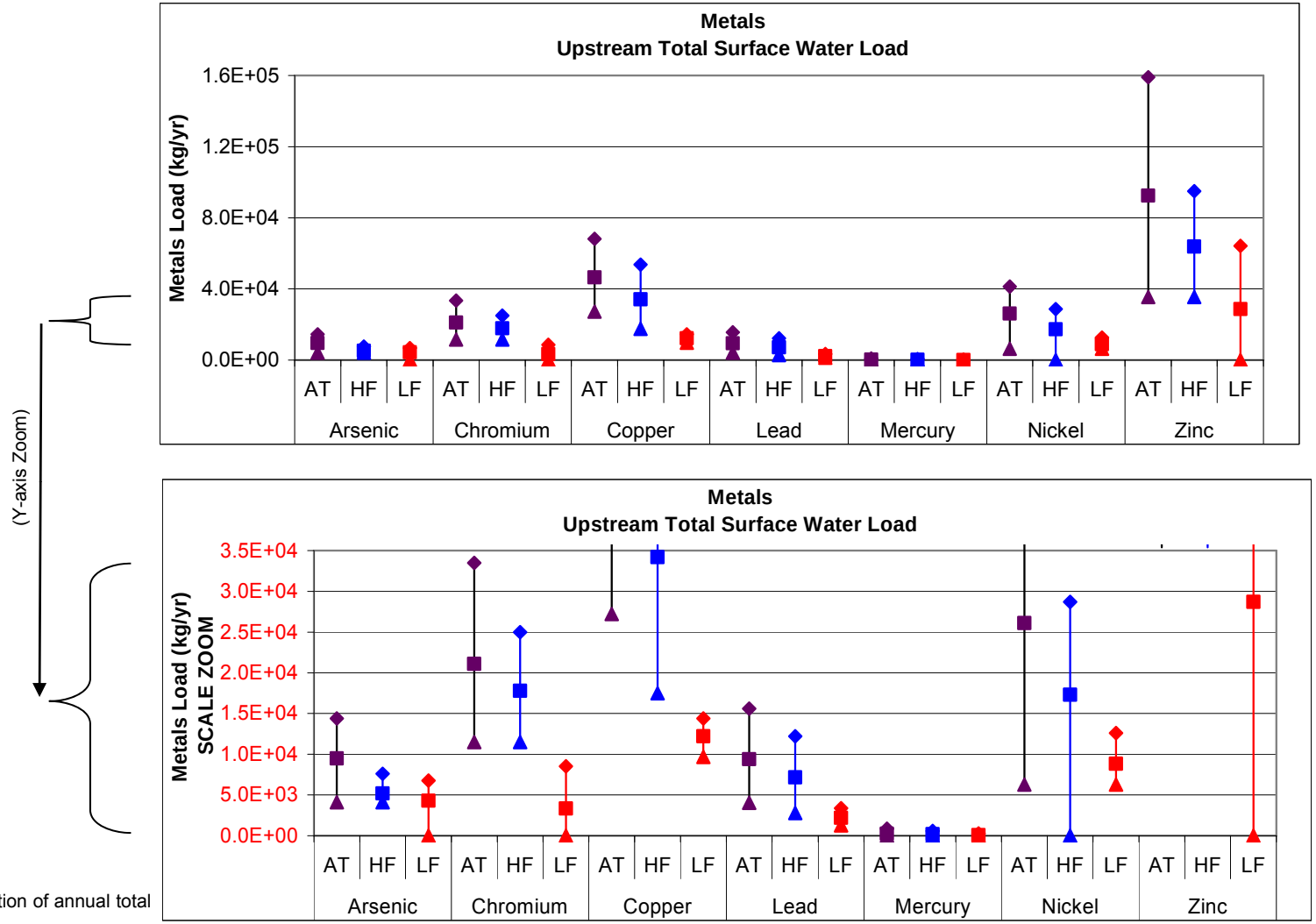
Notes

AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-13
Portland Harbor RI/FS
Remedial Investigation Report
Bar Chart of Surface Water Loading Fractions
Non-DDx Pesticides – Upstream



Legend

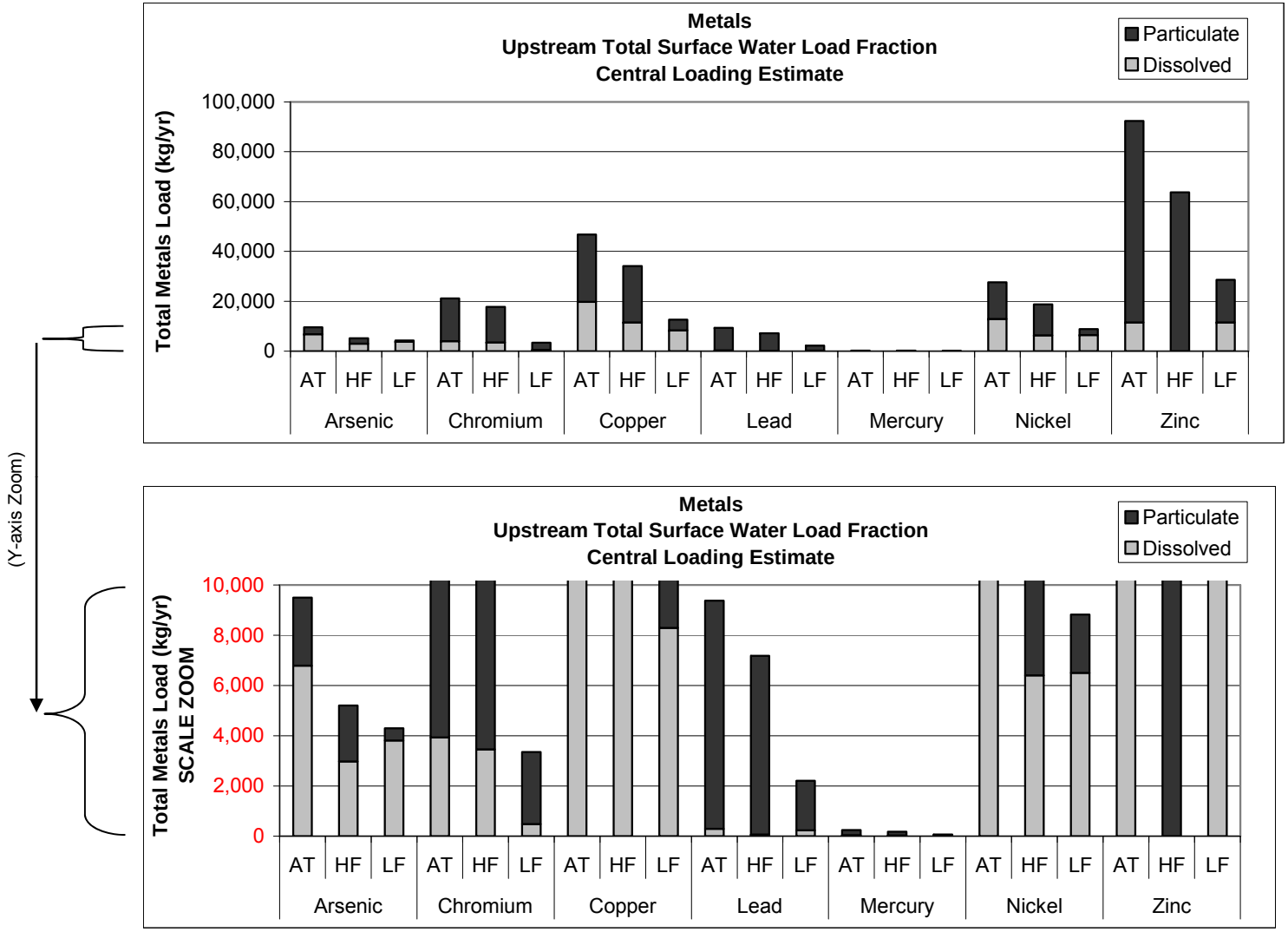
- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-14
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Surface Water Loading Ranges
Metals – Upstream



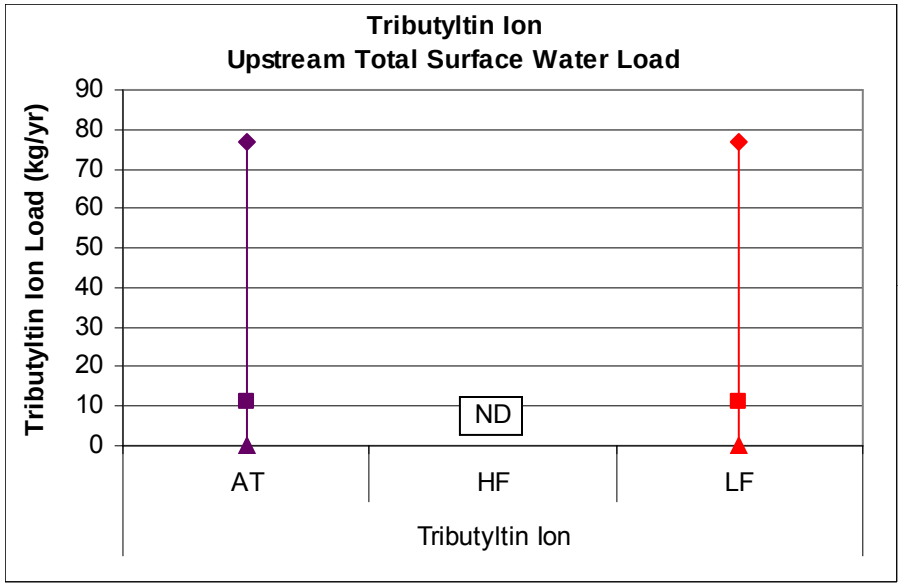
Notes

AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

Figure 6.1-15
Portland Harbor RI/FS
Remedial Investigation Report
Bar Charts of Surface Water Loading Fractions
Metals – Upstream



Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

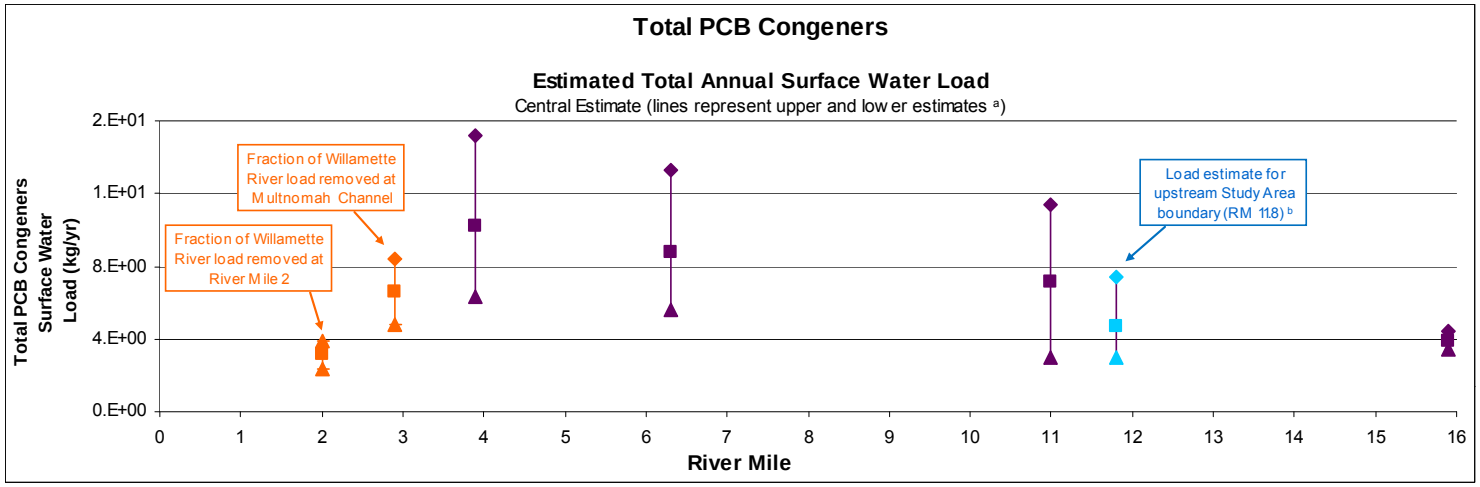
AT: Annual total

HF: High flow (> 50,000 cfs) portion of annual total

LF: Low flow (< 50,000 cfs) portion of annual total

ND: Data below laboratory detection limit. Value set equal to 0 prior to loading calculations

Figure 6.1-16
Portland Harbor RI/FS
Remedial Investigation Report
Plot of Surface Water Loading Ranges
Tributyltin Ion – Upstream



Legend

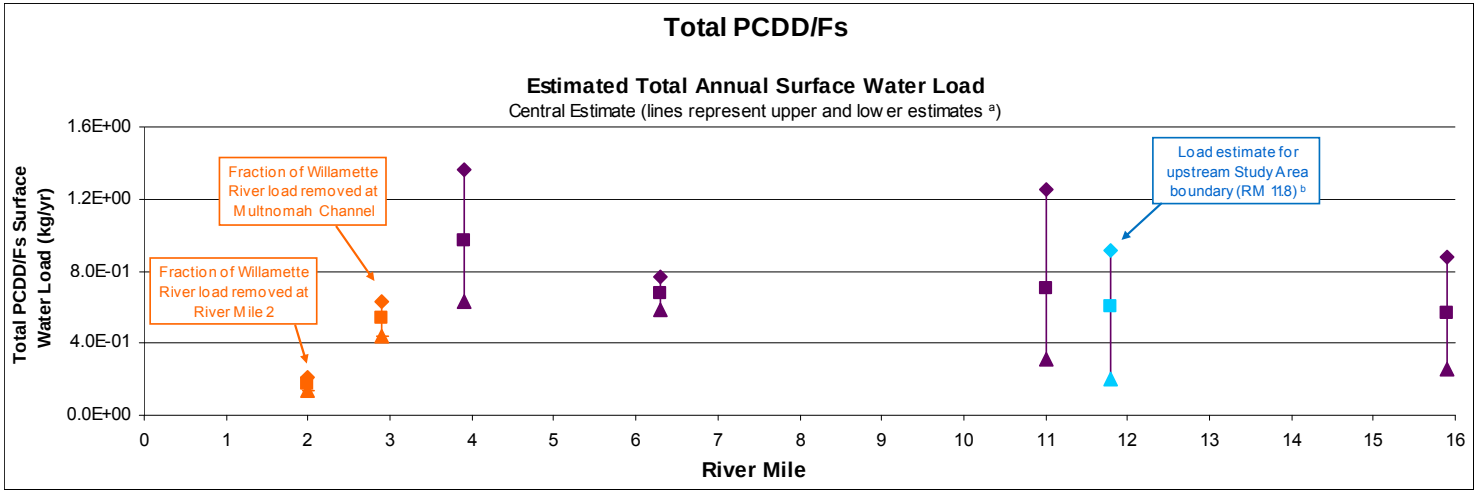
- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

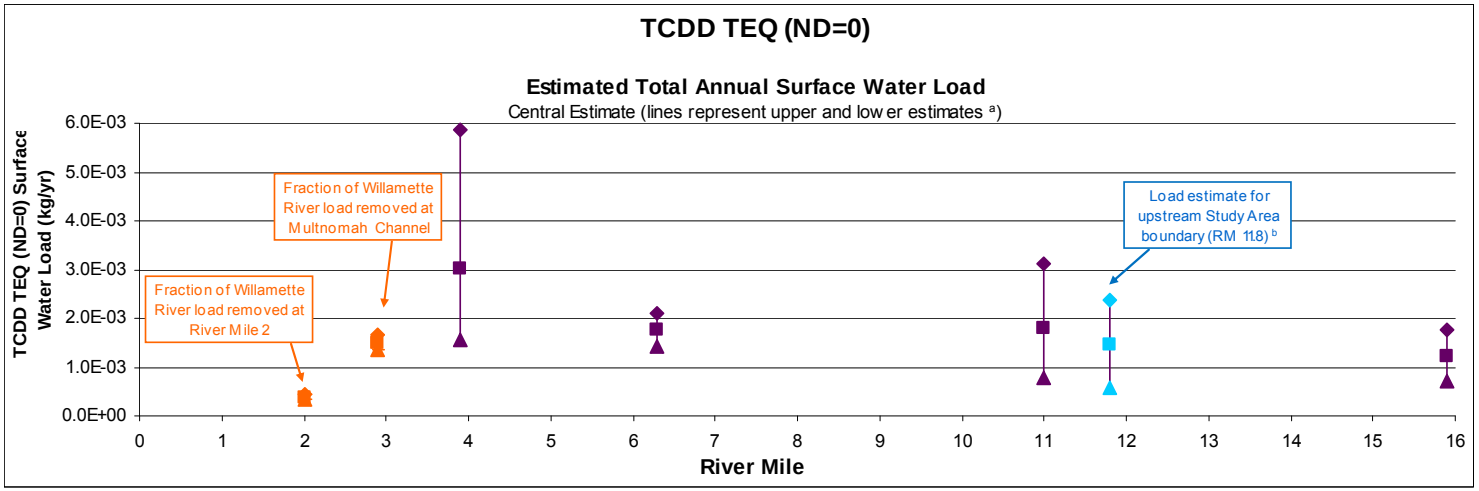
Notes:

[a] **Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate**. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

[b] Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

Figure 6.1-17
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Surface Water Loading Ranges
Total PCBs – River Transects





Legend

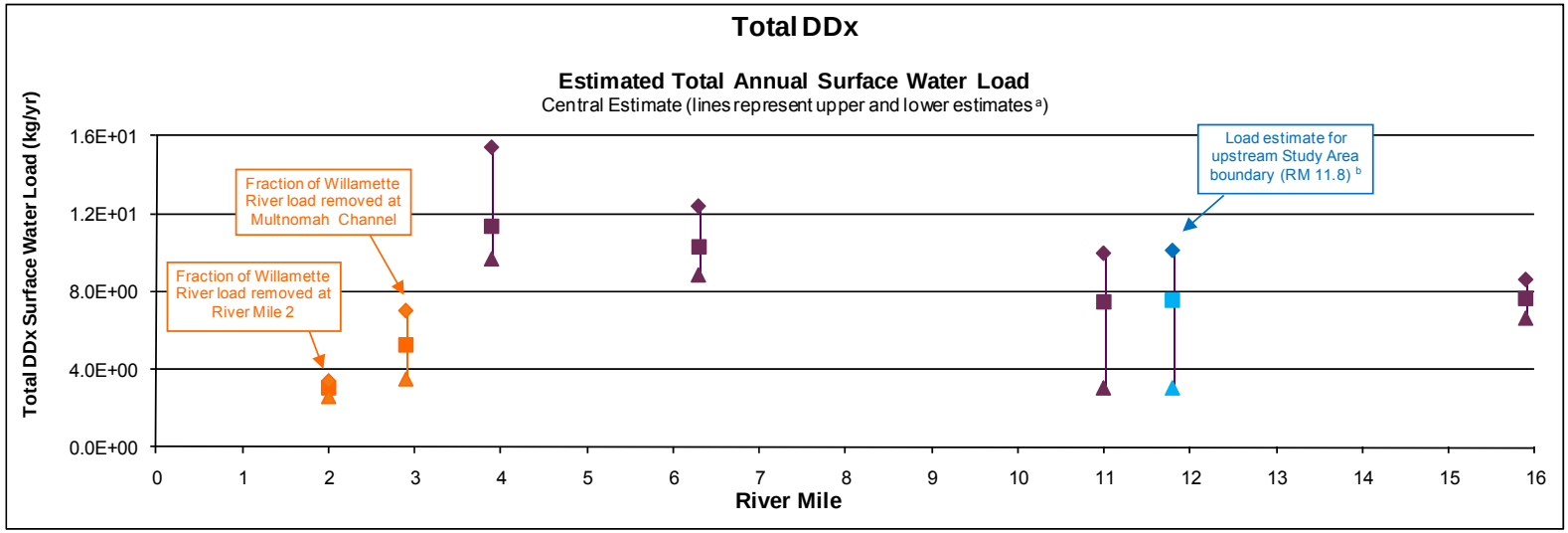
- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

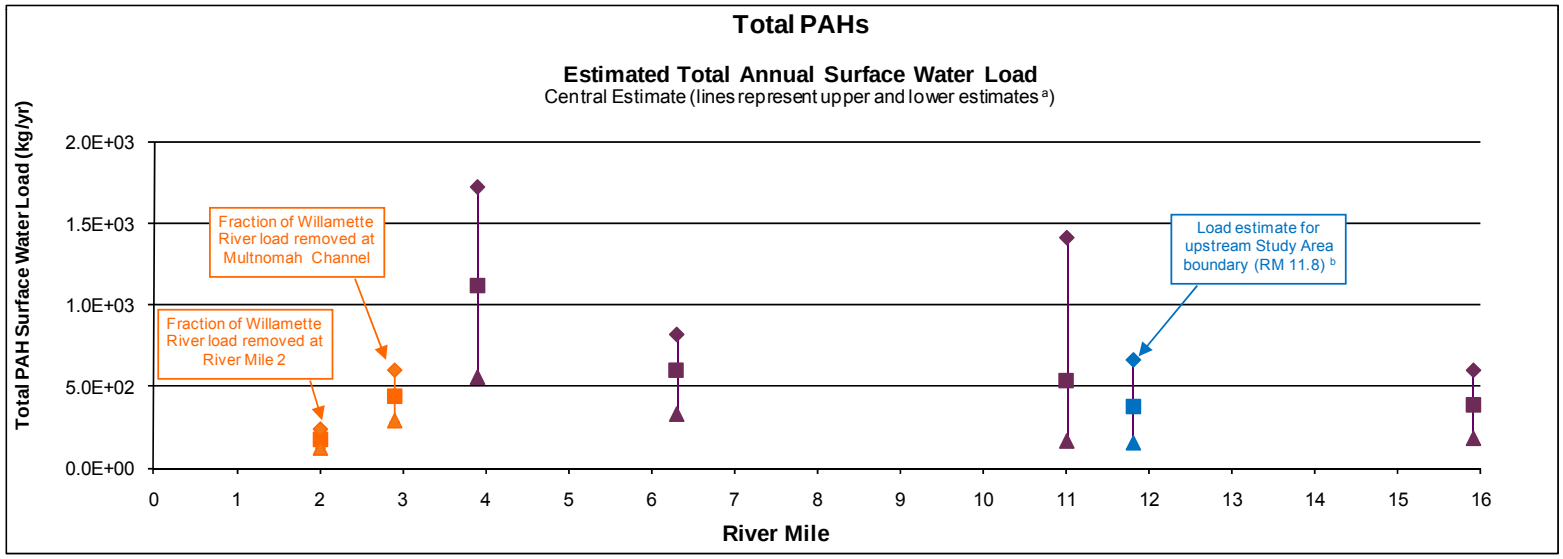
Notes:

[a] **Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate**. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

[b] Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

Figure 6.1-18
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Surface Water Loading Ranges
Total PCDD/Fs and TCDD TEQ (ND=0) – River Transects





Legend

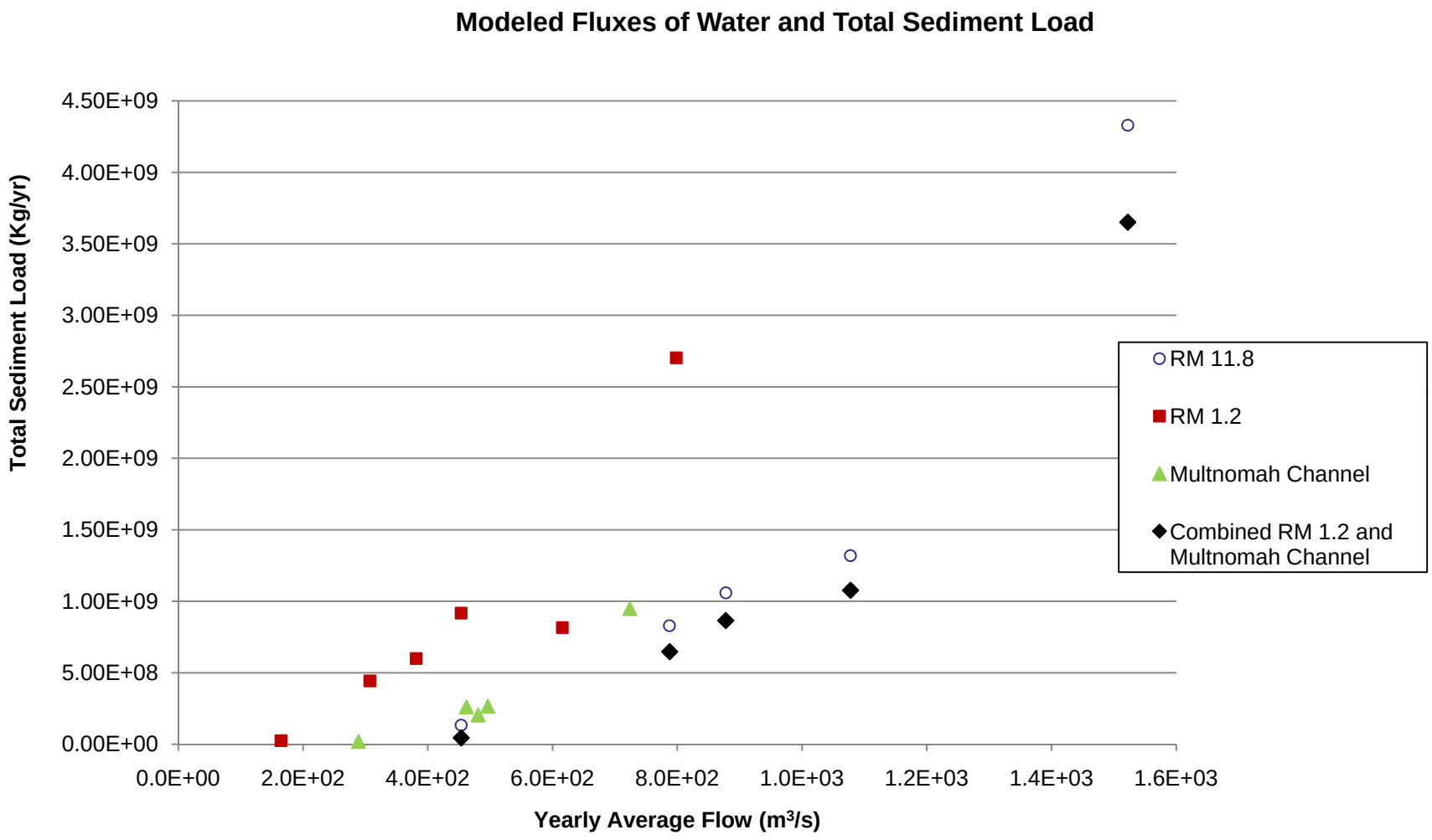
- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

Notes:

[a] **Upper and lower estimates were generated based on available data and do not necessarily reflect uncertainty in estimate**. Refer to text (Sections 6.1 and 10.2) for discussions of uncertainty in these loading estimates.

[b] Upstream surface water load estimated based on data from RM 16 and RM 11, with RM 11 outlying data values excluded.

Figure 6.1-19
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Surface Water Loading Ranges
Total DDx and Total PAHs – River Transects



Note: Open symbol denotes positive loading into the study area.
Solid symbol denotes negative loading out of the study area.

Figure 6.1-20
Portland Harbor RI/FS
Remedial Investigation Report
Modeled Fluxes of Water and Total Sediment Load
RM 11.8, 1.2, and Multnomah Channel

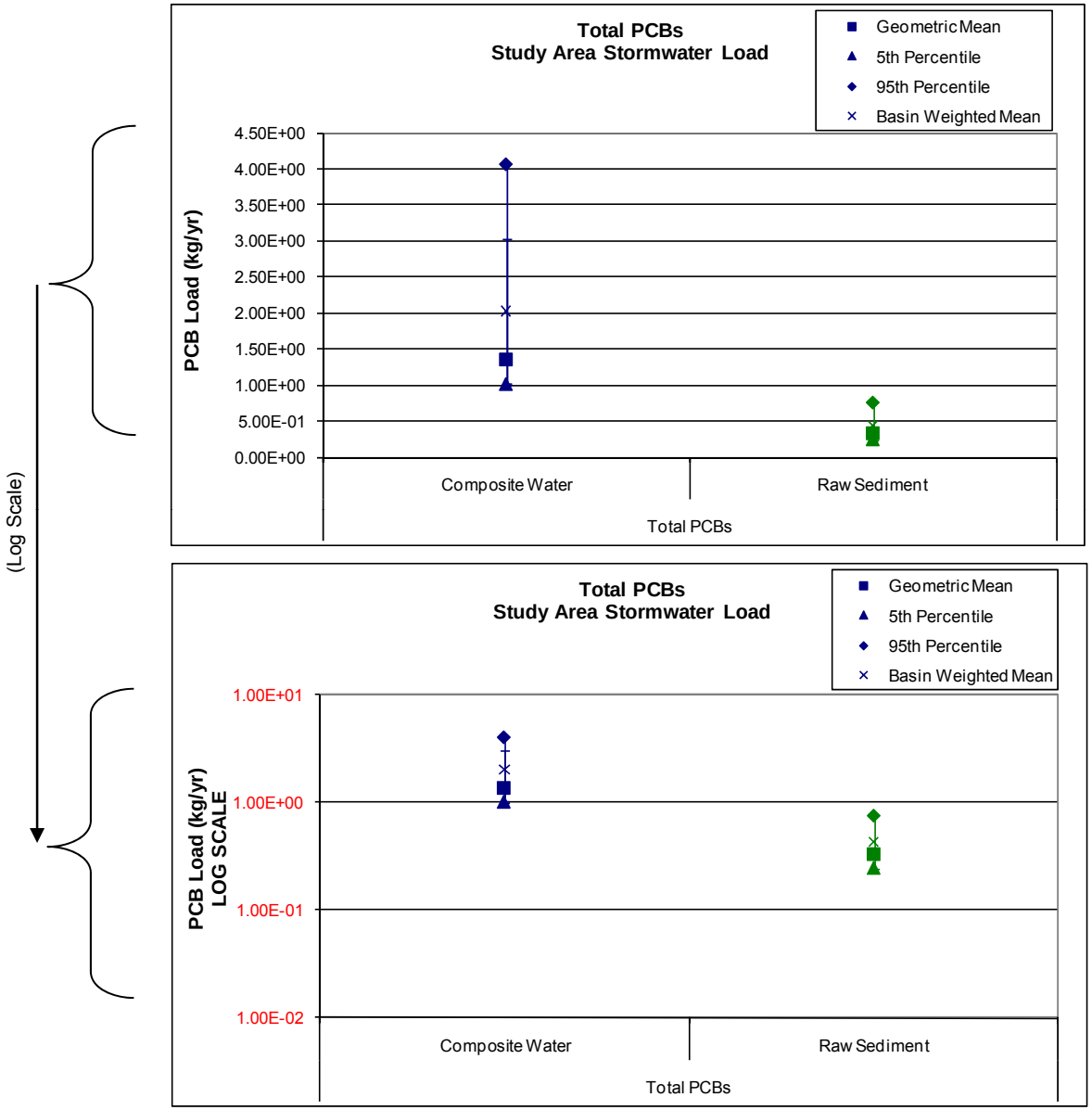


Figure 6.1-21
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Total PCBs

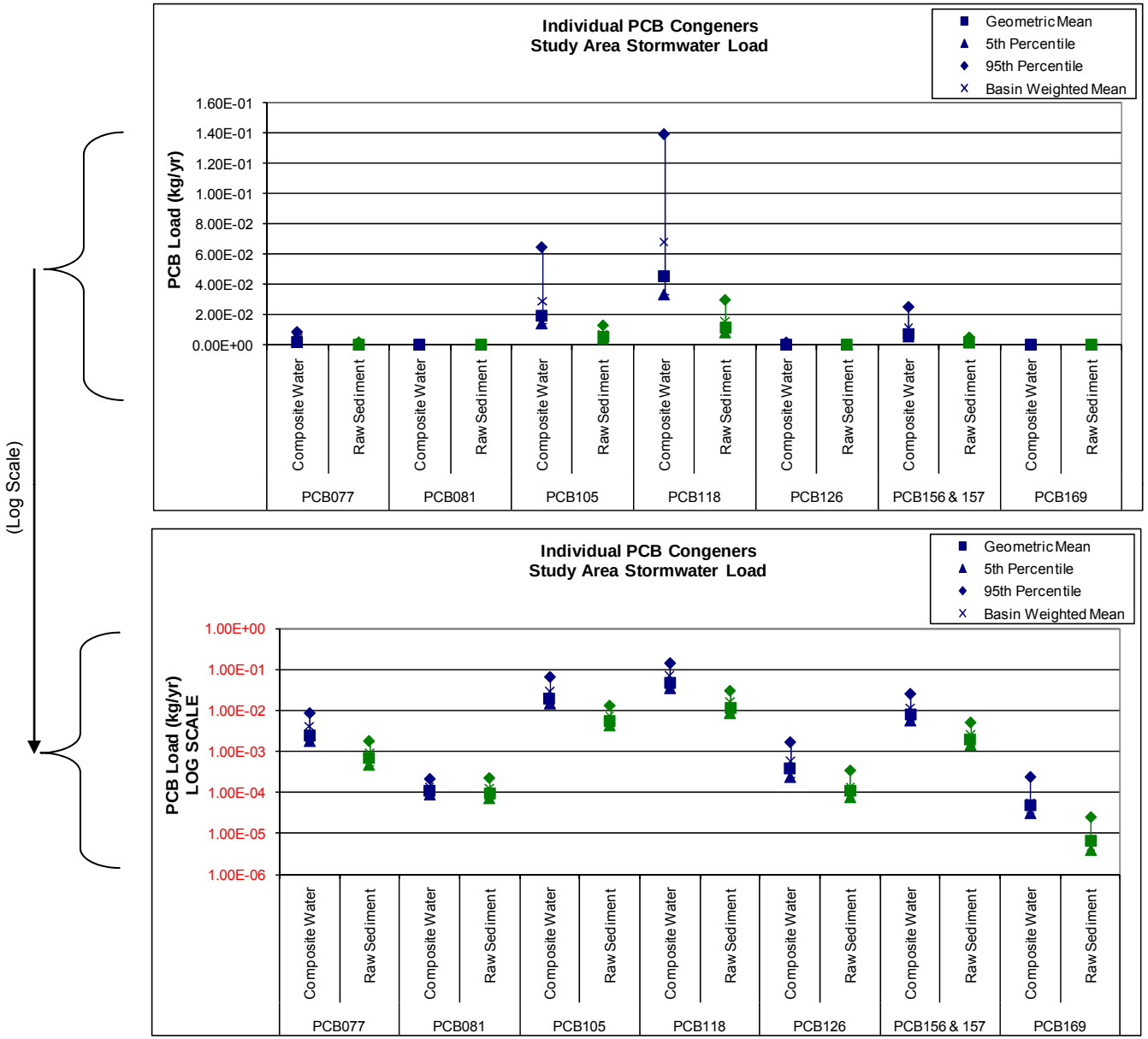


Figure 6.1-22
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Individual PCB Congeners

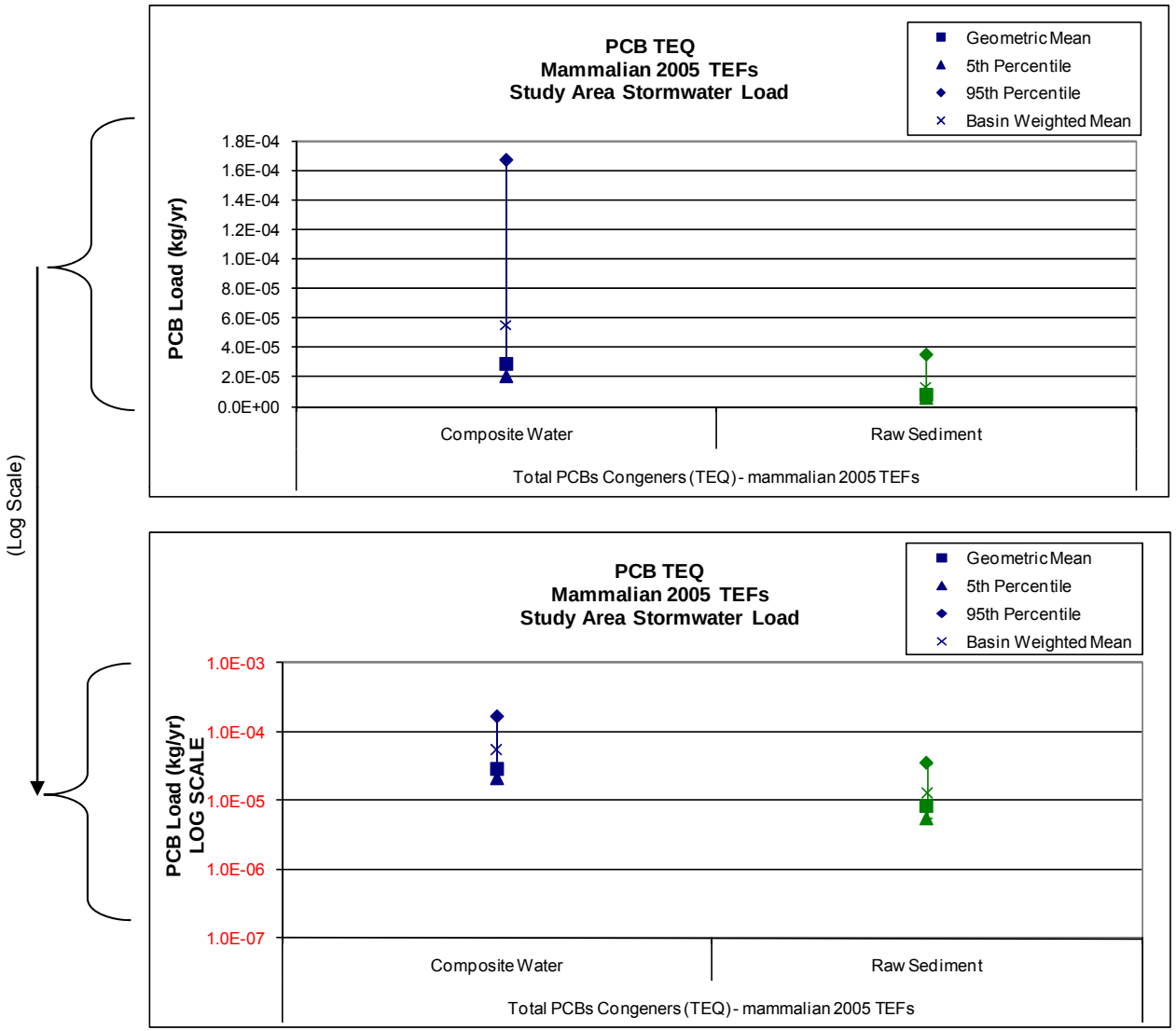


Figure 6.1-23
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
PCB TEQ

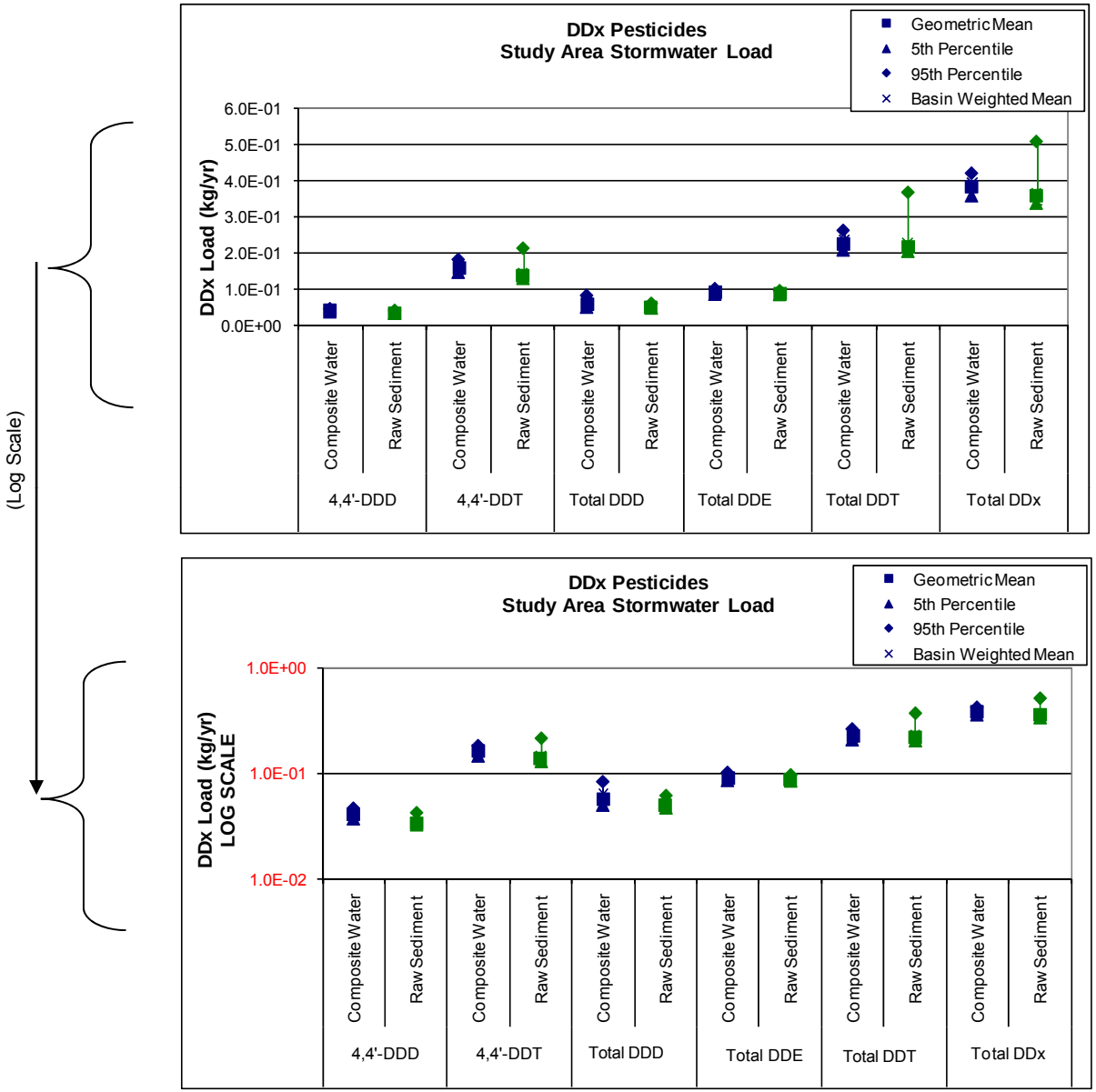


Figure 6.1-24
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
DDx Pesticides

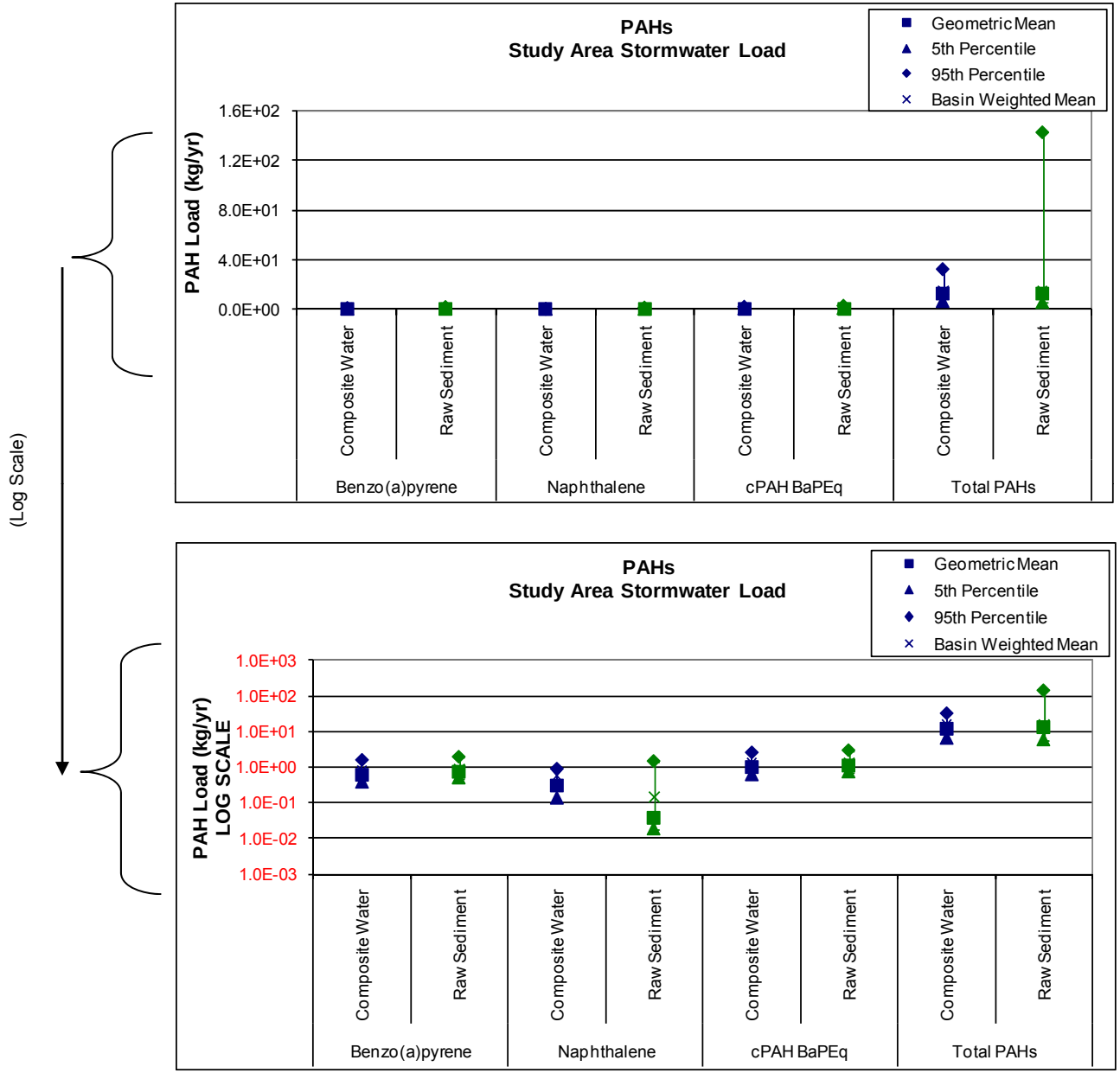


Figure 6.1-25
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
PAHs

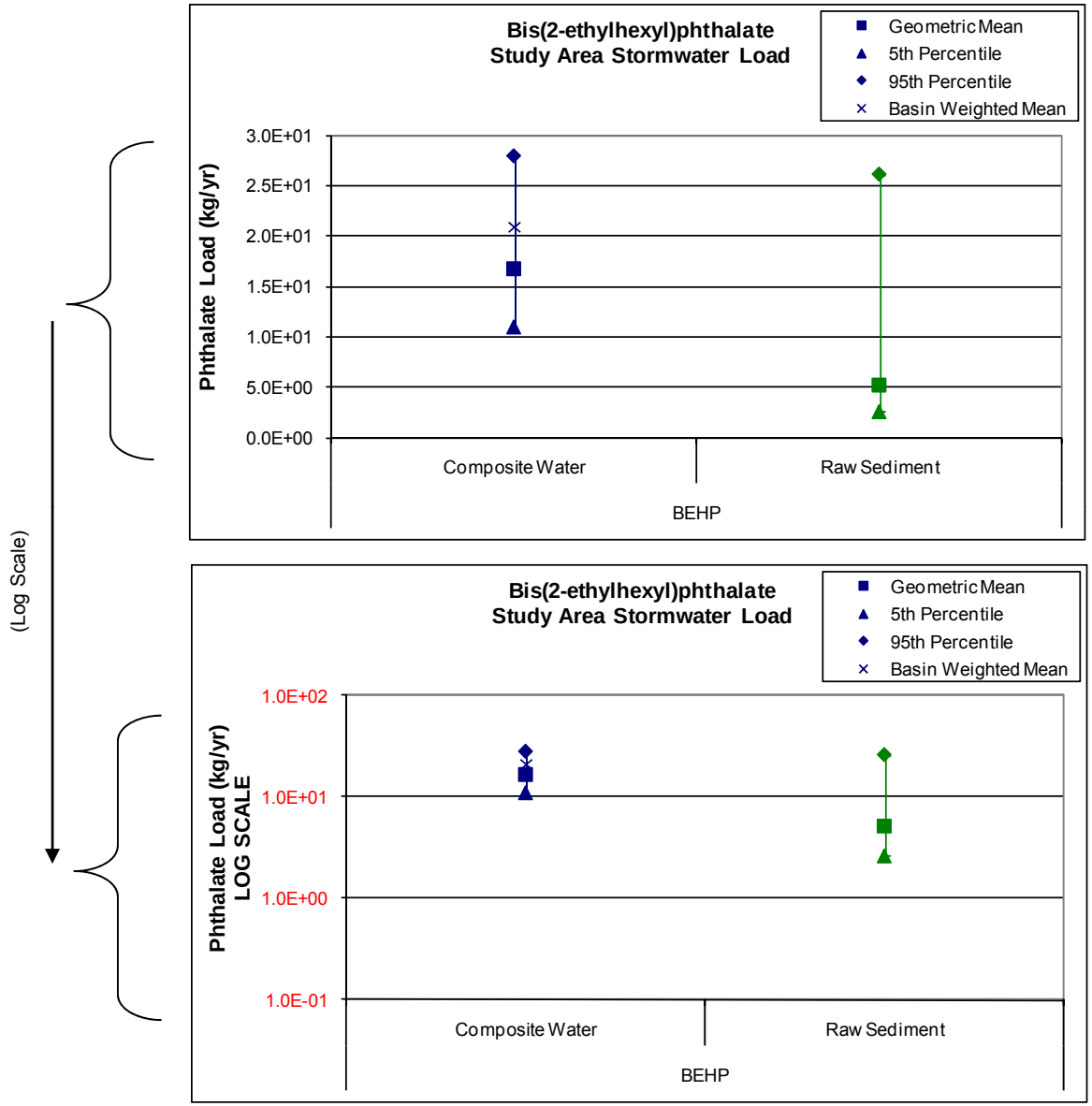


Figure 6.1-26
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Bis(2-ethylhexyl)phthalate

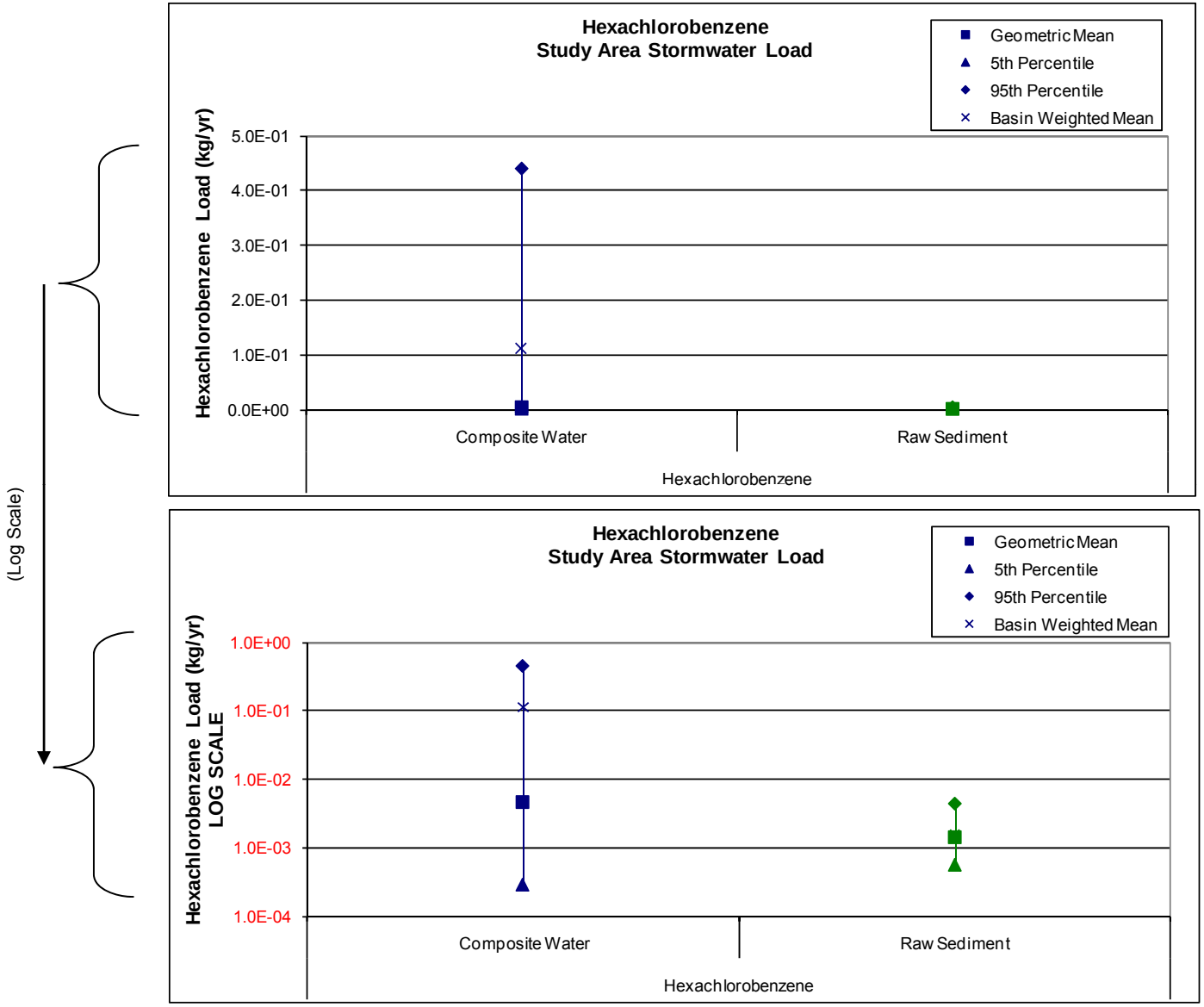


Figure 6.1-27
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Hexachlorobenzene

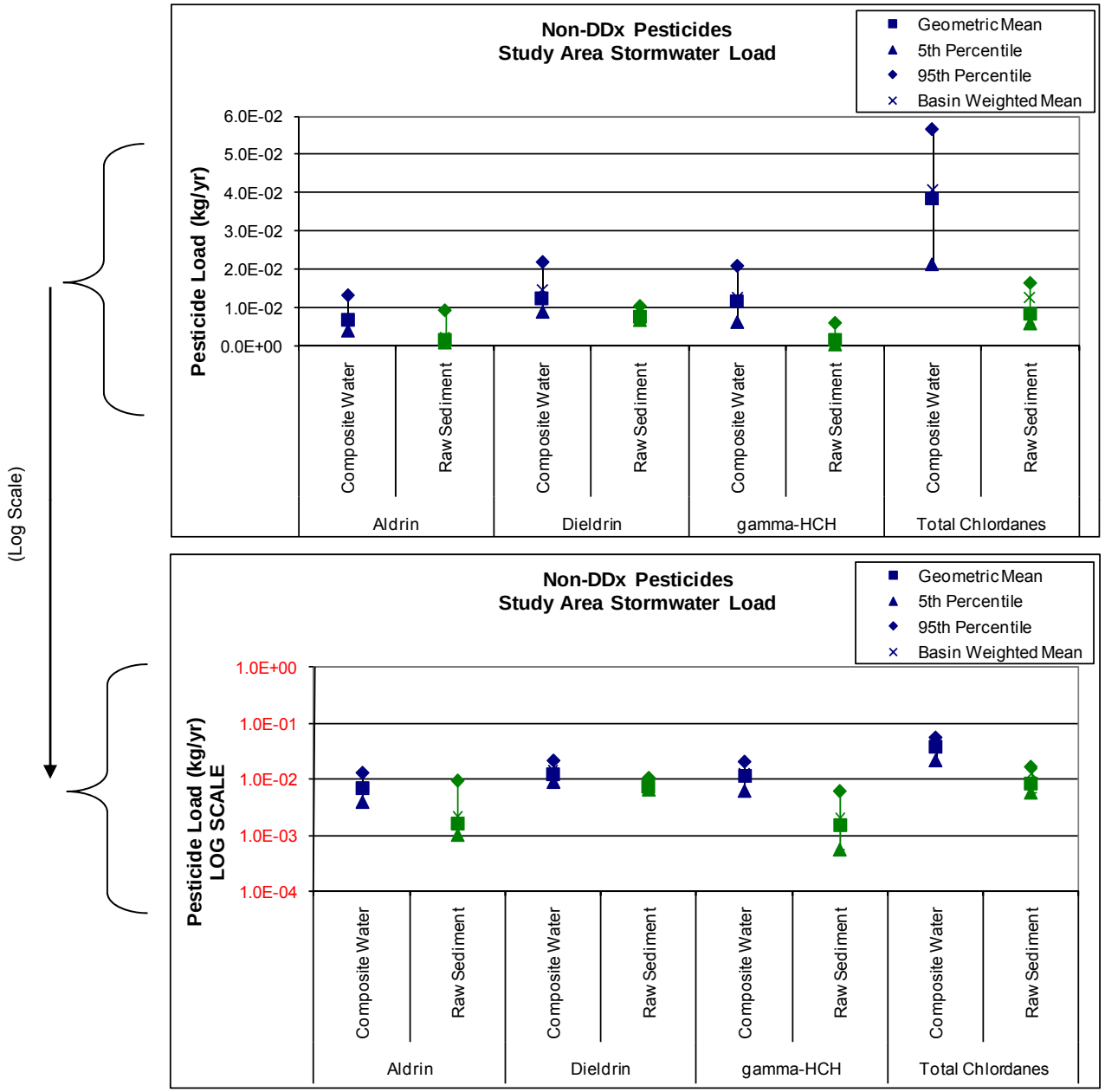


Figure 6.1-28
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Non-DDx Pesticides

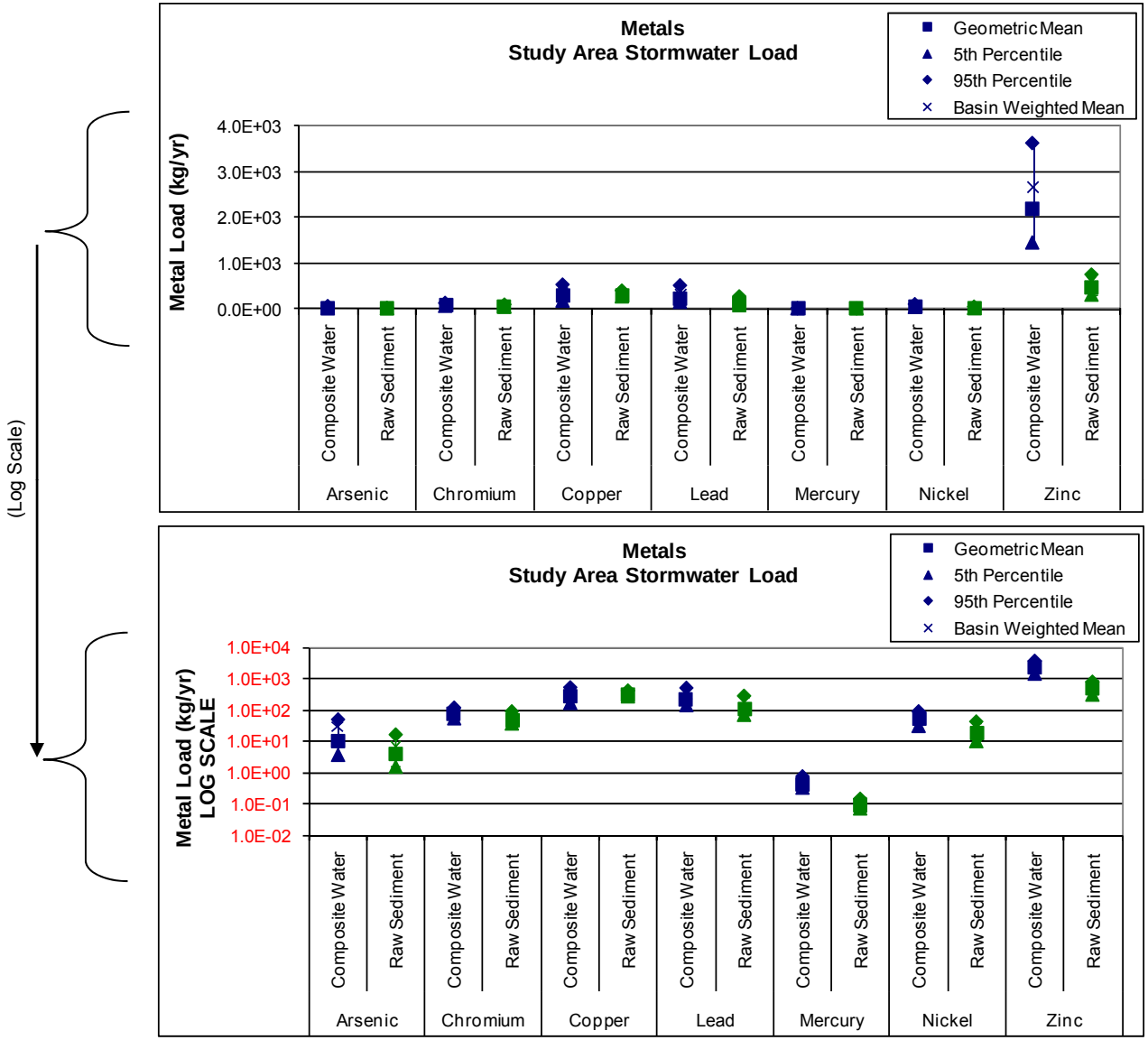
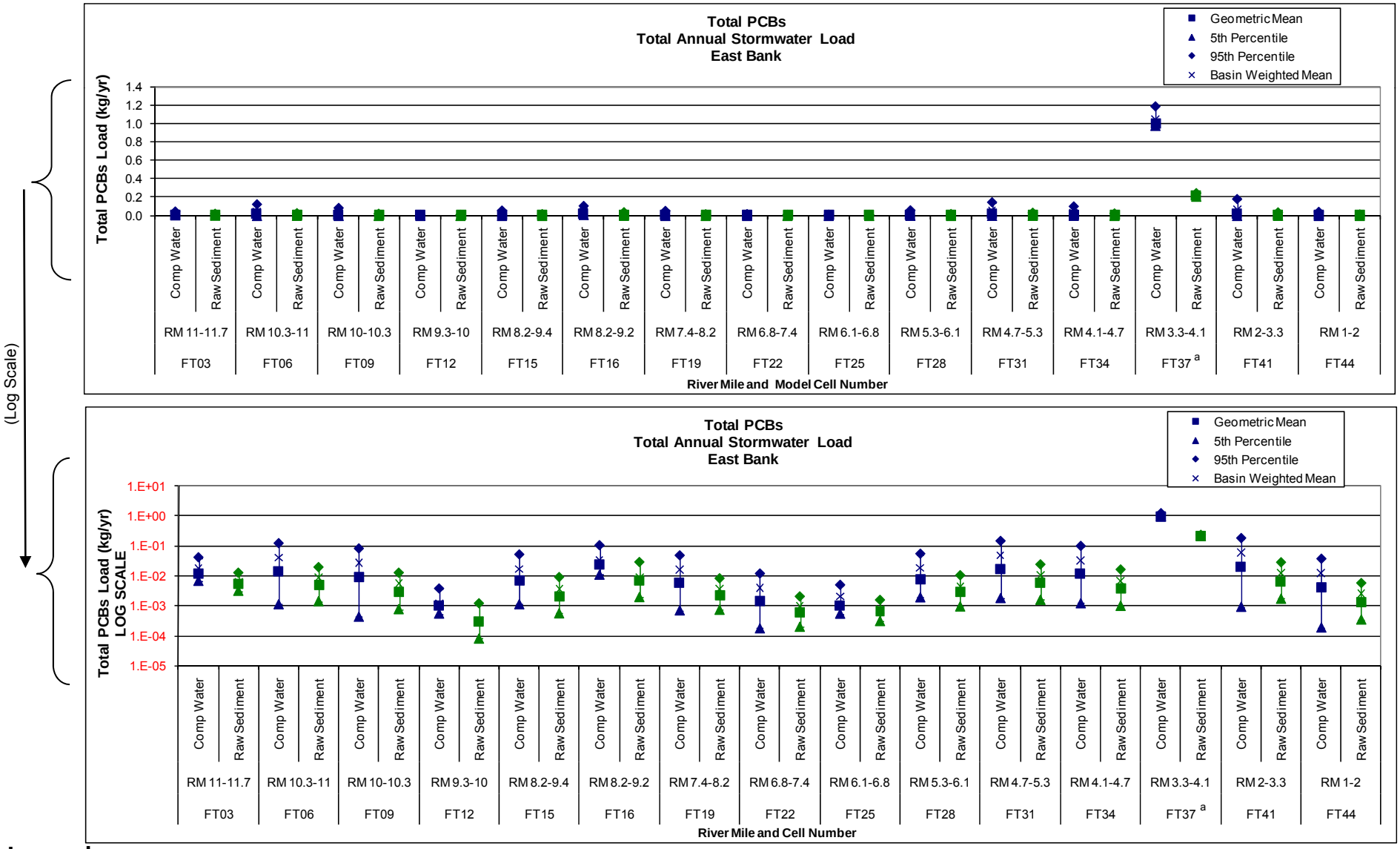


Figure 6.1-29
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Metals

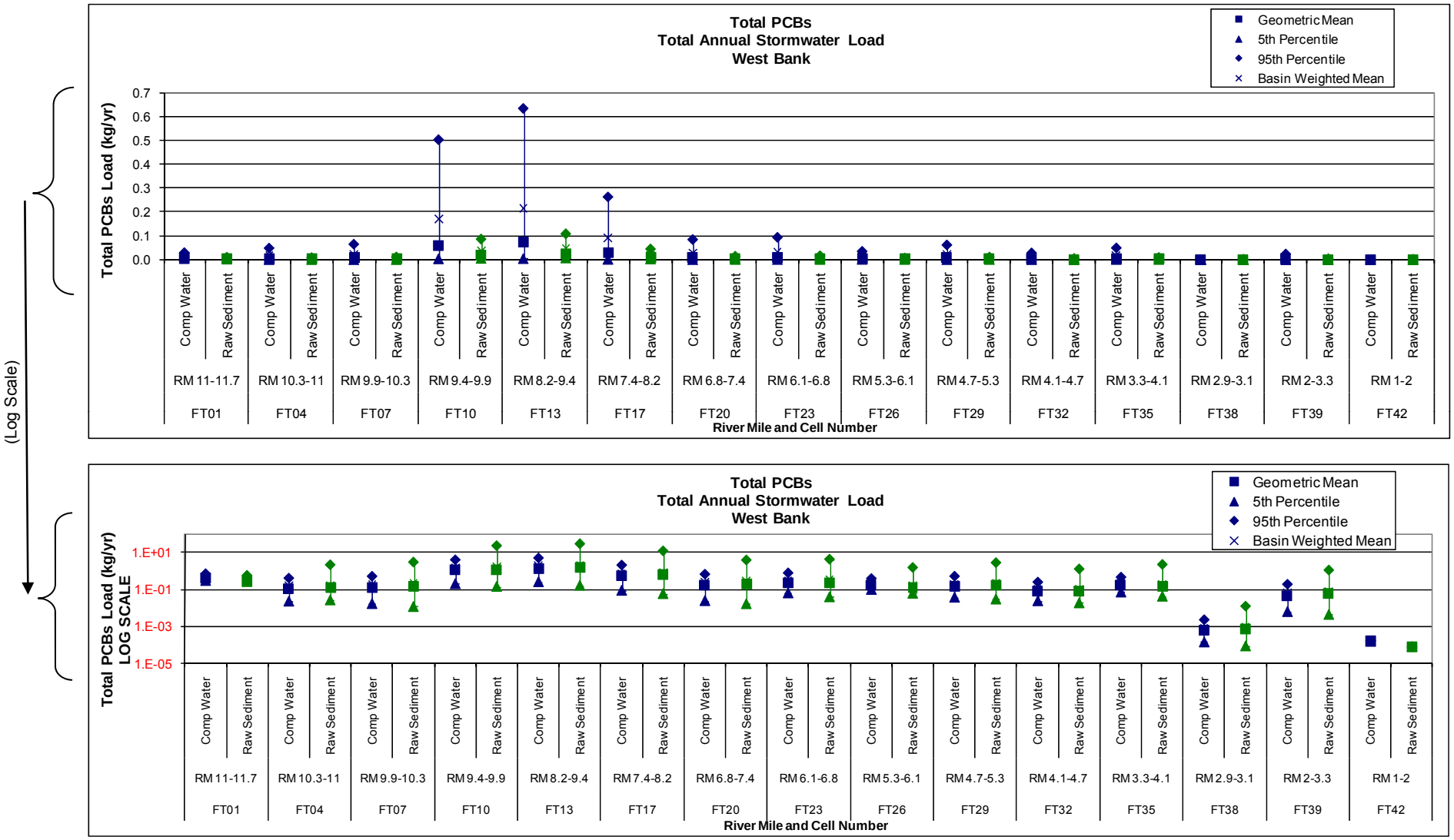


Legend

- ■ Geometric Mean
- ◆ 95th Percentile
- ▲ 5th Percentile
- X Basin Weighted Mean

Note:
[a] Load estimate includes a non-representative site which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).

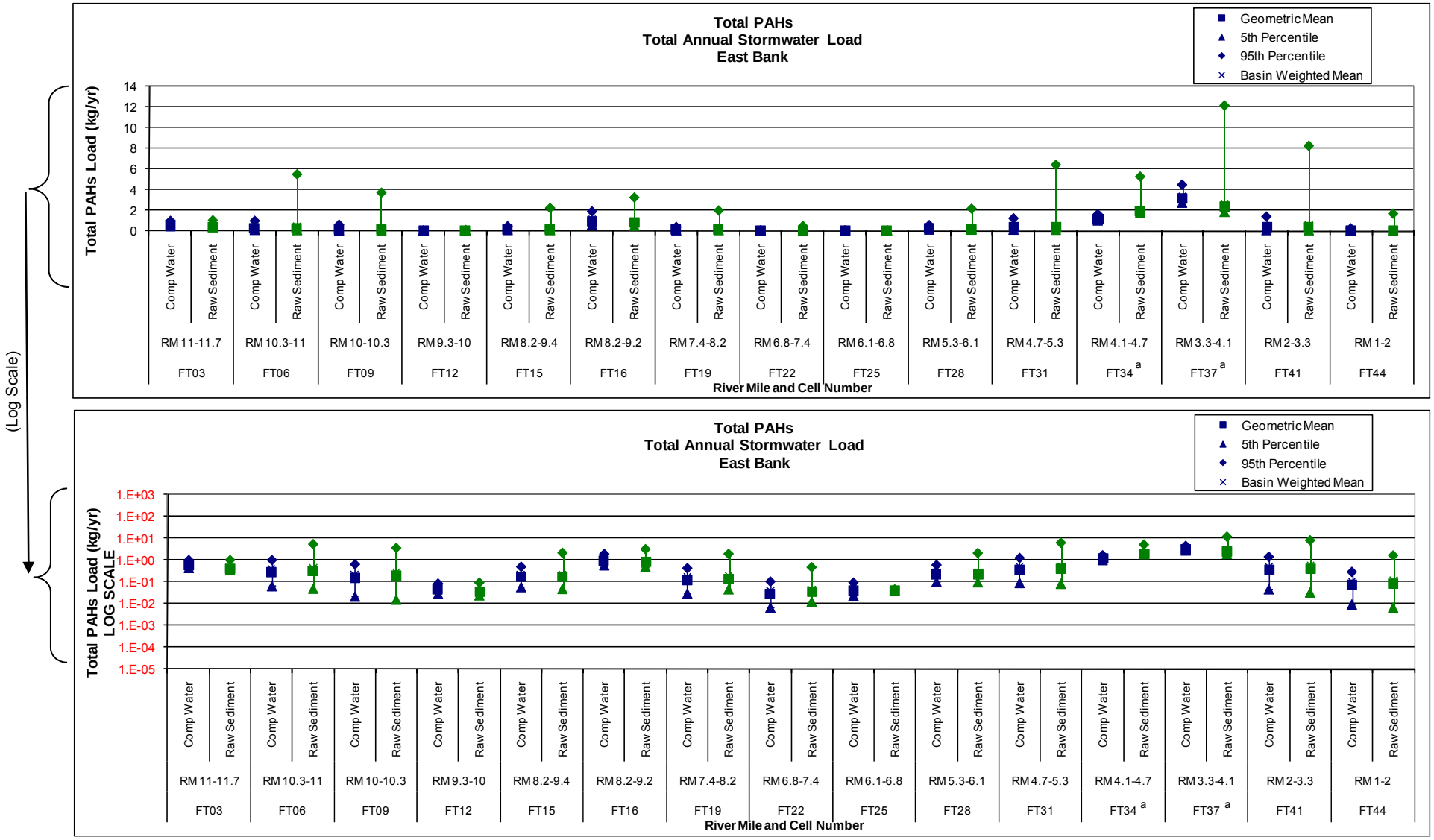
Figure 6.1-30
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Total PCBs East Bank – River Mile Presentation



Legend

- ■ Geometric Mean
- ◆ 95th Percentile
- ▲ 5th Percentile
- X Basin Weighted Mean

Figure 6.1-31
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Total PCBs West Bank – River Mile Presentation

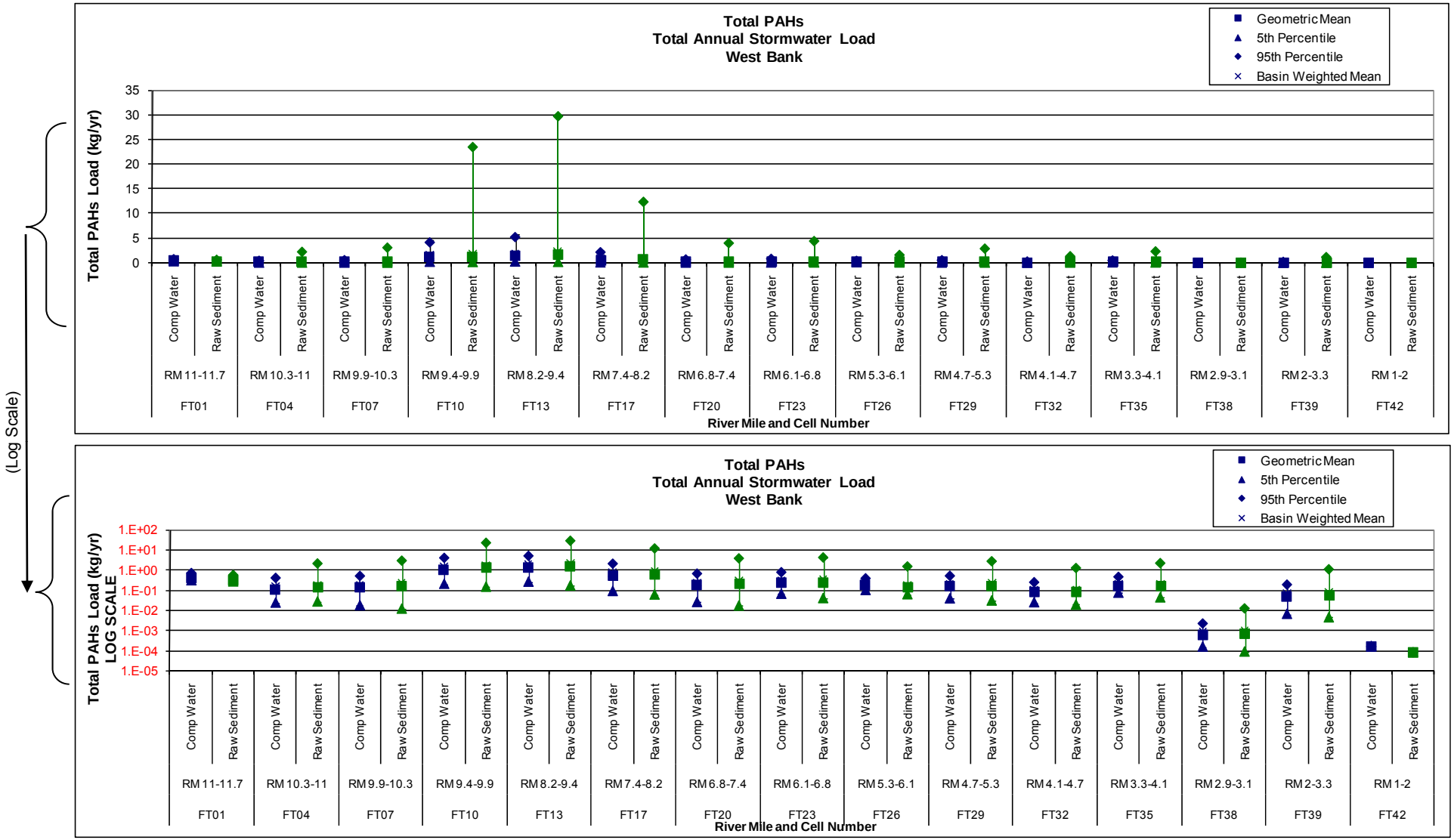


Legend

- ■ Geometric Mean
- ◆ 95th Percentile
- ▲ 5th Percentile
- X Basin Weighted Mean

Note:
[a] Load estimate includes a non-representative site which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).

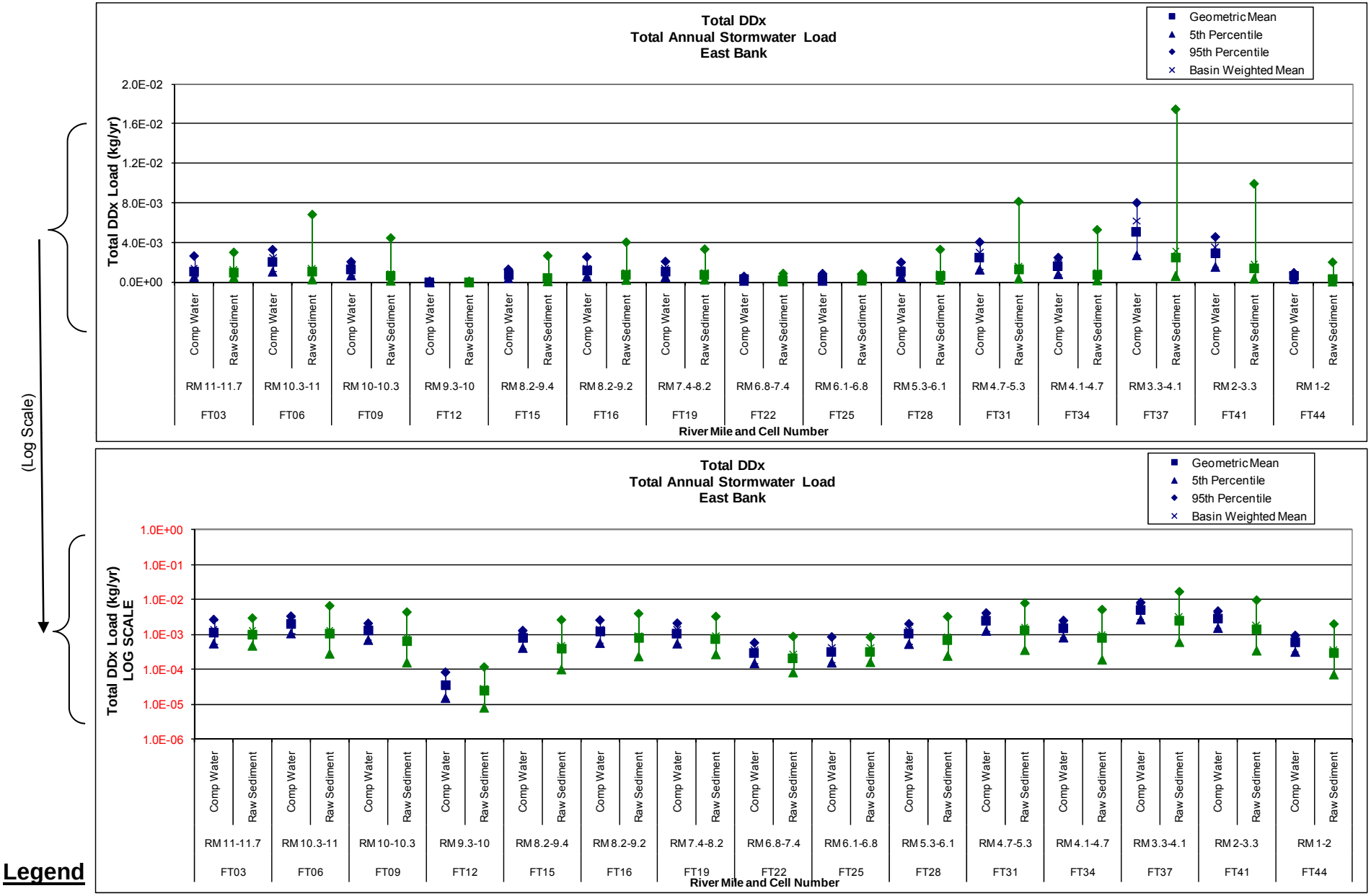
Figure 6.1-32
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Total PAHs East Bank – River Mile Presentation



Legend

- ■ Geometric Mean
- ◆ 95th Percentile
- ▲ 5th Percentile
- X Basin Weighted Mean

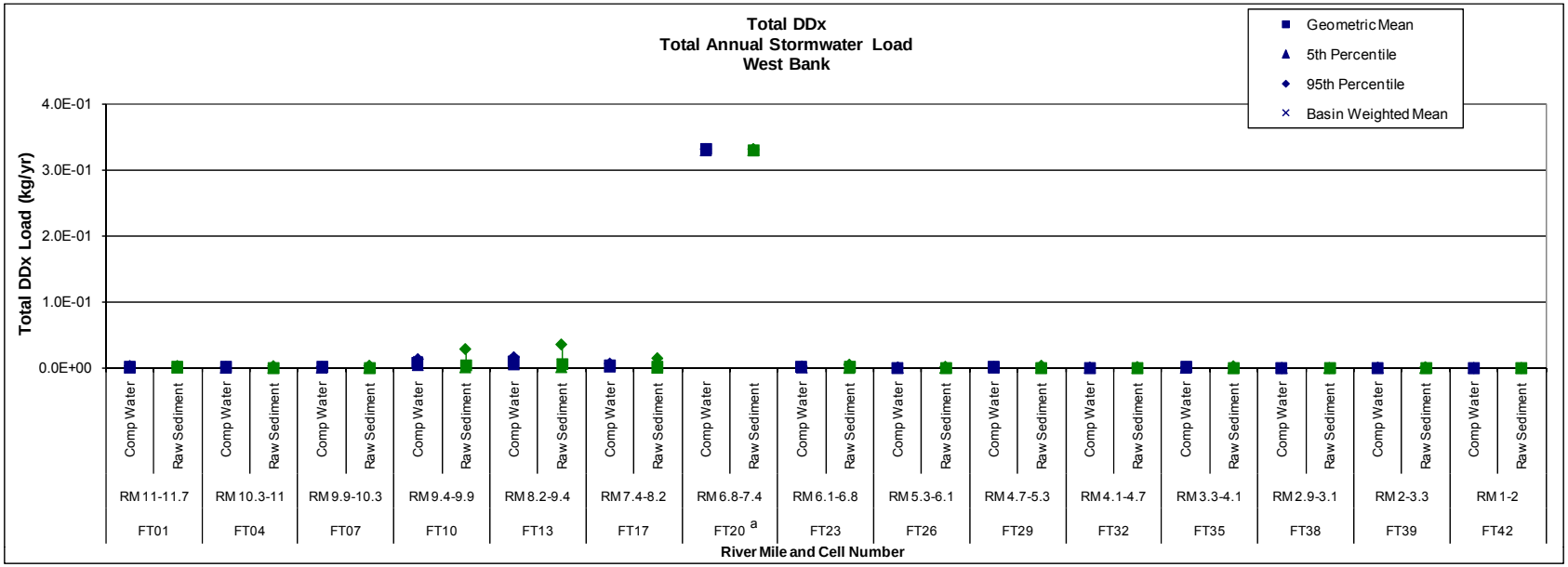
Figure 6.1-33
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Total PAHs West Bank – River Mile Presentation



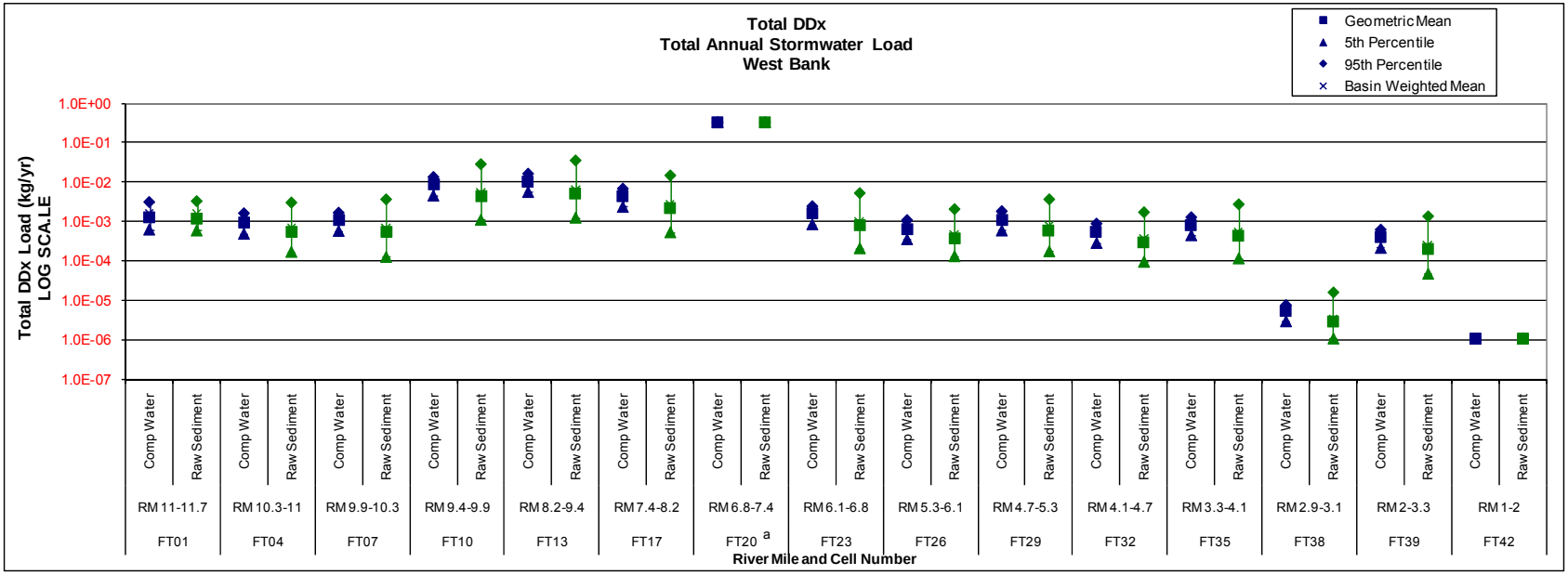
Legend

- ■ Geometric Mean
- ◆ 95th Percentile
- ▲ 5th Percentile
- X Basin Weighted Mean

Figure 6.1-34
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Total DDx East Bank – River Mile Presentation



(Log Scale)

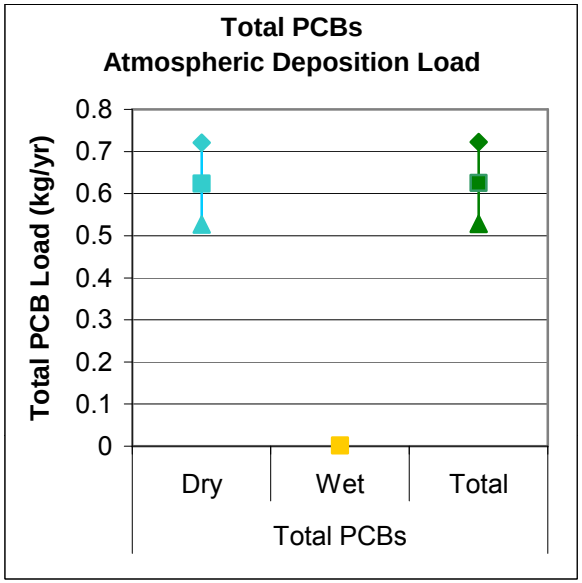


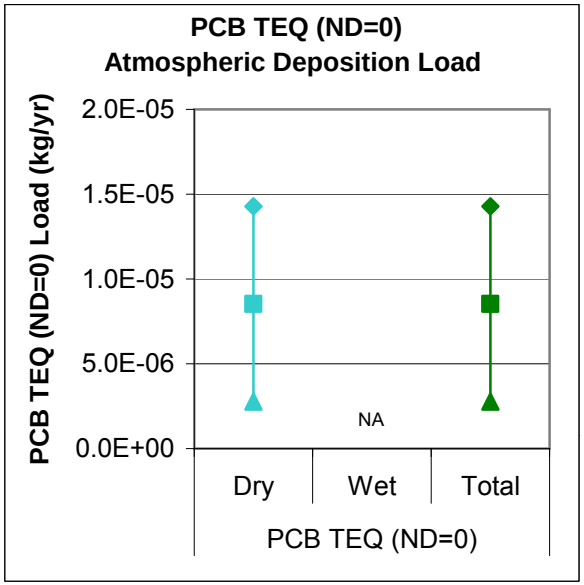
Legend

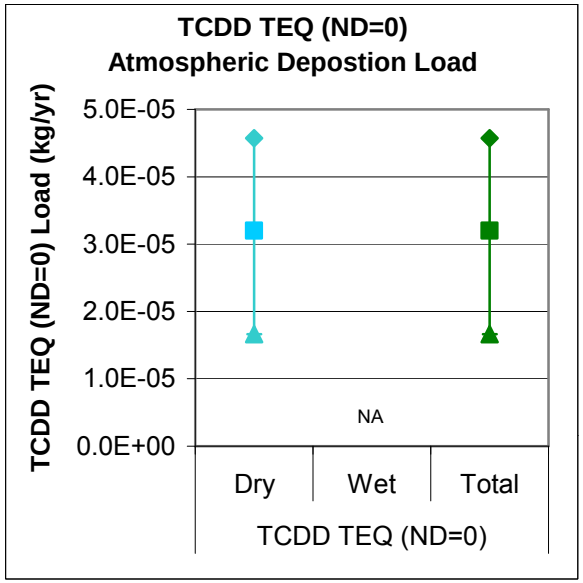
- ■ Geometric Mean
- ◆ 95th Percentile
- ▲ 5th Percentile
- x Basin Weighted Mean

Note:
[a] Load estimate includes non-representative sites which may lead to increased uncertainty related to the stormwater sampling program and load calculation methods (see Section 6.1.2.2).

Figure 6.1-35
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Stormwater Loading Ranges
Total DDx West Bank – River Mile Presentation





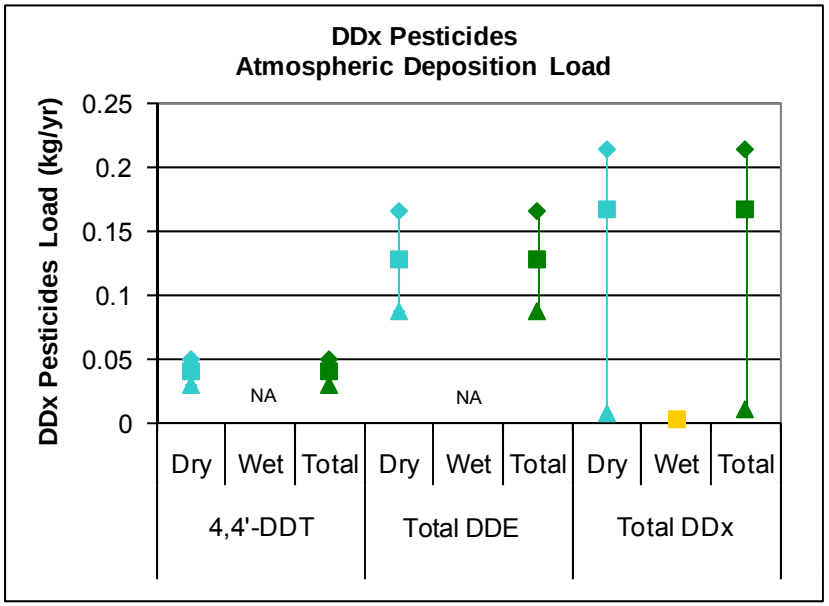


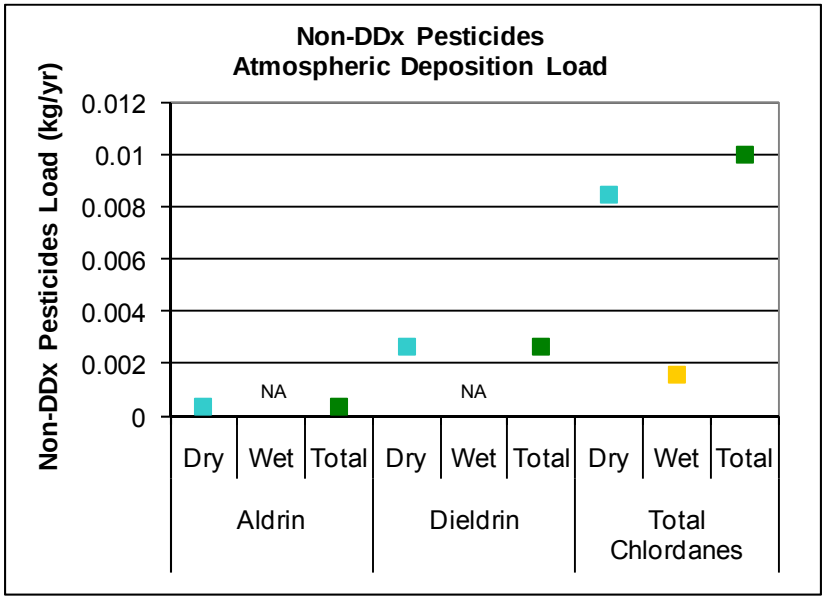
Legend

◆ Upper Load Estimate
■ Central Load Estimate
▲ Lower Load Estimate

NA: Data not available.

Figure 6.1-36
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Atmospheric Deposition Loading Ranges
PCBs and TCDD TEQ (ND=0) – Study Area



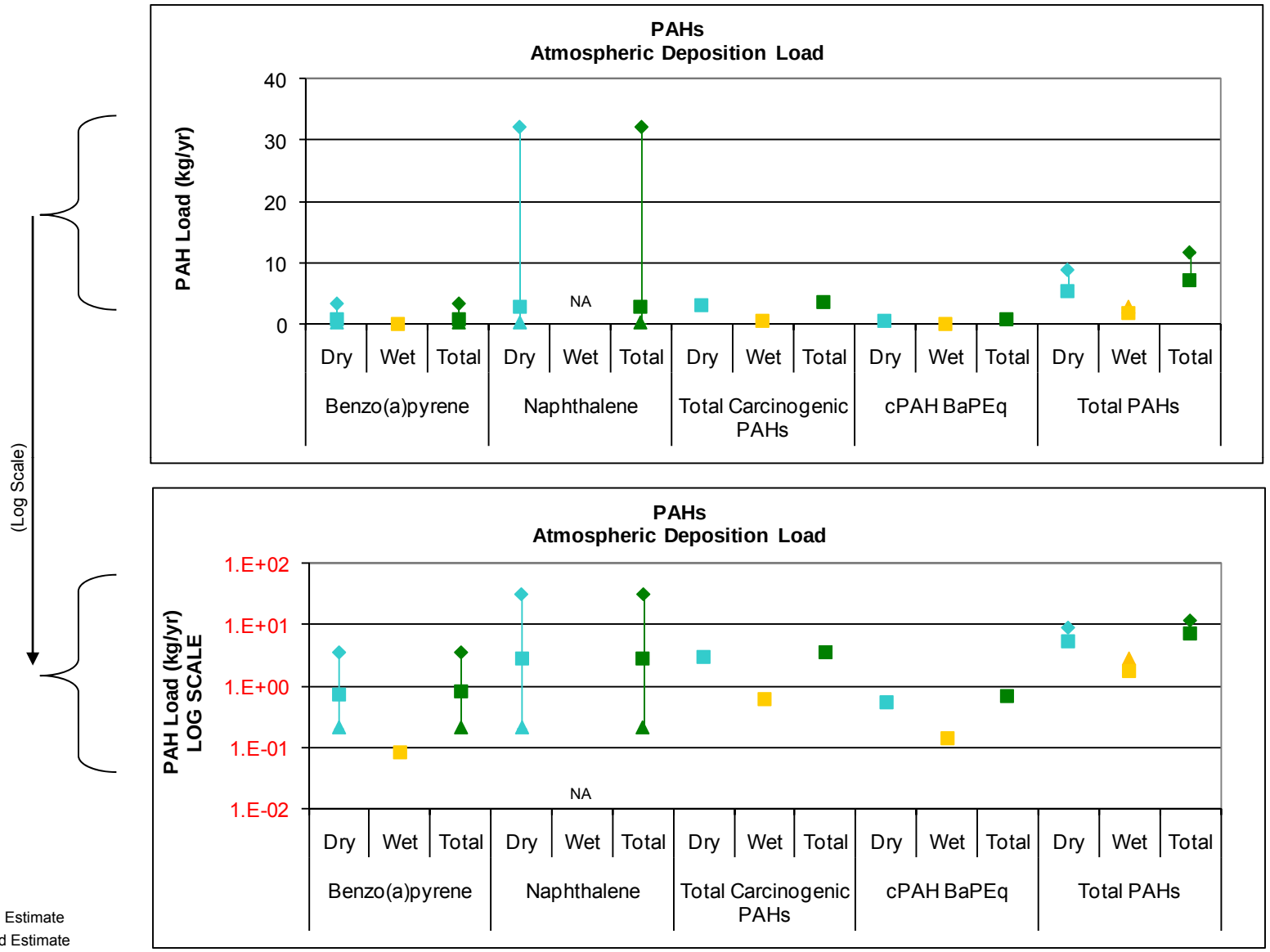


Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

NA: Data not available.

Figure 6.1-37
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Atmospheric Deposition Loading Ranges
DDx and Non-DDx Pesticides – Study Area

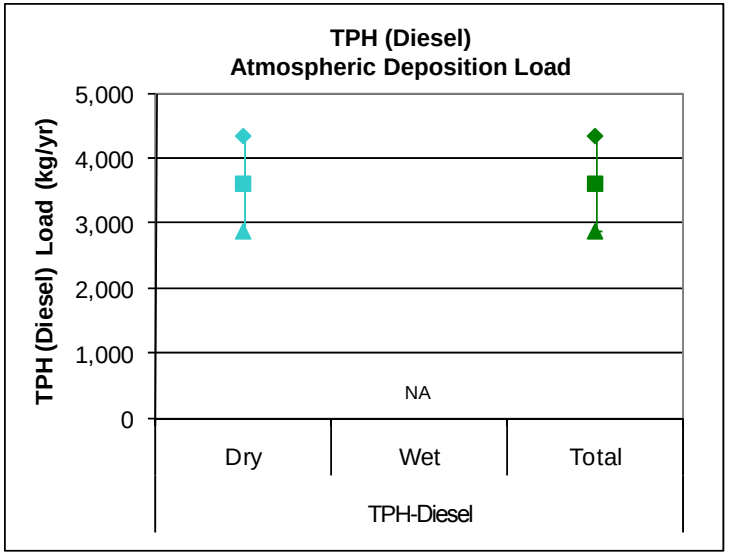


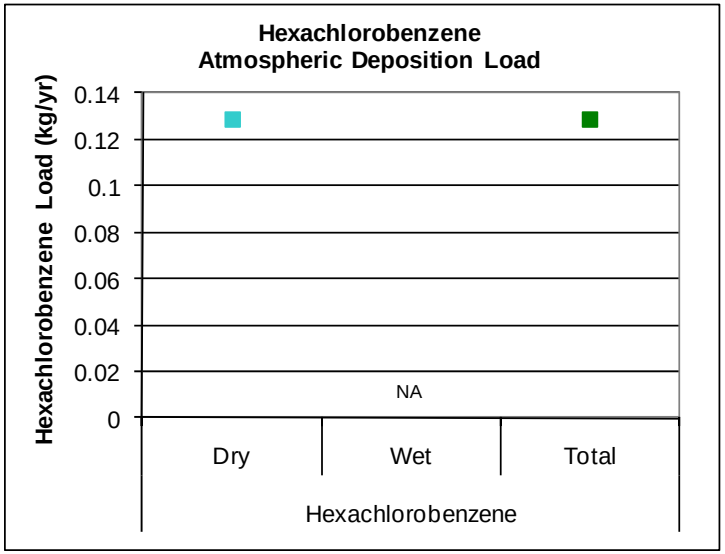
Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

NA: Data not available.

Figure 6.1-38
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Atmospheric Deposition Loading Ranges
PAHs – Study Area





Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

NA: Data not available.

Figure 6.1-39
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Atmospheric Deposition Loading Ranges
TPH (Diesel) and Hexachlorobenzene – Study Area

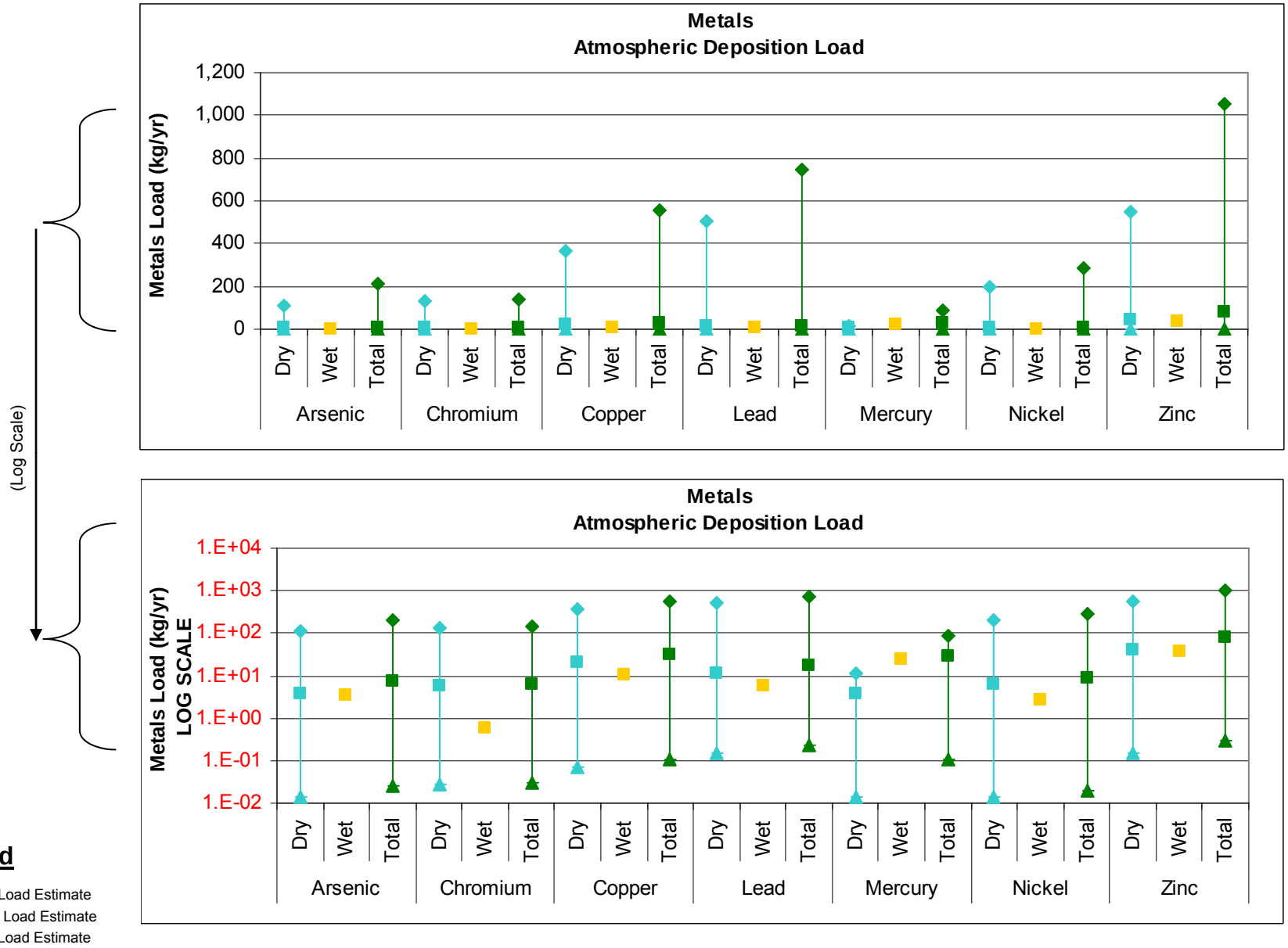
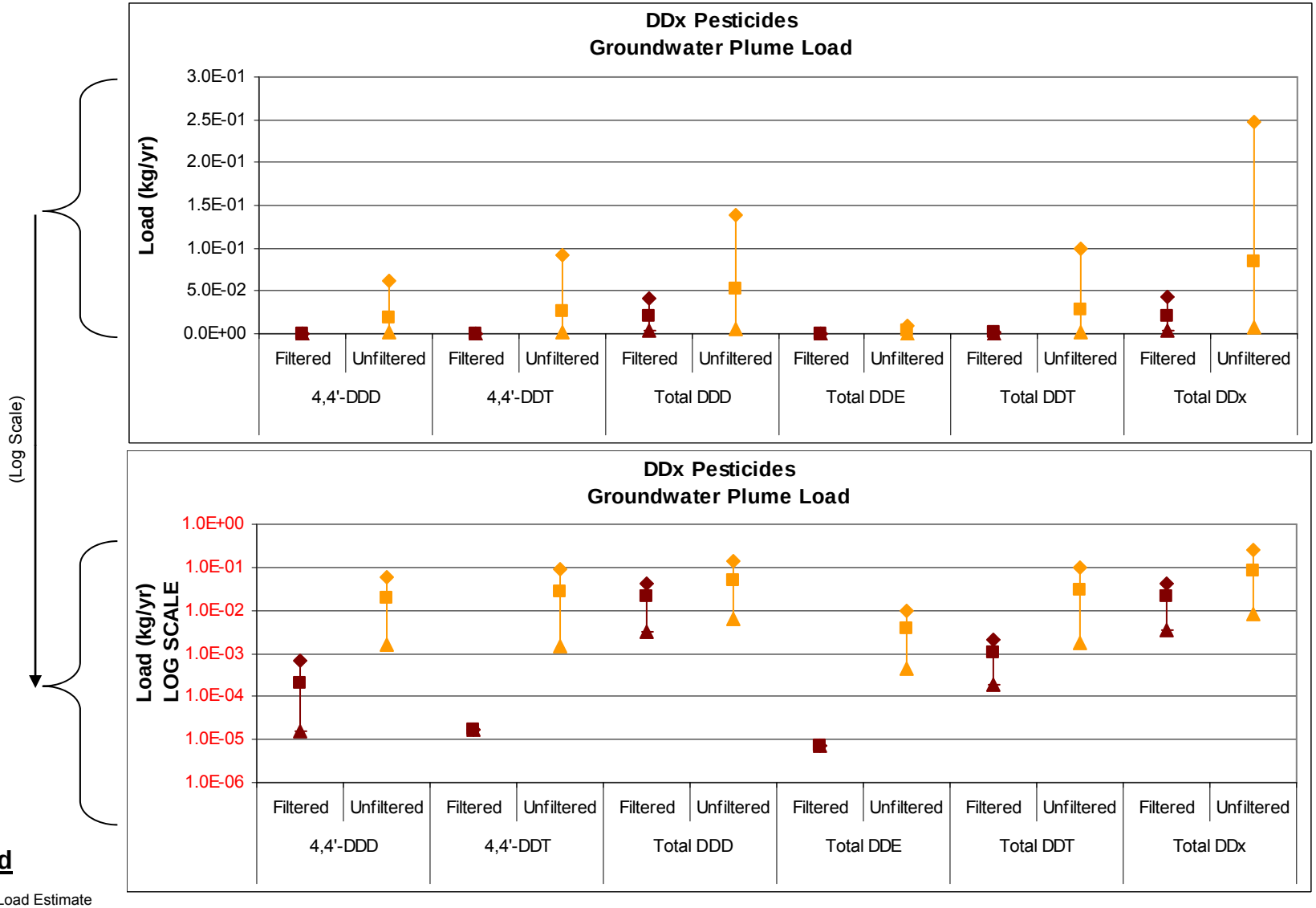


Figure 6.1-40
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Atmospheric Deposition Loading Ranges
Metals – Study Area



Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

Note:
Unfiltered pesticide results are likely biased high due to entrainment of sediments in the TZW samples.

Figure 6.1-41
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Groundwater Plume Loading Ranges
DDx Pesticides – Entire Study Area

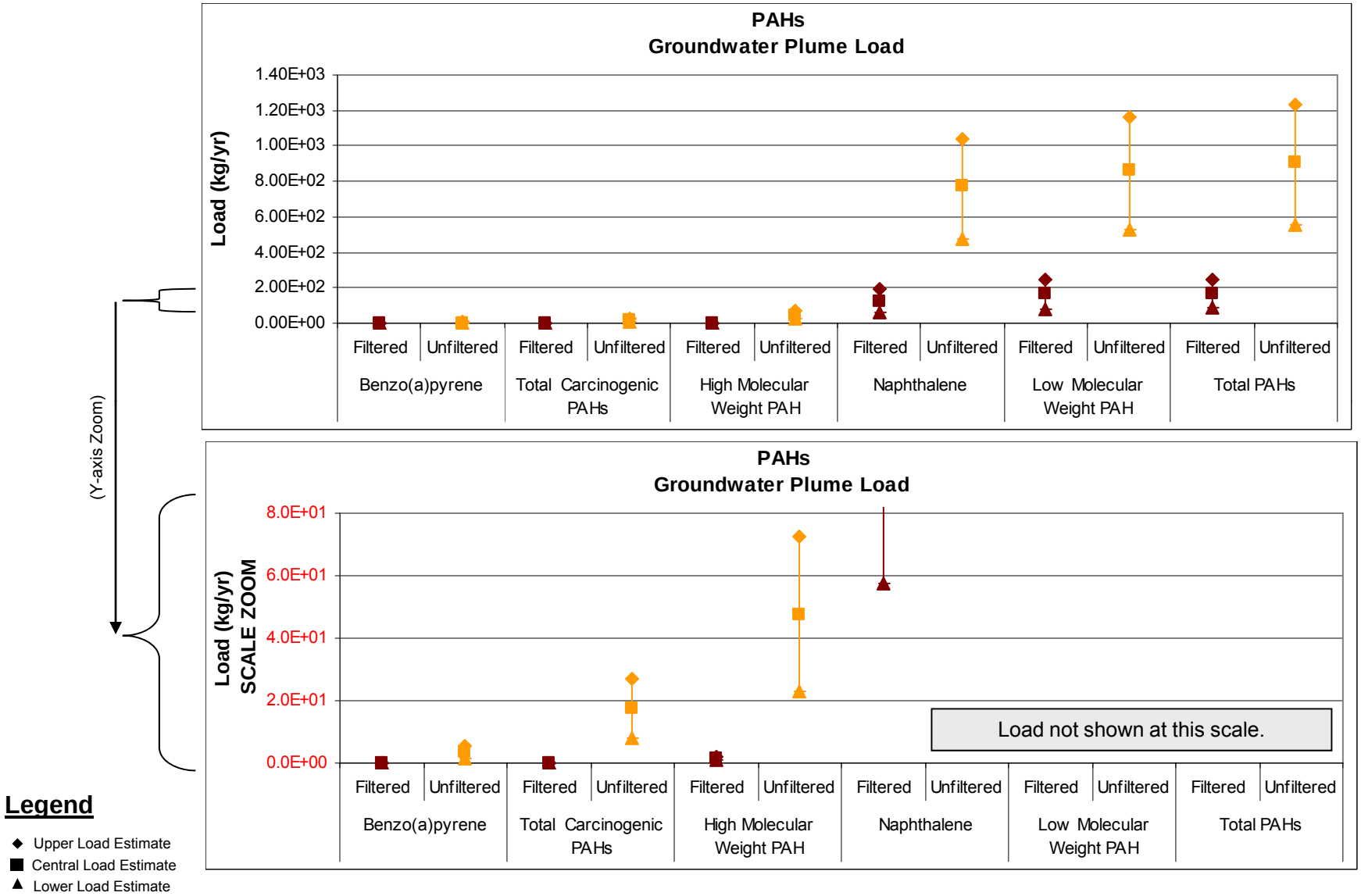
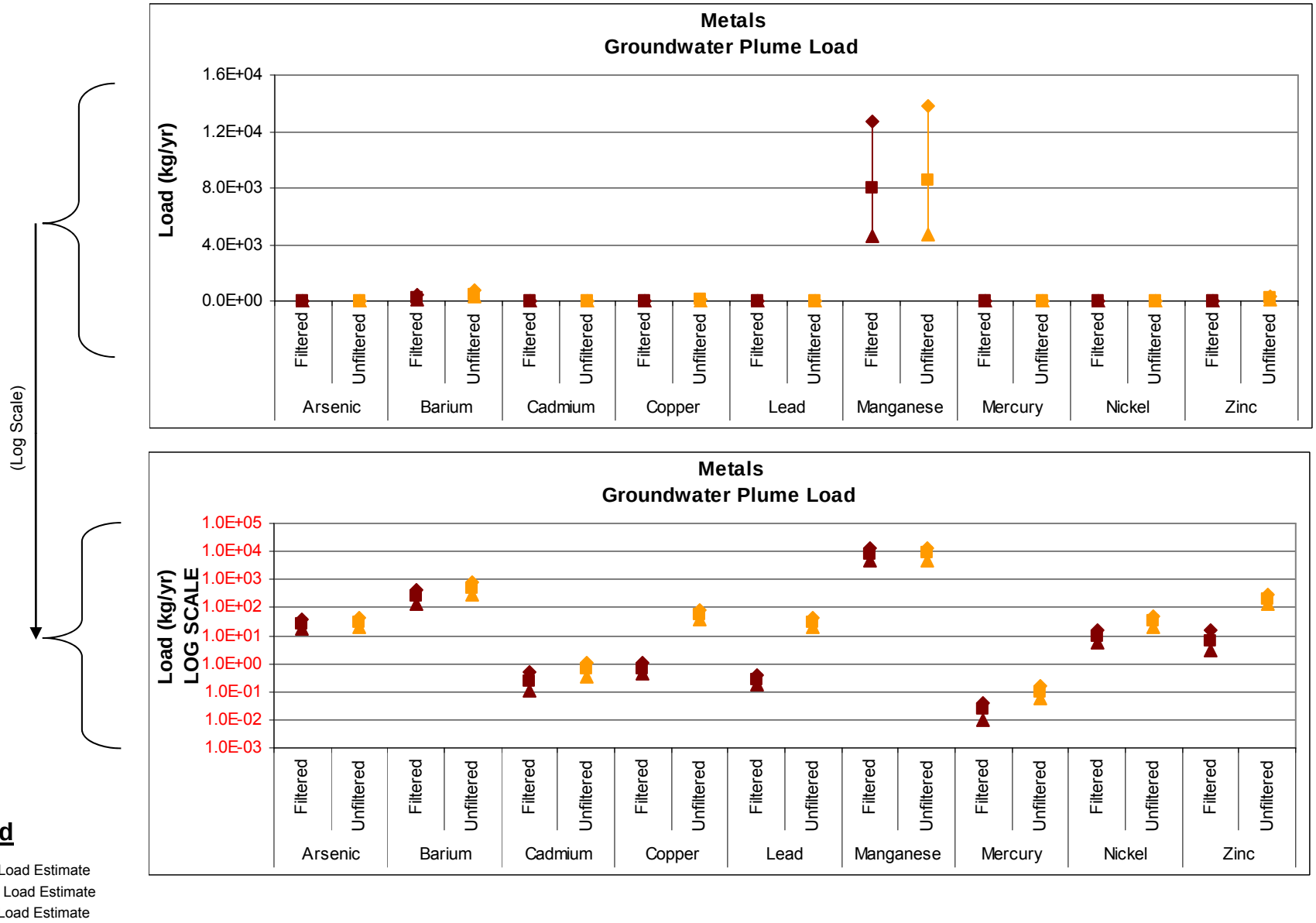


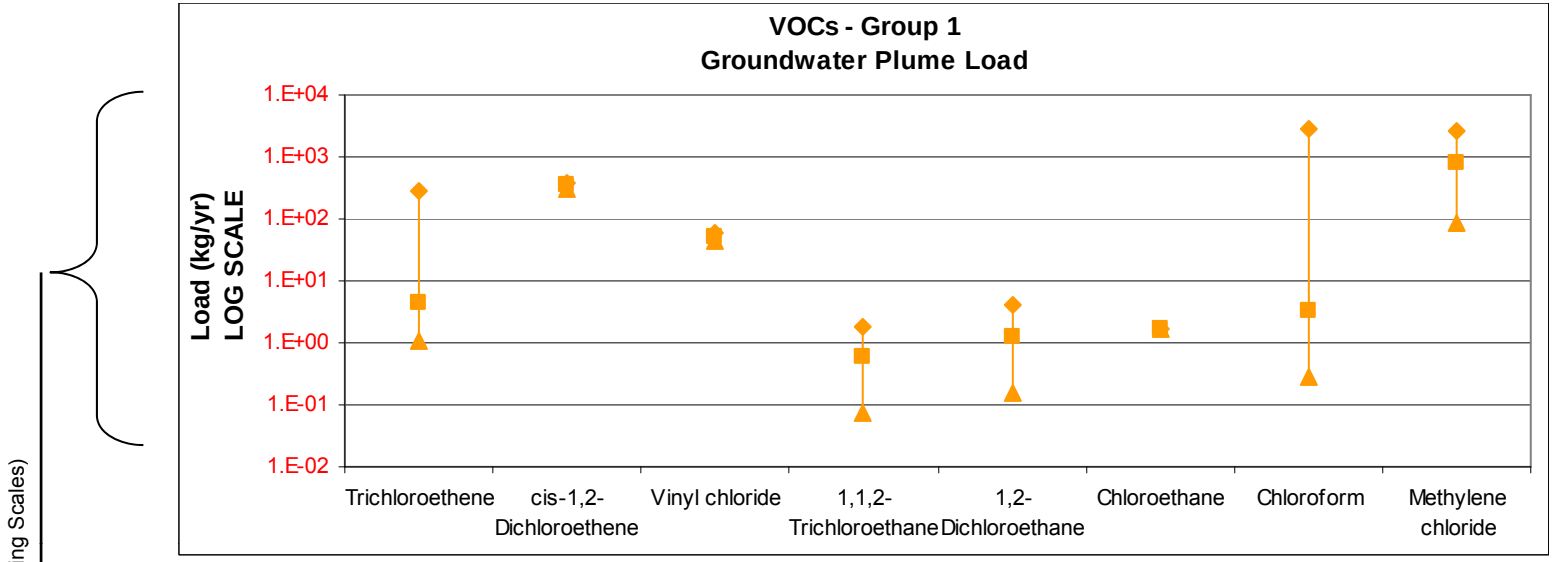
Figure 6.1-42
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Groundwater Plume Loading Ranges
PAHs – Entire Study Area

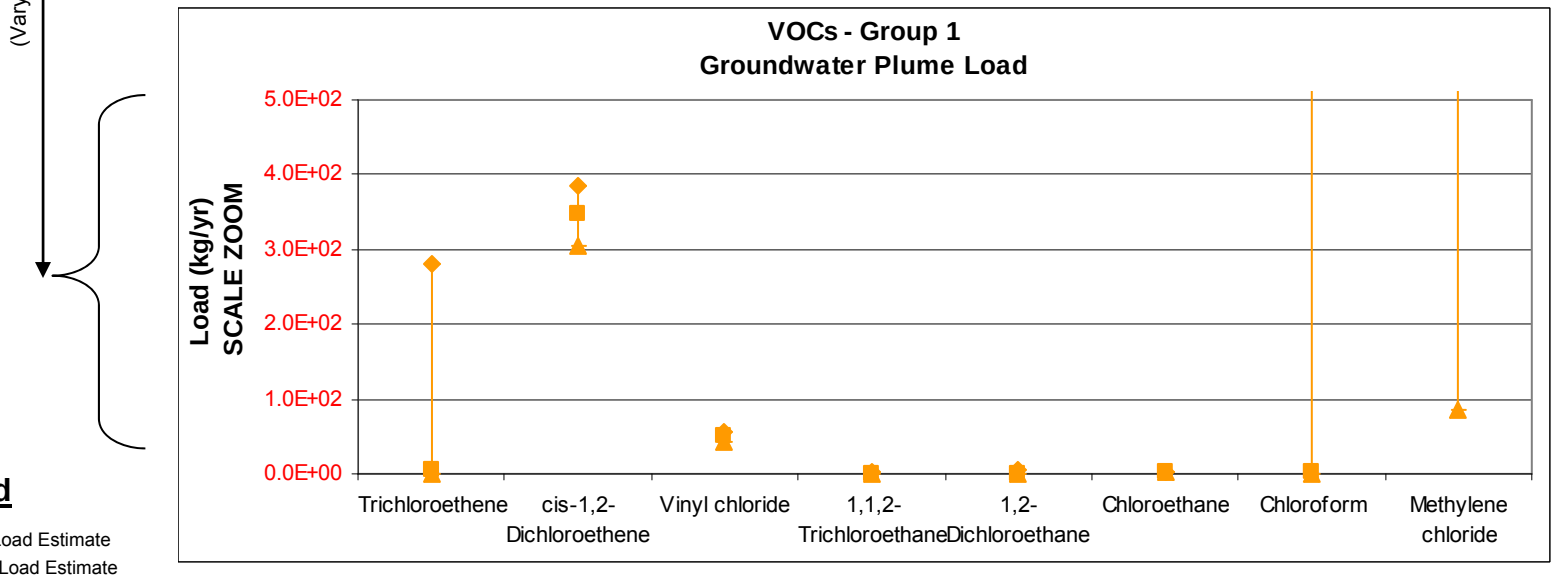


Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

Figure 6.1-43
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Groundwater Plume Loading Ranges
Metals – Entire Study Area



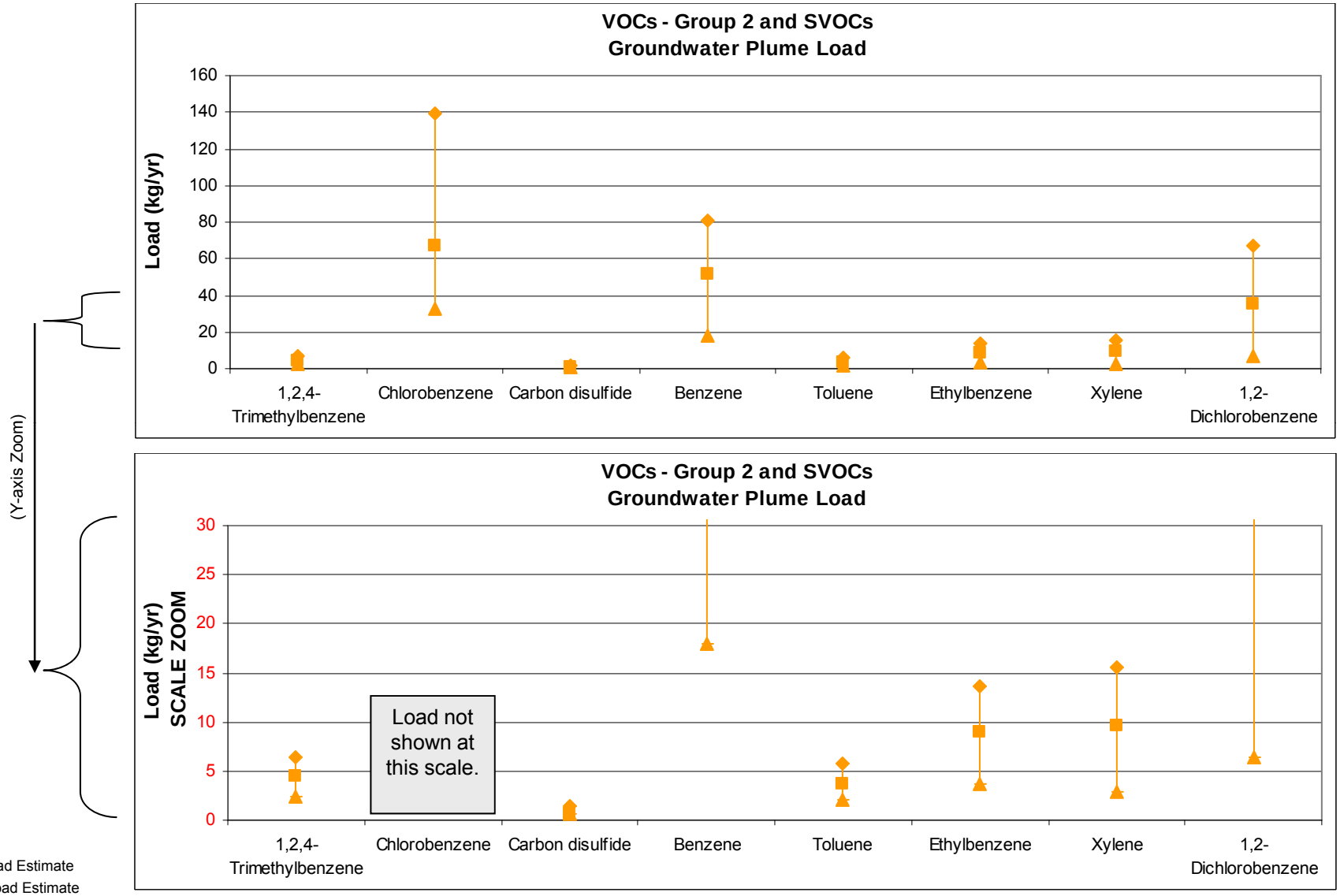


(Varying Scales)

Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

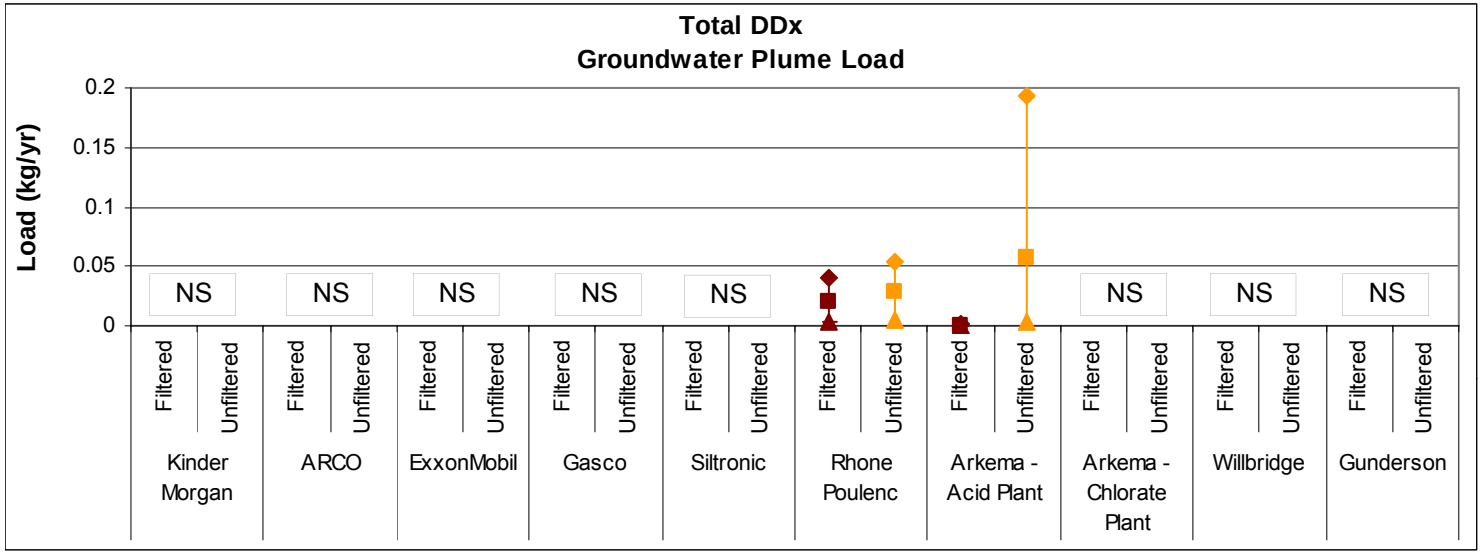
Figure 6.1-44
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Groundwater Plume Loading Ranges
VOCs (Group 1) – Entire Study Area



Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

Figure 6.1-45
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Groundwater Plume Loading Ranges
VOCs (Group 2) and SVOCs – Entire Study Area



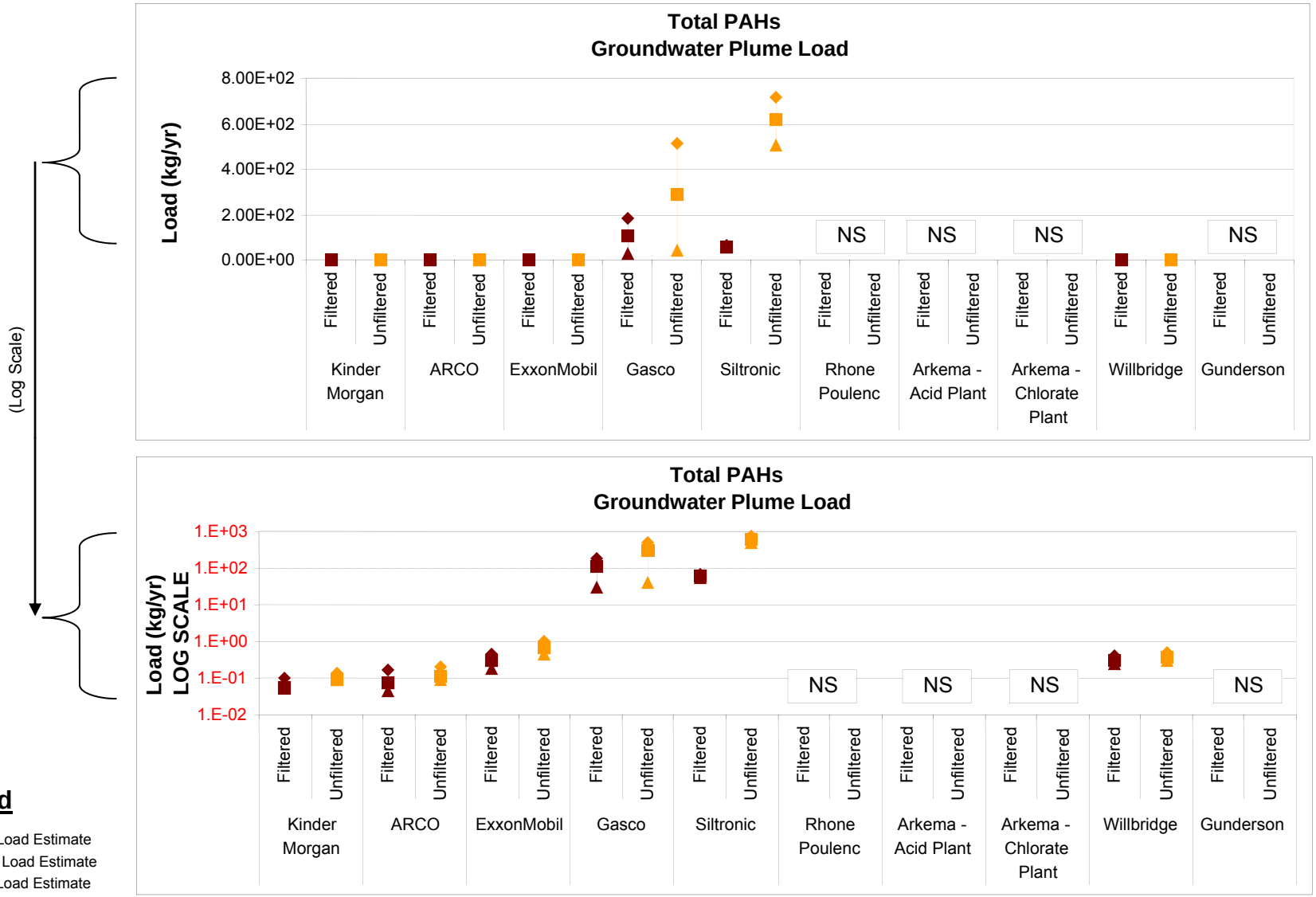
Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

NS: Not Sampled.

Note:
Unfiltered pesticide results are likely biased high due to entrainment of sediments in the TZW samples.

Figure 6.1-46
Portland Harbor RI/FS
Remedial Investigation Report
Plot of Groundwater Plume Loading Ranges
Total DDx – Upland Area Presentation

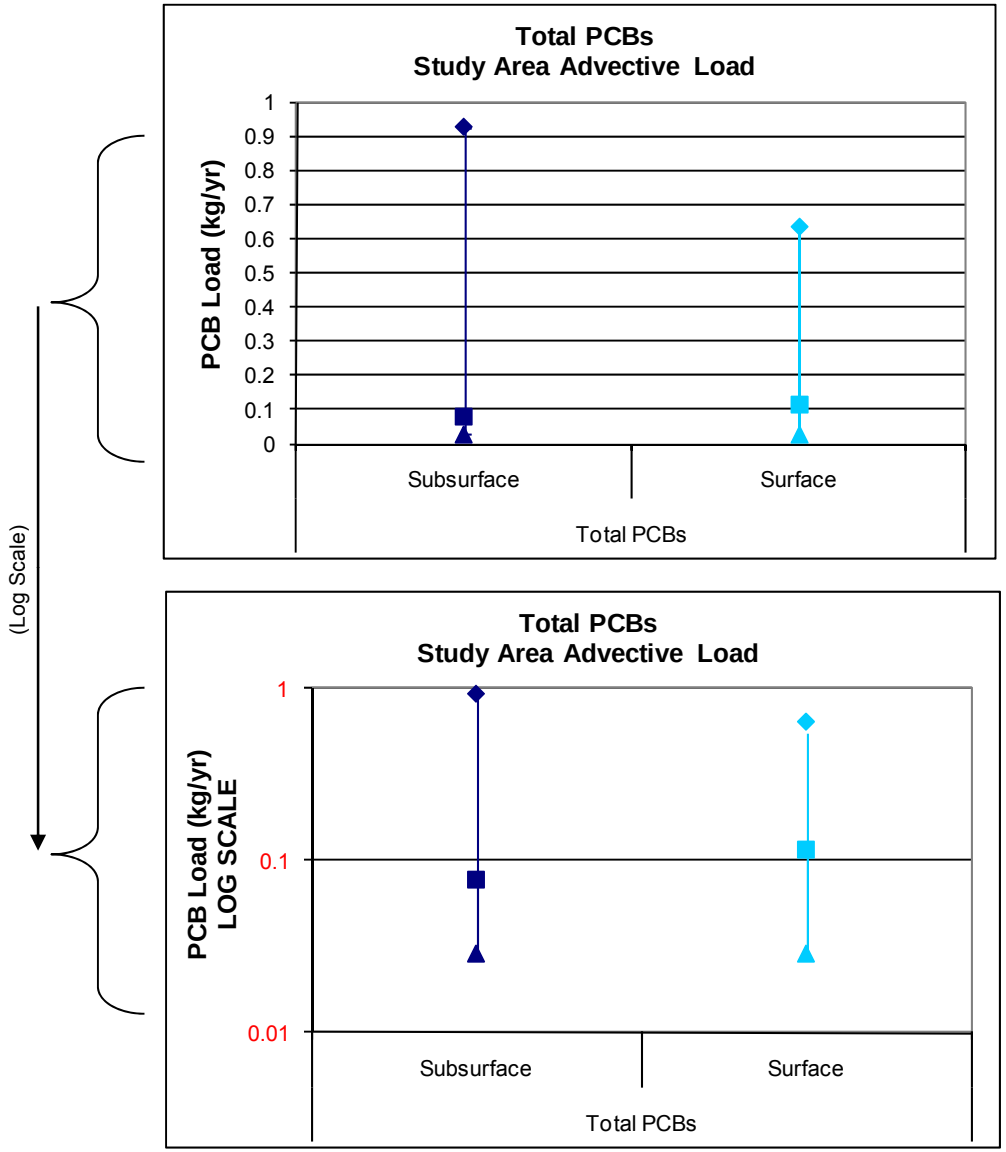


Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

NS: Not Sampled.

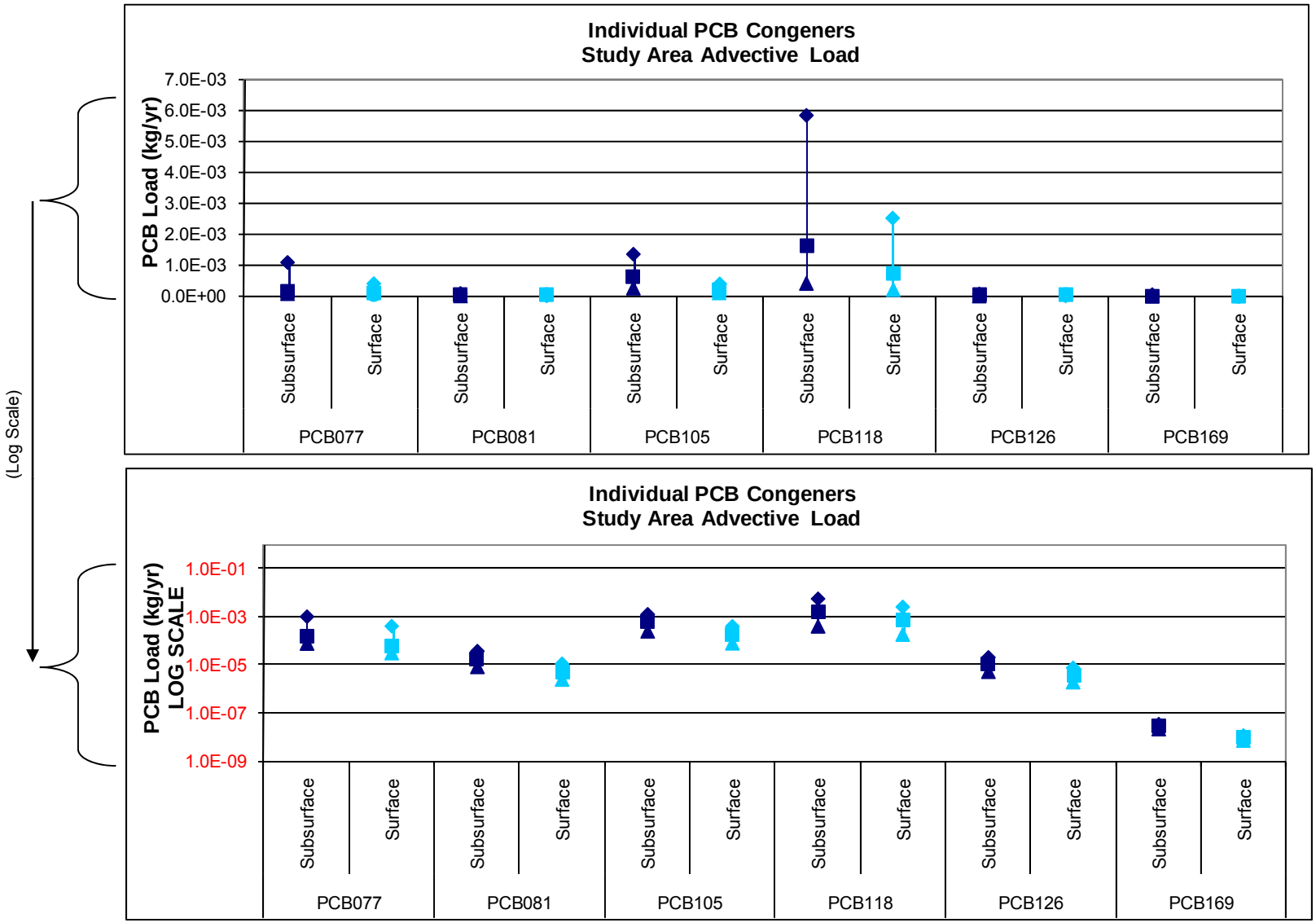
Figure 6.1-47
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Groundwater Plume Loading Ranges
Total PAHs – Upland Area Presentation



Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

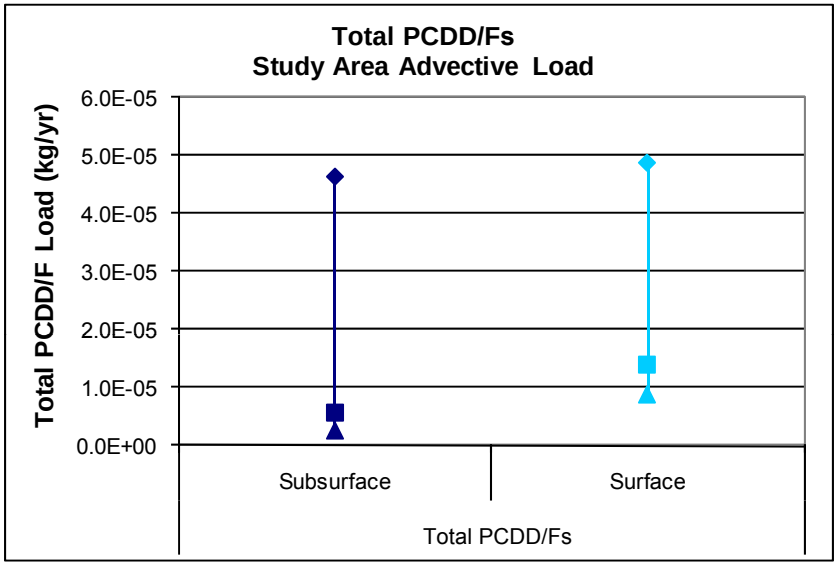
Figure 6.1-48
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Total PCBs – Entire Study Area



Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

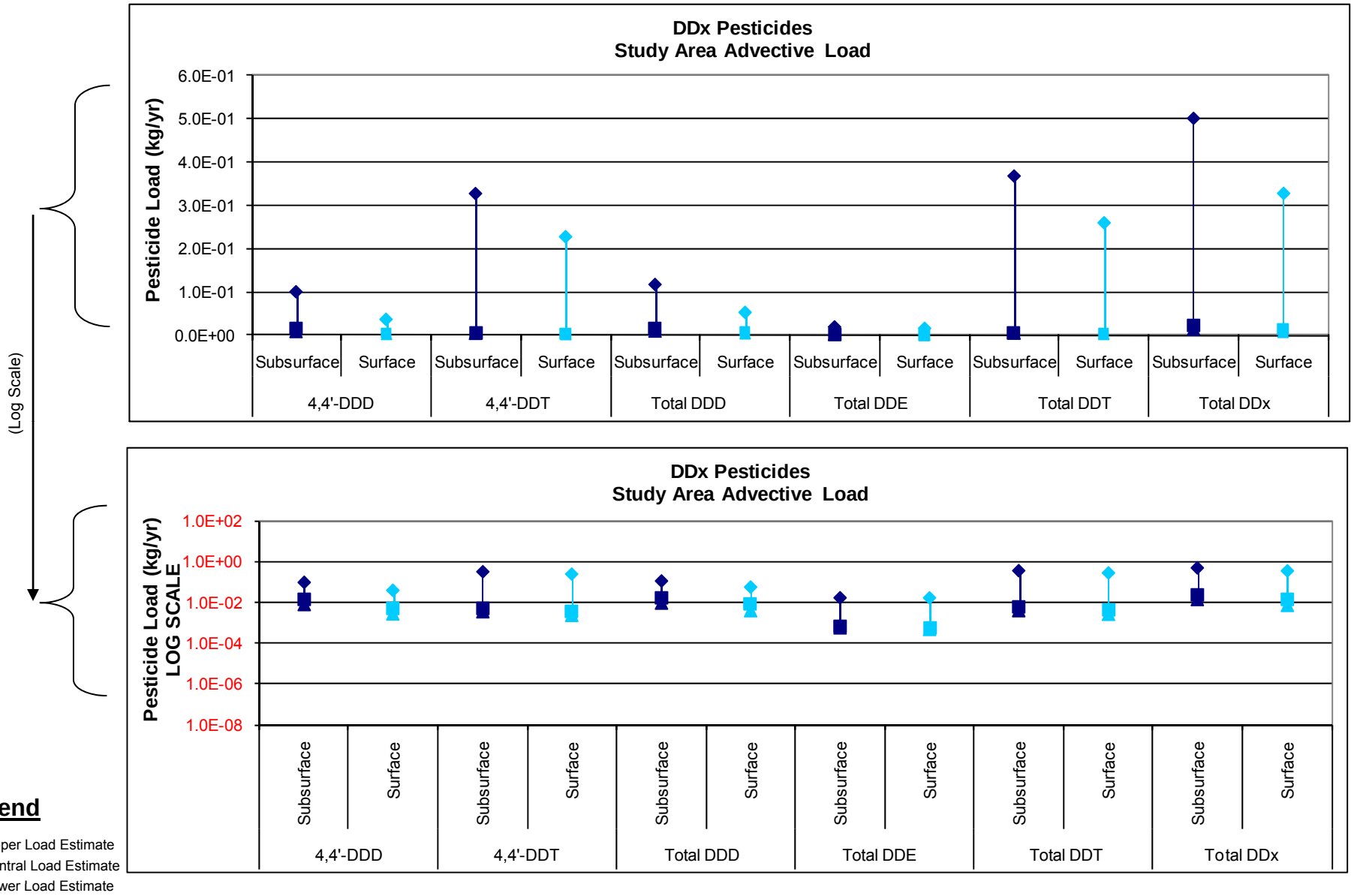
Figure 6.1-49
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Individual PCB Congeners – Entire Study Area



Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

Figure 6.1-50
Portland Harbor RI/FS
Remedial Investigation Report
Plot of Advective Loading Ranges
Total PCDD/Fs – Entire Study Area



Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

Figure 6.1-51
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
DDx Pesticides – Entire Study Area

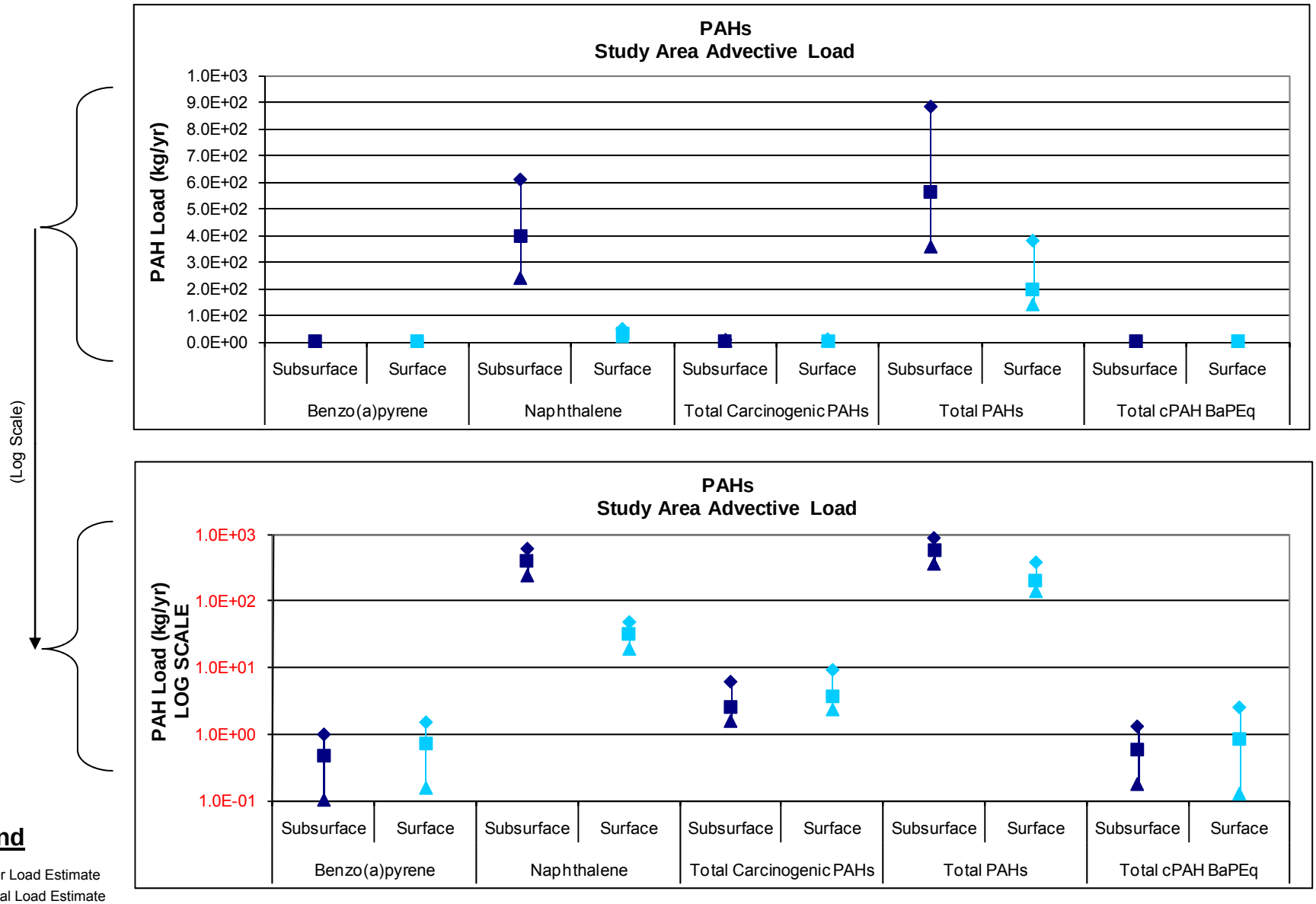
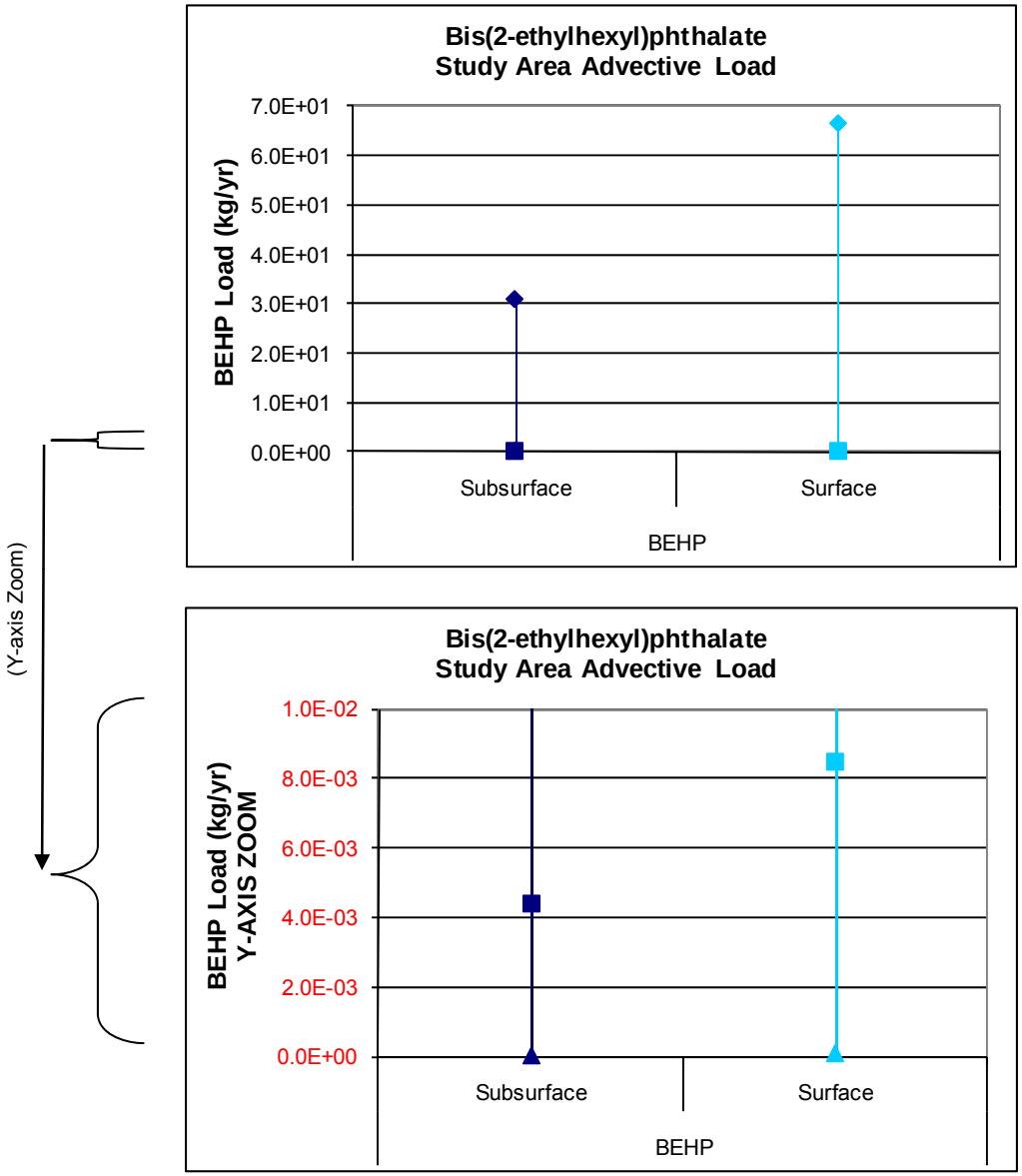


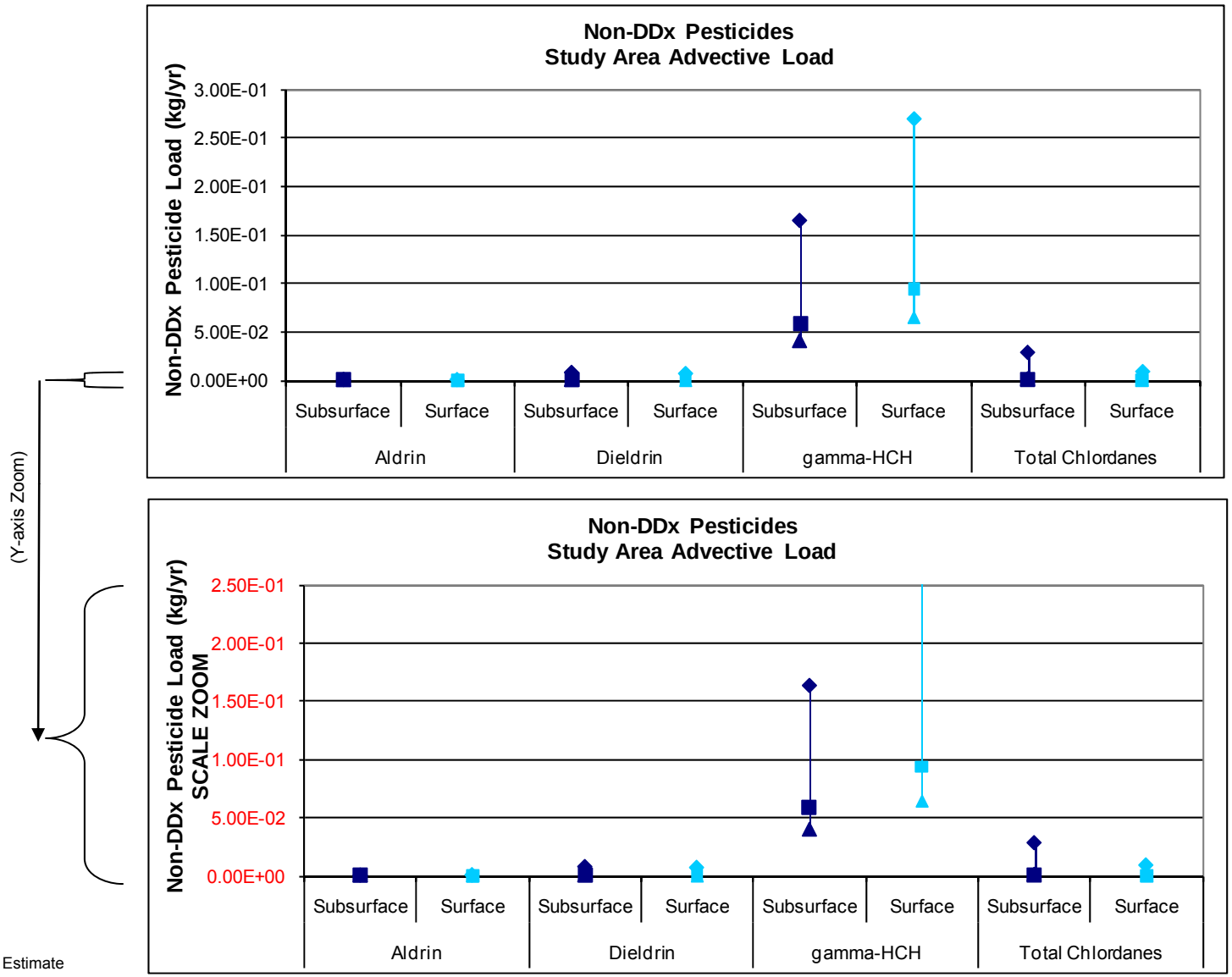
Figure 6.1-52
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
PAHs – Entire Study Area



Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

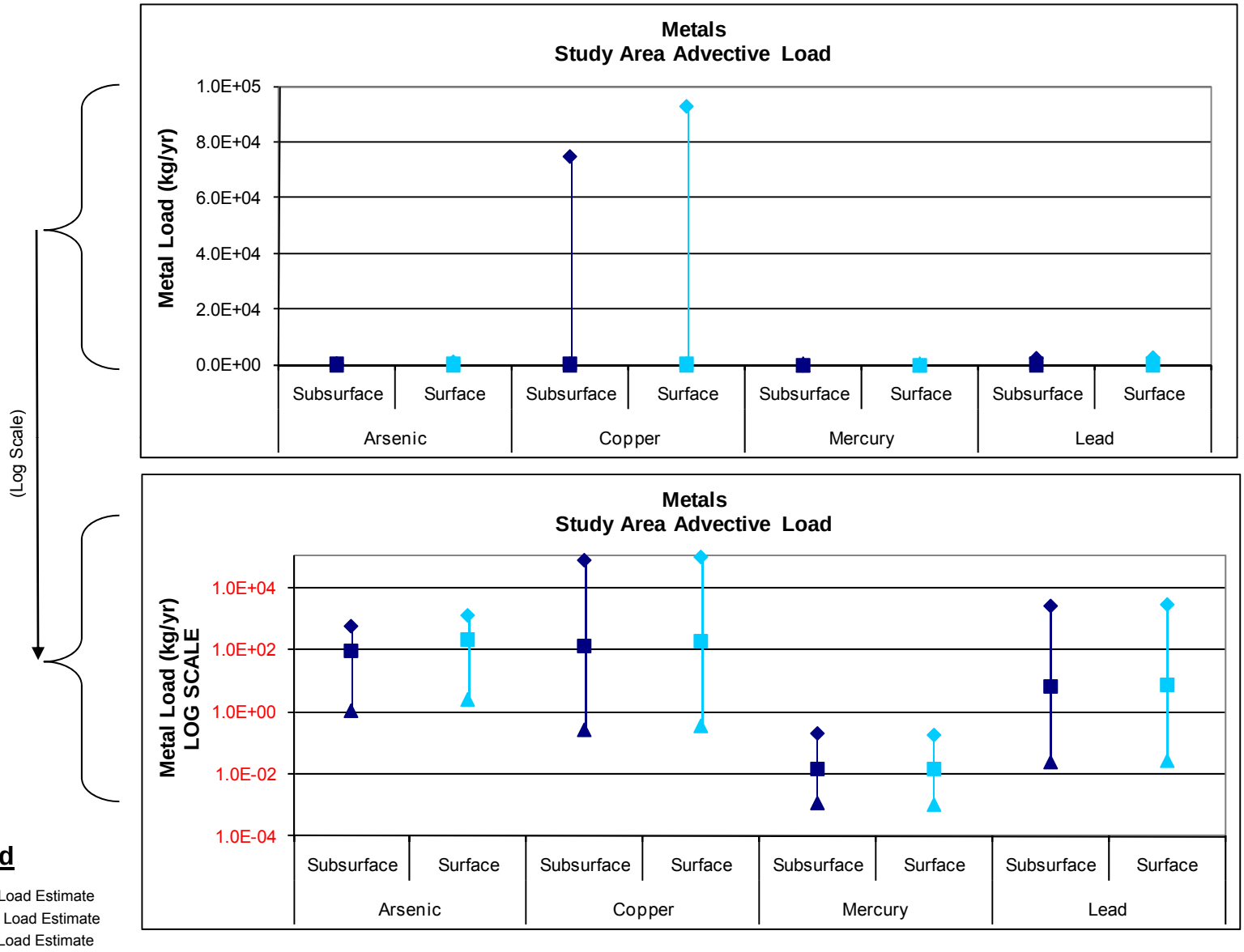
Figure 6.1-53
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Bis(2-ethylhexyl)phthalate – Entire Study Area



Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

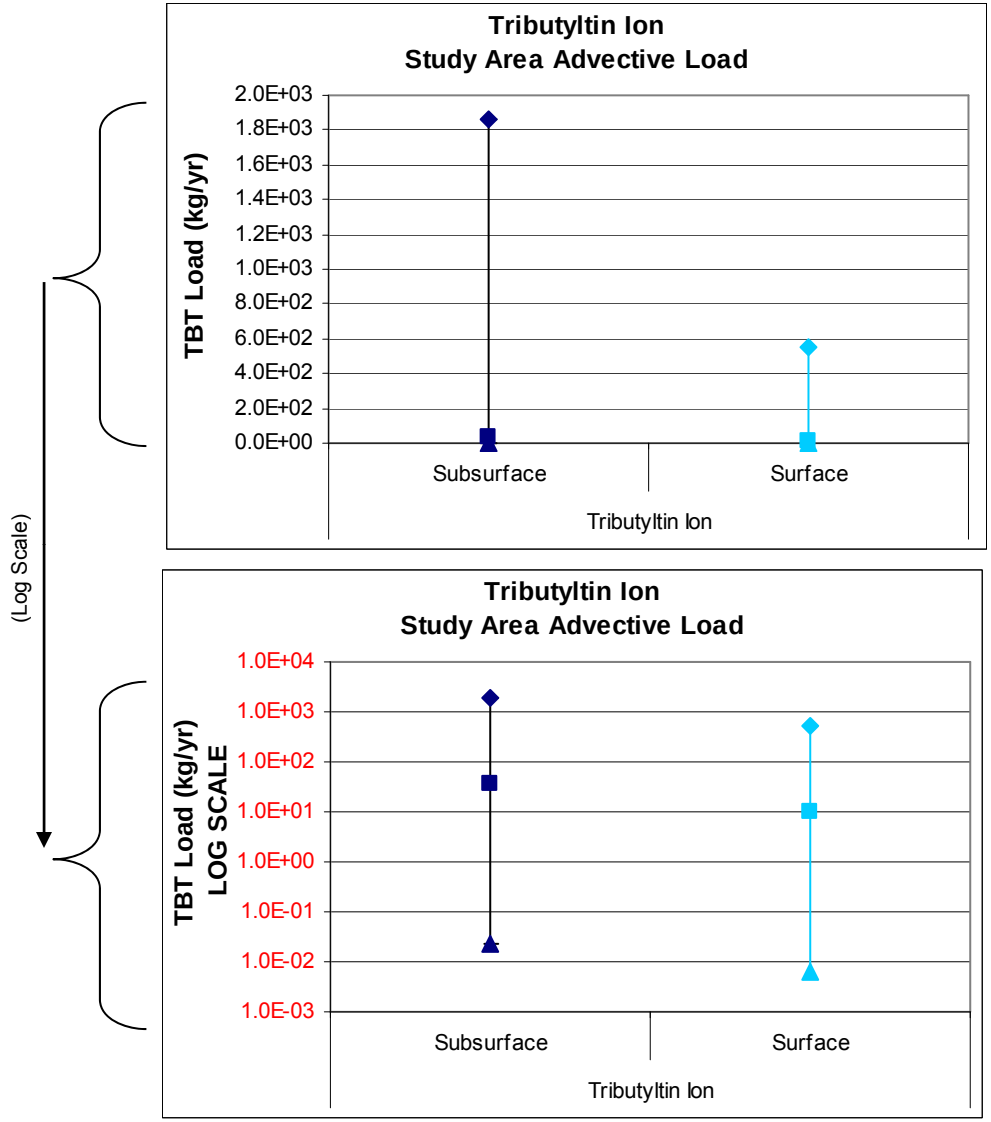
Figure 6.1-54
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Non-DDx Pesticides – Entire Study Area



Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

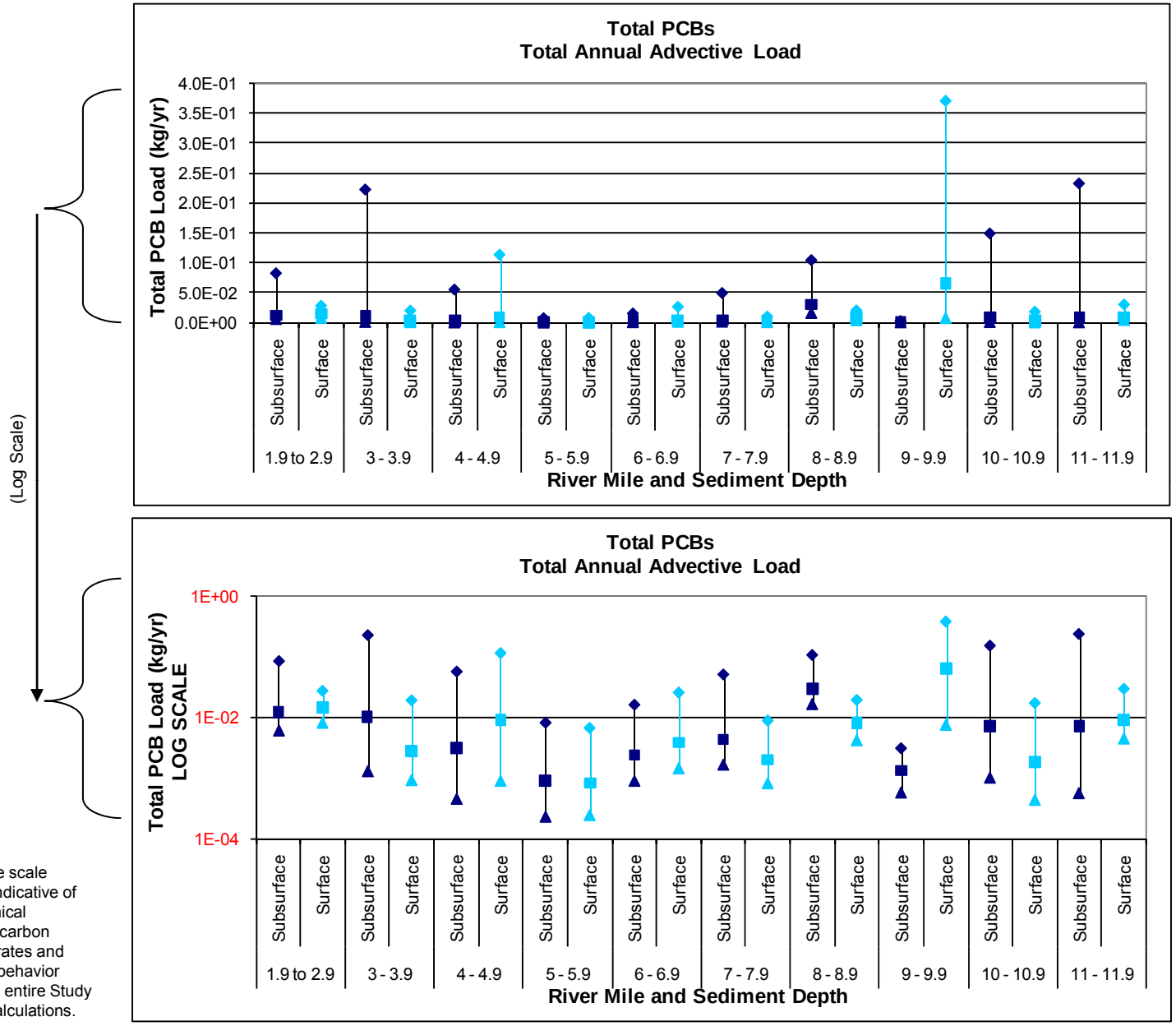
Figure 6.1-55
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Metals – Entire Study Area



Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

Figure 6.1-56
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Tributylin Ion – Entire Study Area

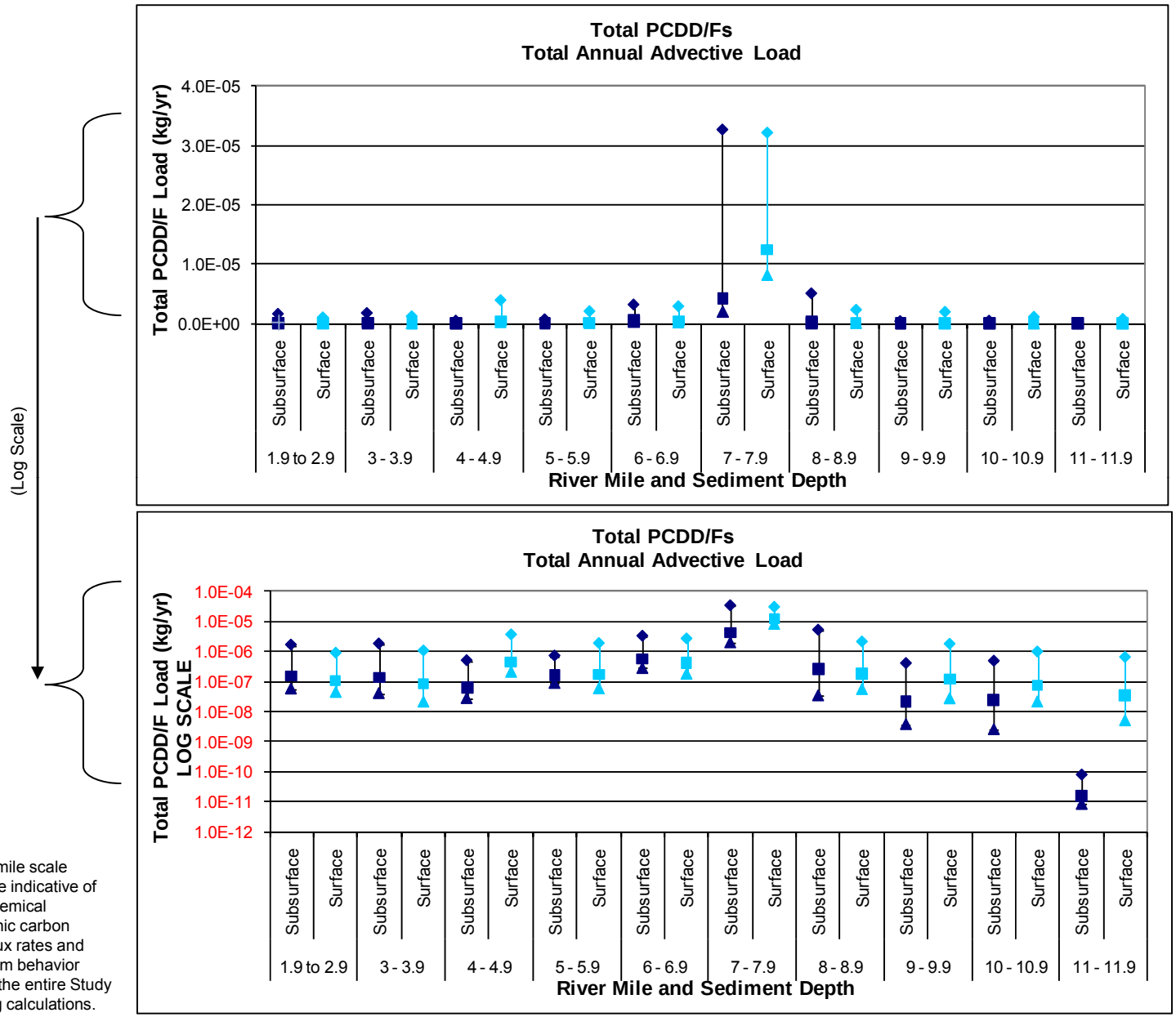


Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

Note: Variations in river-mile scale annual load estimates are indicative of variations in sediment chemical concentrations and organic carbon content. Groundwater flux rates and assumptions of equilibrium behavior were held constant over the entire Study Area in advective loading calculations.

Figure 6.1-57
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Total PCBs – River Mile Presentation

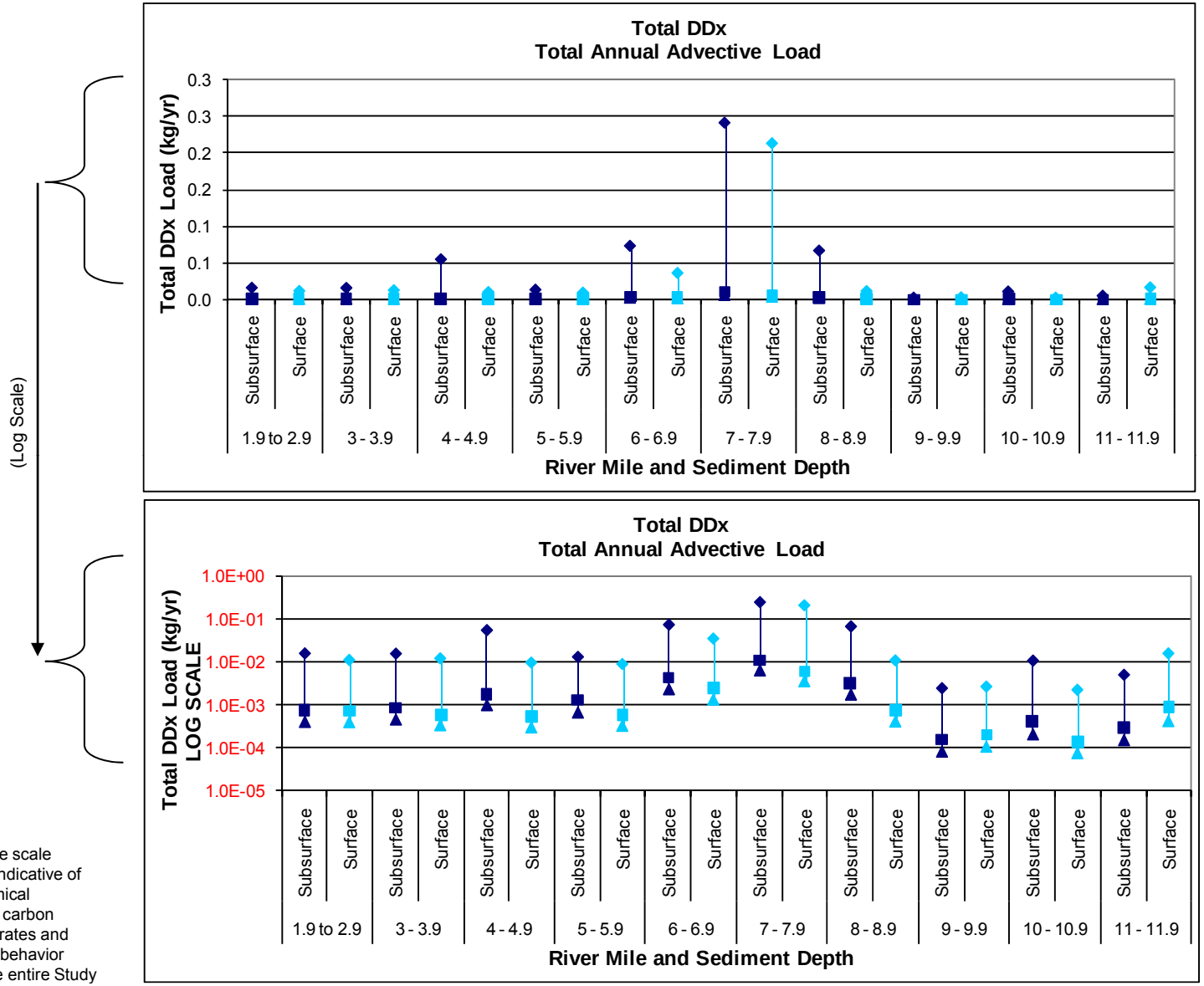


Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

Note: Variations in river-mile scale annual load estimates are indicative of variations in sediment chemical concentrations and organic carbon content. Groundwater flux rates and assumptions of equilibrium behavior were held constant over the entire Study Area in advective loading calculations.

Figure 6.1-58
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Total PCDD/Fs – River Mile Presentation

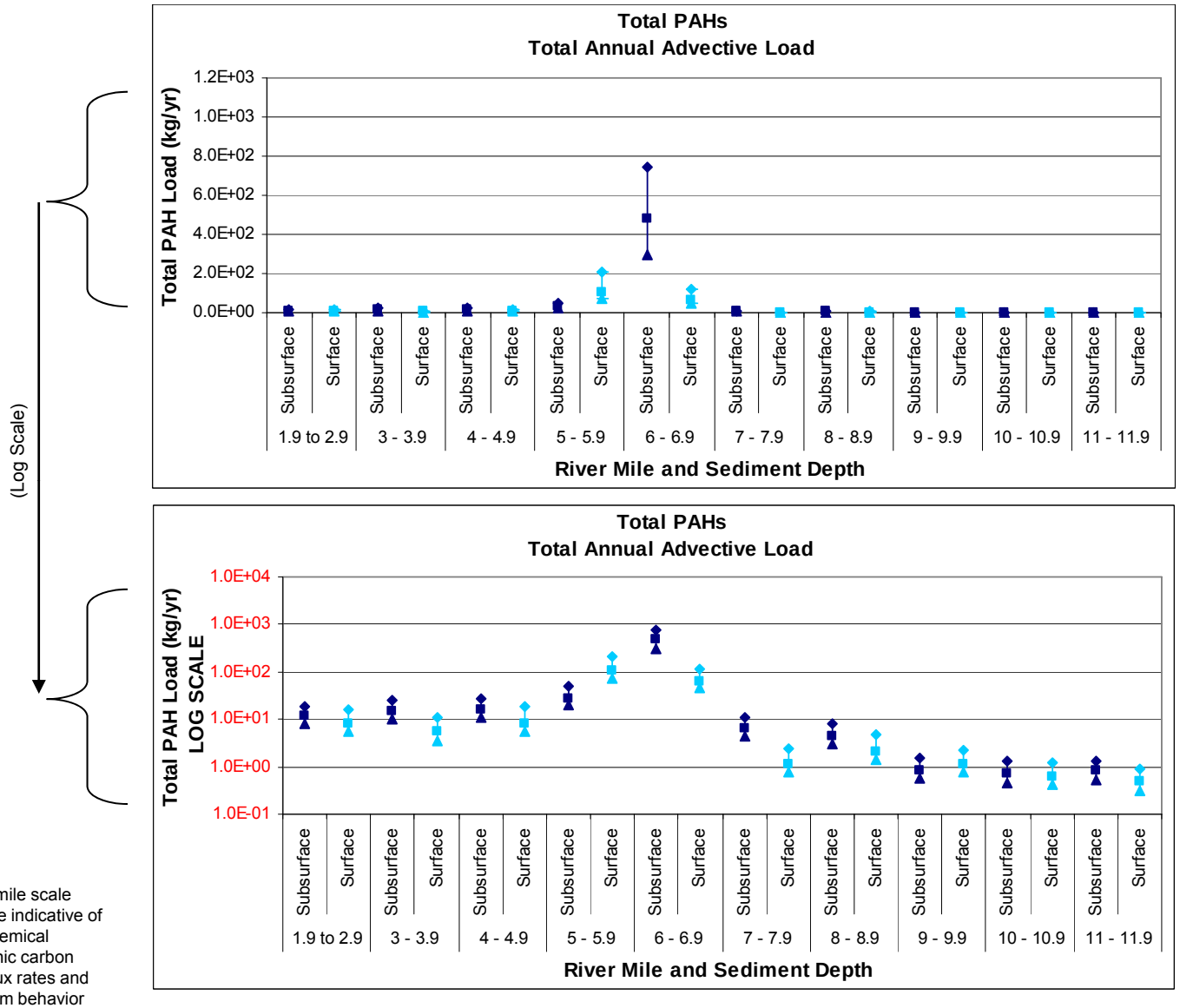


Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

Note: Variations in river-mile scale annual load estimates are indicative of variations in sediment chemical concentrations and organic carbon content. Groundwater flux rates and assumptions of equilibrium behavior were held constant over the entire Study Area in advective loading calculations.

Figure 6.1-59
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Total DDx – River Mile Presentation



Legend

- ◆ Upper Load Estimate
- ■ Central Load Estimate
- ▲ Lower Load Estimate

Note: Variations in river-mile scale annual load estimates are indicative of variations in sediment chemical concentrations and organic carbon content. Groundwater flux rates and assumptions of equilibrium behavior were held constant over the entire Study Area in advective loading calculations.

Figure 6.1-60
Portland Harbor RI/FS
Remedial Investigation Report
Plots of Advective Loading Ranges
Total PAHs – River Mile Presentation

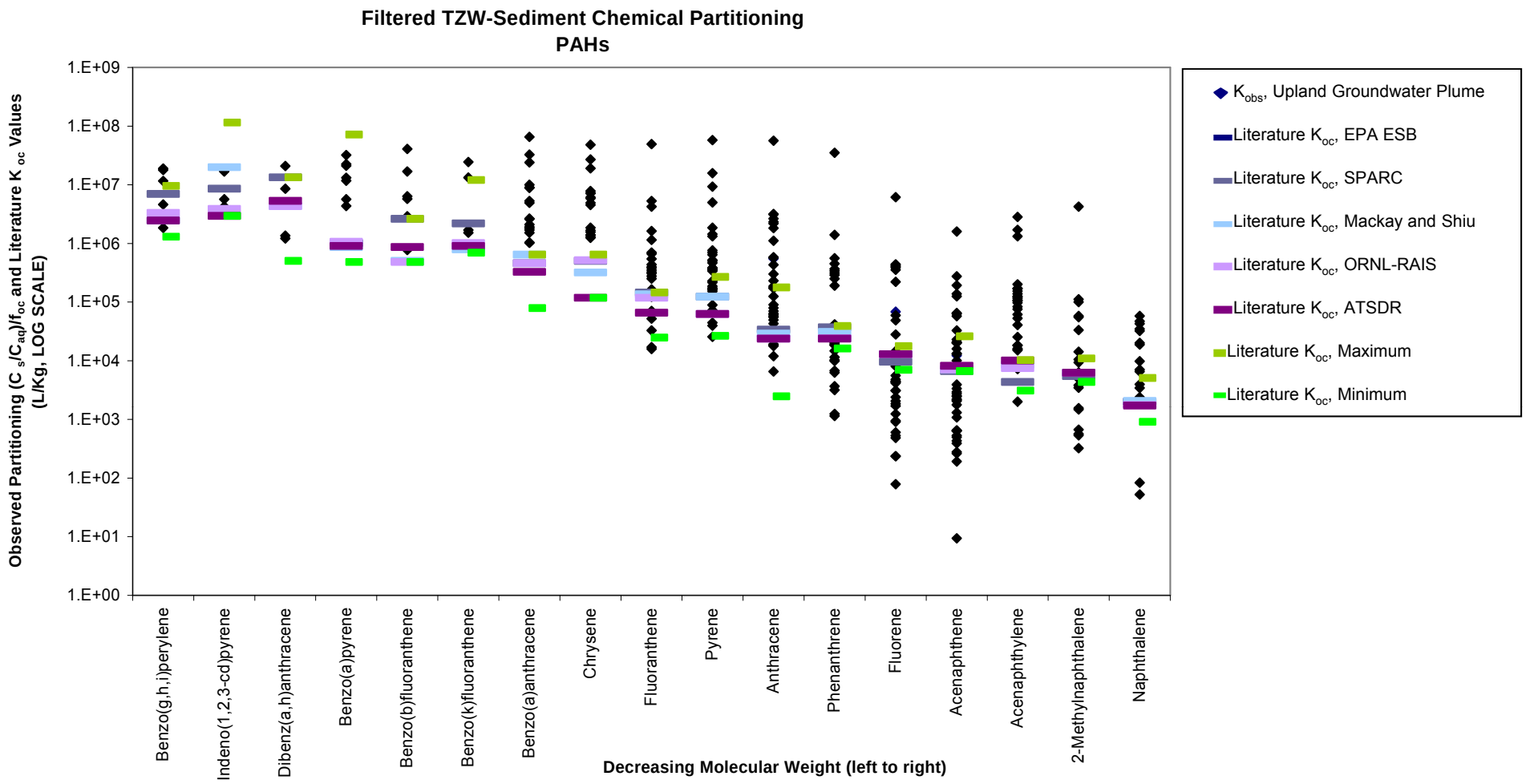


Figure 6.2-1
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Sediment-TZW Partitioning
PAHs

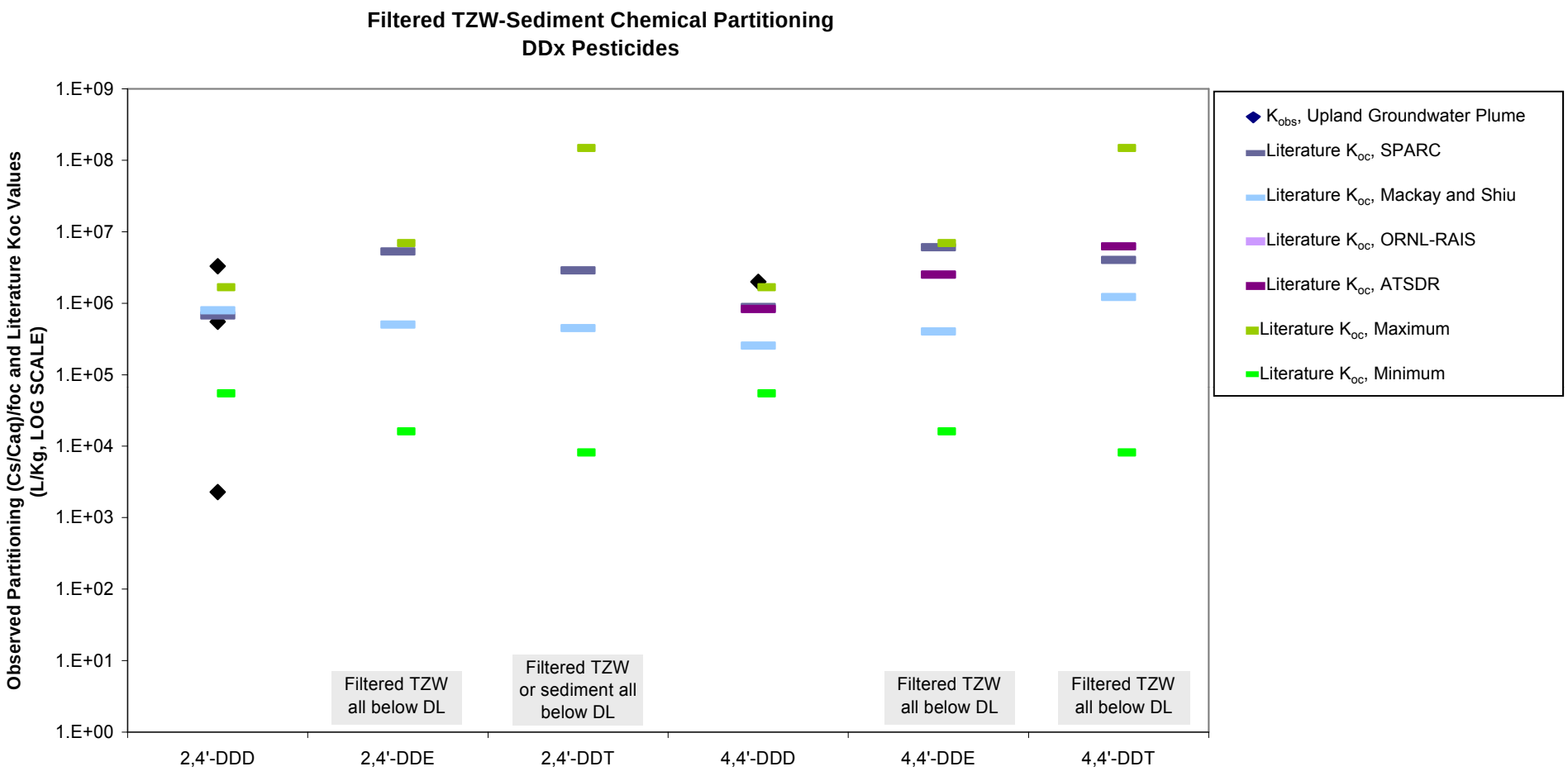


Figure 6.2-2
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Sediment-TZW Partitioning
DDx Pesticides

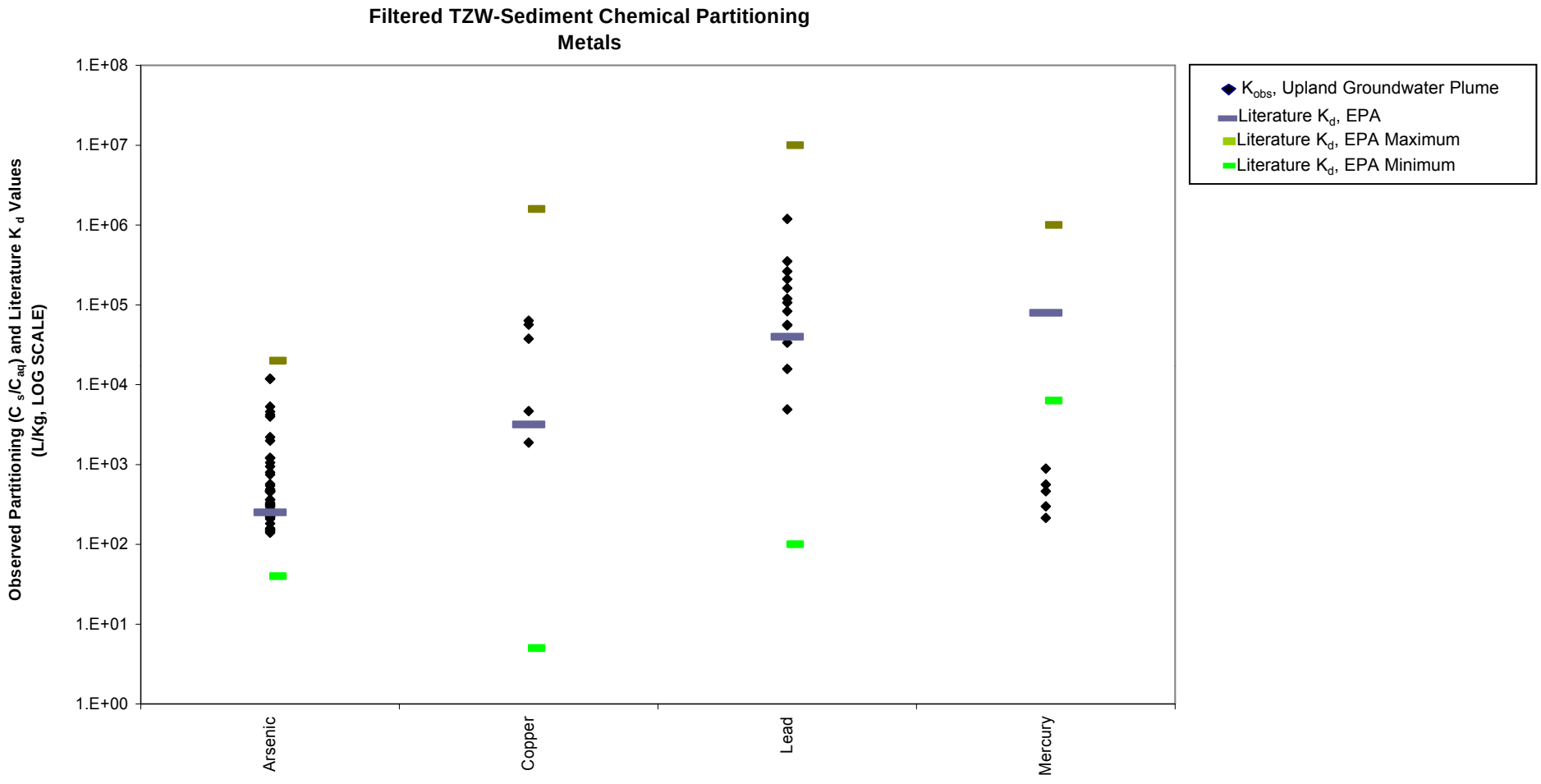


Figure 6.2-3
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Sediment-TZW Partitioning
Metals

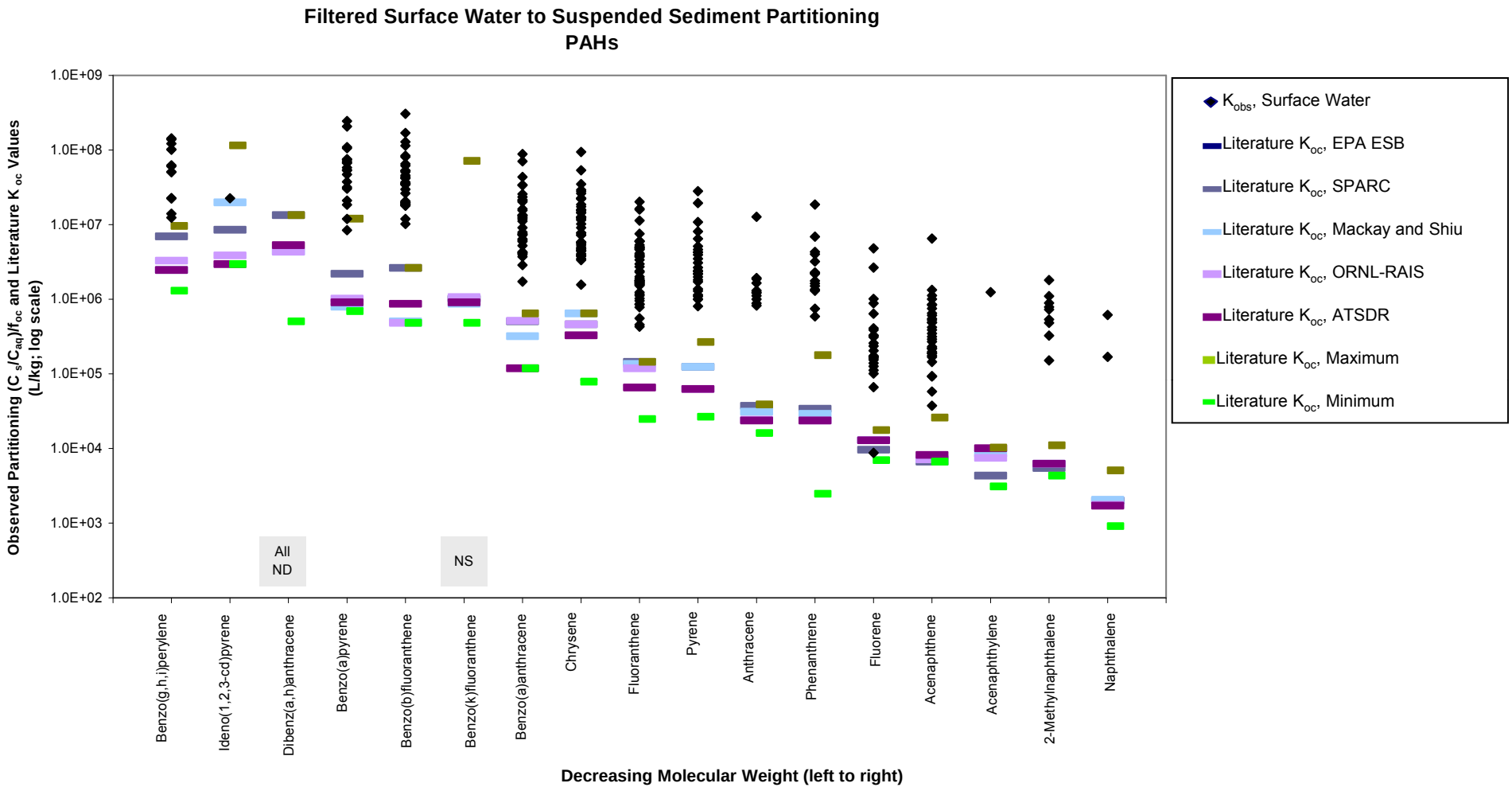


Figure 6.2-4
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Surface Water and
Suspended Sediment Partitioning
PAHs

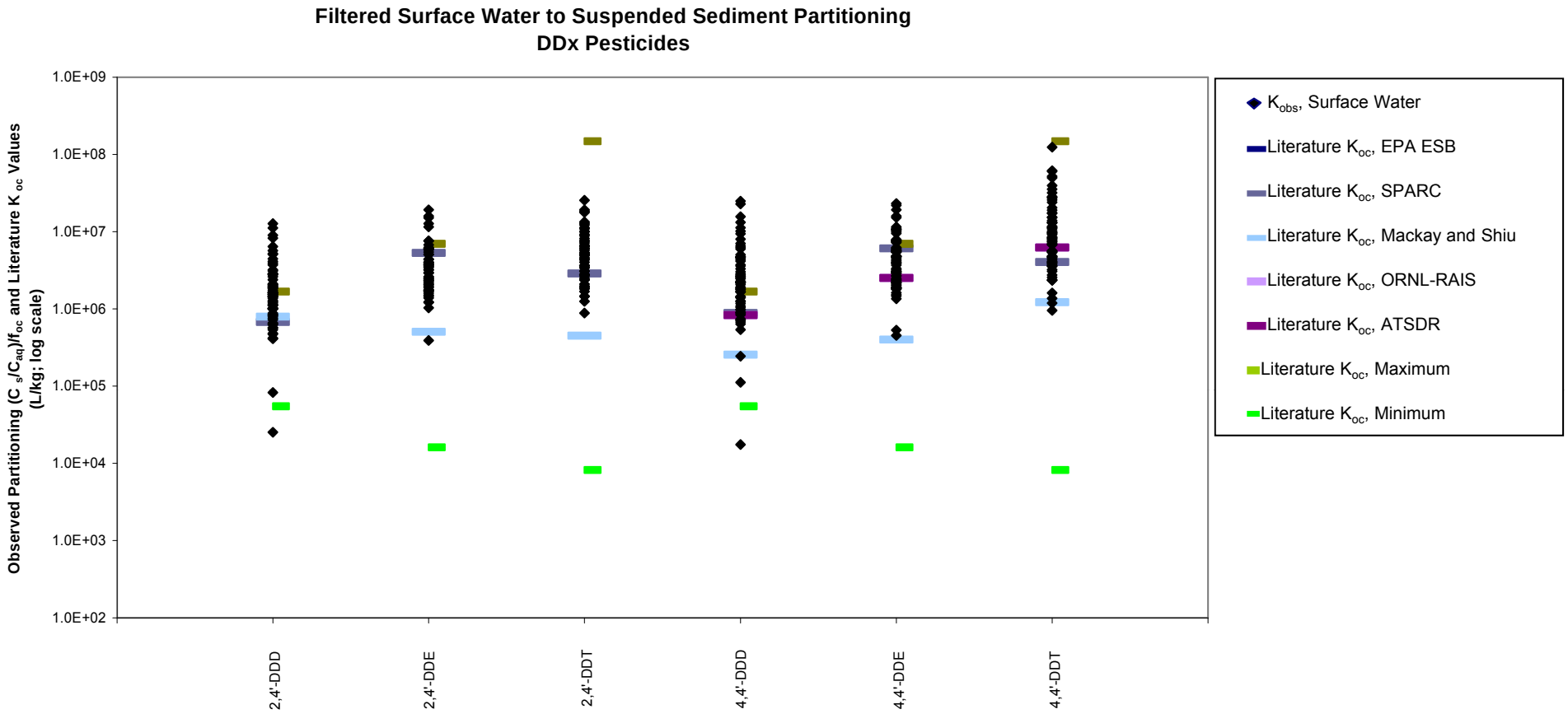


Figure 6.2-5
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Surface Water and
Suspended Sediment Partitioning
DDx Pesticides

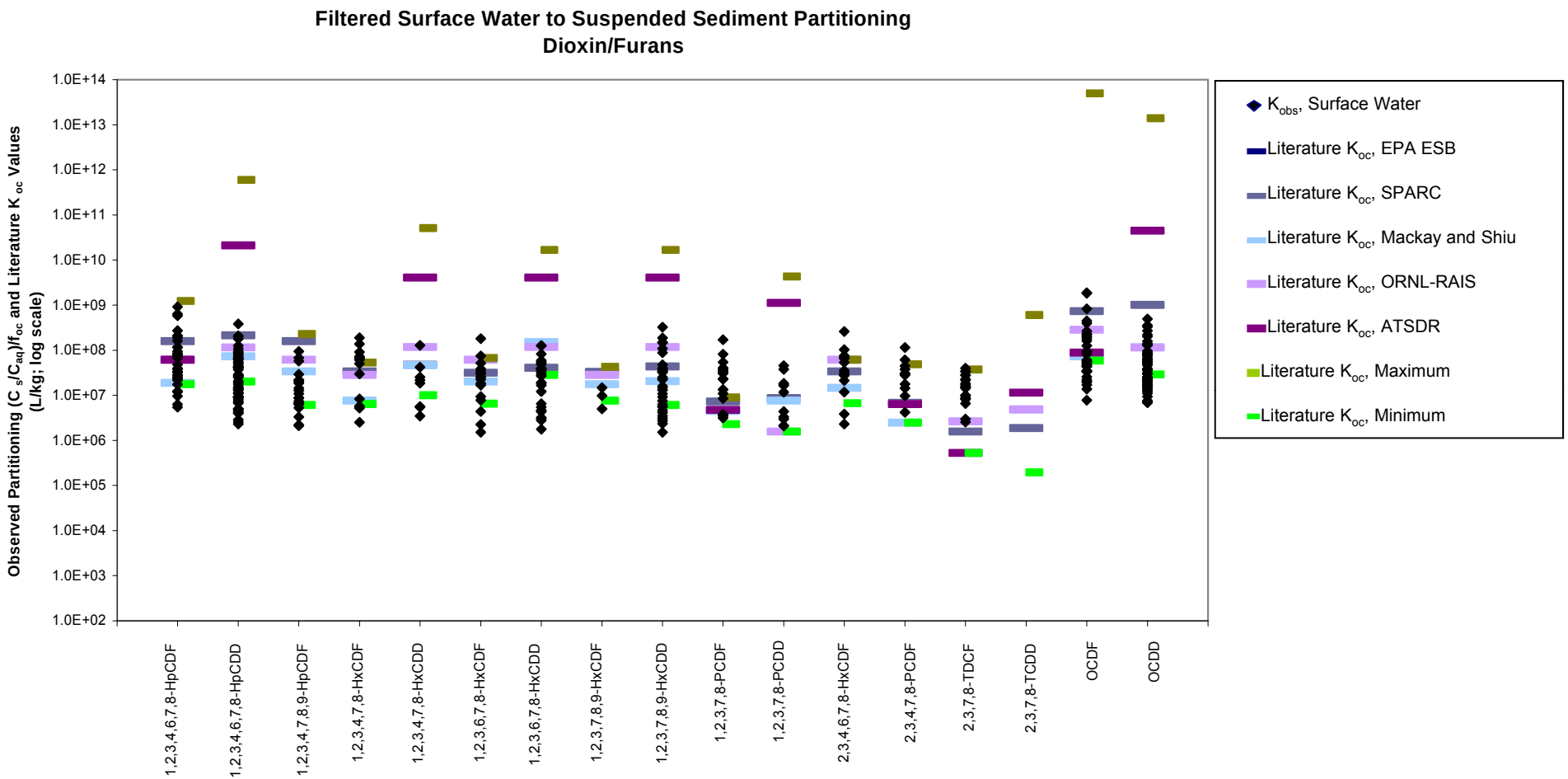


Figure 6.2-6
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Surface Water and
Suspended Sediment Partitioning
PCDD/Fs

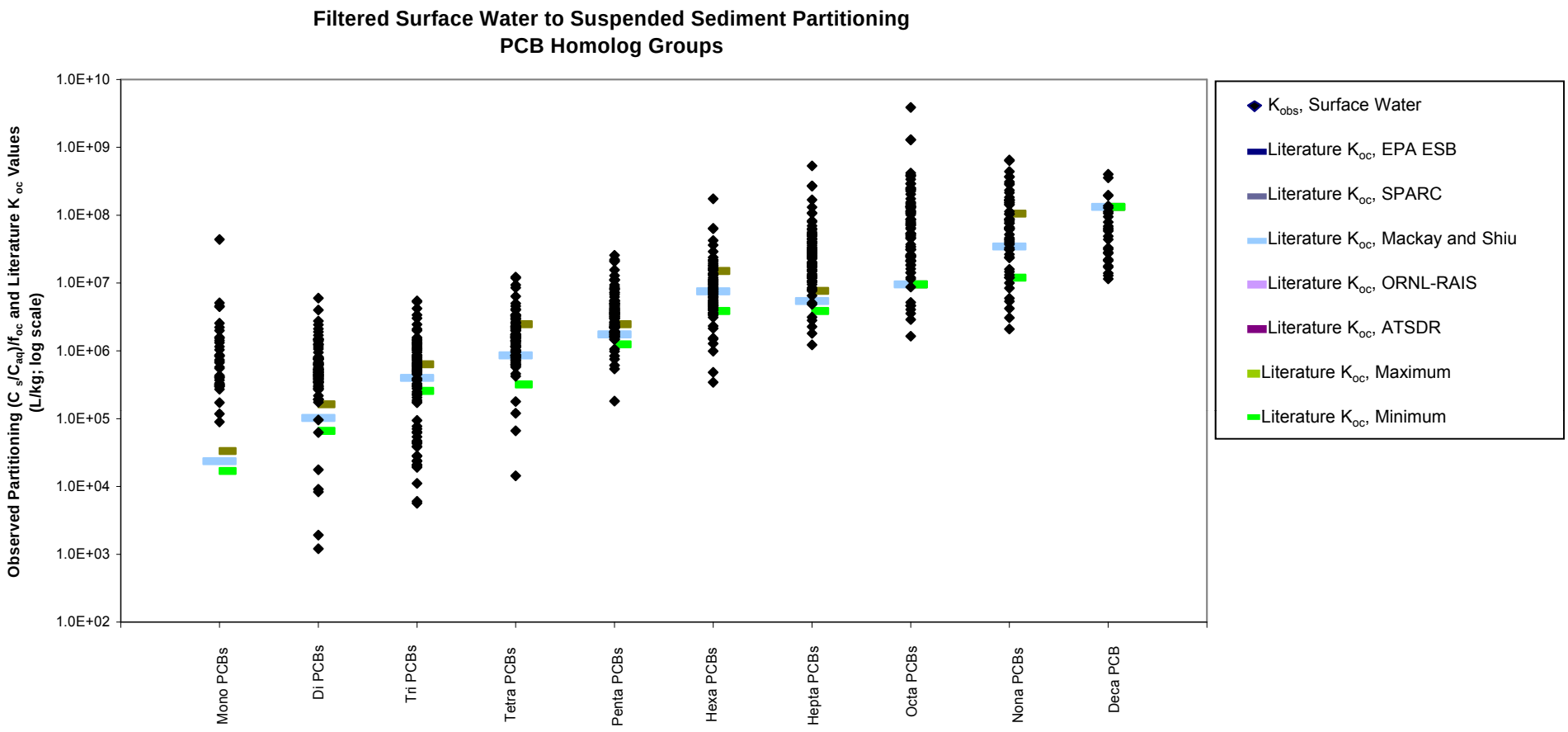


Figure 6.2-7
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Surface Water and
Suspended Sediment Partitioning
PCB Homologs

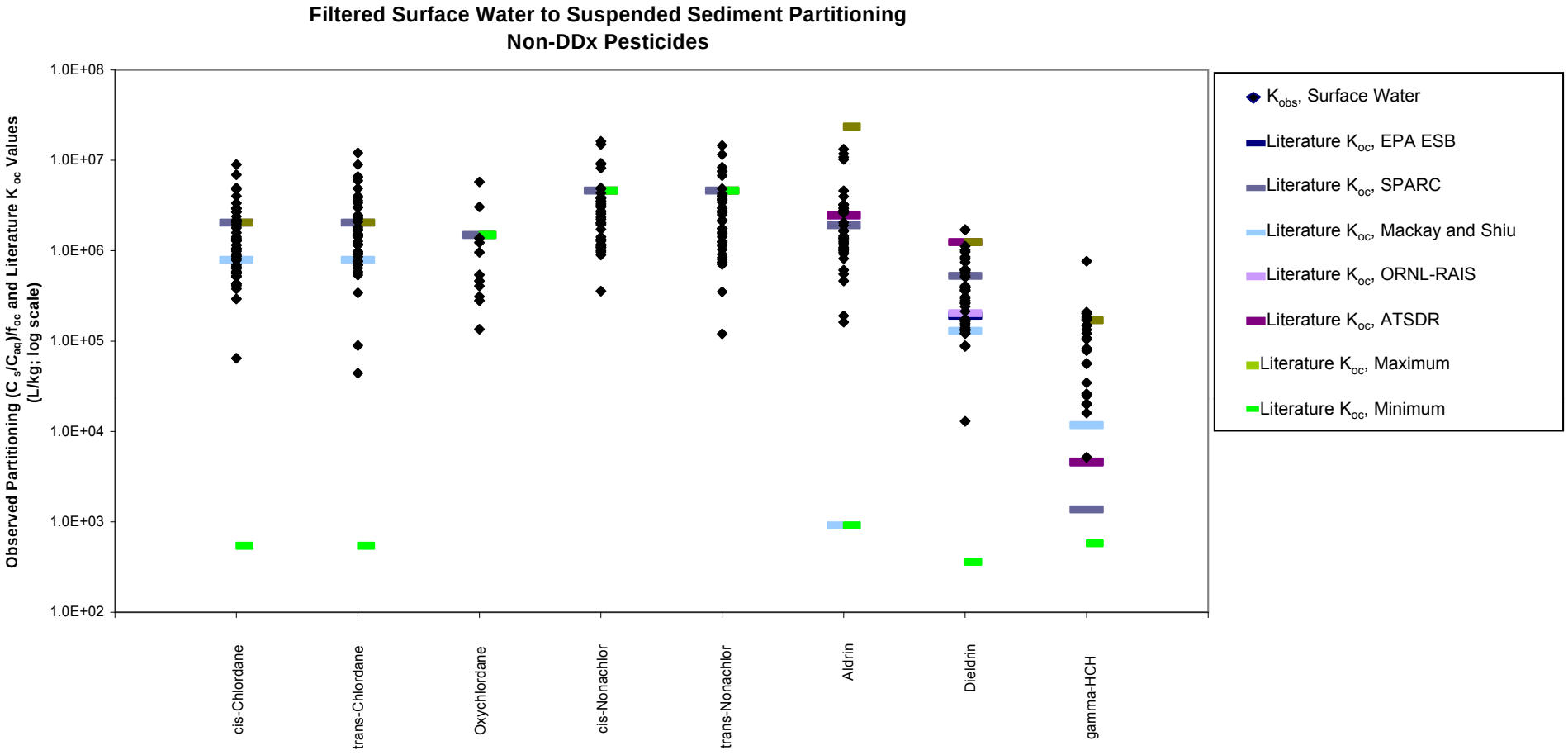


Figure 6.2-8
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Surface Water and
Suspended Sediment Partitioning
Non-DDx Pesticides

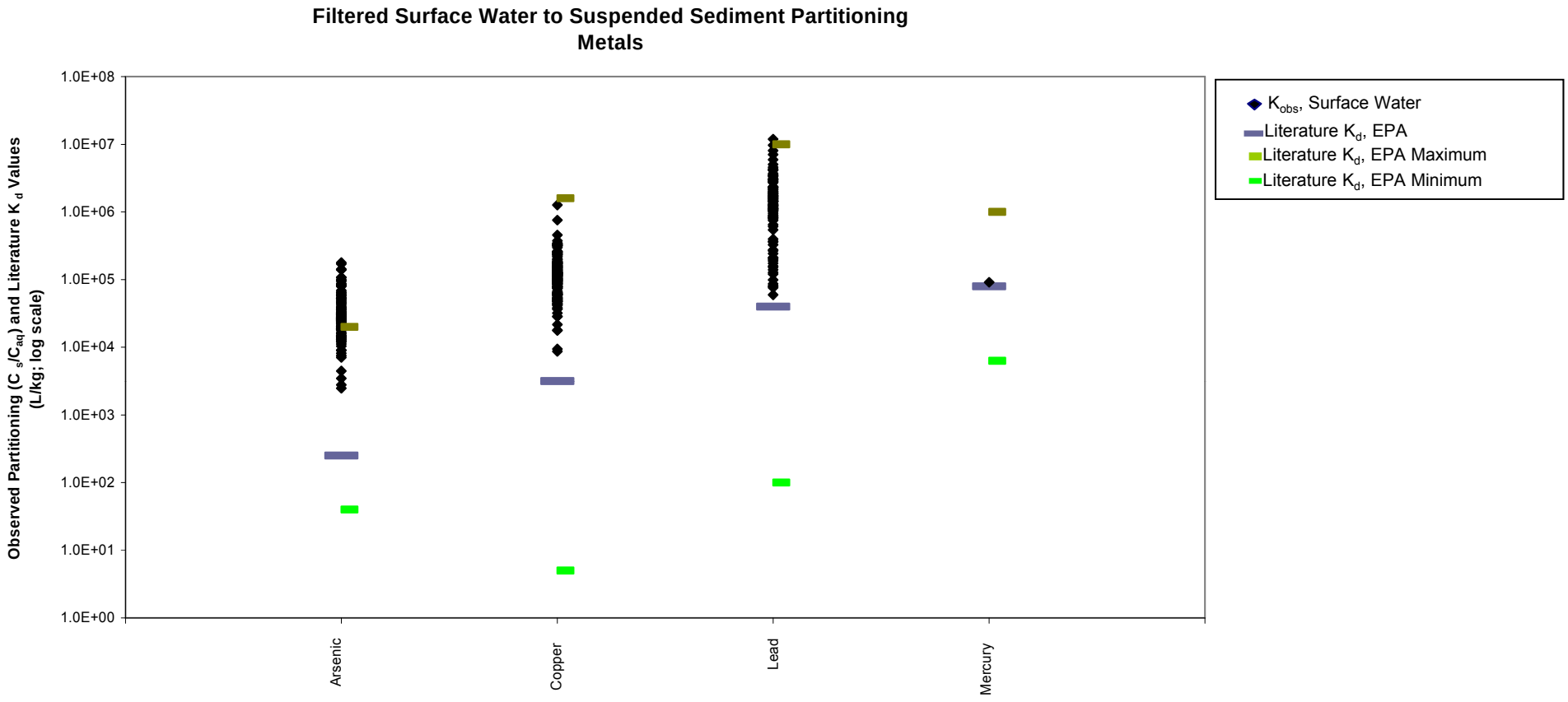
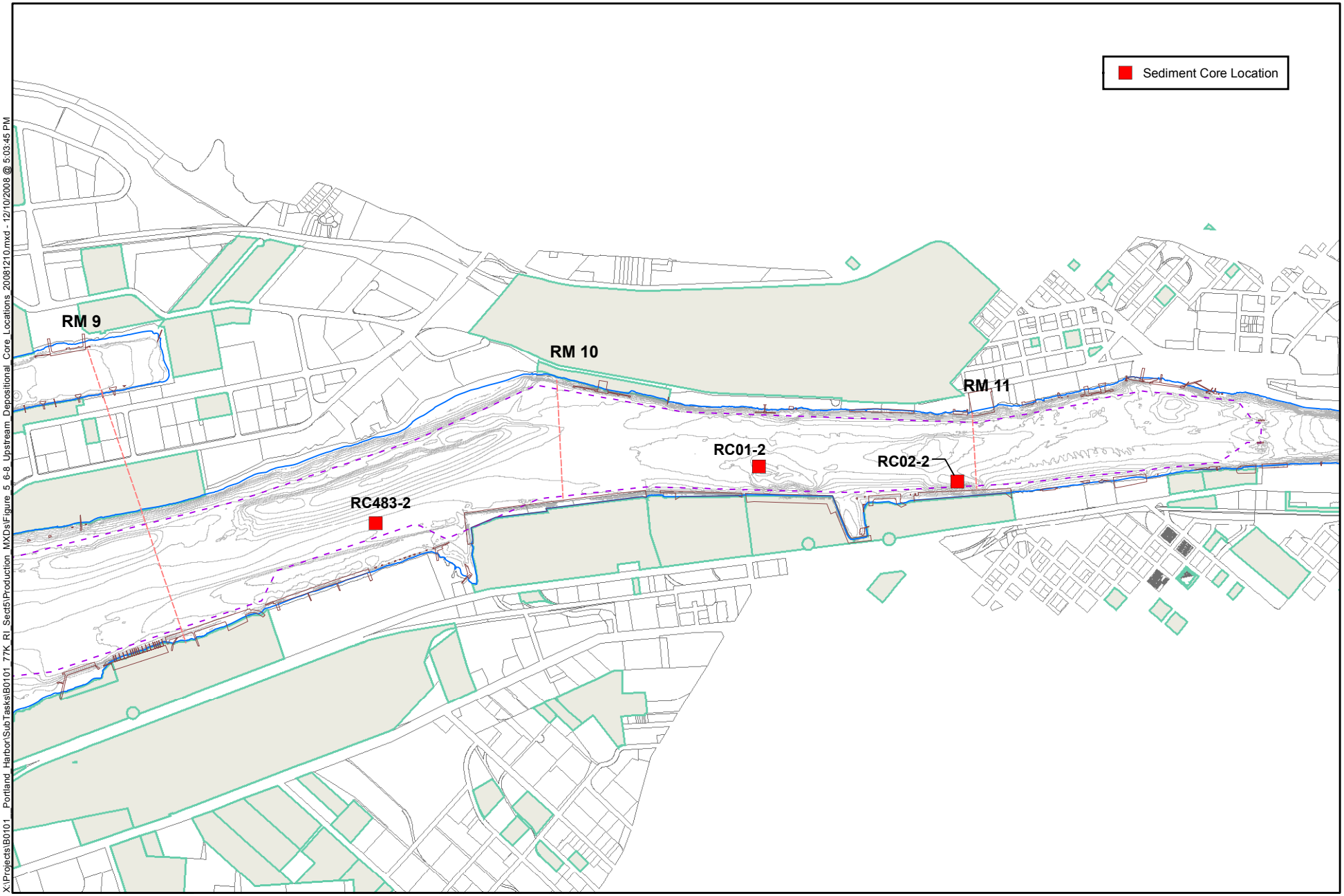


Figure 6.2-9
Portland Harbor RI/FS
Remedial Investigation Report
Scatter Plot of Observed Surface Water and
Suspended Sediment Partitioning
Metals



X:\Projects\B0101_Portland_Harbor\SubTasks\B0101_77K_RI_Sect5\Production_MXDs\Figure_5_6-8_Upstream_Depositional_Core_Locations_20081210.mxd - 12/10/2008 @ 5:03:45 PM

0 0.25 0.5 Miles

FEATURE SOURCES:
Transportation, Property, or Boundaries: Metro RLIS.
Channel & River Miles: US Army Corps of Engineers.
Bathymetric Information: David Evans and Associates, Inc.

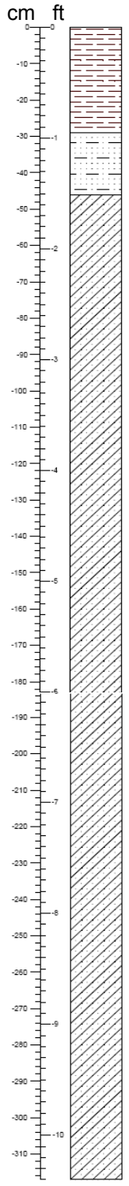
N

Map Features

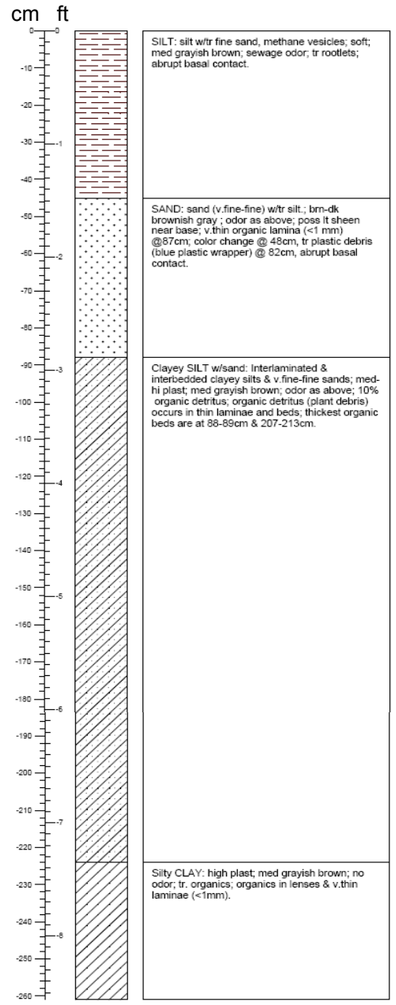
- River Miles
- Docks and Structures
- Navigation Channel
- Bathymetry (5 ft interval)
- Upland Sites (2008)
- Waterfront Taxlots

Figure 6.3-1
Portland Harbor RI/FS
Remedial Investigation Report
Upstream Depositional Core Locations

RC483 Shoal Station RM 9.6



RC01 Borrow Pit Station RM 10.5



RC02 Borrow Pit Station RM 10.9

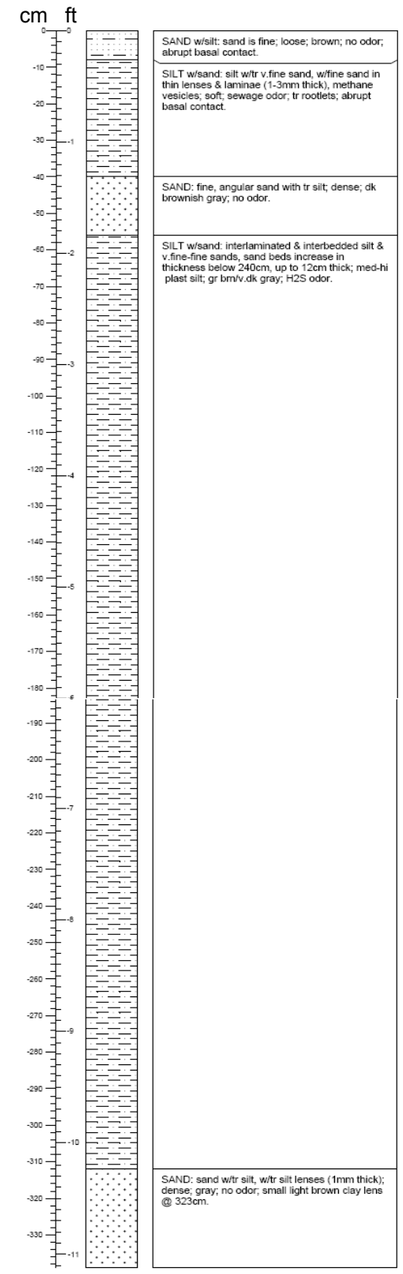


Figure 6.3-2
Portland Harbor RI/FS
Remedial Investigation Report
Core Logs for the RC483-2, RC01-2, RC02-1

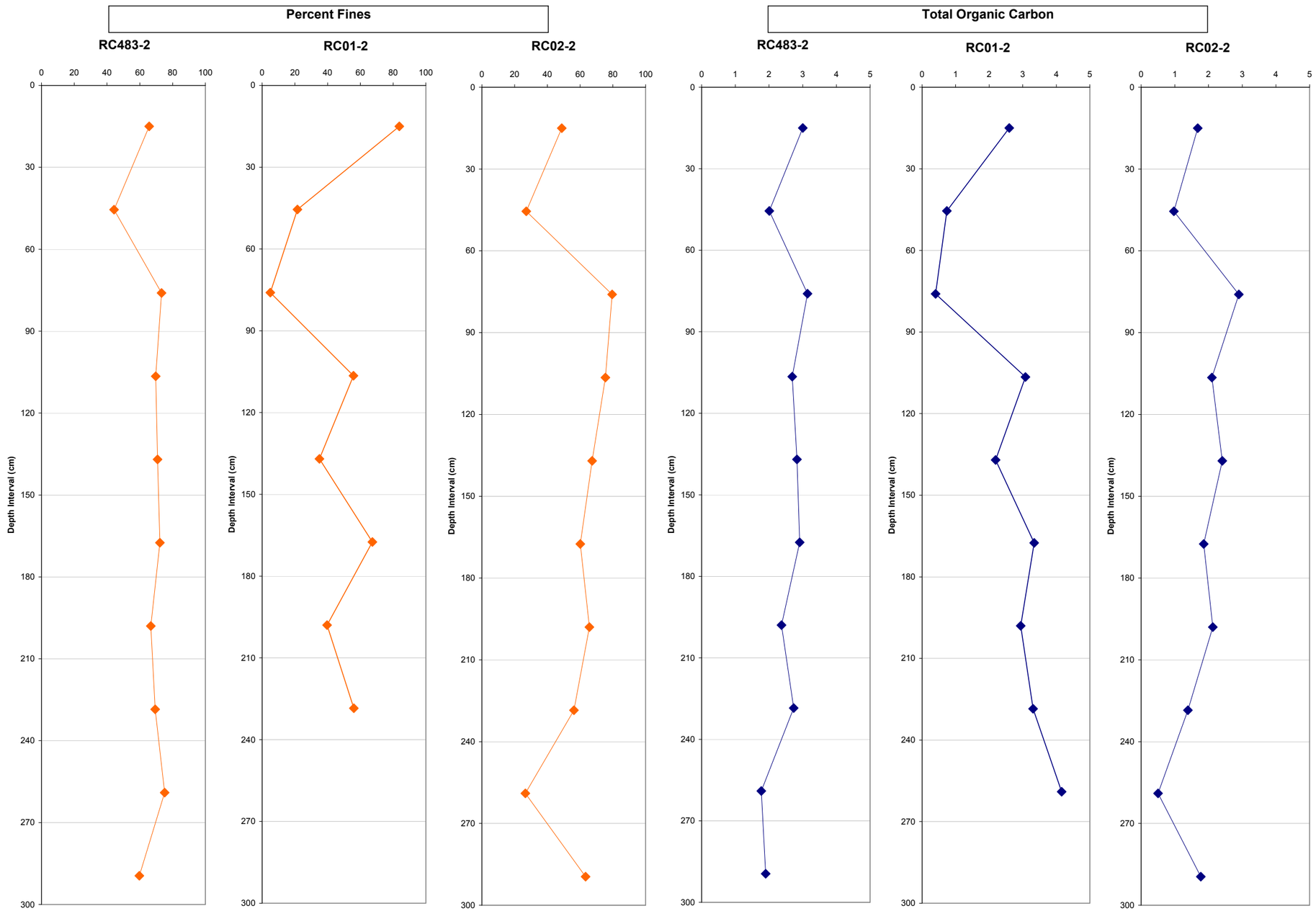


Figure 6.3-3
Portland Harbor RI/FS
Remedial Investigation Report
Grain Size and TOC Plots for RC483-2, RC01-2, RC02-1

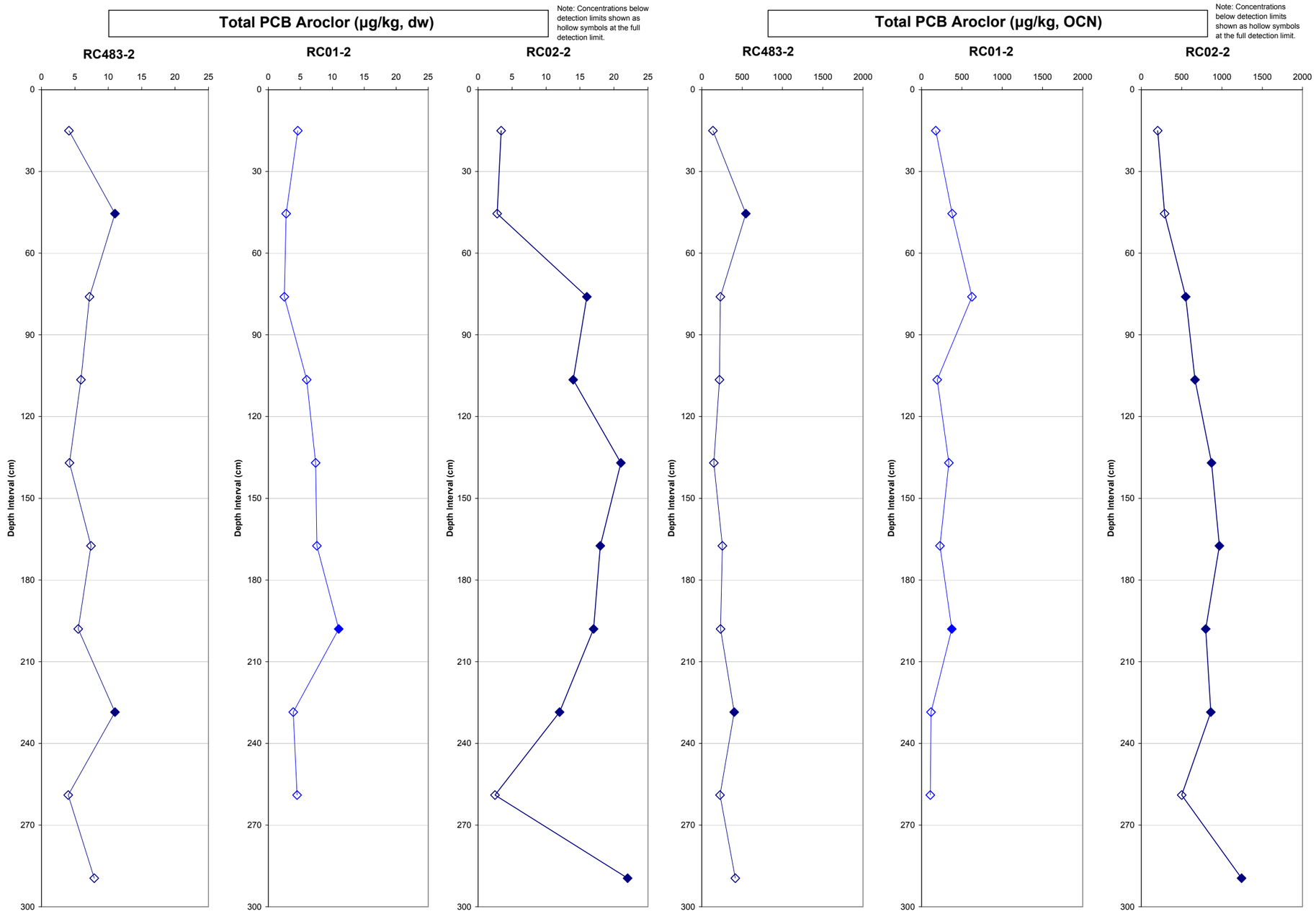


Figure 6.3-4
Portland Harbor RI/FS
Remedial Investigation Report
Total PCB Plots for RC483-2, RC01-2, RC02-1

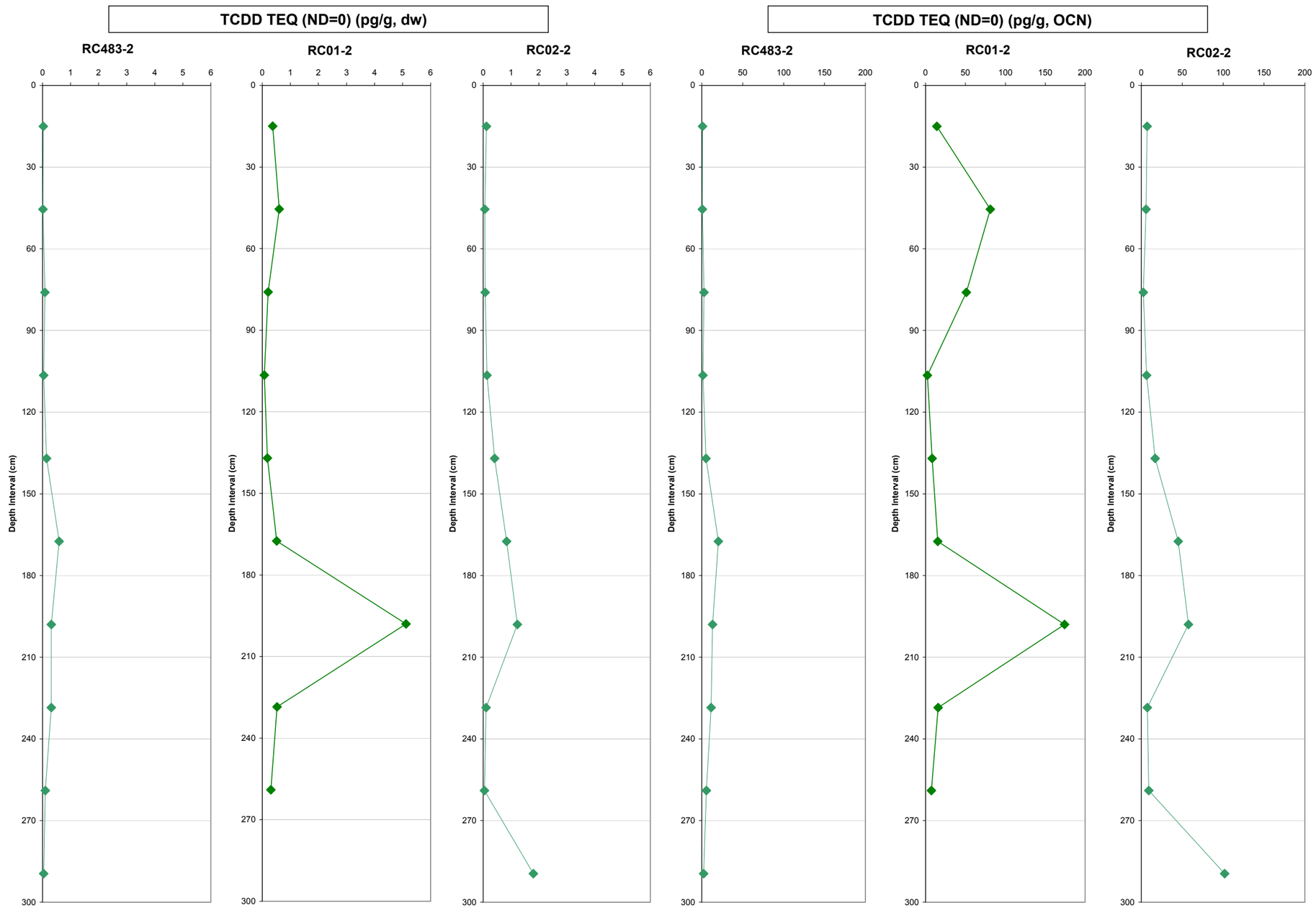


Figure 6.3-5
Portland Harbor RI/FS
Remedial Investigation Report
TCDD TEQ (ND=0) Plots for RC483-2, RC01-2, RC02-1

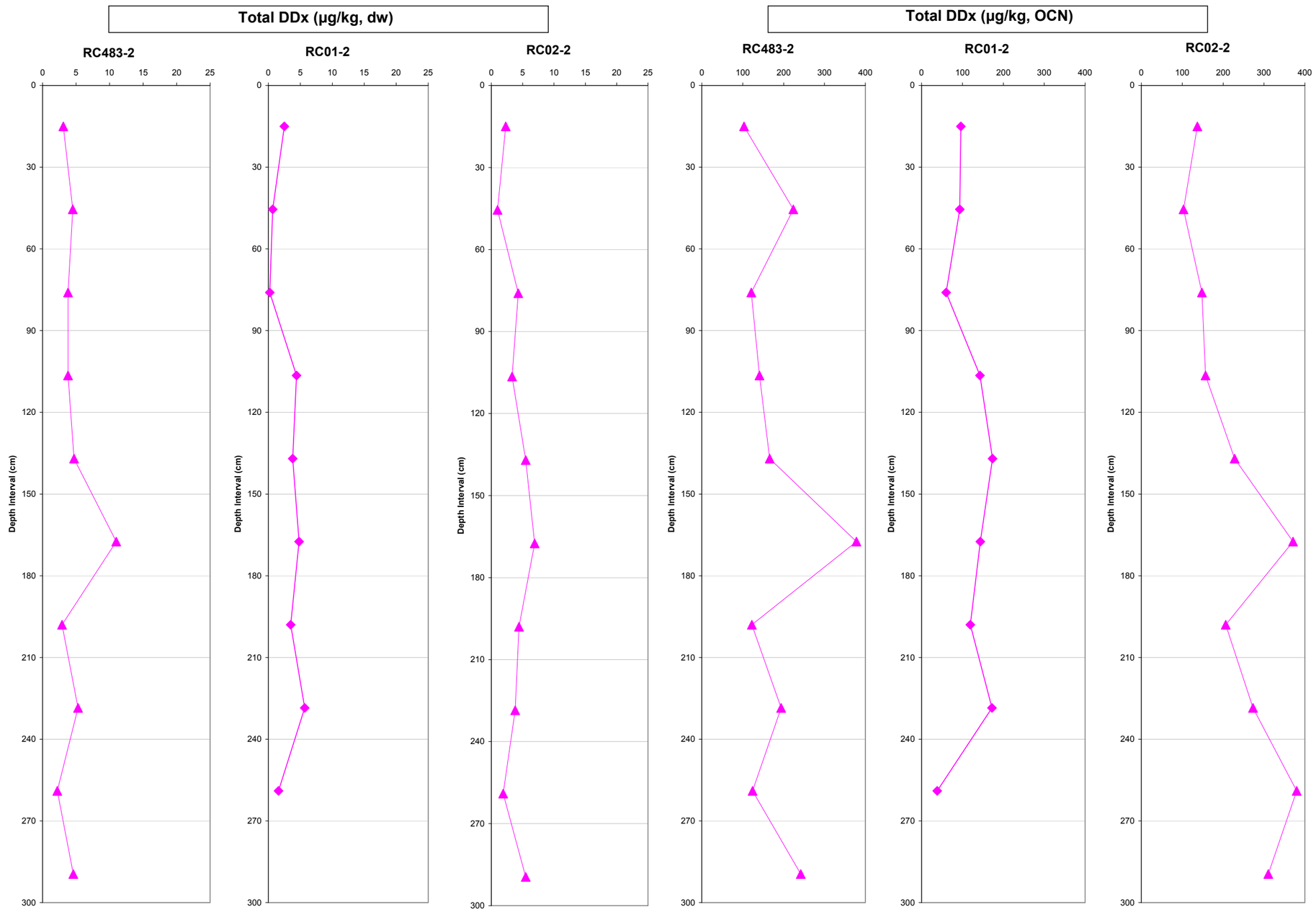


Figure 6.3-6
Portland Harbor RI/FS
Remedial Investigation Report
Total DDx Plots for RC483-2, RC01-2, RC02-1

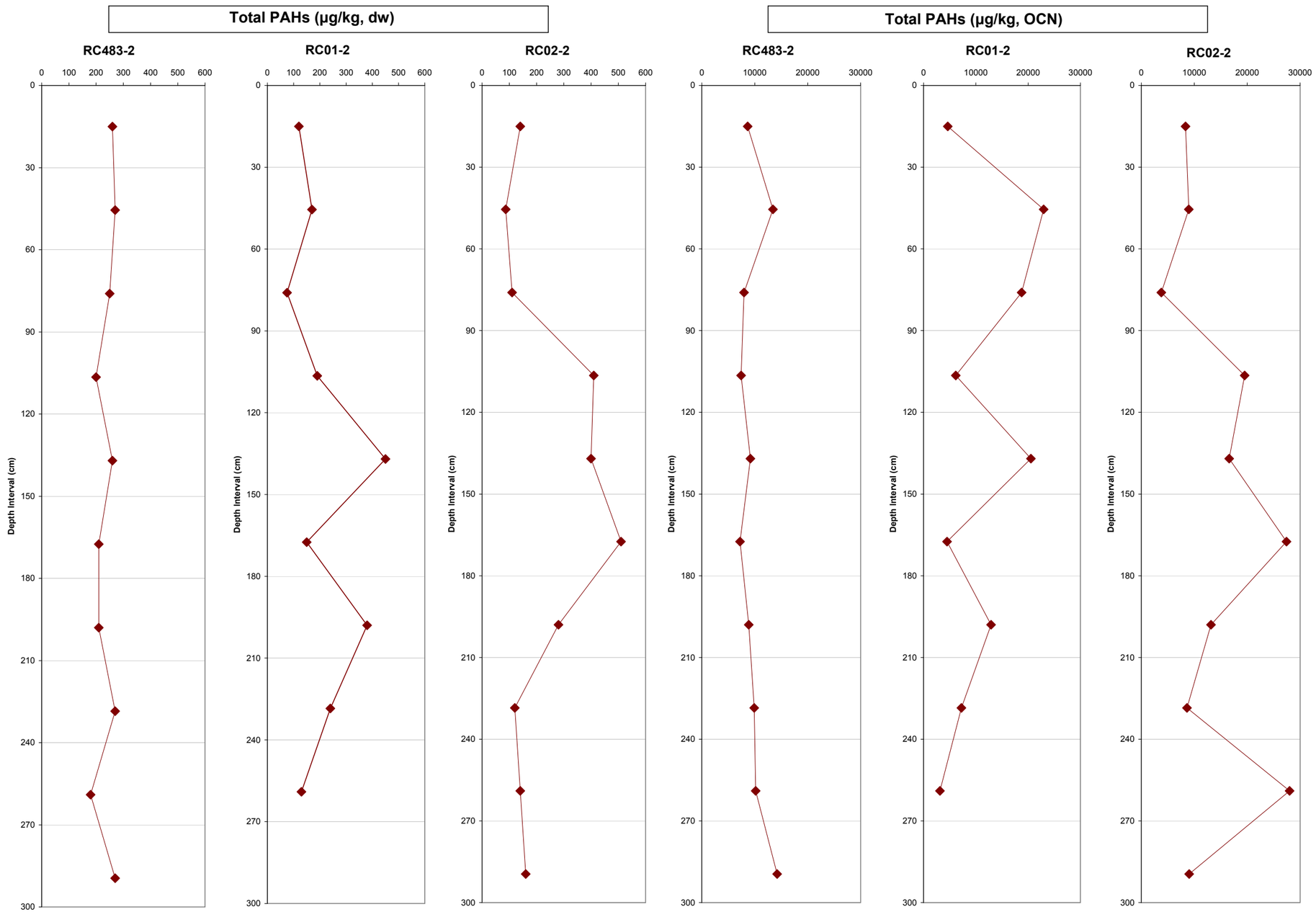


Figure 6.3-7
Portland Harbor RI/FS
Remedial Investigation Report
Total PAH Plots for RC483-2, RC01-2, RC02-1