



Sediment



Sediment Sampling

■ Analytes

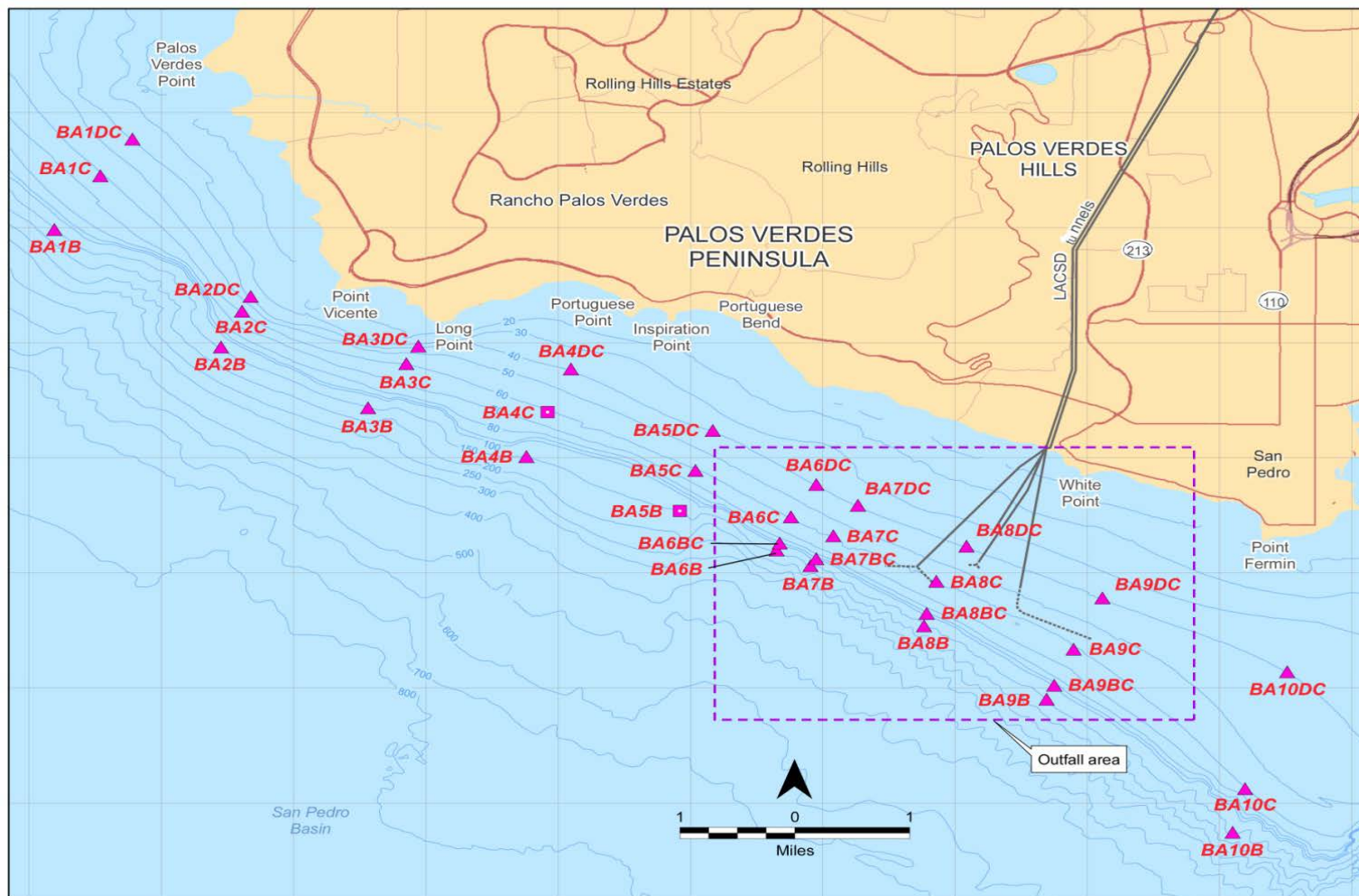
- **DDT Compounds:** *o,p'*-DDD, *o,p'*-DDE, *o,p'*-DDT, *p,p'*-DDD, *p,p'*-DDE, and *p,p'*-DDT, *p,p'* DDMU and *p,p'* DDNU
- **PCBs Expanded List (45 Congeners):** PCBs 8, 18, 28, 44, 52, 66, 77, 81, 101, 105, 114, 118, 123, 126, 128, 138/158, 153, 156, 157, 167, 169, 170, 180, 187, 189, 195, 206, 209, 31, 37, 49, 70, 74, 87, 99, 110, 119, 149, 151, 168, 177, 183, 194, 201, 203

■ Locations:

- 2009 sampling locations (34 baseline and 25 in the outfall area) plus 10 additional locations

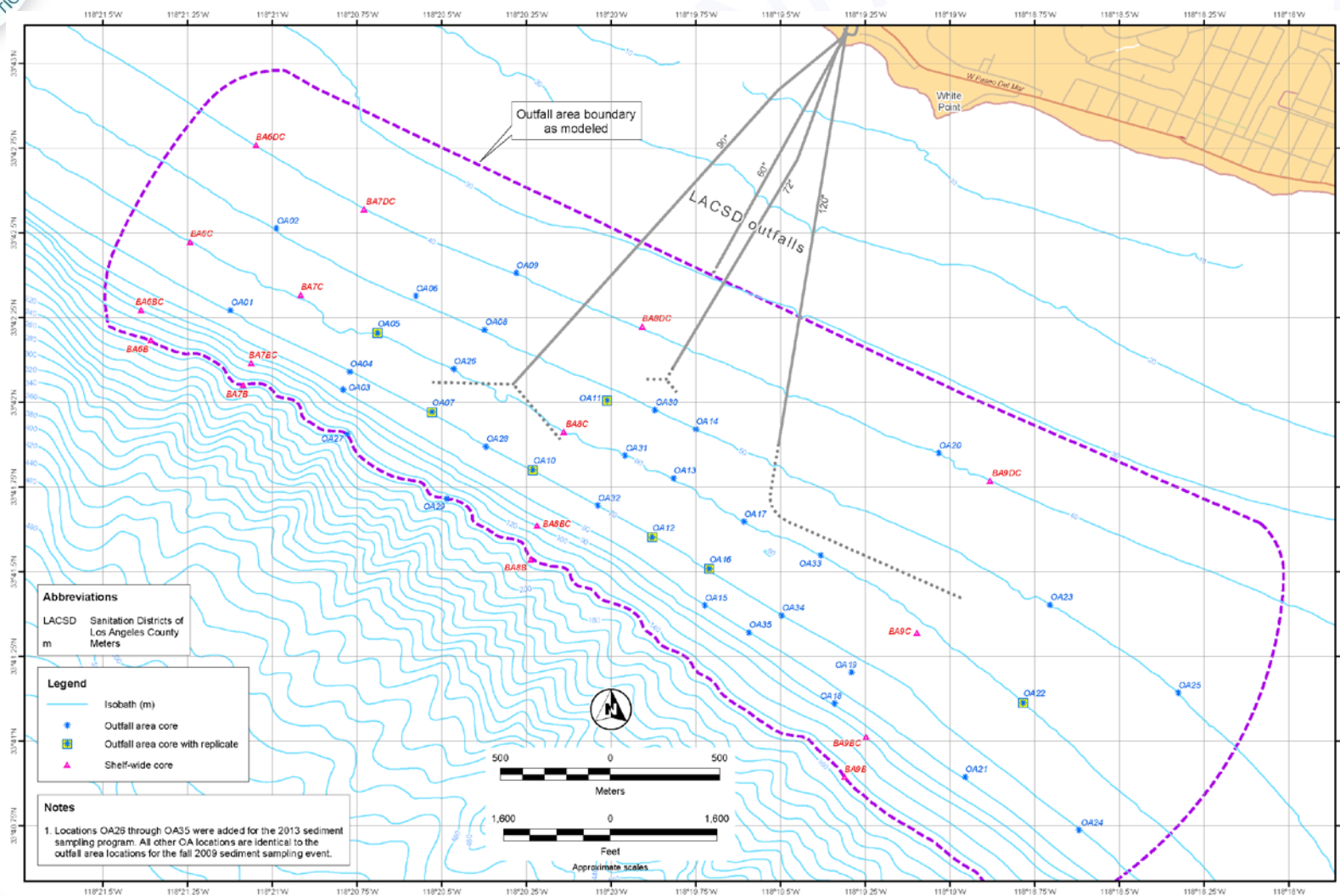


Shelf-Wide Sampling Locations





Outfall Area Sampling Locations





Sediment Sampling (cont.)

- **Sample Preparation/Compositing**

- Cut into slices with thickness of 2 cm
- 0-8 cm: analyze slices individually
- 8 cm and below: analyze composite slices

- **QA/QC**

- Bight 13 Inter-laboratory study lab
- LACSD split samples with EPA for QA/QC purposes.
- Initial analysis from 3 cores only (3C, 6C, and 8C)
- Blind sediment sample analysis
- Site Specific Reference Material analysis
- Laboratory Bias Study



Sediment Sampling (cont.)

- **Core Collection:**

- October 15, 2013 - October 23, 2013
- Collect by Sanitation Districts using the *Ocean Sentinel*

- **Core Slicing:**

- November 18, 2013 – November 22, 2013
- December 9, 2013 - December 11, 2013
- Performed by Sanitation Districts' Carson Water Quality Lab

- **Contract Laboratory:** EurofinCalScience

- **Sample Analysis:**

- September 11, 2015 – November 13, 2015
- All results are flagged due to holding time issue

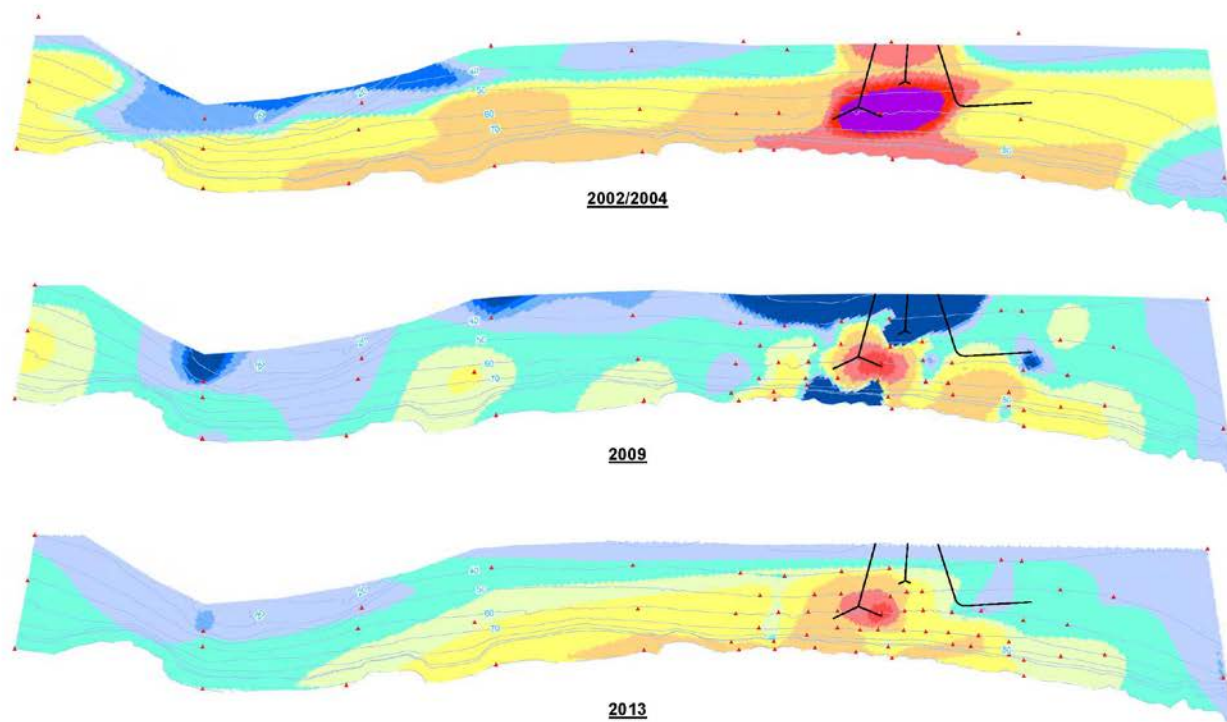


Sediment Sampling





Total DDTs Time Trend (0-8 cm)



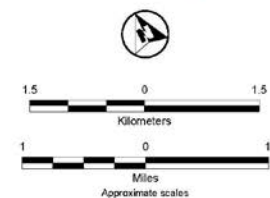
Legend

- Isobath (m)
- Outfall
- Sediment core location

DDTs (mg/kg)		
0 - 0.05	0.5 - 1	10 - 25
0.05 - 0.1	1.0 - 1.5	25 - 50
0.1 - 0.2	1.5 - 3	50 - 90
0.2 - 0.5	3 - 10	90 - 155

Notes

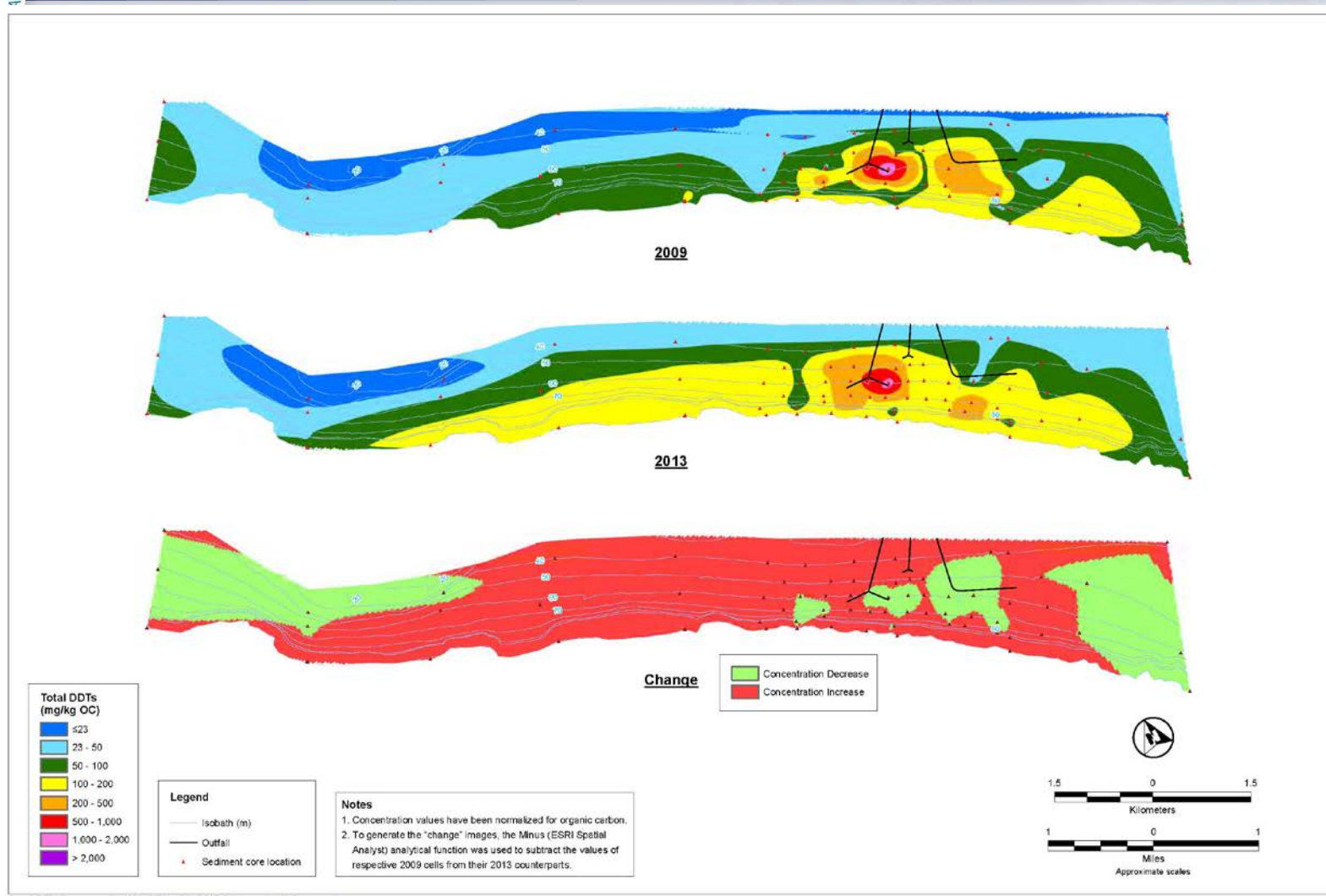
- The 2002/2004 data set was based on results of samples collected by Sanitation District using the Van Veen sampler. To provide data north of Palos Verdes Point, this data set also used results from four Bight 1994 samples, one 1993 Sanitation District sample, and two 1992 NOAA samples.
- Concentrations were not normalized for organic carbon.



G:\Monitoring\PalosVerdes\ShallowBight\DDTs\0-8cm.mxd 6/16/2017 arthur richard

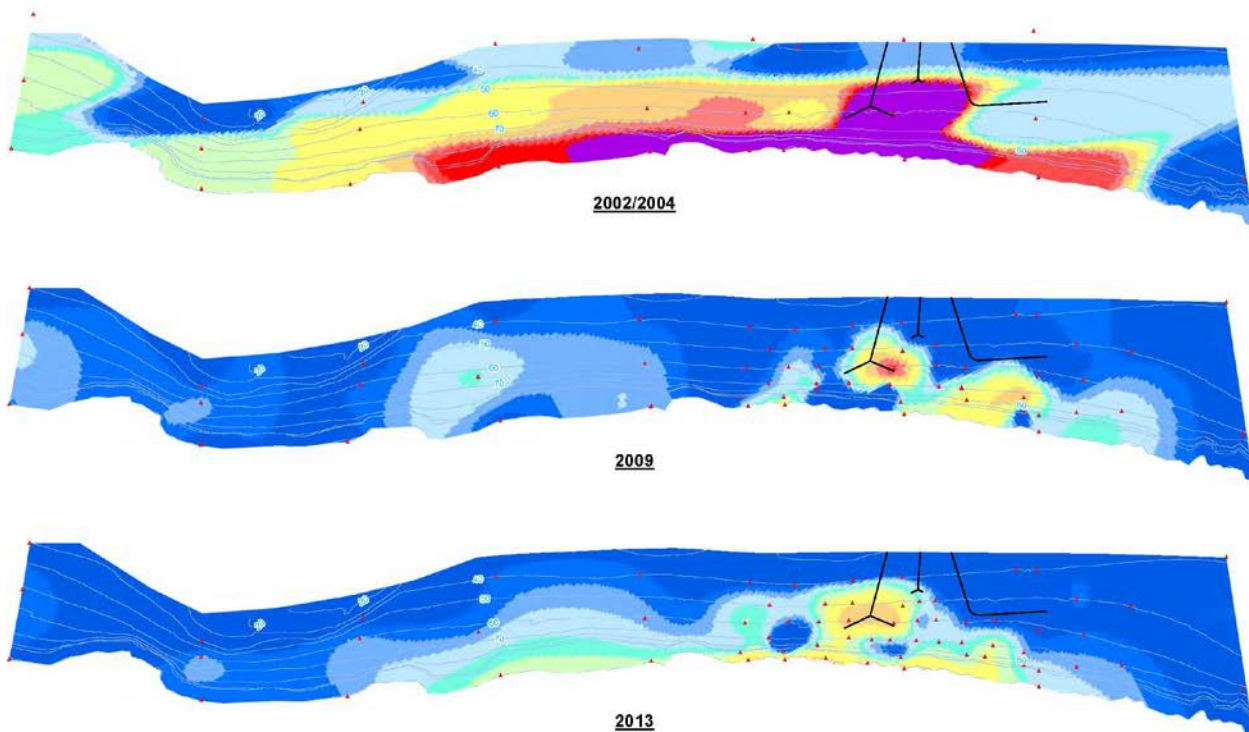


Total DDTs (0-8 cm) 2009 vs. 2013





Total PCBs Time Trend (0-8 cm)



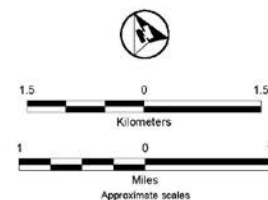
Legend

- Isobath (m)
- Outfall
- Sediment core location

Total PCBs (mg/kg)		
0 - 0.05	0.15 - 0.2	0.75 - 1
0.05 - 0.075	0.2 - 0.3	1 - 1.25
0.075 - 0.1	0.3 - 0.5	1.25 - 1.5
0.1 - 0.15	0.5 - 0.75	1.5 - 2

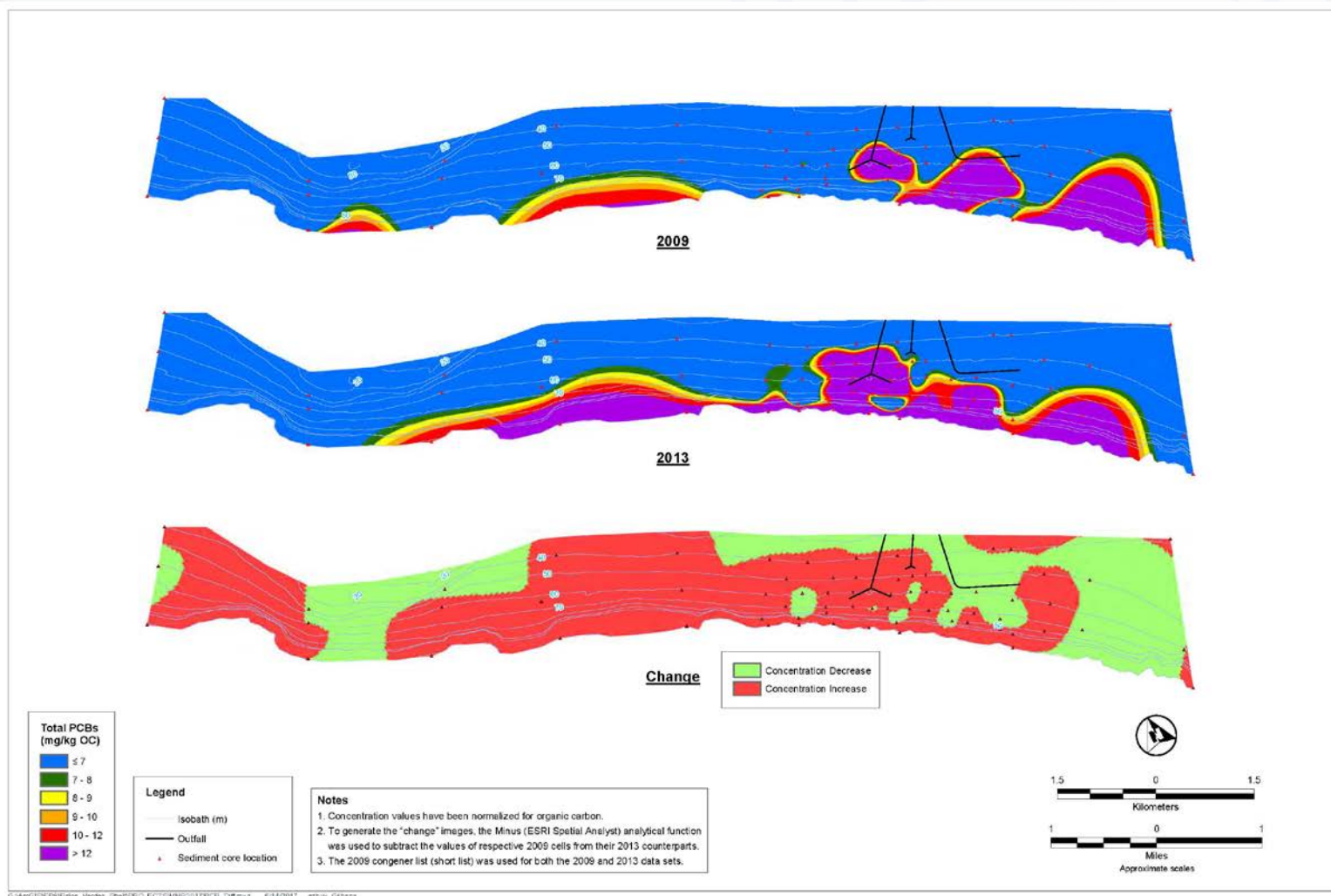
Notes

- The 2002/2004 data set was based on results of samples collected by Sanitation District using the Van Veen sampler. To provide data north of Palos Verdes Point, this data set also used results from four Bight 1994 samples; one 1993 Sanitation District sample; and two 1992 NOAA samples.
- Concentrations were not normalized for organic carbon.





Total PCBs (0-8 cm) 2009 vs. 2013

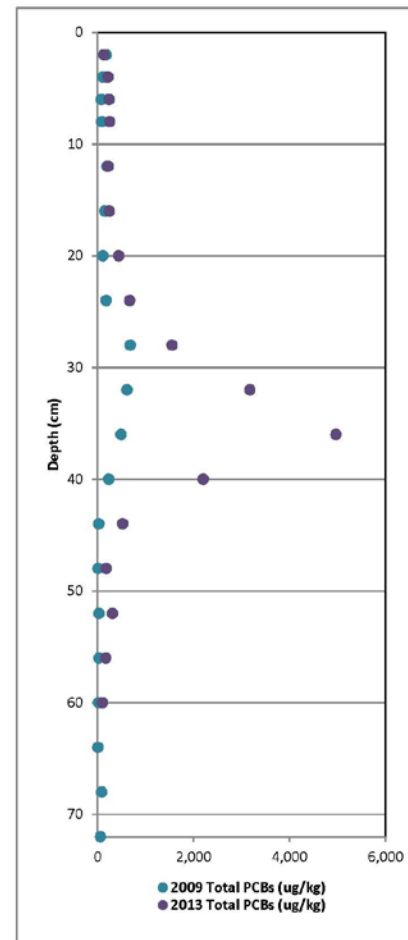
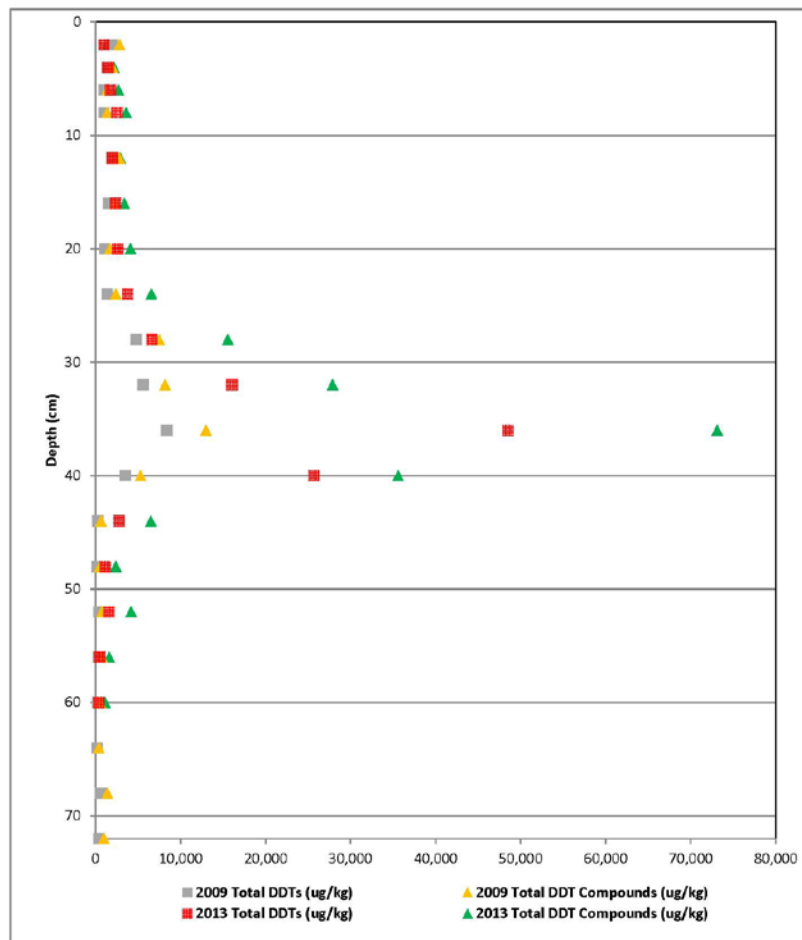
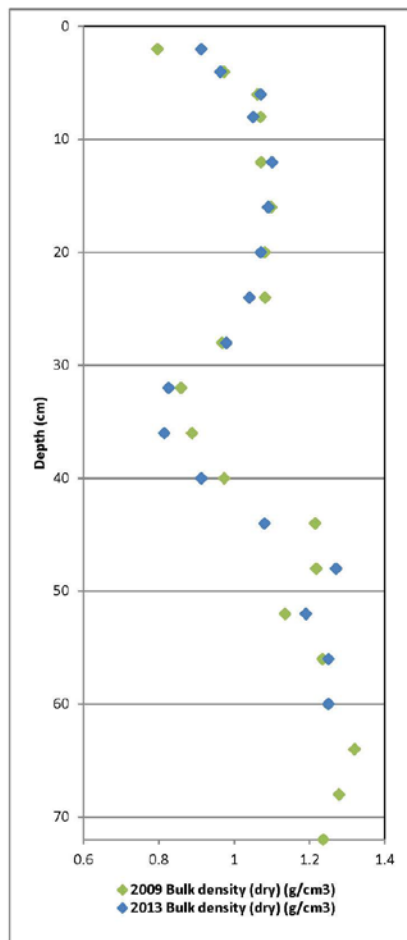




MVS Model

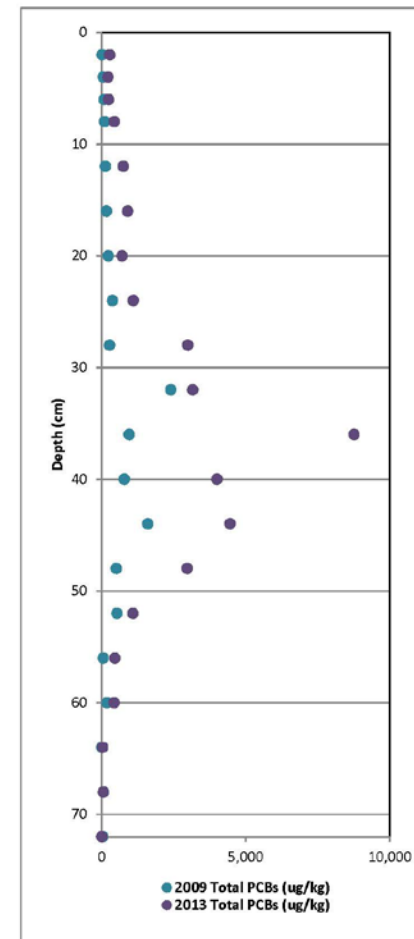
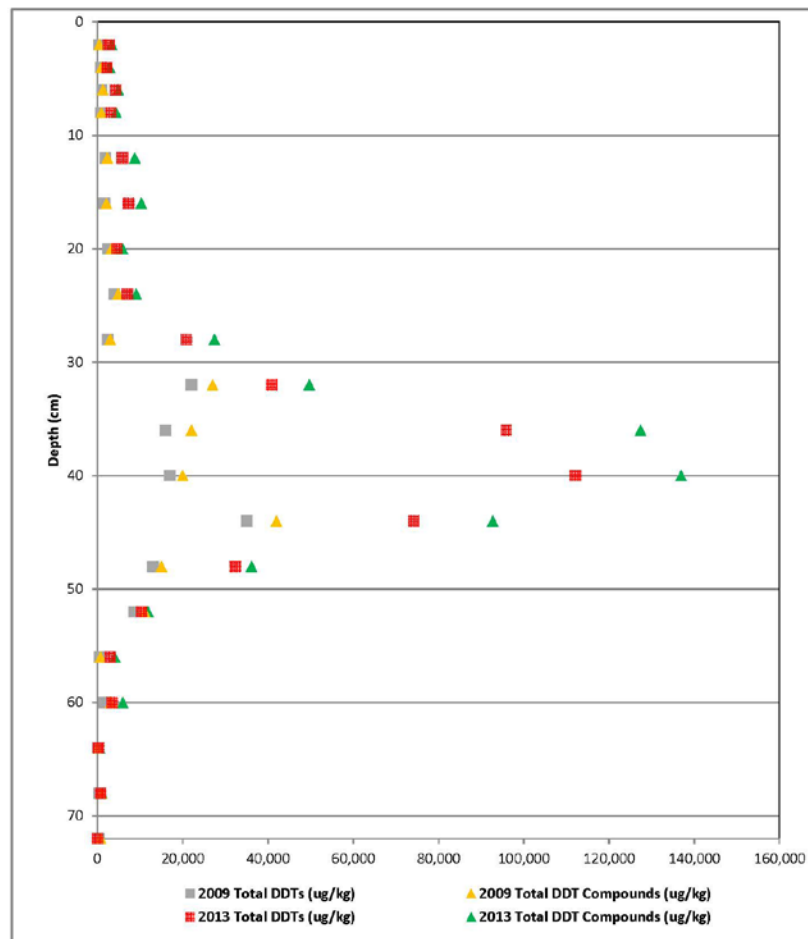
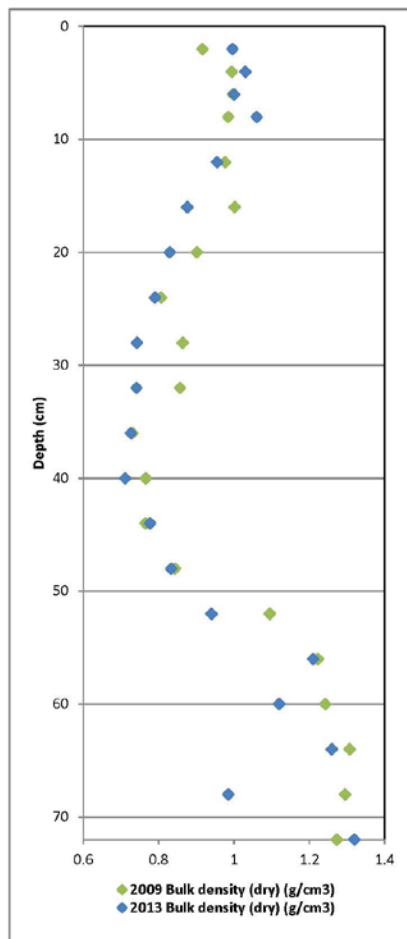


Vertical Profile BA4C



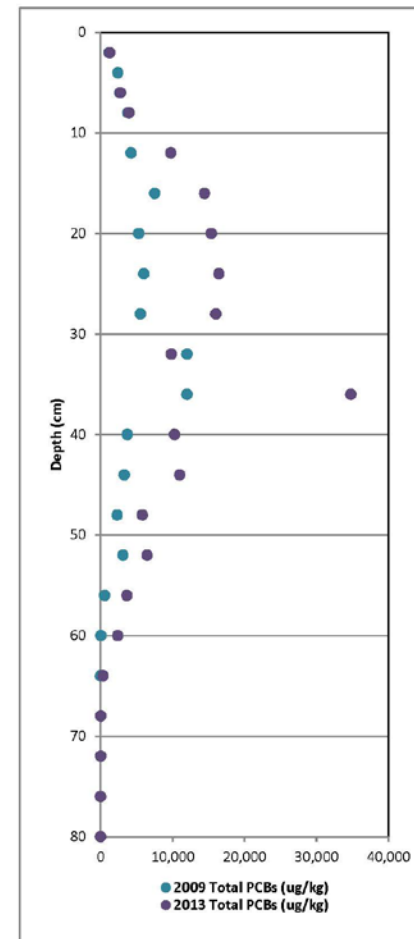
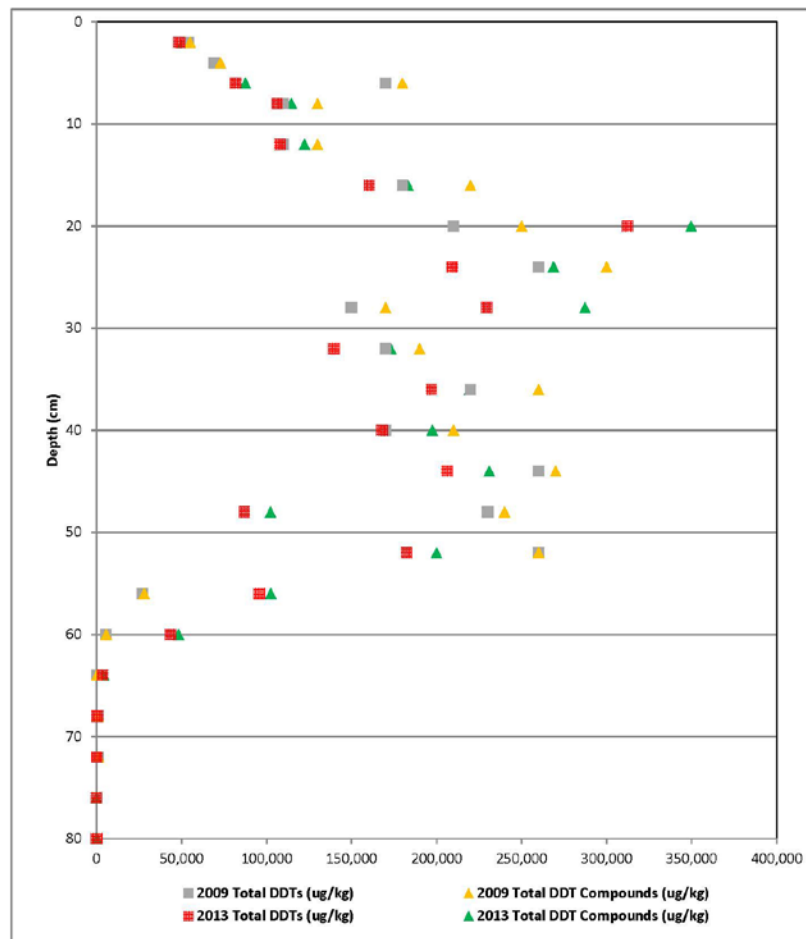
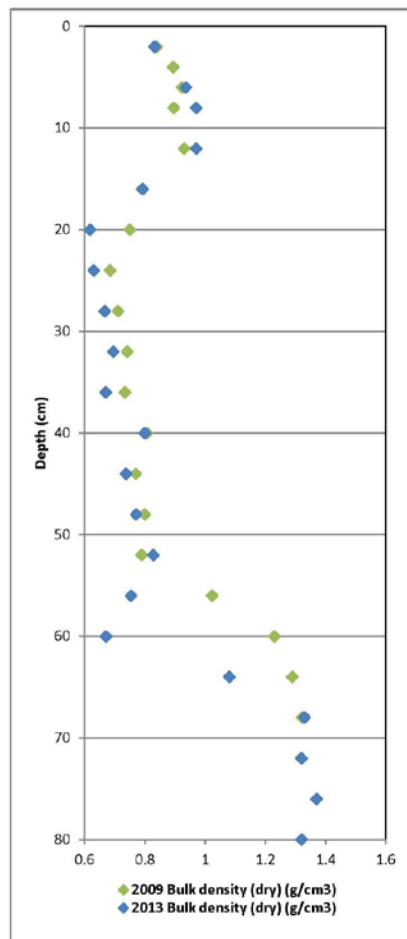


Vertical Profile BA6C



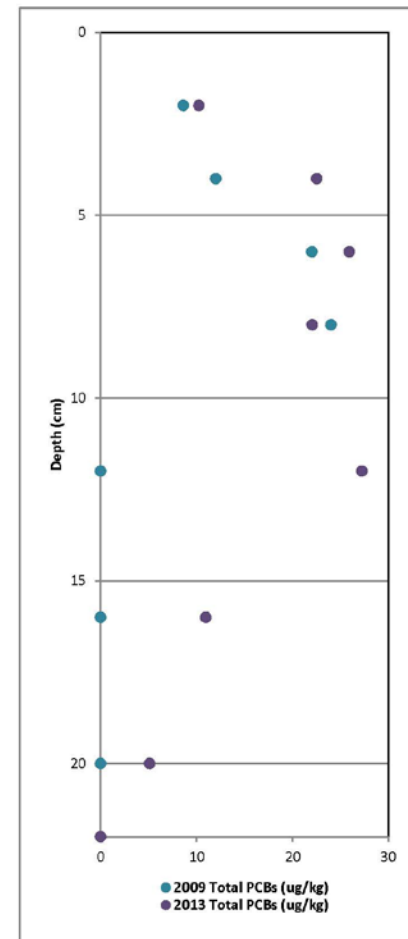
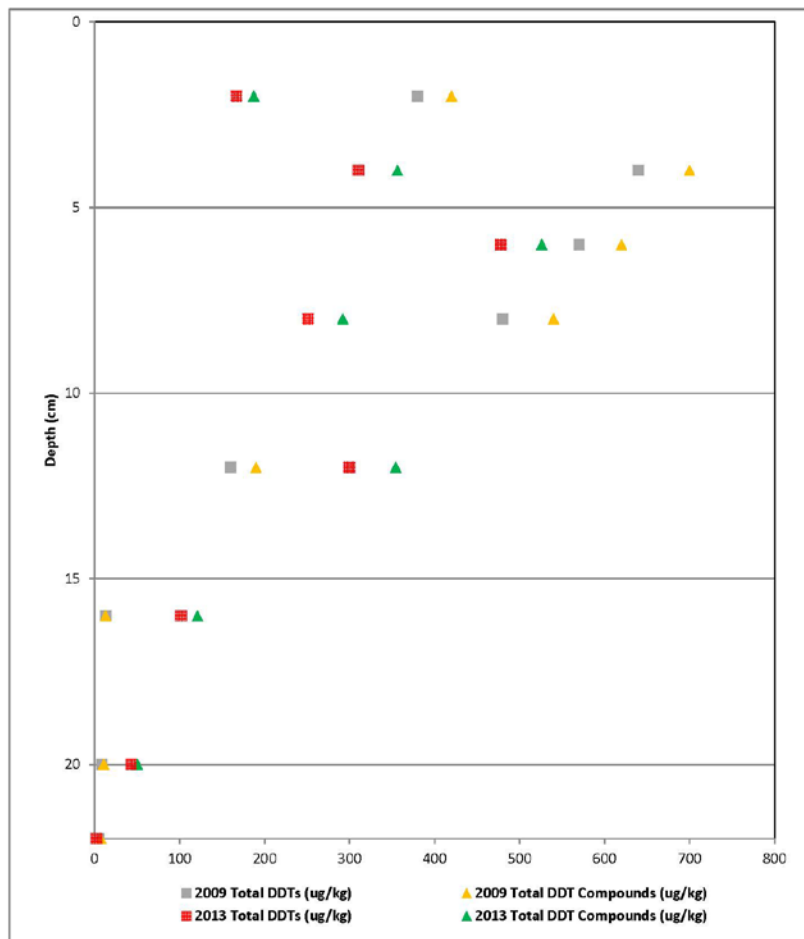
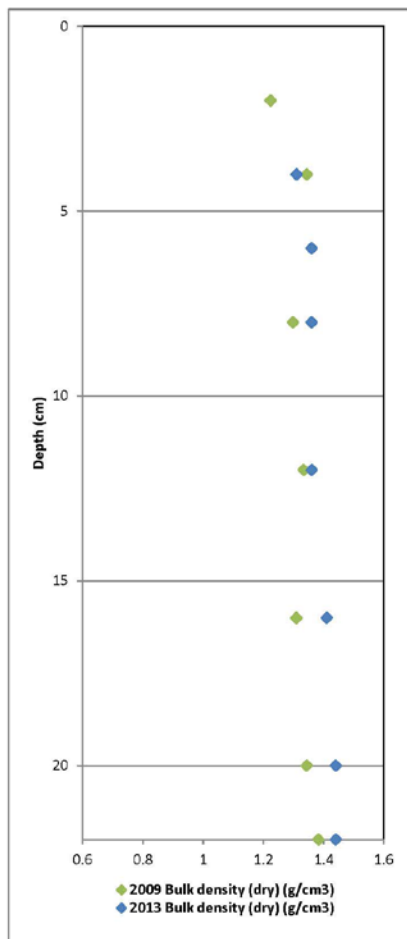


Vertical Profile BA8C



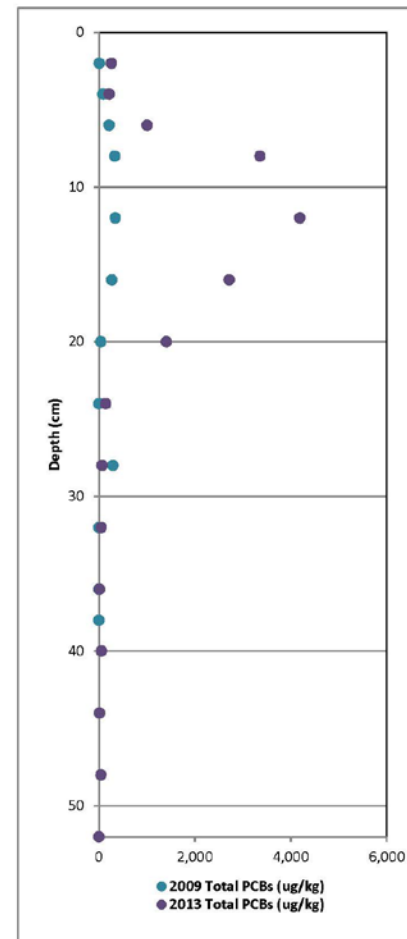
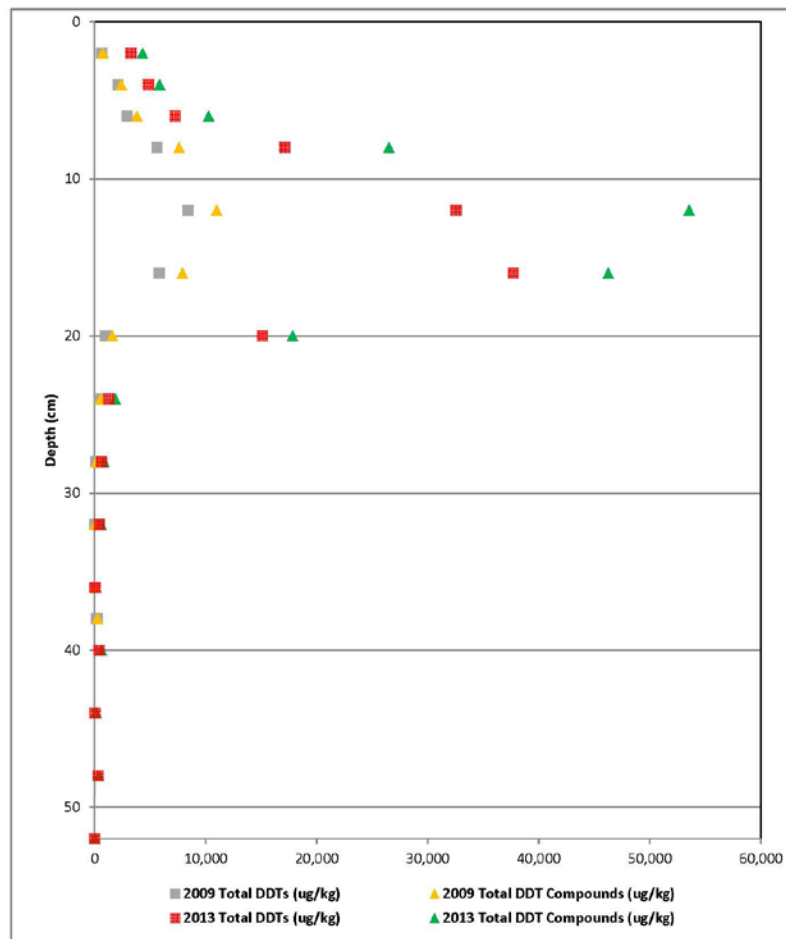
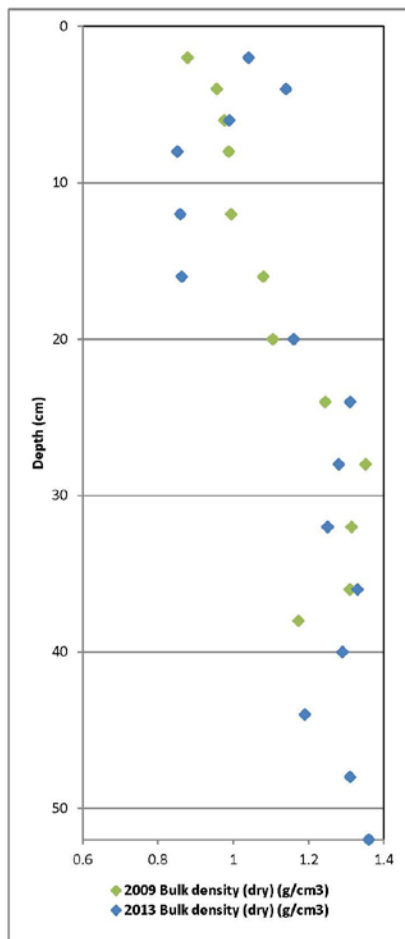


Vertical Profile BA10C





Vertical Profile OA10





Modeled Sediment Concentrations

- **Carbon Normalized Shelf-wide Average:**
 - Total DDTs: 87,000 $\mu\text{g/kg}$
 - Total DDTs Compounds: 123,000 $\mu\text{g/kg}$
 - Total PCBs: 5,600 $\mu\text{g/kg}$
 - Total PCBs Expanded List: 11,000 $\mu\text{g/kg}$
- **Carbon Normalized Shelf-wide Average 0-8 cm Interval:**
 - Total DDTs: 77,000 $\mu\text{g/kg}$
 - Total DDT Compounds: 100,000 $\mu\text{g/kg}$
 - Total PCBs: 4,800 $\mu\text{g/kg}$
 - Total PCBs Expanded List: 9,700 $\mu\text{g/kg}$



Modeled Sediment Mass

■ Shelf-wide Average:

- Total DDTs: 42,000 kg
- Total DDTs Compounds: 61,000 kg
- Total PCBs: 2,900 kg
- Total PCBs Expanded List: 5,900 kg

Shelf-wide Average 0-8 cm Interval:

- Total DDTs: 36,000 kg
- Total DDTs Compounds: 5,000 kg
- Total PCBs: 280 kg
- Total PCBs Expanded List: 570 kg



IROD Goals Data Comparison

	IROD Post Capping Goals (Mean)	IROD First Five Year Review Goals	Final Goals	IROD Estimate	2009 Sediment Study	2018 MNR Study
Concentration($\mu\text{g/kg}$)						
Total DDTs	78,000	46,000	23,000		58,000	87,000
Total DDT Compounds					85,000	123,000
Total PCBs	7,000	7,000			410	5,600
Mass (kg)						
Total DDTs				110,000	14,000	42,000
Total DDT Compounds					20,000	61,000
Total PCBs				10,000	1,000	2,900



Same Lab Split Results

Location	Field sample ID	Lab sample ID	Original ID	Year collected	SBD - SED (cm)	DDNU	DDMU	o,p'-DDD	o,p'-DDE	o,p'-DDT	p,p'-DDD	p,p'-DDE	p,p'-DDT	Total DDTs	Total DDT Compounds	Total PCBs
BA5B	PVSED-001	17-03-0175-1	BA5B01200905	2009	4-6	210	3,000	200	1,400	27.0 J	510	10,000	140	12,000	15,000	1,900
	PVSED-003	17-03-0175-3	BA5B01201305	2013	4-6	240	6,200	260	1,900	49.0 J	670	12,000	440	15,000	22,000	3,900
	PVSED-002	17-03-0175-2	BA5B01200907	2009	6-8	280	4,000	260	2,000	60.0 J	700	15,000	600	19,000	23,000	3,000
	PVSED-004	17-03-0175-4	BA5B01201307	2013	6-8	390	14,000	460	3,300	65.0 J	1,100	18,000	370	23,000	38,000	5,000
BA6BC	PVSED-005	17-03-0175-5	BA6BC01200905	2009	4-6	170	3,800	180	1,200	50	590	7,700	290	10,000	14,000	1,500
	PVSED-007	17-03-0175-7	BA6BC01201305	2013	4-6	210	7,000	210	1,200	43	680	5,400	740	8,300	15,000	2,200
	PVSED-006	17-03-0175-6	BA6BC01200907	2009	6-8	240	6,200	240	1,400	32.0 J	1,300	8,100	340	11,000	18,000	2,800
	PVSED-008	17-03-0175-8	BA6BC01201307	2013	6-8	340	16,000	470	2,400	70.0 J	1,400	7,600	930	13,000	29,000	5,100
BA9C	PVSED-009	17-03-0175-9	BA9C01200903	2009	2-4	49	1,100	86	520	17.0 J	260	2,700	370	4,000	5,100	570
	PVSED-010	17-03-0175-10	BA9C01201303	2013	2-4	18.0 J	250	19.0 J	110	3.40 J	57	650	19.0 J	860	1,100	140
OA10	PVSED-011	17-03-0175-11	OA1001200901	2009	0-2	71	1,300	97	690	16.0 J	380	4,400	1,000	6,600	8,000	740
	PVSED-014	17-03-0175-14	OA1001201301	2013	0-2	78	1,400	81	560	13.0 J	280	3,400	230	4,600	6,000	650
	PVSED-012	17-03-0175-12	OA1001200905	2009	4-6	64	1,400	80	640	23.0 J	300	3,900	780	5,700	7,200	990
	PVSED-015	17-03-0175-15	OA1001201305	2013	4-6	150	3,500	210	1,300	120	660	6,900	1,300	10,000	14,000	1,400
	PVSED-013	17-03-0175-13	OA1001200907	2009	6-8	150	4,500	200	1,500	31.0 J	720	8,900	950	12,000	17,000	2,000
	PVSED-016	17-03-0175-16	OA1001201307	2013	6-8	420	12,000	460	3,300	130	1,500	15,000	1,400	22,000	34,000	7,300
OA11	PVSED-017	17-03-0175-17	OA1101200901	2009	0-2	110	2,400	150	1,500	32.0 J	500	9,400	1,400	13,000	15,000	1,700
	PVSED-019	17-03-0175-19	OA1101201301	2013	0-2	49	1,600	59	750	12.0 J	230	4,200	670	5,900	7,600	860
	PVSED-018	17-03-0175-18	OA1101200905	2009	4-6	44	1,100	80	720	17.0 J	400	4,500	350	6,100	7,200	700
	PVSED-020	17-03-0175-20	OA1101201305	2013	4-6	61	2,200	84	990	15.0 J	300	5,700	460	7,500	9,800	1,200

Abbreviations

cm - Centimeters

ug/kg = micrograms per kilogram = parts per billion

Notes

1. All results are in ug/kg.



Potential Causes

- **Laboratory Variability**
- **Target Reacquisition**
- **Site Heterogeneity**