

# Dioxin Strategy Update

RMP TRC

December 2011 meeting

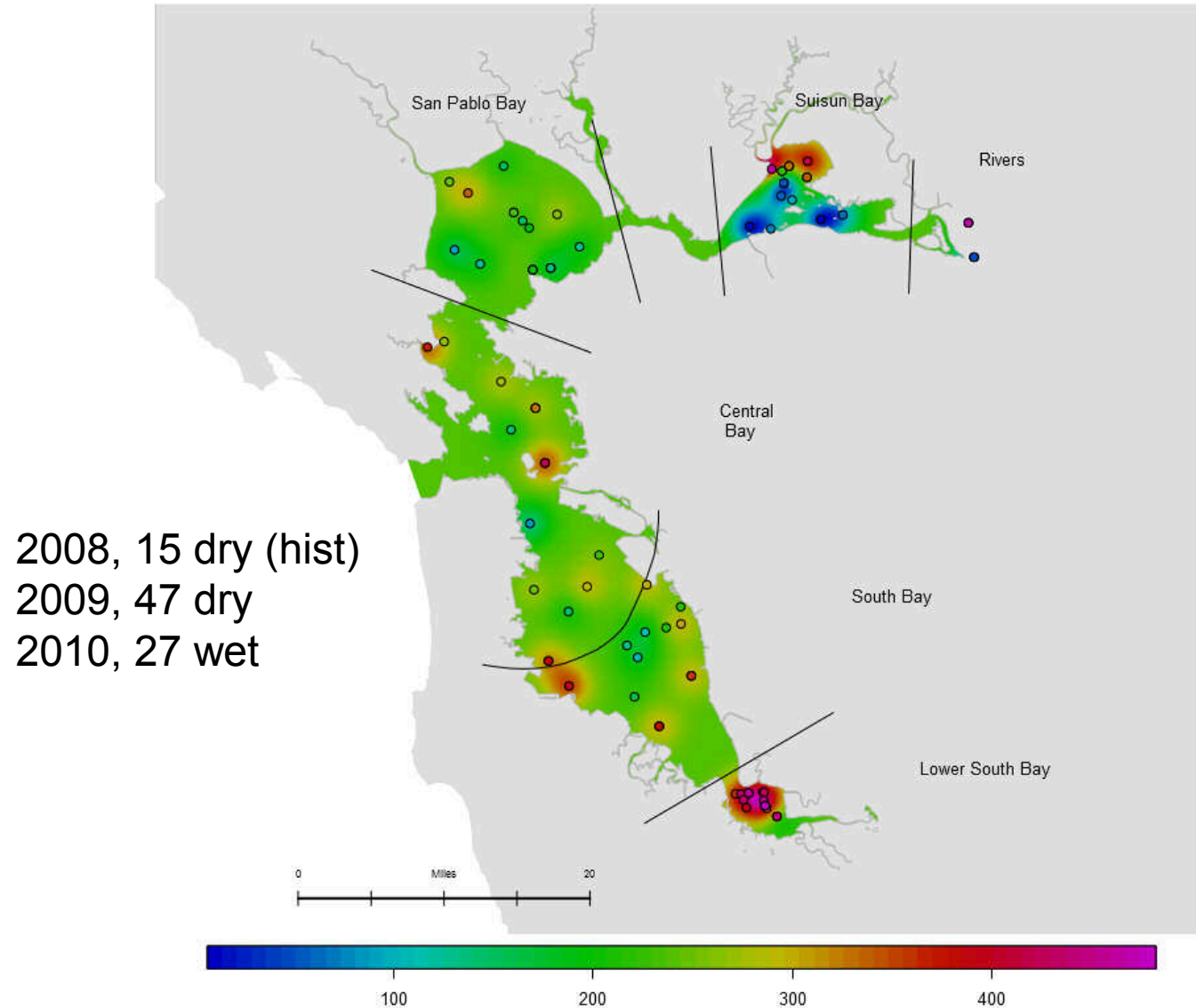
# Dioxin Strategy

- Overview of strategy
- Update of 2011 activities
- Plans for 2012

# RMP Mgmt Qs Template

1. Are the beneficial uses of San Francisco Bay impaired by dioxins?
2. What is the spatial pattern of dioxin impairment?
3. What is the dioxin reservoir in Bay sediments and water?
4. Have dioxin loadings/concentrations changed over time?
5. What is the relative contribution of each loading pathway as a source of dioxin impairment in the Bay?
6. What future impairment is predicted for dioxins in the Bay?

# Surface Sediments



# Budget & Timeline

## PLAN AND ESTIMATED COSTS FOR RMP DIOXIN WORK (updated October 2011)

Design Element	2008	2009	2010	2011	2012	2013	2014	Total by Element
Sport fish		\$22,000 (completed)			\$24,000			\$46,000
Bird eggs					\$12,500			\$12,500
Surface sediment	\$58,000	\$58,000 (completed)	\$58,000 (mix of 2008 & 2010 analyzed; completed)		\$31,500			\$147,500
In-Bay surface water		\$26,000 (completed)		\$26,000 (samples collected, sent to lab)				\$52,000
Sediment cores	\$57,000		\$57,000 (completed)					\$57,000
Trib loadings, Delta outflow			\$31,000 (Zone 4 Line A) \$34,000 (Delta outflow) \$34,000 (Guadalupe) (completed)		\$51,500			\$150,500
Atmospheric deposition			\$20,000 (draft report in review)					\$20,000
One-box model							\$20,000	\$20,000
Foodweb model							\$20,000	\$20,000
QAPP		\$13,500 (completed)						\$13,500
Data synthesis report						?	?	?
Total by Year	\$0	\$119,500	\$234,000	\$26,000	\$119,500	?	\$40,000	\$539,000

# Surface Sediment Summary

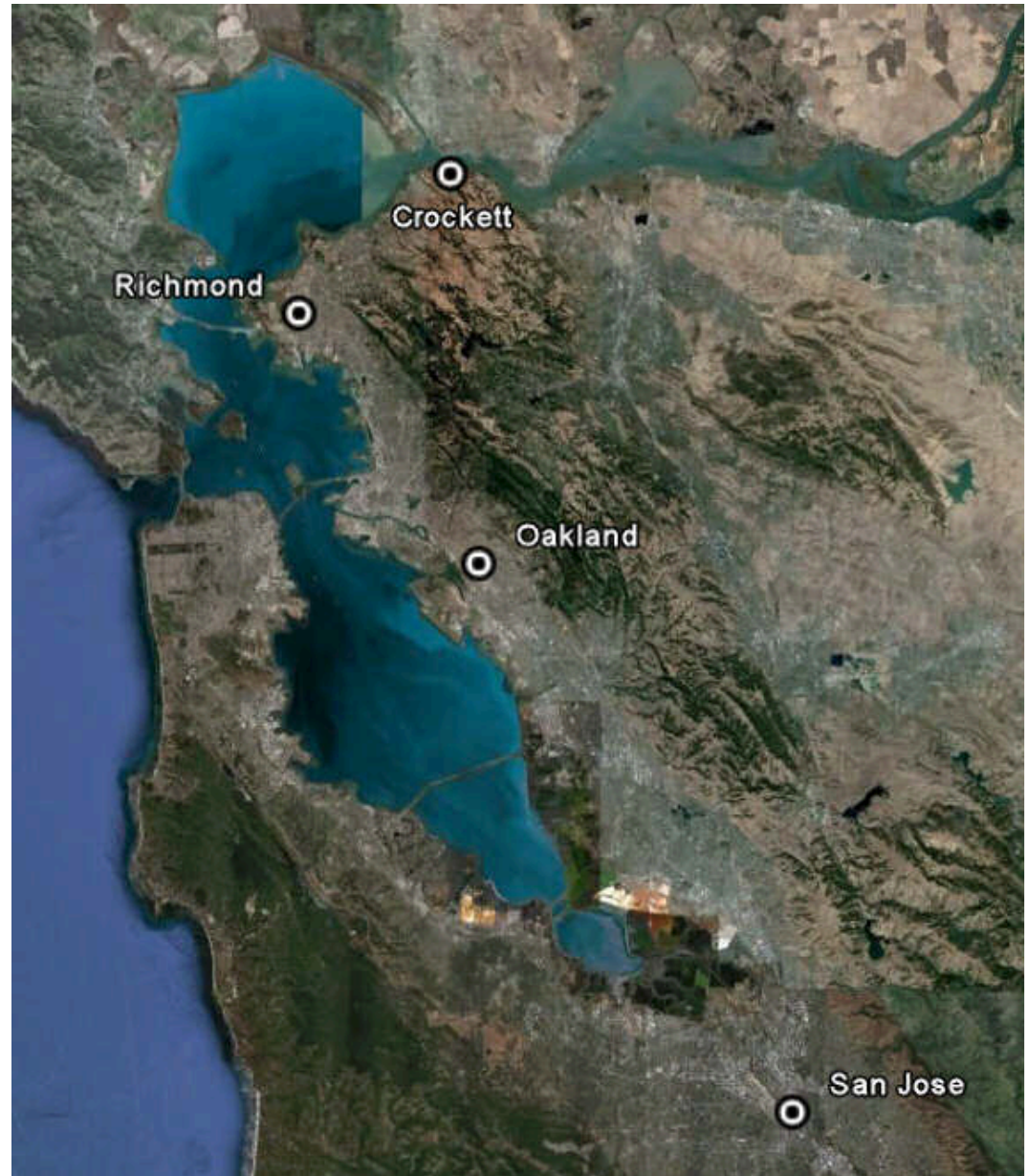
- Concentrations highest in South Bay, Lower South Bay
- No consistent seasonal concentration differences
- Congener profiles similar Bay-wide
- Not enough quantitative data for long-term trends

# Dioxins in Air

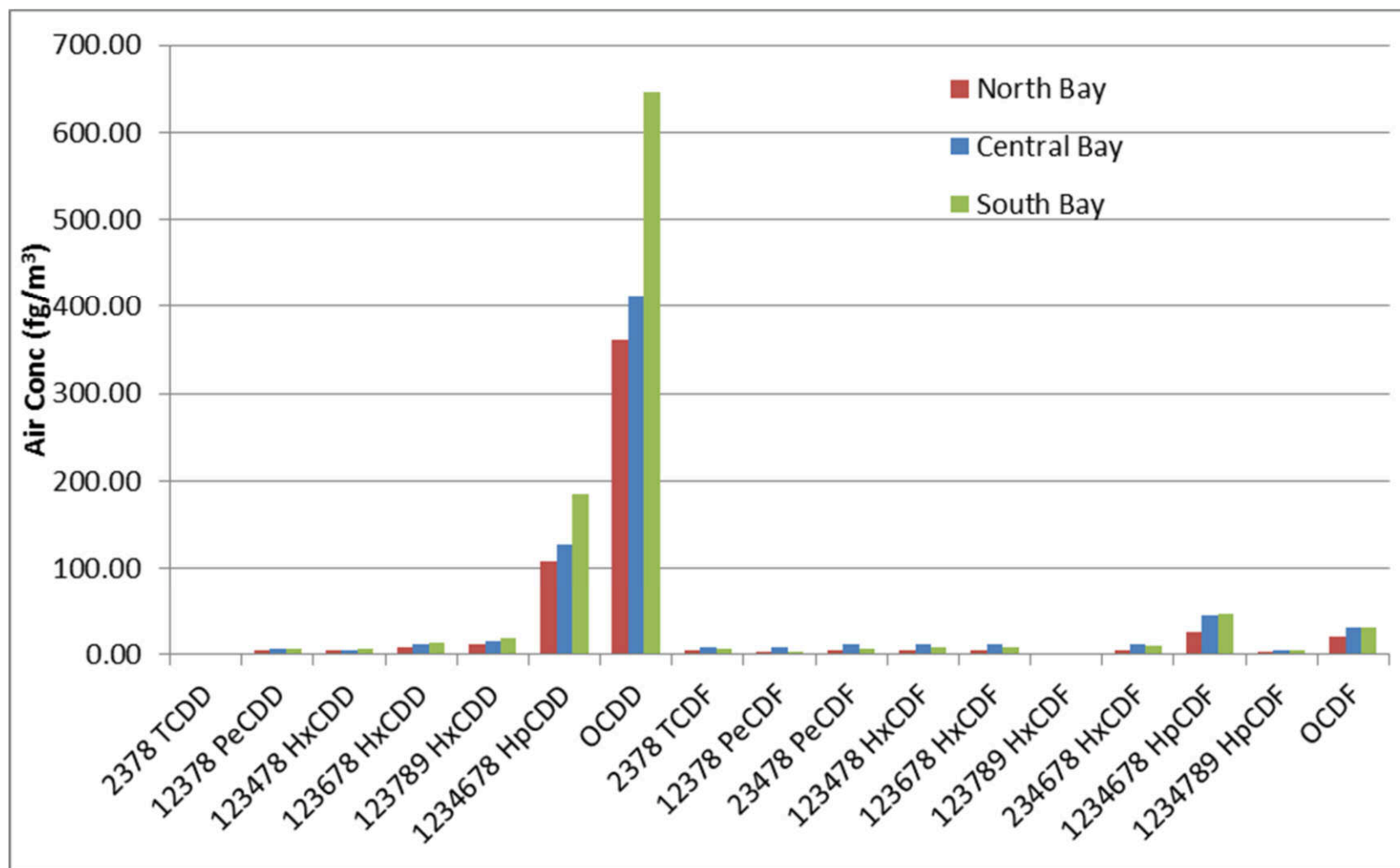
CARB, BAAQMD, &  
USEPA monitoring

Total air *concentrations*  
monthly December  
2001 to May 2006

Bay Area locations:  
Oakland, San Jose,  
Richmond, and Crockett



# Air Data Congener Profiles





# Net Loading

Net loading = particulate loading + gaseous loading  
- volatilization

$$L(\textit{net}) = L(\textit{p}) + L(\textit{g}) - V(\textit{g})$$

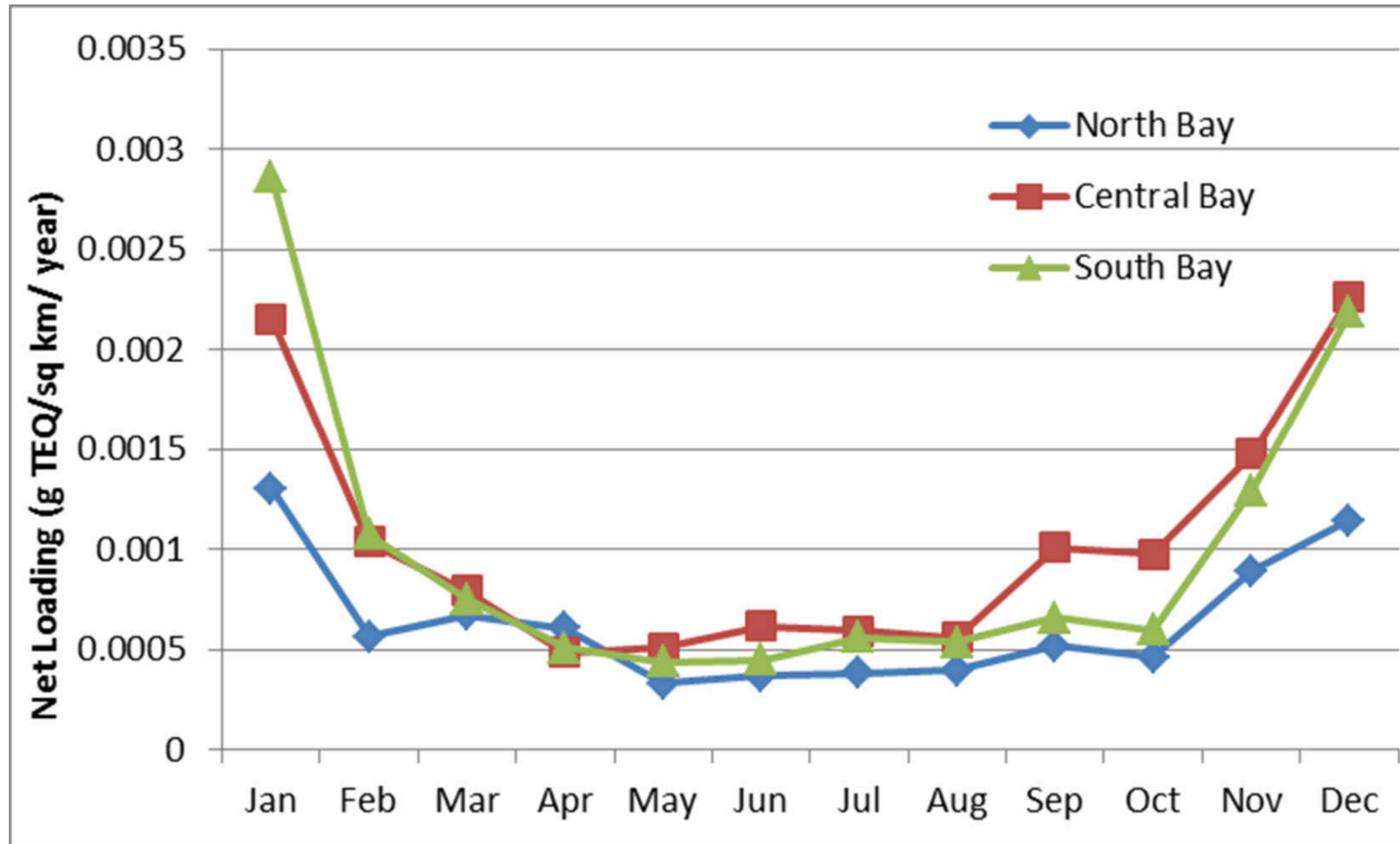
Calculated for

Each congener

Each month

Each segment of the Bay (North, Central and South)

# Seasonal and Spatial Variations



# Net Loading

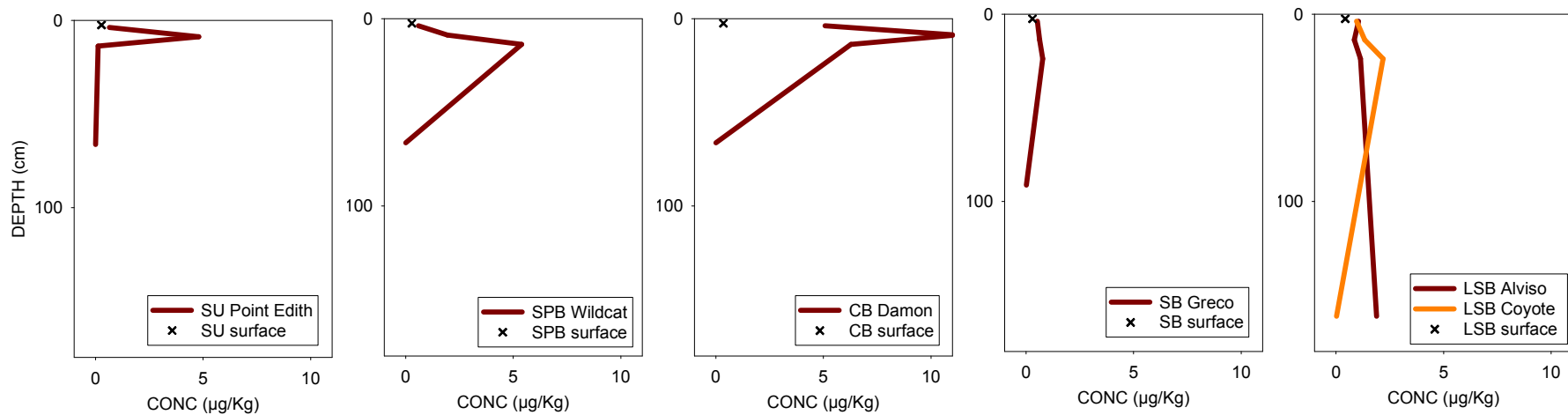
Congener	Net Loading (g/year)	2005 TEF weighted Net Loading (g/year)	1998 TEF and BEF sed weighted Net Loading (g/year)	2005 TEF and BEF water weighted Net Loading (g/year)
2378 TCDD	1.08	1.08	1.08	1.08
12378 PeCDD	3.74	3.74	3.37	4.23
123478 HxCDD	3.23	0.32	0.10	0.13
123678 HxCDD	7.23	0.72	0.07	0.12
123789 HxCDD	9.32	0.93	0.09	0.17
1234678 HpCDD	88.65	0.89	0.04	0.06
OCDD	303.29	0.09	0.00	0.00
2378 TCDF	5.43	0.54	0.43	0.26
12378 PeCDF	3.12	0.09	0.02	0.02
23478 PeCDF	5.29	1.59	2.54	2.52
123478 HxCDF	4.69	0.47	0.04	0.04
123678 HxCDF	4.76	0.48	0.10	0.11
123789 HxCDF	0.37	0.04	0.02	0.03
234678 HxCDF	5.15	0.51	0.36	0.43
1234678 HpCDF	23.86	0.24	0.00	0.00
1234789 HpCDF	2.31	0.02	0.01	0.01
OCDF	16.58	0.00	0.00	0.00
<b>TEQ</b>		<b>11.77</b>	<b>8.28</b>	<b>9.23</b>

# Core Objectives

- Distribution of dioxin inventory
  1. Is there a legacy pool (Bay cores)
  2. Risk to biota (humans)
  3. Loading trend (pre/post industrial) (wetland cores)

# PCDD/Fs in Wetland Cores

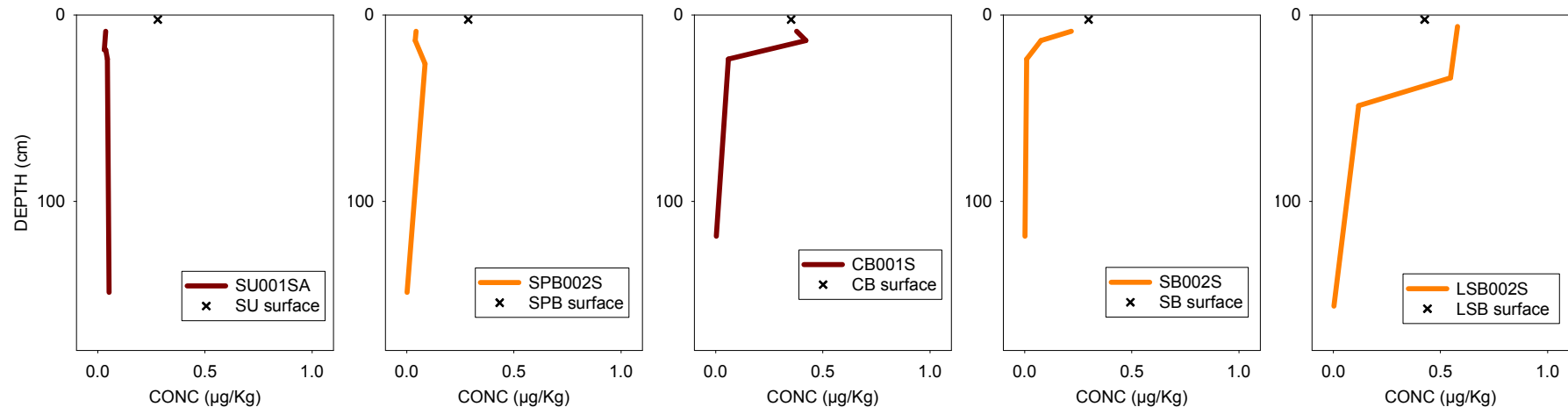
- PCDD/Fs in wetlands show past peaks



Concentrations in  $\mu\text{g/kg}$  fine sediment ( $<63\mu\text{m}$ )

# PCDD/Fs in Bay Cores

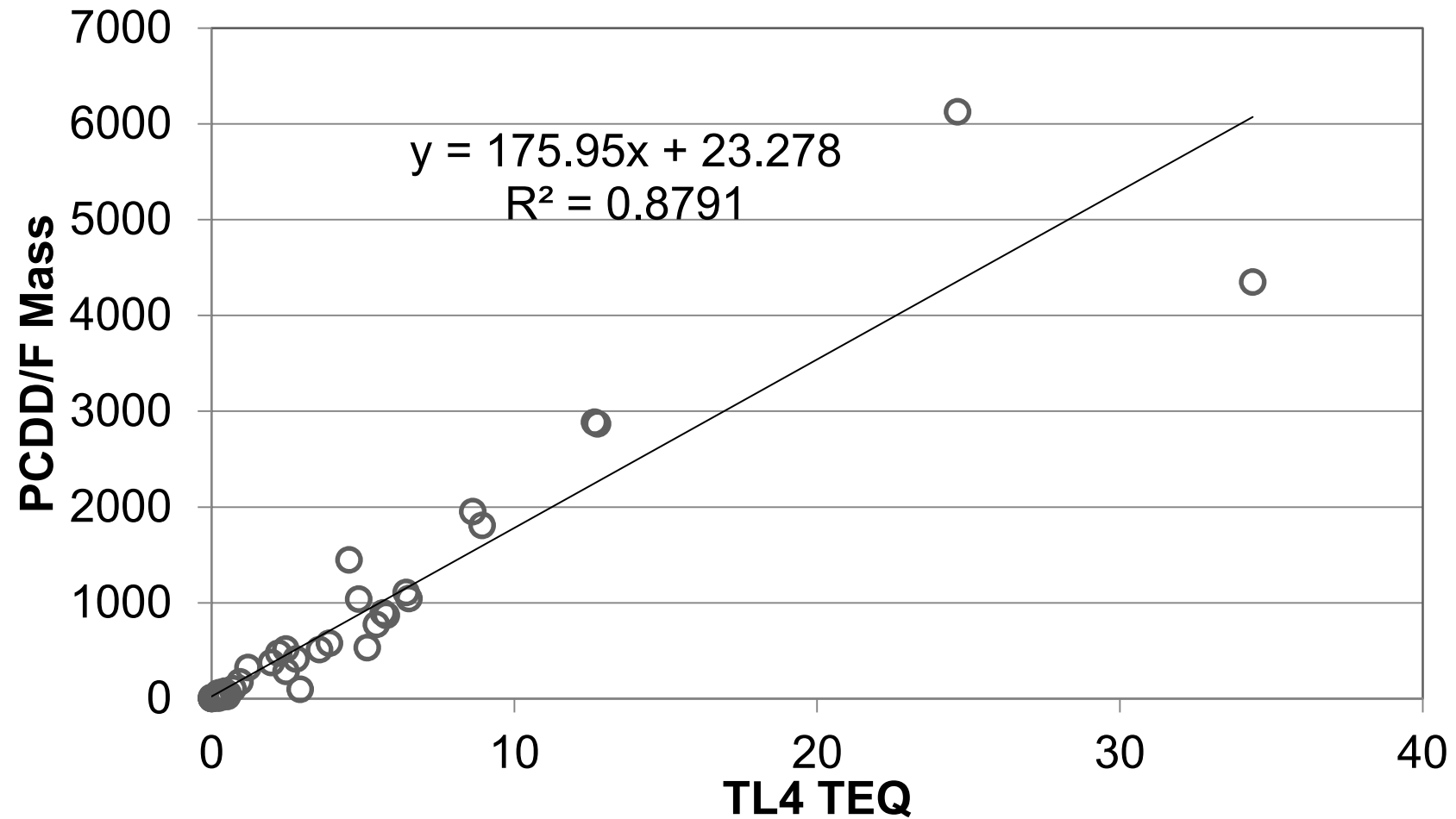
- PCDD/Fs in Bay slightly elevated near surface



Concentrations in  $\mu\text{g/kg}$  fine sediment ( $<63\mu\text{m}$ )

\*note scale 10x lower

# Ambient Toxicity $\propto$ Mass

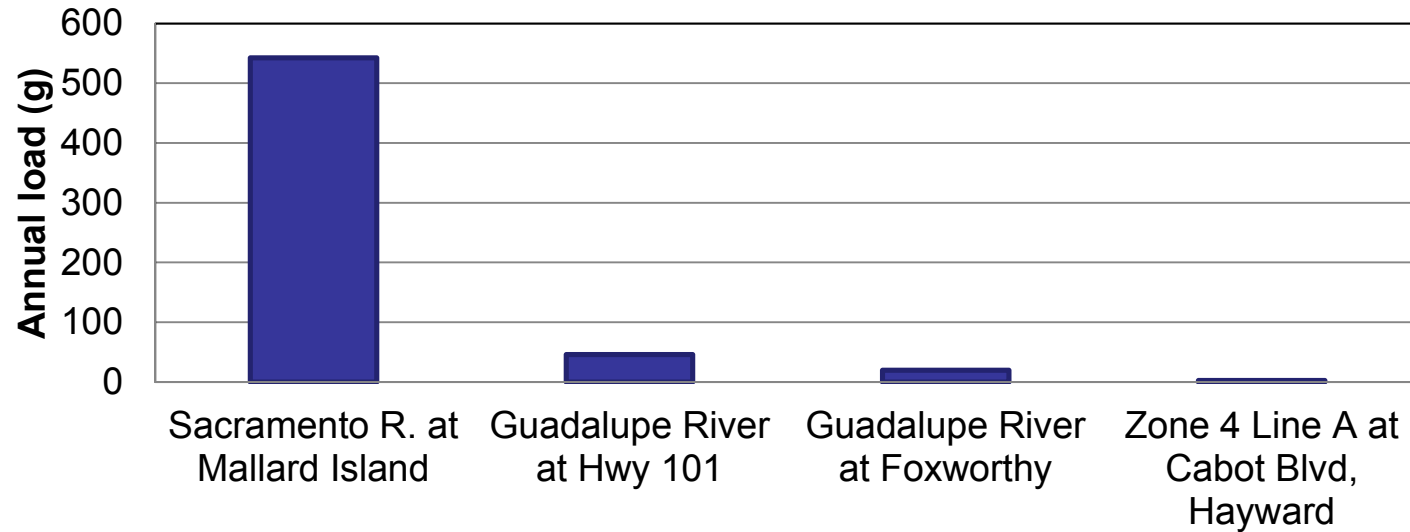


# Loads calculation methods

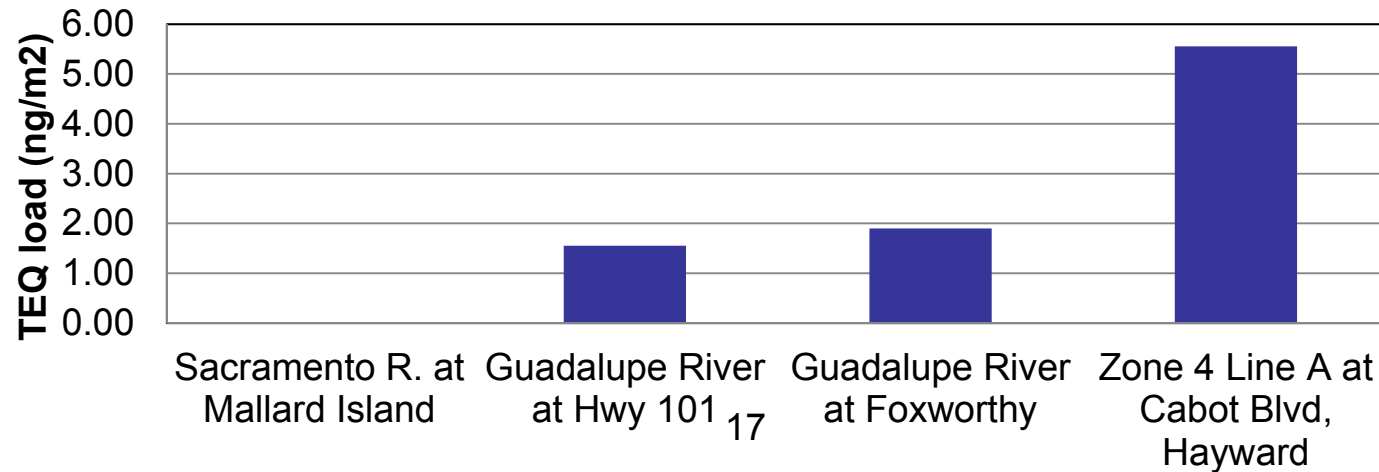
- Turbidity surrogate regression (15 min discharge and turbidity)
- Linear interpolation (Preferred method for contaminants)
- FWMC – when the preferred methods are not possible



# Summary Loads (preliminary)



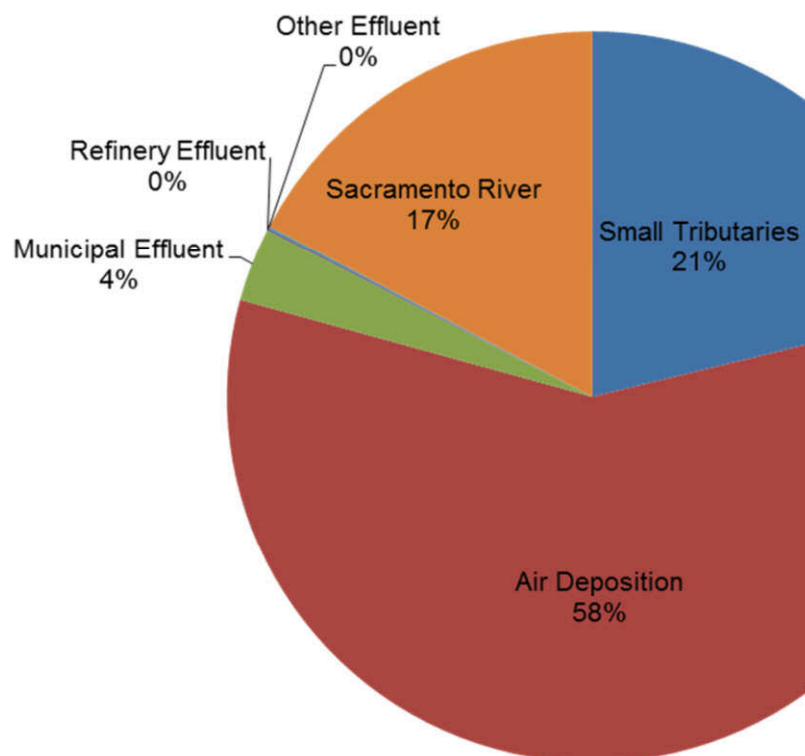
## WHO'05 TEQ load



# Up-scaled TEQ loads

Location	Annual Load (g)	WHO'05 TEQ load (g)	Annual Load (ng/m2)	WHO'05 TEQ load (ng/m2)	Land use	Area (sqkm)	Annual Load (g)	WHO'05 TEQ load (g)
Sacramento R. at Mallard Island	543		3.5					
Guadalupe River at Hwy 101	46	0.37	192	1.55	"Urban"	2,130	409	3.3
Guadalupe River at Foxworthy	20	0.150	251	1.90	"Open / Ag"	4147	1039	7.9
Zone 4 Line A at Cabot Blvd, Hayward	2.3	0.0250	513	5.6	"Industrial"	374	192	2.08
					Total	6,651	1,640	13.3

# 2011 Loading Estimates



	Gervason and Tang 1998	Connor et al. 2004	Current Best Estimate
Small Tributaries	5.1	5.1	3.7 - 4.3
Air Deposition	1.2	1.2	11.8 (4.73-43)
Municipal Effluent	0.13	0.67	0.67 (0.03-13)
Refinery Effluent	0.004	0.019	0.019 (0.0033-0.11)
Other Effluent	-	0.019	0.019 (0.0073-0.051)
Sacramento River	-	0.88	3.5
Total	6.4	7.9	21 (8.7-110)

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# Dioxin WG Recommendations

- More surface sediment may not be useful
  - Fairly similar between Bay sites already
  - Analyze more core samples instead
- Instead of separate reports on food web and mass balance modeling, combine in synthesis
  - Both sets of authors would eventually have to collaborate on synthesis
  - No reviewable interim product