Status and Trends for PCBs and Mercury in San Francisco Bay

Implications of the TMDL to Dredging

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Topics

- Background
  - —History of RMP sediment monitoring
  - —TMDLs and dredging
- TMDL and DMMO thresholds
- Changes in monitoring program

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Regional Monitoring Program (RMP)

- Started in 1993 as a collaborative effort between regulators and regulated community
- Collect water, sediment, and tissue samples from San Francisco Bay and its tributaries
- Provides water quality regulators and managers with information they need to manage the estuary effectively
- Oversight by steering committee and technical review committee

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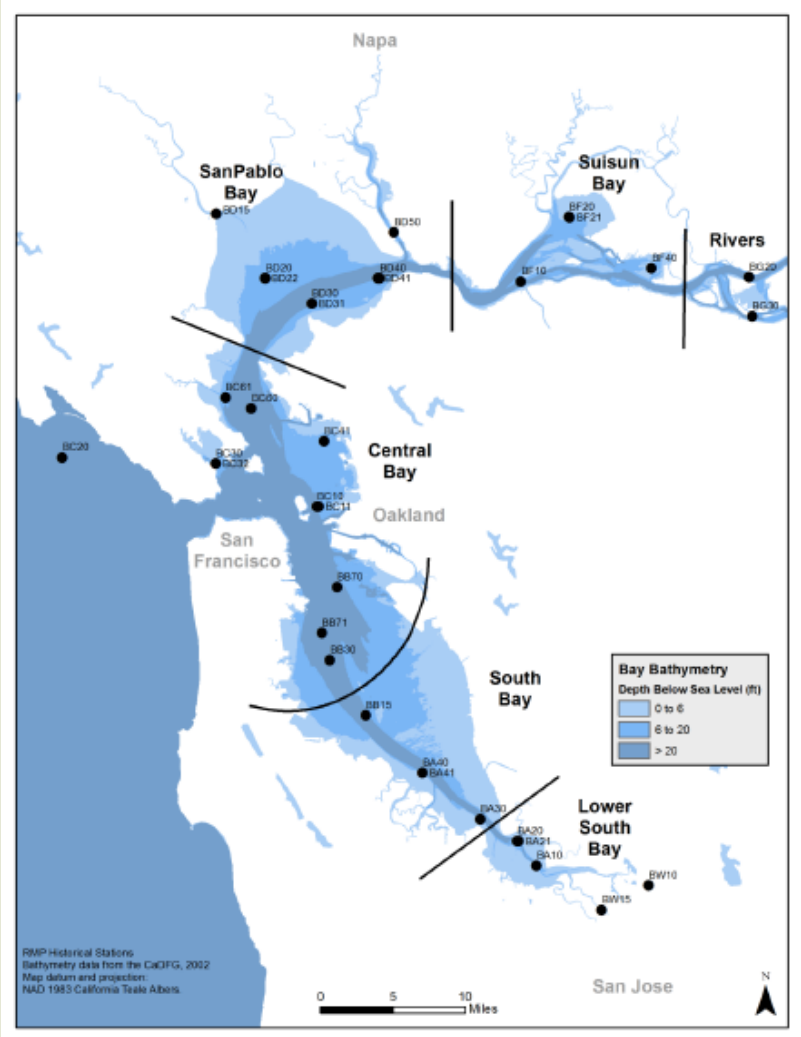
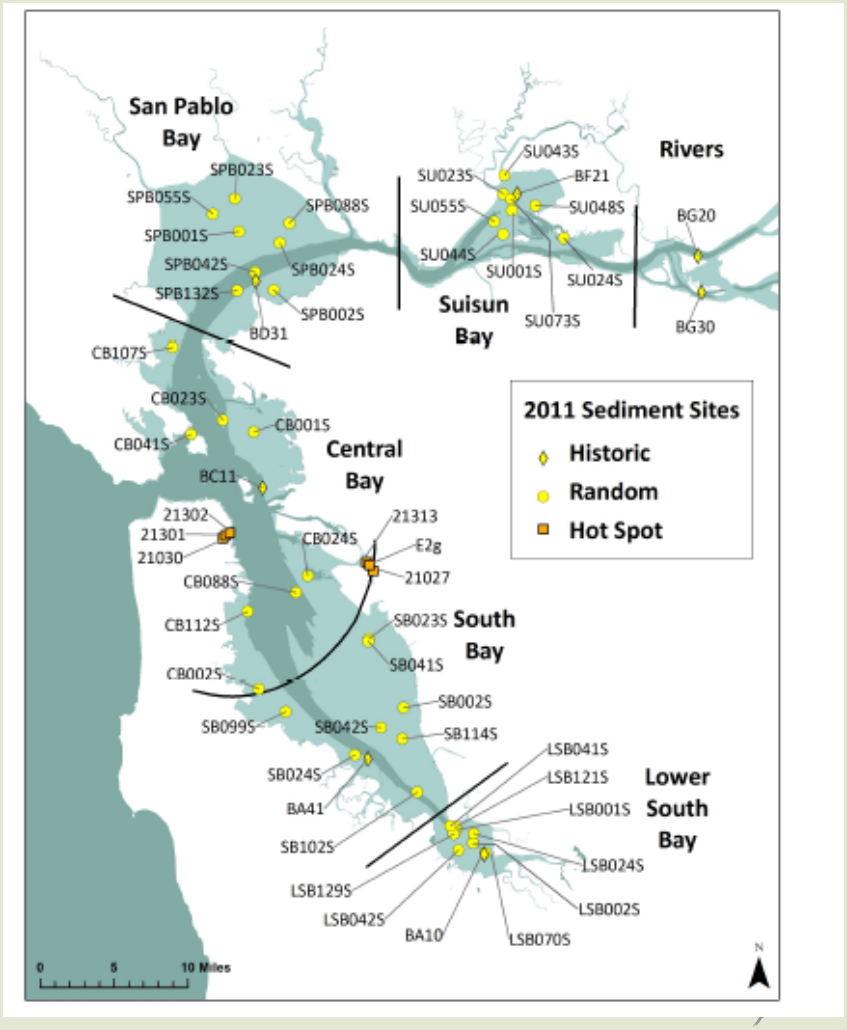
RMP Sediment Monitoring

Original Design: Fixed Stations



Redesign: Fixed & Random Stations



Dredging and TMDLs

- Dredging results in an overall net loss of PCBs and Hg from the Bay
- No load is allocated
- Sediments disposed of in Bay should have PCB & Hg concentrations no greater than that in ambient surface sediments in the Bay.
  - not to exceed the 99th percentile of total PCB and Hg concentrations of the previous 10 years of Bay surface sediment samples collected through the RMP

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http://www.sfei.org/content/dmmo-ambient-sediment-conditions

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Current Thresholds

Dredged Material Testing Thresholds Effective in Calendar Year 2014

	Mercury[a] (mg/kg dw)	Total PCBs (µg/kg dw)	Total PAHs (µg/kg dw)	Total DDTs (µg/kg dw)	Total Chlordane (µg/kg dw)	Dieldrin (µg/kg dw)	Dioxins/ Furans (pg/g dw)
Bioaccumulation Trigger	0.33	18	4,500	50	37	1.9	10
TMDL Limit	0.470	29.6	--	--	--	--	--
Basis	b	b	b	c	c	d	e

a. DMMO no longer requires bioaccumulation testing for mercury above the BT. See Amendment to EFH consultation.
b. Threshold based on San Francisco Bay ambient sediment concentrations, as describe further below.
c. Published bioaccumulation trigger for Puget Sound marine sediments.
d. Published marine SL value from the Pacific Northwest Sediment Evaluation Framework.
e. Toxicity Equivalency Quotient (TEQ) based on WHO 1998 Toxicity Equivalency Factors (TEFs). Value is consistent with the published Puget Sound limit for unconfined aquatic disposal, and is ½ the established limit for placement at the Hamilton Wetlands Restoration Project site.

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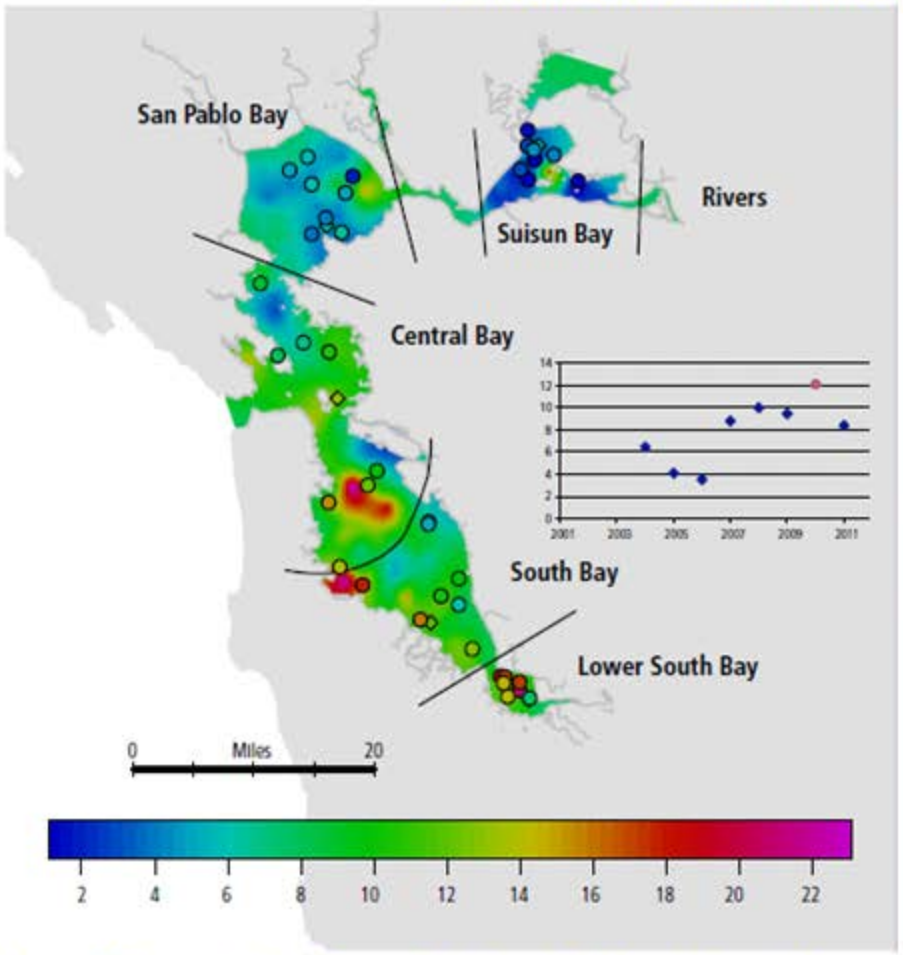
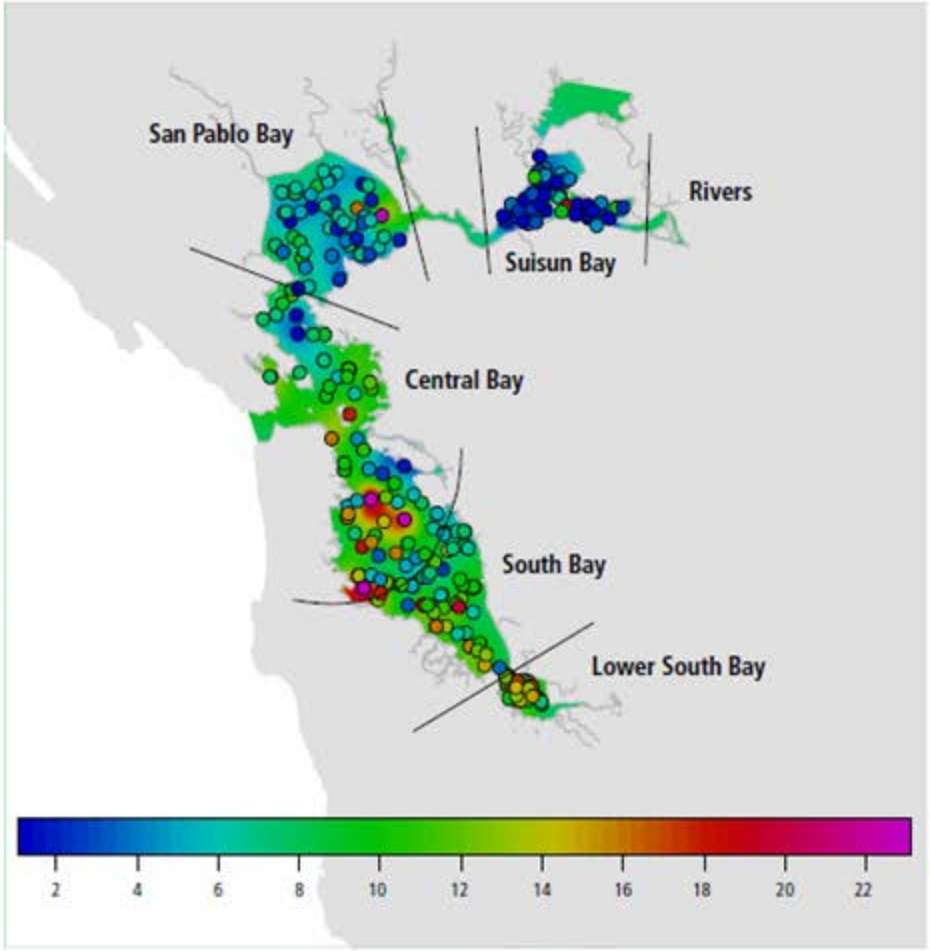
Status and Trends

Sum of PCBs in Sediment (ppb)



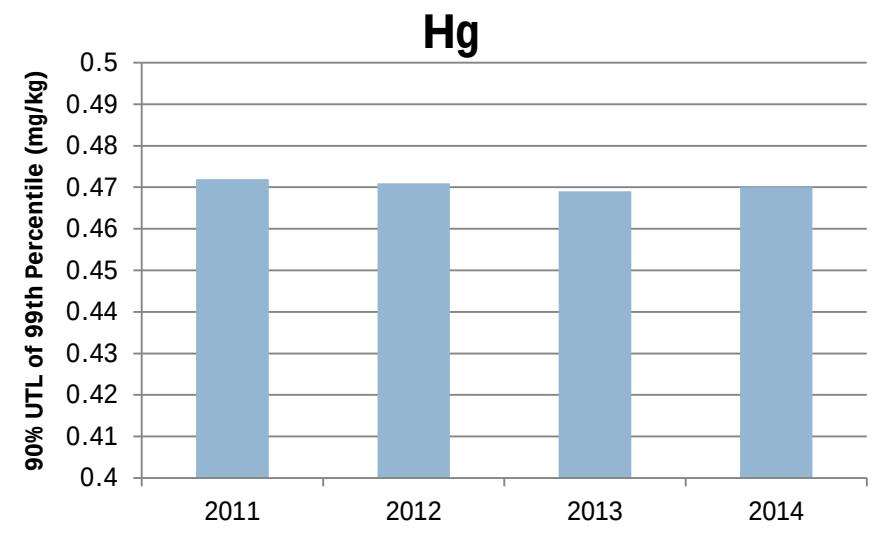


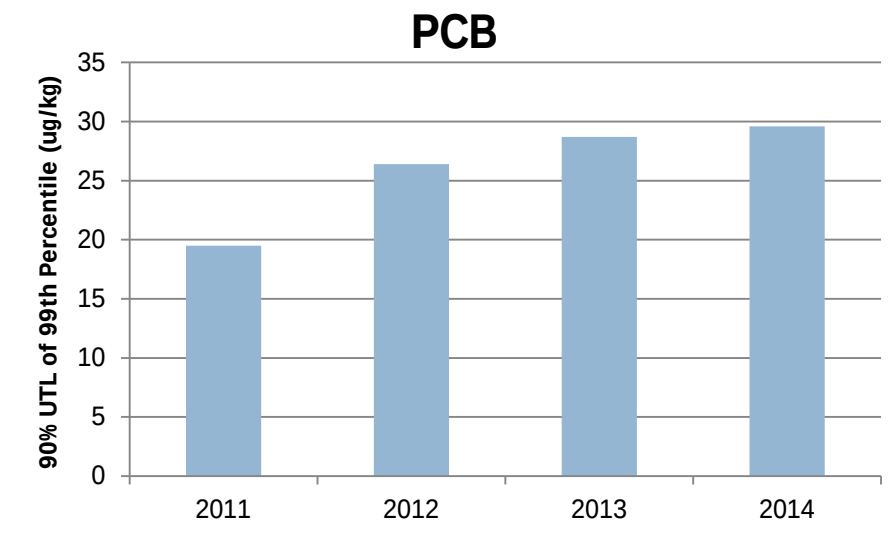
Average PCB concentrations in Bay sediment have been highest in the southern reach of the Estuary: Lower South Bay (10.7 ppb), South Bay (8.6 ppb), and Central Bay (9.0 ppb). Average concentrations have been lower in San Pablo Bay (4.7 ppb) and Suisun Bay (2.4 ppb). The Bay-wide average for 2011 was 8.4 ppb, higher than the overall long-term average of 7.2 ppb. Models suggest that sediment PCB concentrations must decline to about 1 ppb for concentrations in sport fish to fall below the threshold of concern for human health. Suisun Bay dipped below this value in 2006 (0.8 ppb), but averaged 2.0 ppb in 2011.

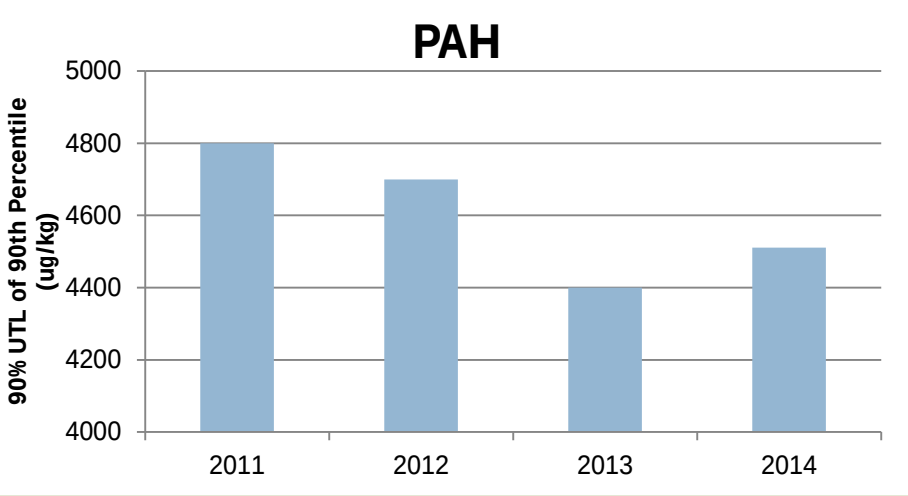
Footnote: Contour plot based on 329 RMP data points over nine rounds of dry season sampling from 2002-2011 (data from a wet season sampling in 2010 are excluded). The maximum concentration was 30 ppb in South Bay in 2008. Colored symbols on map show results for samples collected in 2011. Circles represent random sites. Diamonds represent historic fixed stations. Trend plot shows annual Bay-wide averages. Red circle on trend plot indicates a wet season sample; other samples were dry season. Concentrations presented on a dry weight basis.

PCB concentration map, showing all of the individual data points

Trends in TMDL/DMMO Limits







- **34% increase for PCBs and 6% decrease for PAHs from 2011 to 2014**
- **Hg concentrations stable**

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Change in Sampling Frequency

Program	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Water										
Ancilliary, Cu, CN, Se, MeHg		X		X		X		X		X
Aquatic Toxicity		X		X		X		X		X
PCB, PAHs, Pesticides										X
CTR parameters (metals, cyanide, VOC, SVOC, PAH, PCB, pestides, dioxin)		X								X
Sediment										
TOC, N, % Solids, Grain Size	X				X				X	
Hg	X				X				X	
MeHg	X				X				X	
Al, As, Cd, Cu, Fe, Pb, Mn, Ni, Se, Ag, Zn	X				X				X	
PAHs	X				X				X	
209 PCBs	X				X				X	
Pesticides	X				X				X	
PBDEs	X				X					
Toxicity					X				X	
Benthos									X	

27 stations for sediment, 2014 - 2023

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Summary

- Thresholds vary each year
  - Material acceptable one year may be unacceptable the next due to changes in 10-year averages
  - PCBs currently increasing, but management actions are intended to lower concentrations over time
  - Future TMDLs (Se, PAHs)
- Change in testing frequency
  - Effect is unknown
  - Fewer data points; introduces some uncertainty
- Should testing frequency be reconsidered?
- Should averaging period be reconsidered?

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