

Background Studies for TMDL Evaluation -Mouths of Chollas Creek and Paleta Creek

SPAWAR



Systems Center
San Diego



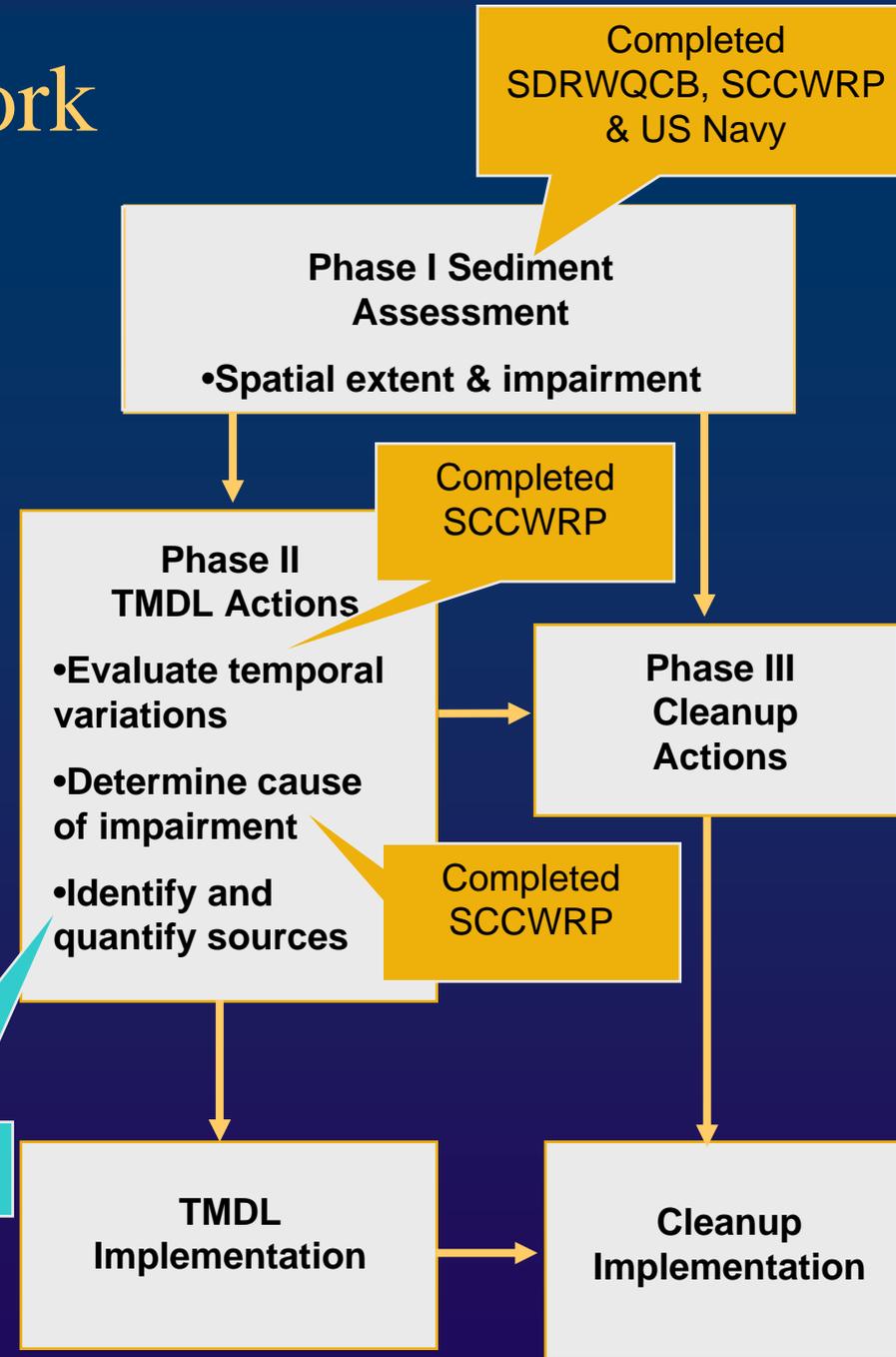
US Navy Presentation

11 October 2005

Program Framework

- ◆ Comprehensive program integrates requirements for:
 - THS clean up
 - TMDL source control
- ◆ Program phases allow implementation of source control while clean up requirements are determined

Current Effort





Presentation Outline

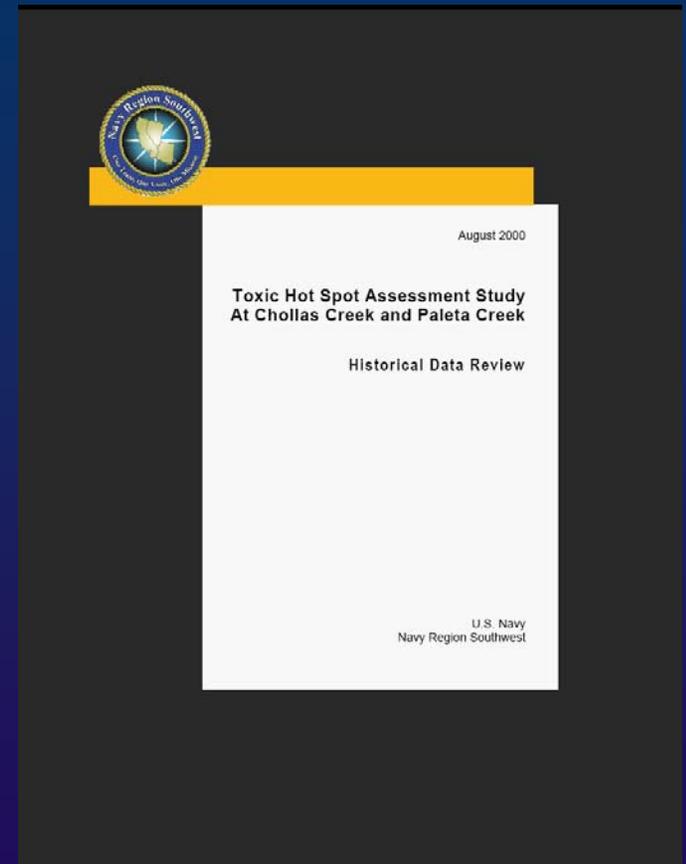
- ◆ Navy Historical Data Review
- ◆ Phase I Sediment Assessment at the Mouths of Chollas Creek and Paleta Creek
- ◆ Navy Storm Water Studies
- ◆ Other Relevant Navy Studies

Sediment Assessment at the Mouths of Chollas Creek and Paleta Creek:

Historical Data Review

US Navy

Final: August 2000





Historical Review Objectives

- ◆ Determine the extent of measurement data already available for the two sites.
- ◆ Determine if the findings of the BPTCP study are consistent with other studies in the area
- ◆ Determine if sufficient data are available to evaluate spatial and temporal trends
- ◆ Identify contaminants of Potential concern (CoPCs) for the two areas
- ◆ Determine if continuing sources of CoPCs are present at the sites
- ◆ Identify the type and quantity of additional data to complete the assessment of the sites and sources



Historical Review Scope

- ◆ Only utilize data from the last ten years
- ◆ Only utilize data within the identified THS strata
- ◆ Exclude data at stations that had been dredged subsequent to the sampling date
- ◆ Only evaluate data for chemicals that were included in the BPTCP study
- ◆ Only evaluate sources thought to have direct impact on THS site sediments

Historical Review Summary of Findings

◆ Chollas Creek

- A range of chemicals identified at slightly elevated levels relative to SQGs
- Chlordane highly elevated relative to SQGs
- Insufficient data to characterized spatial and temporal variability
- Insufficient data to characterize sources of several CoPCs

	CoC								
	Cu	Hg	Pb	Sb	Zn	PAH	PCB	DDT	Chlordane
Sediment Analysis:	↑	-	↑	↑	↑	↑	↑	↑	↑↑↑
Source Analysis:	Ongoing	Trace ¹	Ongoing	Trace ^{1,2}	Ongoing	Susp ^{1,2}	Susp ^{1,2}	Trace ^{1,2}	Susp ^{1,2}
Data Gaps:	<p>Sb, PAH, PCB and pesticide characterization at low ppt levels for City and Navy stormwater programs</p> <p>Sediment data insufficient to characterize spatial or temporal variability</p>								
Notes:	<p>↑ = slightly elevated >ambient, but < ERM ↑↑ = elevated > ERM, but < 4x ERM ↑↑↑ = highly elevated >4x ERM</p> <p>¹ = method detection limit too high to accurately estimate potential load ² = CoC with no monitoring data available</p> <p>Ongoing = current source of CoC to THS Trace = trace amount, most likely insignificant loading</p>								

Historical Review Summary of Findings

◆ Paleta Creek

- A range of chemicals identified at slightly elevated levels relative to SQGs
- Chlordane highly elevated relative to SQGs
- Insufficient data to characterized spatial and temporal variability
- Insufficient data to characterize sources of several CoPCs

	CoC								
	Cu	Hg	Pb	Sb	Zn	PAH	PCB	DDT	Chlordane
Sediment Analysis:	-	↑	↑	-	↑	↑	↑↑	↑↑	↑↑↑
Source Analysis:	Ongoing	Trace ¹	Ongoing	Susp ²	Ongoing	Ns	Ns	Ns	Ns
Data Gaps:	<p>Sb, PAH, PCB and pesticide characterization at low ppt levels for City and Navy stormwater programs</p> <p>Sediment data insufficient to characterize spatial or temporal variability</p>								
Notes:	<p>↑ = slightly elevated >ambient, but < ERM ↑↑ = elevated > ERM, but < 4x ERM ↑↑↑ = highly elevated >4x ERM</p> <p>¹ = method detection limit too high to accurately estimate potential load ² = CoC with no monitoring data available</p> <p>Ongoing = current source of CoC to THS Trace = trace amount, most likely insignificant loading Susp = suspect assessment, no monitoring data Ns = not significant load</p>								



Sediment Assessment at the Mouths of Chollas Creek and Paleta Creek:

Phase I Assessment

SCCWRP, US Navy

Final: May 2005

SEDIMENT ASSESSMENT STUDY FOR THE MOUTHS OF CHOLLAS AND
PALETA CREEK, SAN DIEGO

PHASE I FINAL REPORT

Prepared by:

Southern California Coastal Water Research Project
Westminster, CA

and

Space and Naval Warfare Systems Center San Diego, U.S. Navy
San Diego, CA

May 2005

A joint study funded by:

San Diego Regional Water Quality Control Board
Commander Navy Region Southwest
City of San Diego

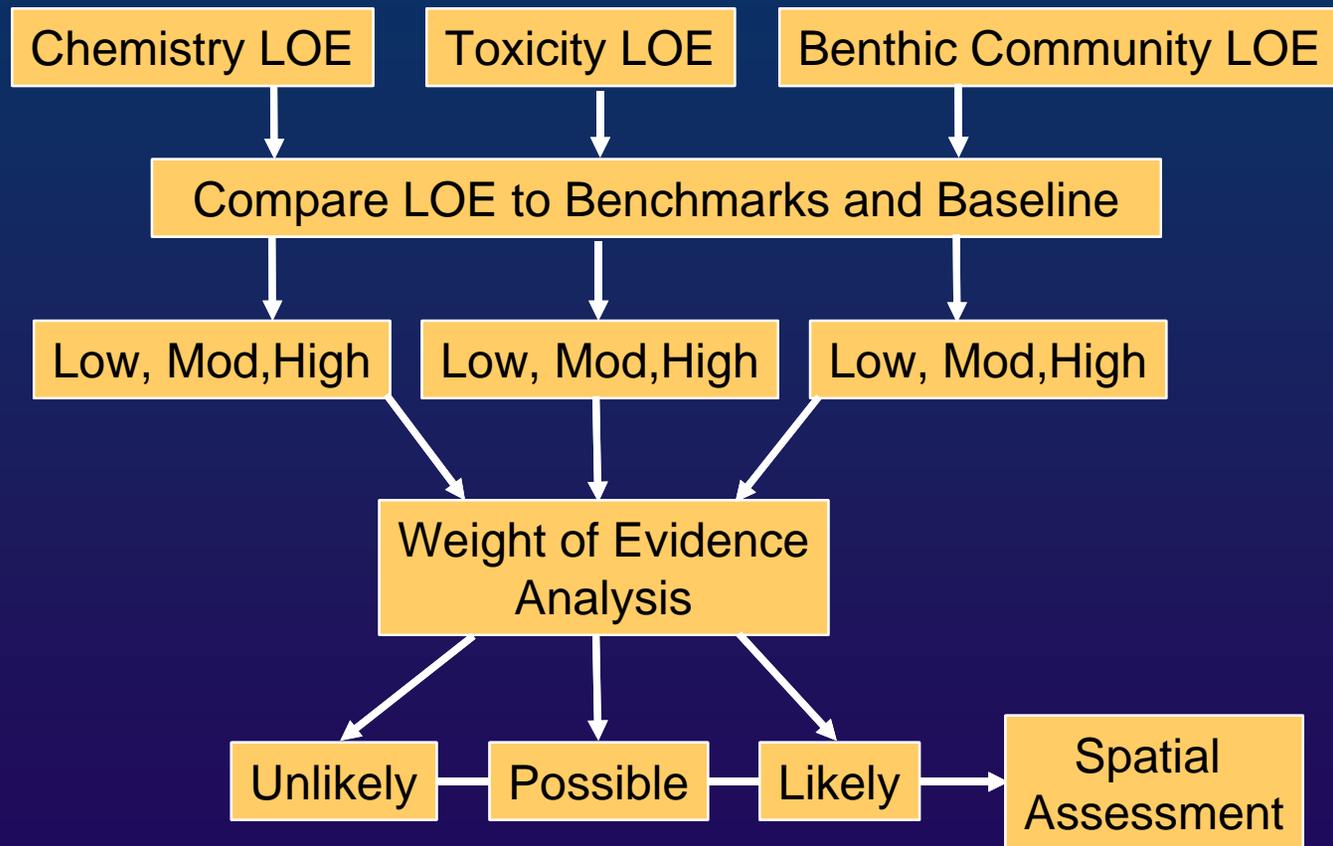


Phase I Study Objectives

- ◆ Spatial distribution and magnitude of sediment contamination
- ◆ Assessment of beneficial use impairment:
 - Aquatic Life Beneficial Use – Weight of evidence (triad) approach (sediment contaminant chemistry, toxicity, and benthic community composition)
 - Wildlife Beneficial Use – Ecological risk screening using contaminant bioaccumulation data for clams
 - Human Health Beneficial Use – Human health risk screening using contaminant bioaccumulation data for clams

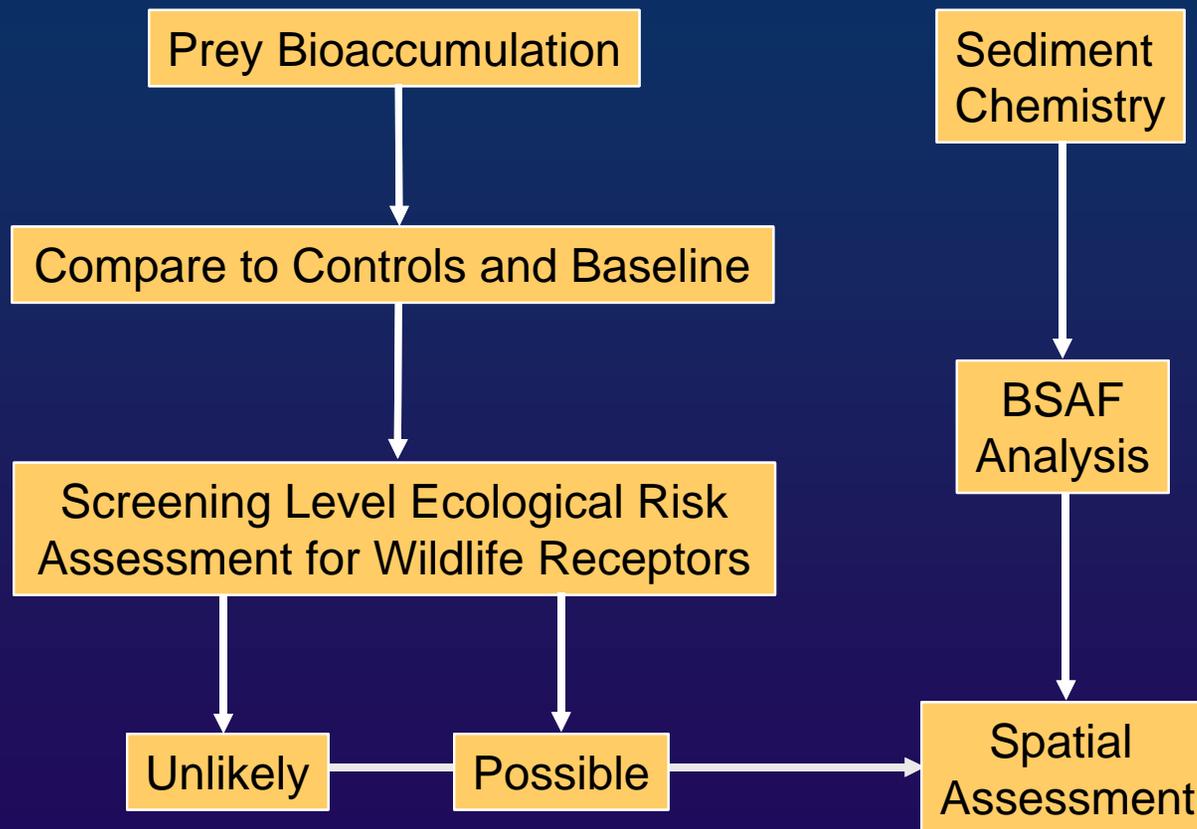
Assessment Framework - Aquatic Life Beneficial Use

- ◆ Primary focus of the sediment assessment
- ◆ Weight of evidence approach



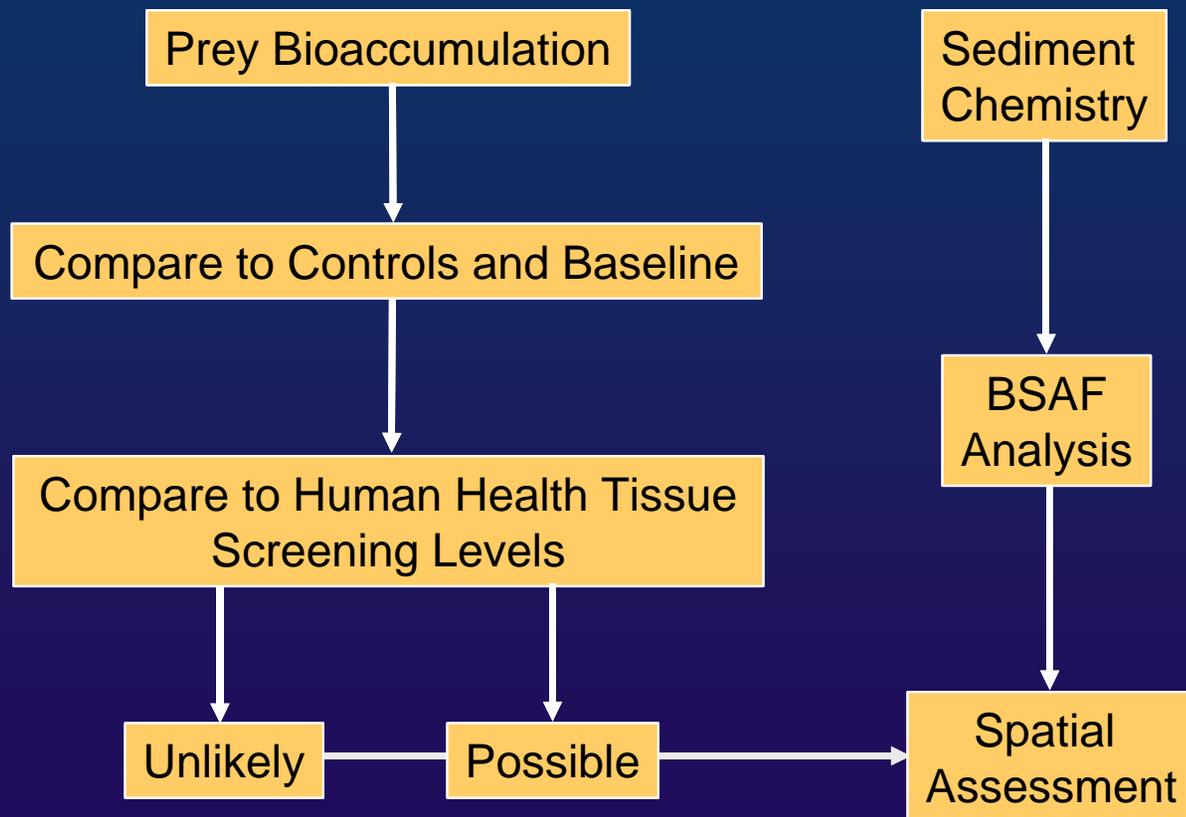
Assessment Framework - Aquatic Dependent Wildlife Beneficial Use

- ◆ Screening level assessment
- ◆ Aquatic-dependent birds and mammals



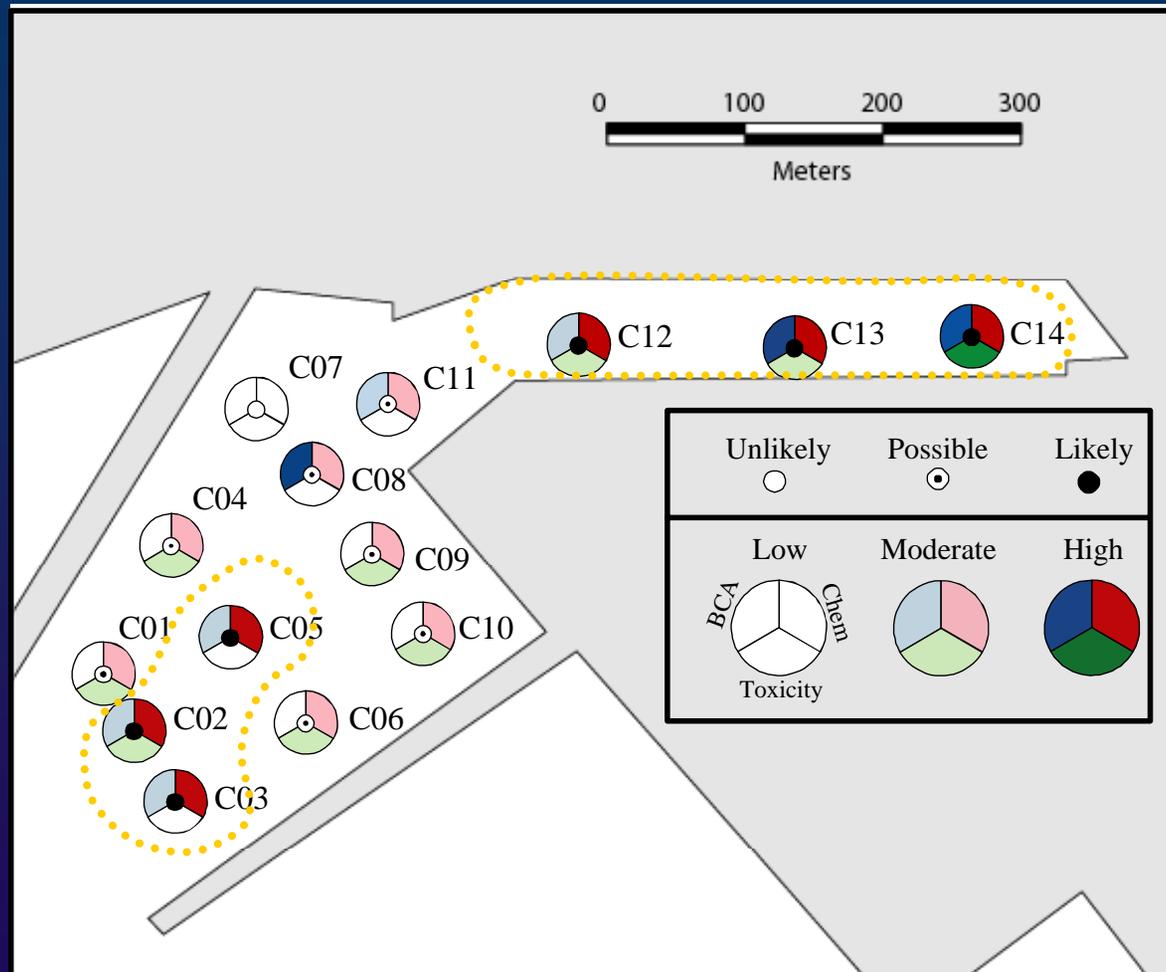
Assessment Framework - Human Health Beneficial Use

- ◆ Screening level assessment
- ◆ Conservative exposure scenarios



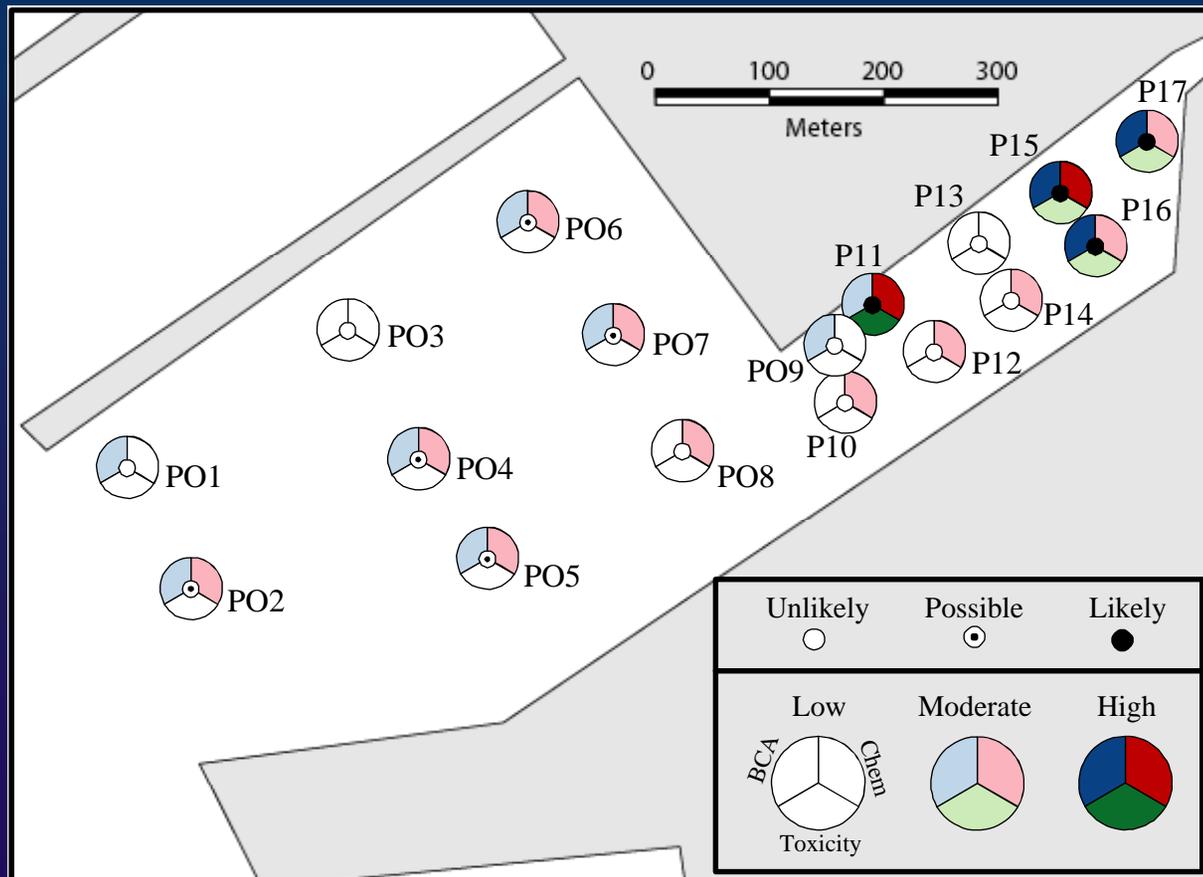
Aquatic Life WOE Results - Chollas

- ◆ Likely impairment in two clustered areas
- ◆ Possible impairment in other areas
- ◆ Overall impairment gradient toward creek and bay



Aquatic Life WOE Results - Paleta

- ◆ Likely impairment in inner creek mouth
- ◆ Unlikely to possible impairment in other areas
- ◆ Overall impairment gradient toward creek



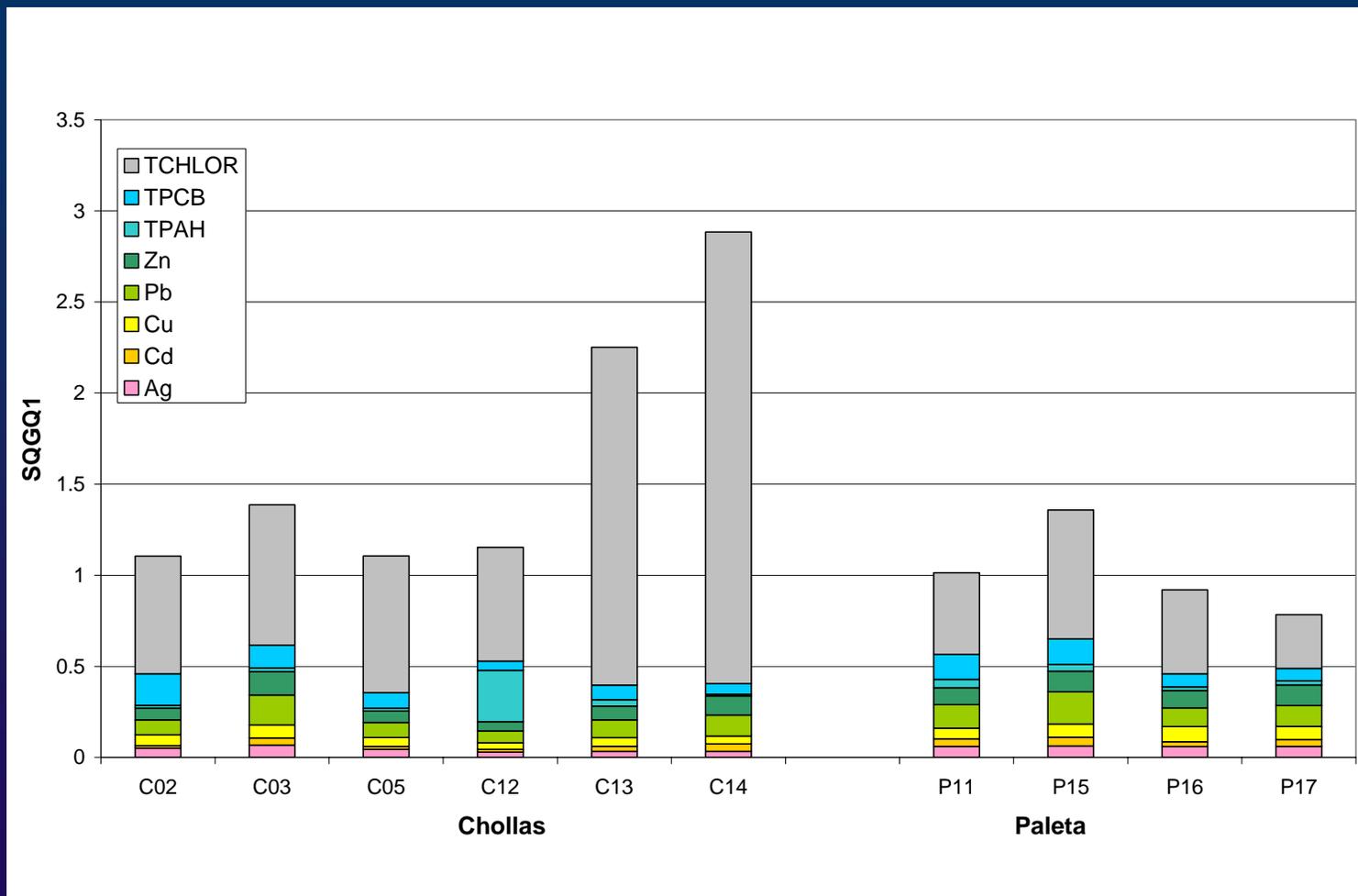


Identification of CoPCs from Phase I

- ◆ Comparison of CoPC levels at likely stations with unlikely and possibly impaired stations
- ◆ Exceedance of SQGs
- ◆ Correlation between chemistry and toxicity
- ◆ Exceedance of screening level aquatic-dependent wildlife risk thresholds
- ◆ Exceedance of screening level human health risk thresholds

Identification of CoPCs from Phase I

◆ Example - CoPC contribution to SQGQ1



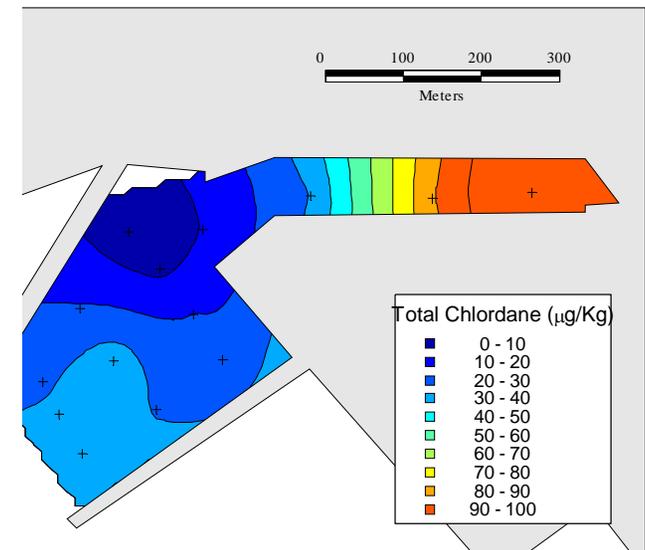
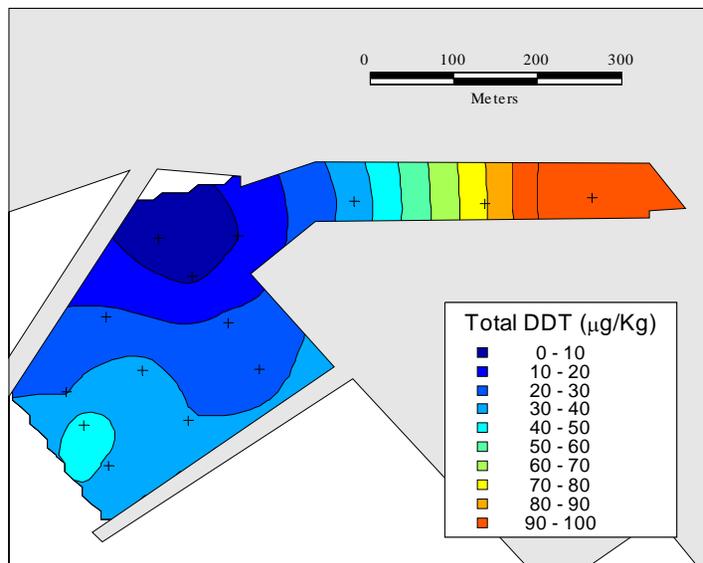


Mouth Of Chollas Creek CoPCs

- ◆ Aquatic Life Impairment:
 - PAH, PCB, Chlordane, and DDT
- ◆ Possible Aquatic-Dependent Wildlife Impairment:
 - Copper
- ◆ Possible Human Health Impairment:
 - Benzo[a]pyrene (PAH), PCBs

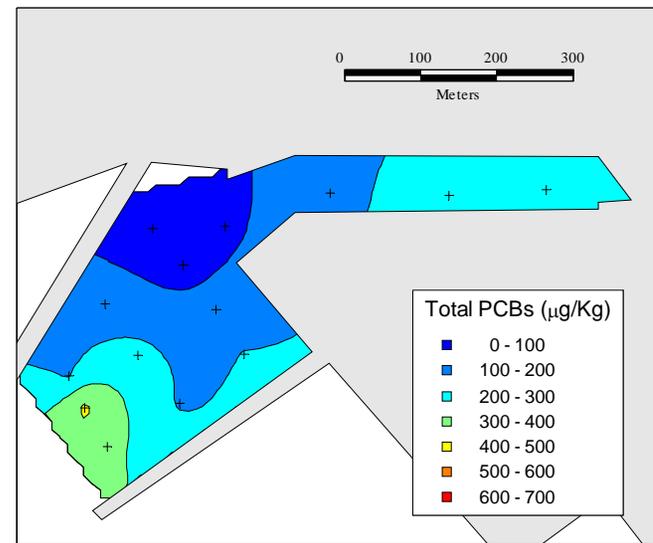
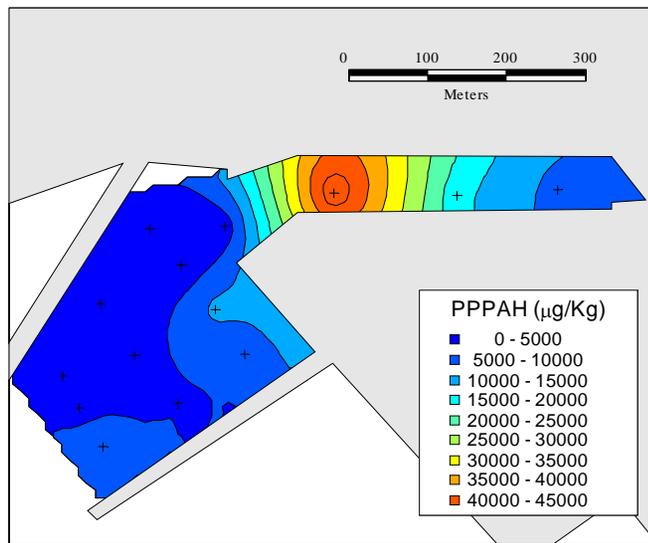
Spatial Distributions – Chollas CoPCs

- ◆ Chlordane and DDT distributions highly correlated
- ◆ Strong gradient toward creek
- ◆ Secondary gradient toward bay
- ◆ Consistent with pattern of overall impairment to aquatic life
- ◆ Potential influence of engine test area



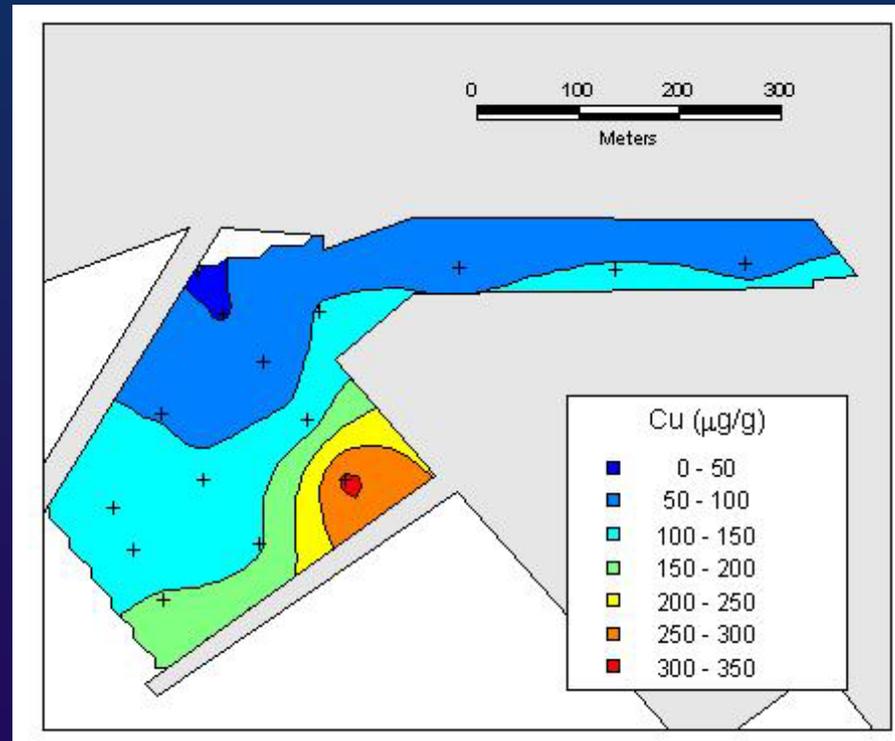
Spatial Distributions – Chollas CoPCs

- ◆ PAH distribution dominated by high concentration in inner creek
- ◆ Gradient toward creek but potential localized source
- ◆ PCB distribution similar to Chlordane but stronger gradient toward bay
- ◆ Potential influence of engine test area



Spatial Distributions – Chollas CoPCs

- ◆ Copper distribution dominated by higher concentrations in outer creek
- ◆ Gradient toward bay and pier areas
- ◆ Potential influence of engine test area
- ◆ Screening level ecorisk assessment only



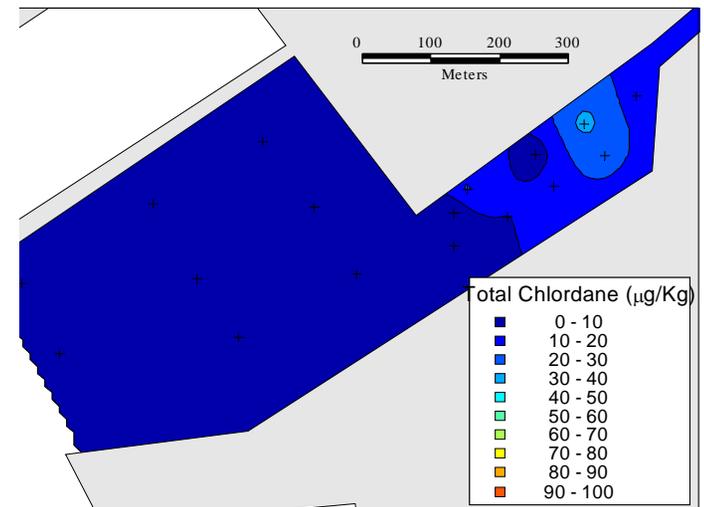
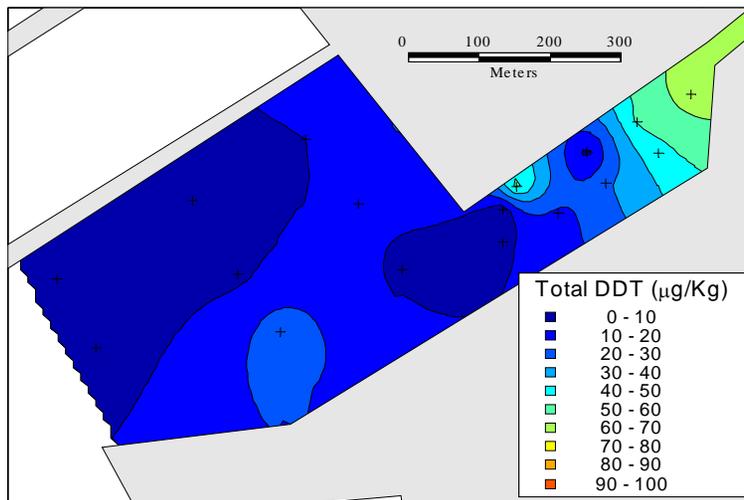


Mouth of Paleta Creek CoPCs

- ◆ Aquatic Life Impairment:
 - Lead, PAH, PCB, Chlordane and DDT
- ◆ Possible Aquatic-Dependent Wildlife Impairment:
 - None
- ◆ Possible Human Health Impairment:
 - Benzo[a]pyrene (PAH), PCBs

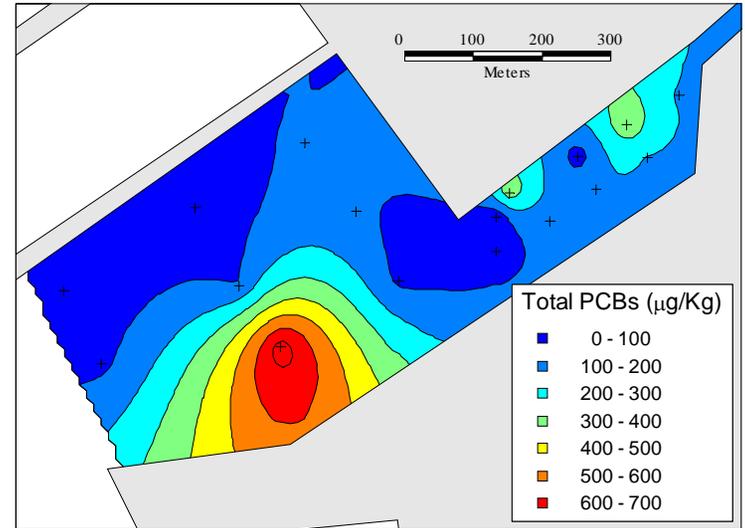
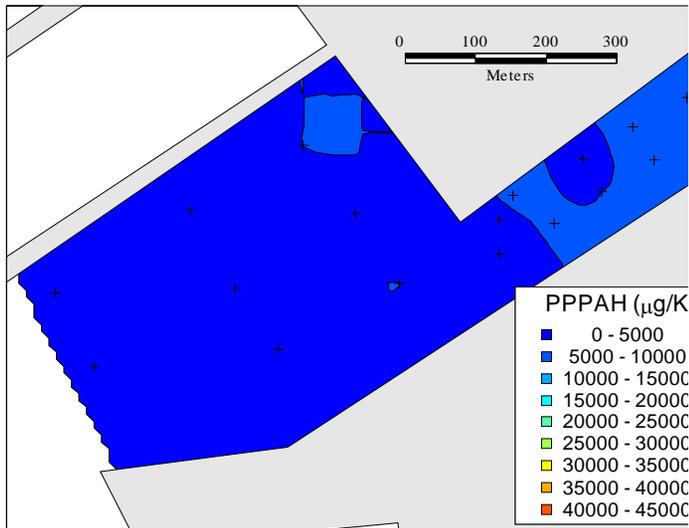
Spatial Distributions – Paleta CoPCs

- ◆ Chlordane and DDT distributions highly correlated (note: scale adjusted to match Chollas)
- ◆ Strong gradient toward creek
- ◆ Consistent with pattern of overall impairment to aquatic life



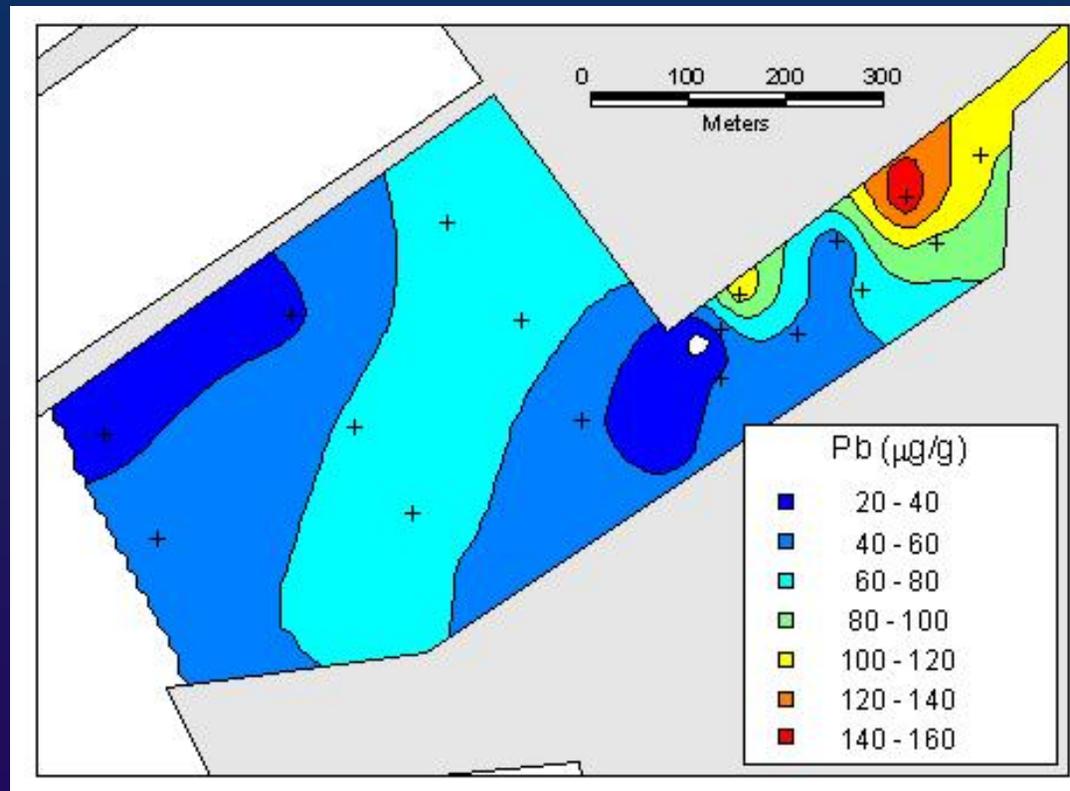
Spatial Distributions – Paleta CoPCs

- ◆ PAH distribution has weak gradient toward creek (note: scale adjusted to match Chollas)
- ◆ PCB distribution shows gradient to creek but dominated by single high concentration in outer mouth area



Spatial Distributions – Paleta CoPCs

- ◆ Lead distribution shows primary gradient toward creek
- ◆ Elevated lead in outer mouth area corresponds to area of higher fines content





Phase I Study Recommendations

- ◆ Complete the Phase II TIE work to validate the findings of Phase I and guide TMDL source quantification and control efforts
- ◆ Complete the Phase II source evaluation studies to determine the strength and origin of sources for identified chemicals that are driving the impairment
- ◆ Following identification and control of sources, conduct Phase III sediment cleanup studies including:
 - Refine the wildlife risk assessment for copper and the human health risk assessments for BAP and TPCB using tissue concentrations from resident fish and shellfish and site-specific exposure parameters
 - Develop cleanup thresholds based on aquatic life, aquatic-dependent wildlife, and human health related impairments
 - Determine potential cleanup boundaries including vertical and horizontal extent

Chollas and Paleta Creek Storm Water Monitoring

Studies Conducted by the US Navy



Storm Water Sampling

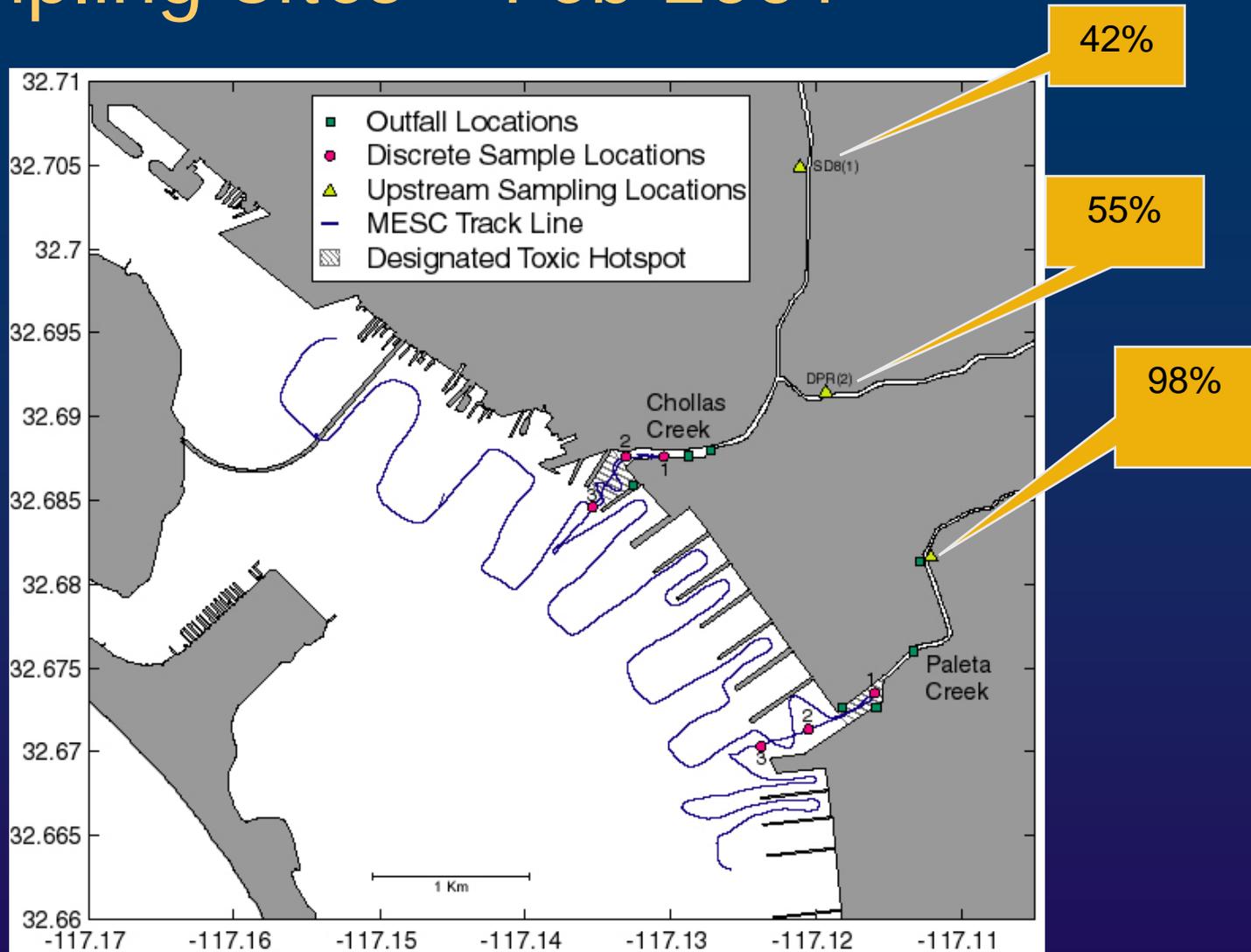
Creek	Storm Date	Rainfall Total	Sample Type	Metals	Organics
Chollas	February 13, 2001	0.58"	F-W Composite	Cu, Pb, Hg, Sb, Zn	PAH, Chlordane, PCB
			Receiving Water	Cu, Pb, Hg, Sb, Zn	PAH, Chlordane, PCB
Paleta	January 31, 1996	0.79"	F-W Composite	Cu, Pb, Hg, Ag, Zn	PAH
	April 18, 1996	0.27"	F-W Composite	Cu, Pb, Hg, Ag, Zn	PAH
	February 13, 2001	0.58"	F-W Composite	Cu, Pb, Hg, Sb, Zn	PAH, Chlordane, PCB
			Receiving Water	Cu, Pb, Hg, Sb, Zn	PAH, Chlordane, PCB

Measurements

1. Rainfall
2. Creek Flow
3. Event Mean Concentrations*
 - Metals – Total and Dissolved Cu, Pb, Hg, Sb, Ag, Zn
 - TPAH – Sum of 24 or 41 PAH analytes
 - TCHLOR - Sum of gamma, alpha, cis-, and trans-isomers
 - TDDT - Sum of 2, 4' and 4,4' - DDT, DDD, and DDE
 - TPCB - Sum of 26 PCB congeners
 - TSS - Total Suspended Solids
4. Receiving Water Concentrations Before, During, After (2001)
5. Receiving Water Plume Mapping (2001)

* **Nominal Method Detection Limits:** Metals 0.1 (Hg=0.005) ug/L; Organics 1 ng/L

Sampling Sites – Feb 2001

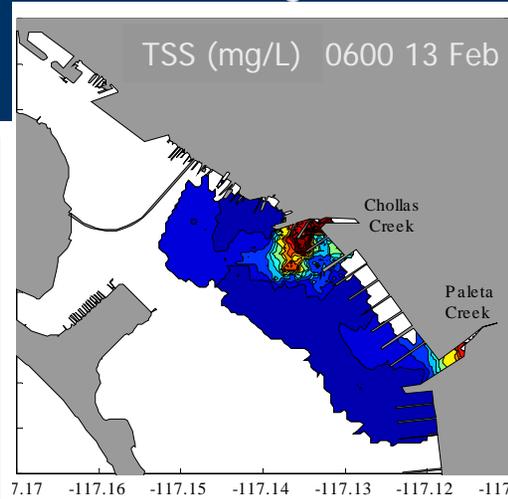
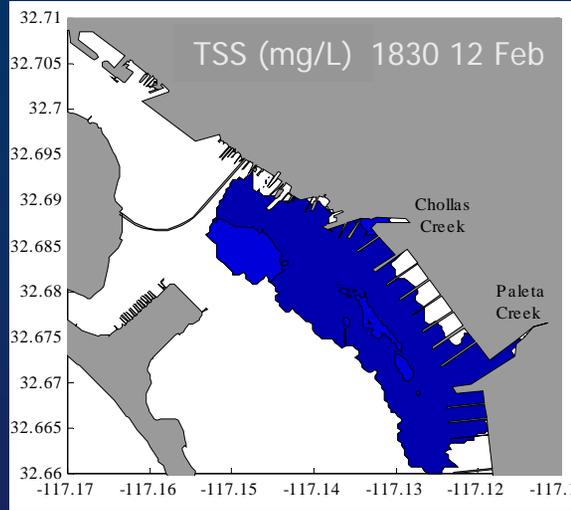


Plume Mapping – Feb 2001

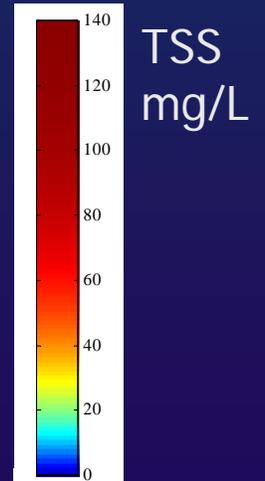
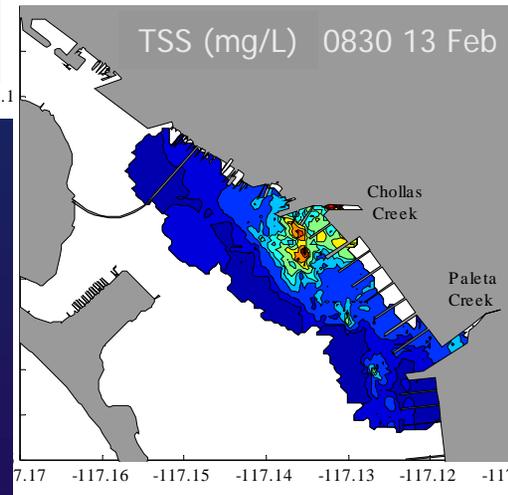
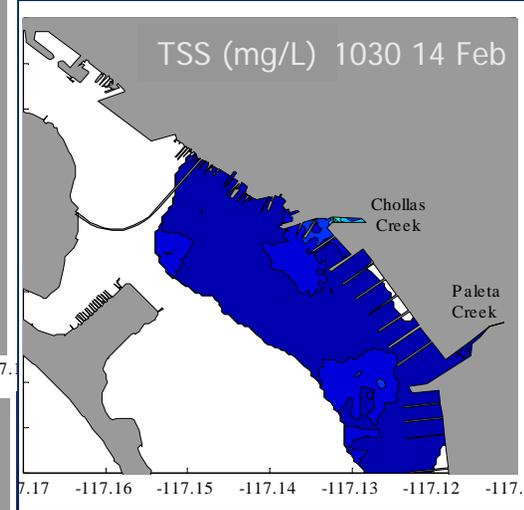


During

Before



After

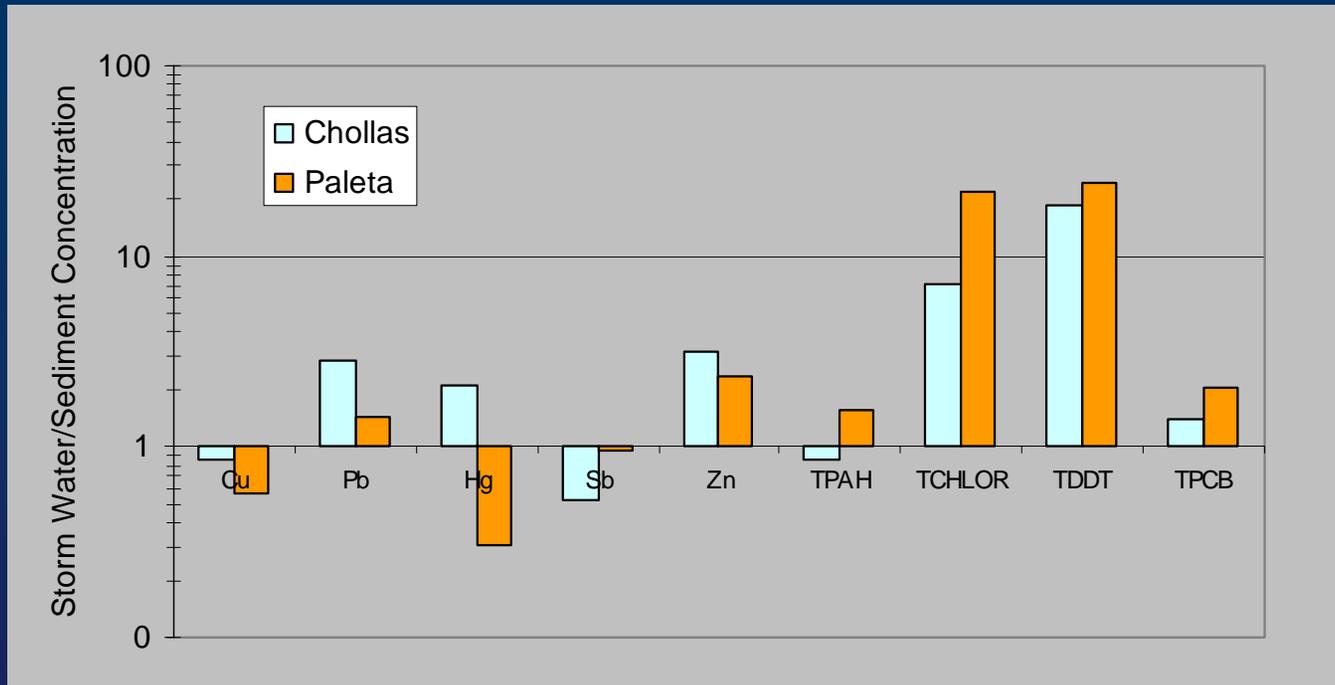




Contaminant Evaluation – Feb 2001

- ❖ Pre-storm receiving water COC concentrations at mouth of both creeks are similar
- ❖ Plume levels of chlordane, Pb, and Hg exceeded pre-storm conditions by as much as a factor of 200
- ❖ Plume COC concentrations averaged a factor of 28 and 7 above pre-storm conditions off Chollas and Paleta Creek, respectively
- ❖ Of the metals, only dissolved copper exceeded its Water Quality Criterion (WQC) in the plume though it also exceeded it prior to the storm
- ❖ All organics surpassed WQC in the plume during the storm though chlordane and DDT were also above their respective WQC prior to the storm

Ongoing Storm Water Sources

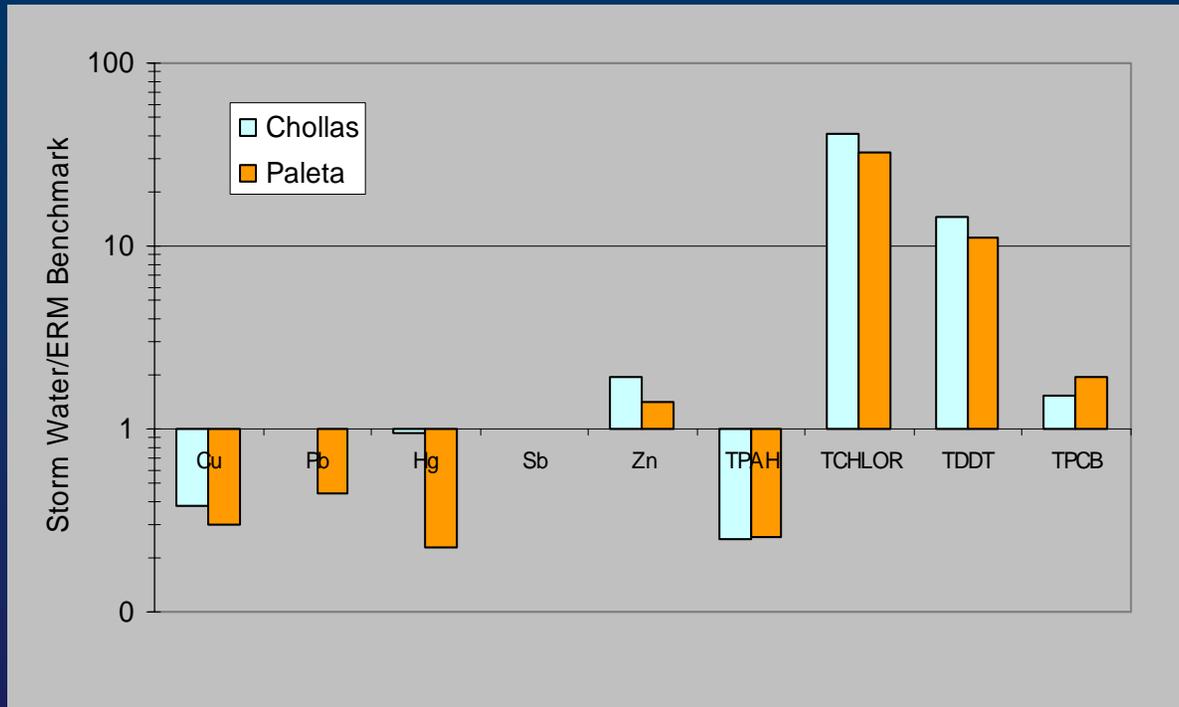


Relative to current sediment conditions:

Chollas - Pb, Hg, Zn, Chlordane, DDT and PCBs

Paleta - Pb, Zn, PAH, Chlordane, DDT and PCBs

Ongoing Storm Water Sources



Relative to Effects Range Median Benchmark:

Both Creeks - Zn, Chlordane, DDT and PCBs

Other Navy Studies

- ◆ Industrial stormwater monitoring reports
- ◆ Installation restoration cleanup reports
- ◆ Upstream sediment sampling on Paleta Creek
- ◆ Groundwater discharge assessment on Paleta Creek
- ◆ Pathway Ranking for In-Place Sediment Management (PRISM) demonstration at Paleta Creek
- ◆ Sediment Quality Characterization Naval Station San Diego

Proposed CoCs

Mouth of Chollas Creek TMDL

COPC	Potential Impairment to:				COC Source Indicators		TMDL COC
	Aquatic Life		Aq. Dependent Wildlife	Human Health	Source Spatial Pattern	Source in Stormwater	
	WOE	TIE					
Ag	No	No	No	No			No
As	No	No	No	No			No
Cd	No	No	No	No			No
Cr	No	No	No	No			No
Cu	No	No	Yes ¹	No	Bay, Local	Low	Yes ¹
Hg	No	No	No	No			No
Ni	No	No	No	No			No
Pb	No	No	No	No			No
Zn	No	No	No	No			No
PAH	Yes	Poss.	No	Yes ¹	Creek, Local	Moderate	Yes ^{1,2}
PCB	Yes	No	No	Yes ¹	Bay, Creek, Local	Moderate	Yes ¹
Chlordane	Yes	Yes	No	No	Creek	High	Yes
DDT	Yes	No	No	No			No

- Notes:
1. CoC identification is partly or fully based on a screening level risk assessment
 2. CoC identification was not clearly confirmed by the TIE study

Proposed CoCs

Mouth of Paleta Creek

COPC	Potential Impairment to:				COC Source Indicators		TMDL COC
	Aquatic Life		Aq. Dependent Wildlife	Human Health	Source Spatial Pattern	Source in Stormwater	
	WOE	TIE					
Ag	No	No	No	No			No
As	No	No	No	No			No
Cd	No	No	No	No			No
Cr	No	No	No	No			No
Cu	No	No	No	No			No
Hg	No	No	No	No			No
Ni	No	No	No	No			No
Pb	Yes	No	No	No			No
Zn	No	No	No	No			No
PAH	Yes	Yes	No	Yes ¹	Creek	Moderate	Yes ¹
PCB	Yes	No	No	Yes ¹	Creek, Local	Moderate	Yes ¹
Chlordane	Yes	Poss.	No	No	Creek	High	Yes ²
DDT	Yes	No	No	No			No

Notes: 1. CoC identification is partly or fully based on a screening level risk assessment
 2. CoC identification was not clearly confirmed by the TIE study