Callahan Mine

July 18, 2012

Public Update

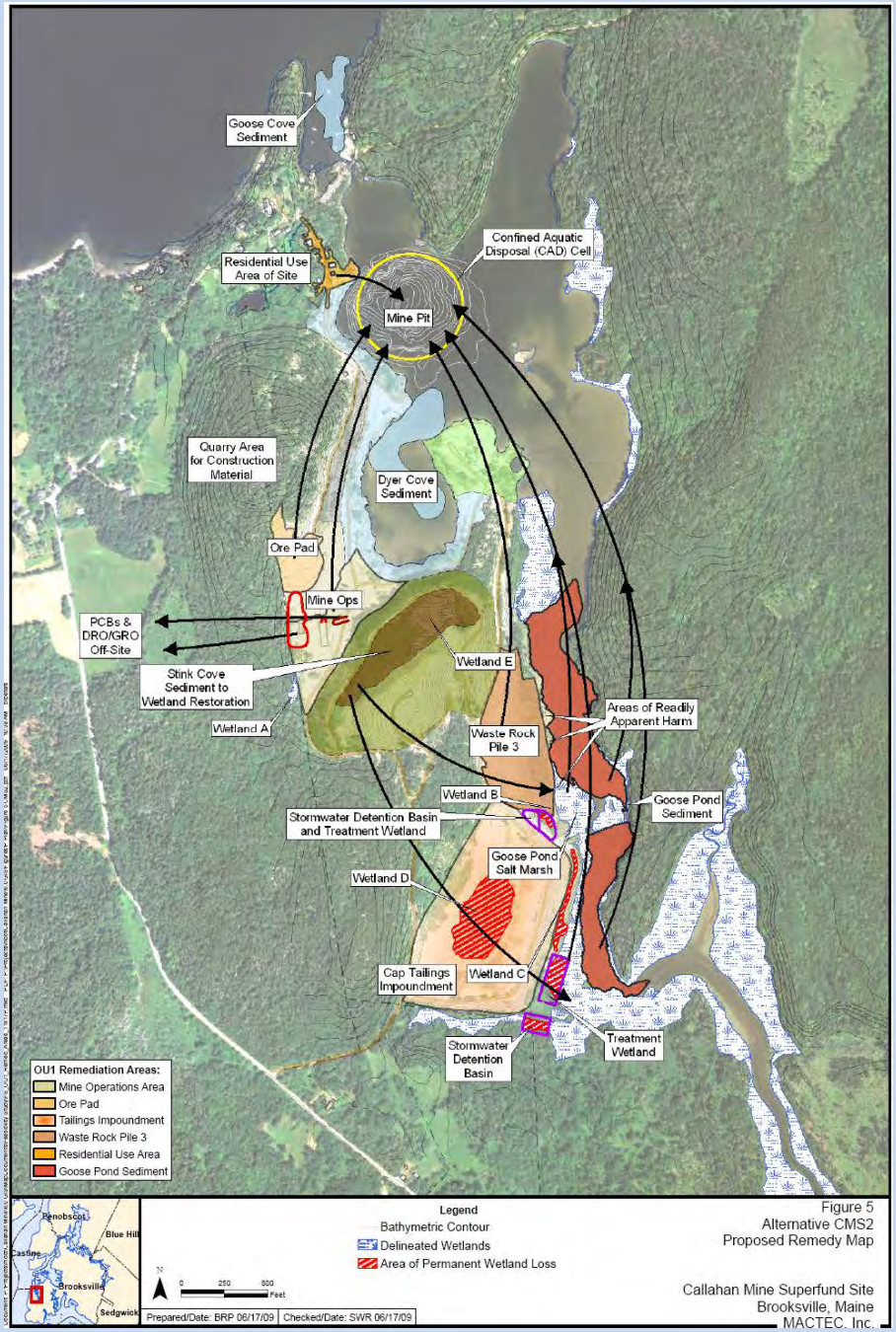
SDMS Doc ID 517876

Callahan Mine Update

- Background
- Status of Cleanup Actions
- Summary of Site Research Activities
- Future Site ownership

Callahan Mine Update

- Record of Decision (ROD) for cleanup signed in September 2009.
- Two components of the cleanup were included in the ROD : Operable Unit 1(OU1) and Operable Unit 3 (OU3).
- Operable Unit 2 (OU2): Cleanup decision will be made in the future. OU2 will continue to study the groundwater and any areas of soil/waste that are not subject to OU1 or OU3.



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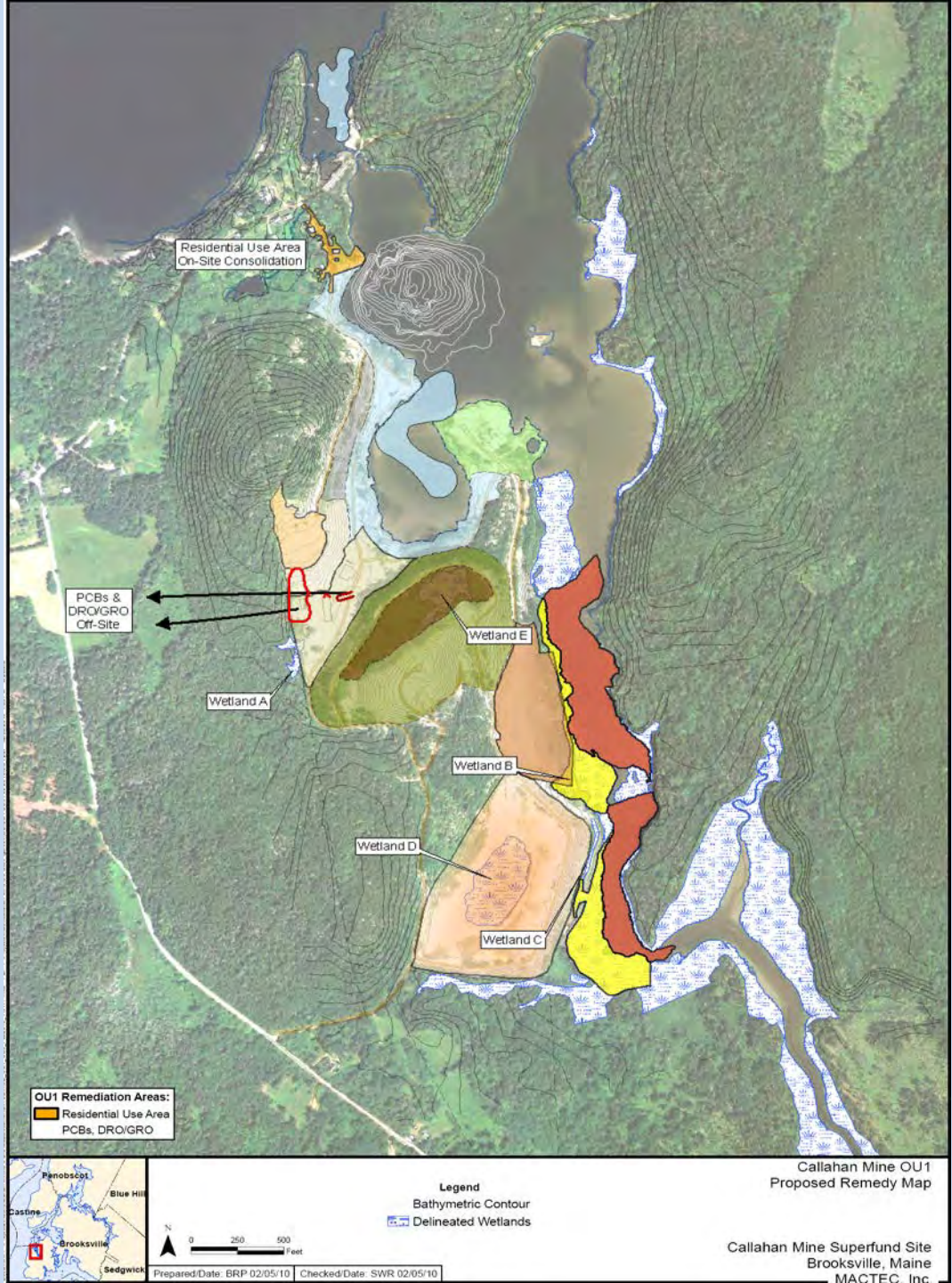
OU1

- PCB Hot Spot removal.
- Residential yard cleanup for lead and arsenic.
- Estimated cost $3 million



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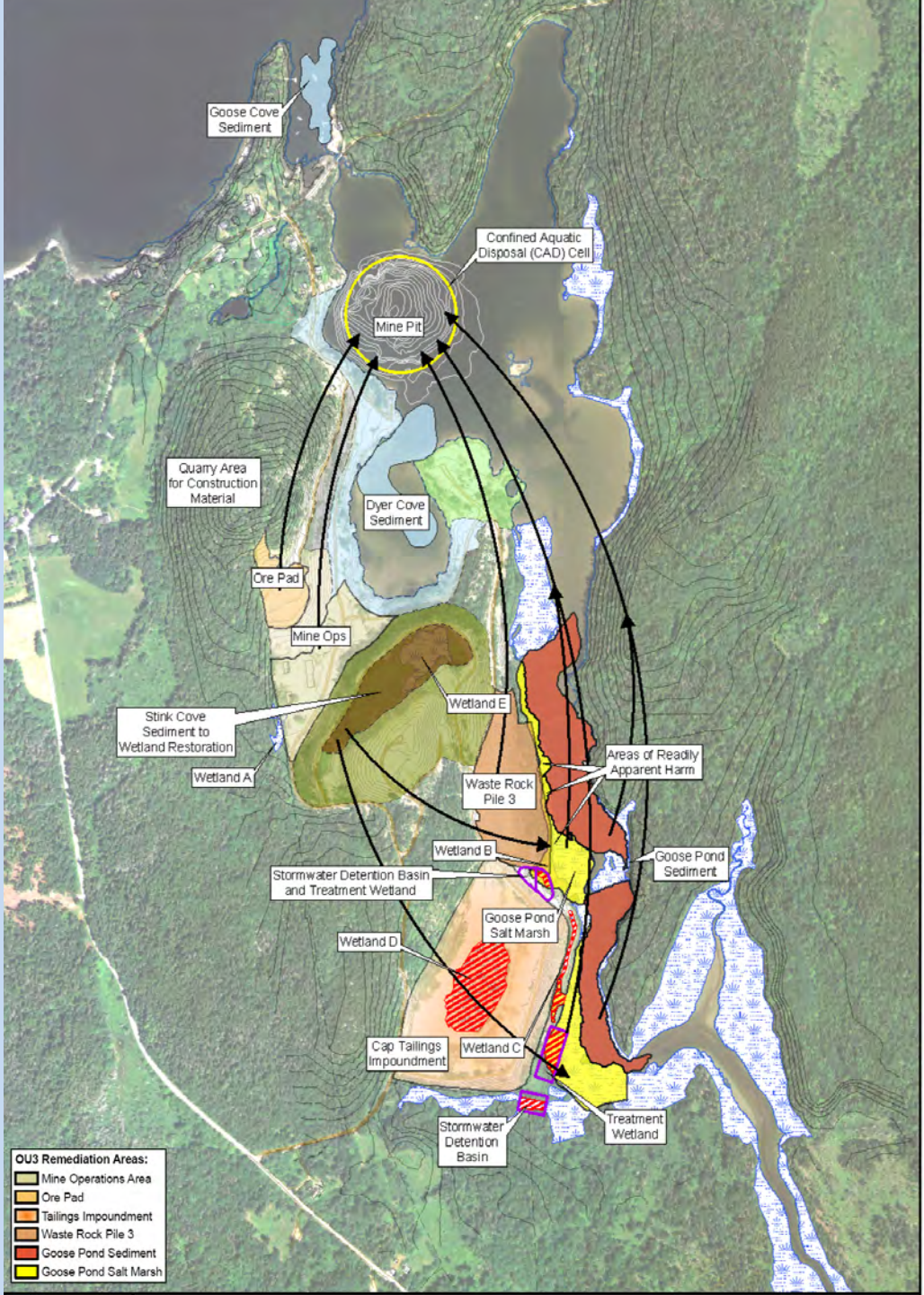
OU3

- Tailings impoundment cover system, stability measures, and horizontal drain.
- Waste Rock Area 3 removal and subaqueous disposal in CAD cell.
- Southern Goose Pond and Salt Marsh Sediment removal and subaqueous disposal in CAD cell.
- Ore Pad/Mine Ops Area waste removal and subaqueous disposal in CAD cell.
- Dyer Cove and Goose Cove sediment removal and subaqueous disposal in CAD cell.
- Estimated Cost: Present Value is $22.8 million.



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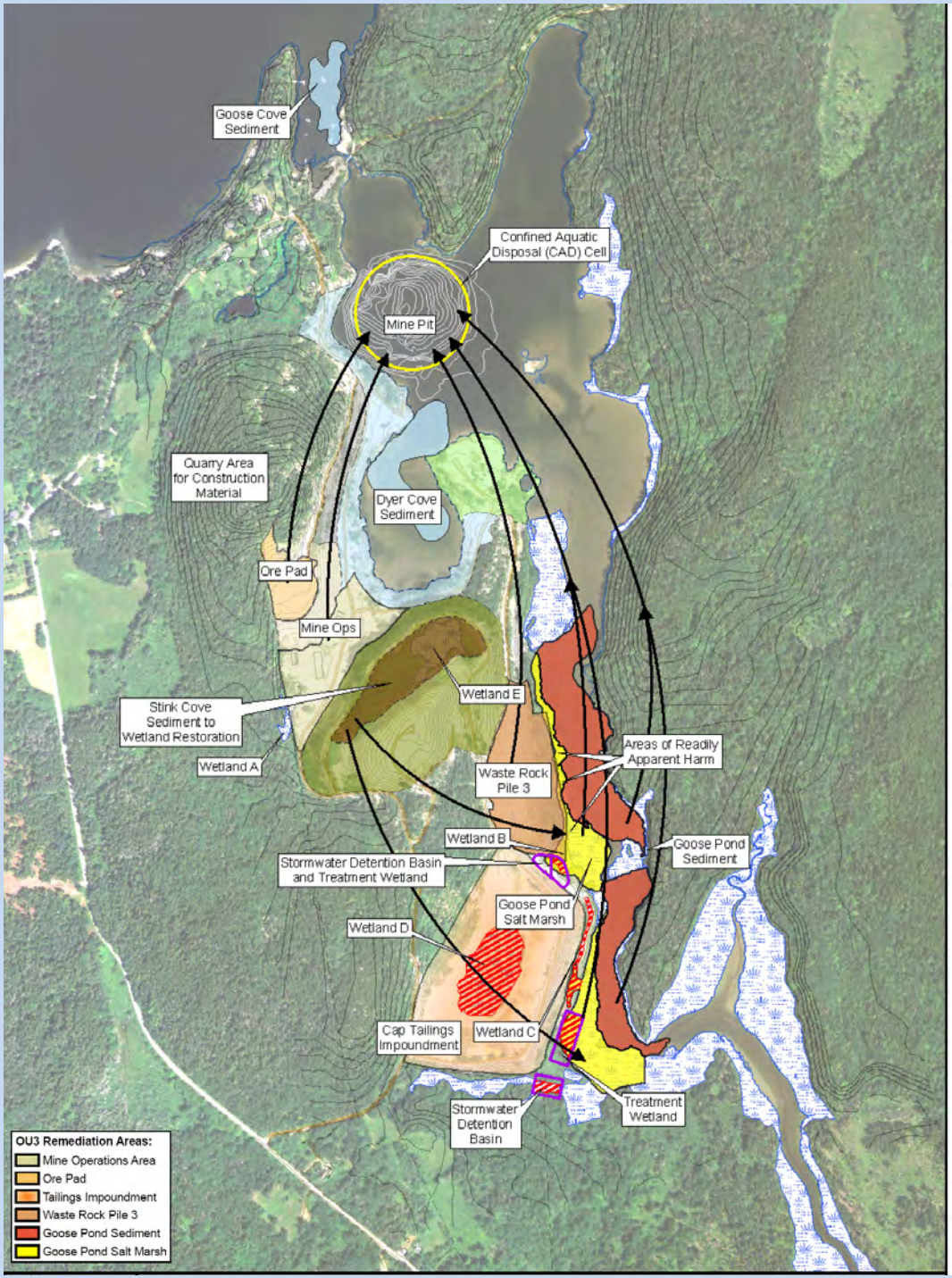
- OU3
  - The design for OU3 will continue through 2012 and 2013.
  - Some design support field work may occur in 2012.
  - The US Army Corp performed modeling of the former mine pit to evaluate the placement of dredge material.



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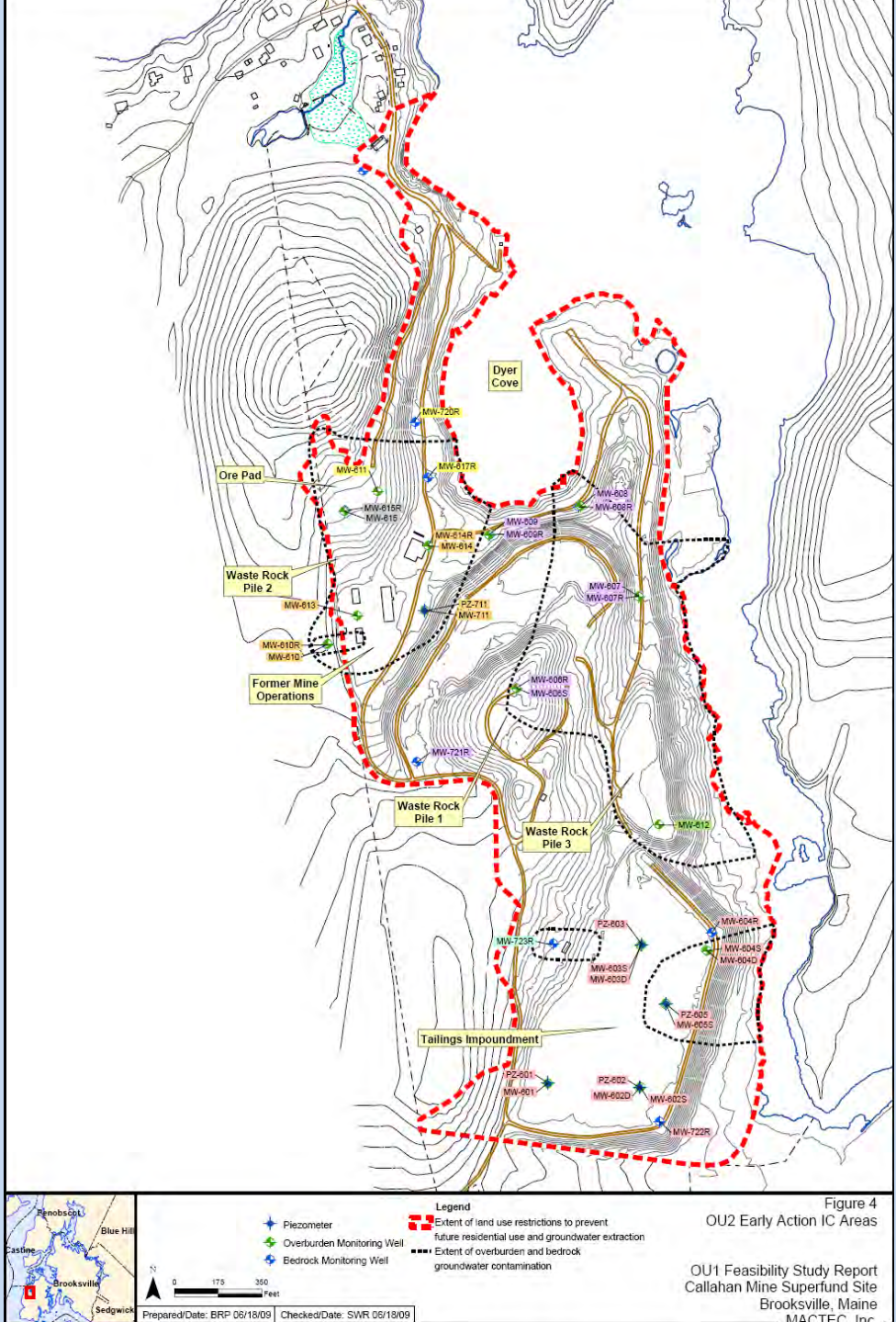
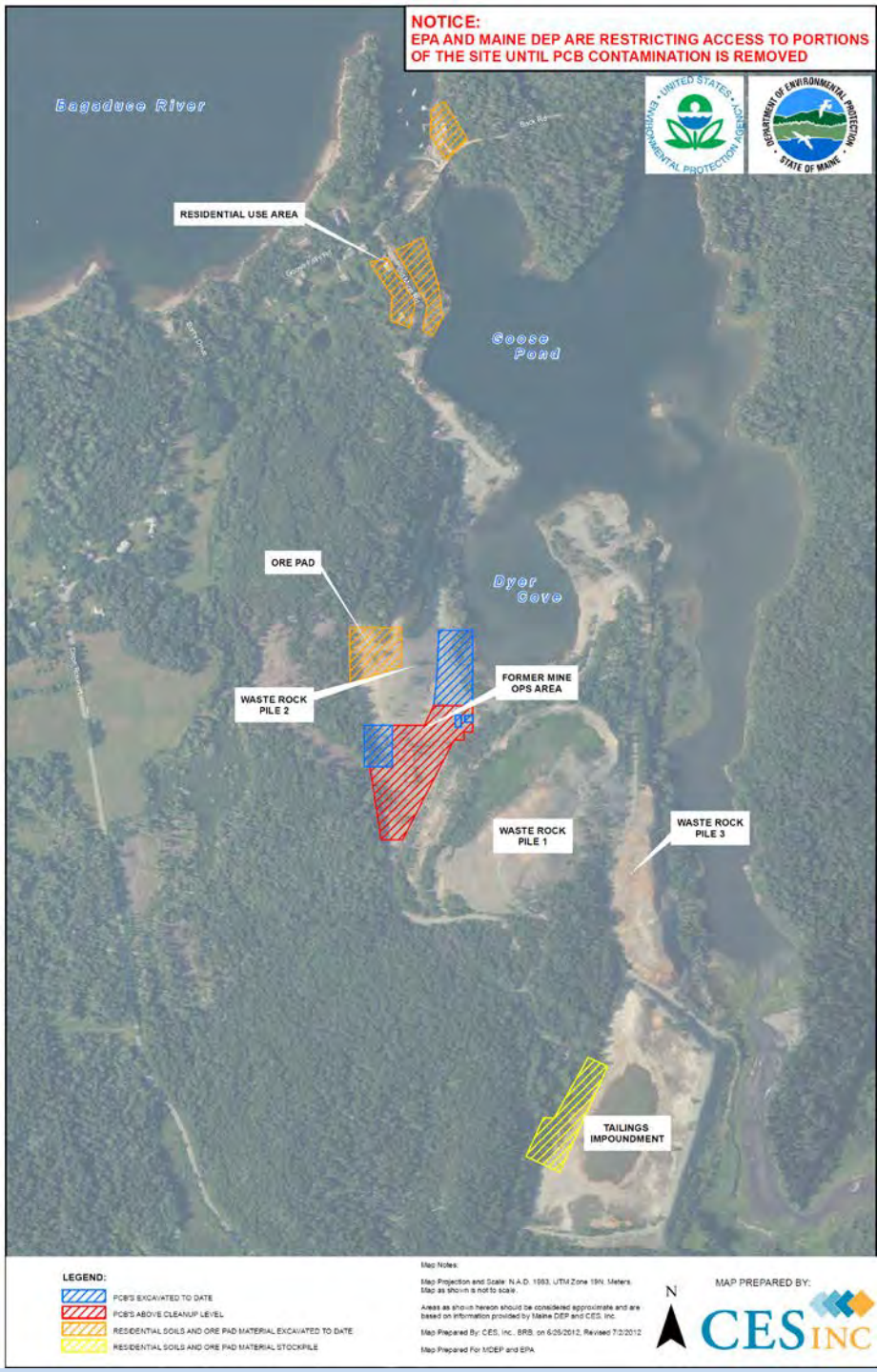
- OU2
  - Will rely on data collected during OU1 and OU3 cleanup and long-term groundwater monitoring.
  - Land use restrictions are being developed to prevent future residential use and also prevent future groundwater use.



Callahan Mine OU1 Update

- Residential cleanup was completed in 2011 (all mine waste removed from four properties):
  - 4,809 cubic yards of mine waste removed from the properties.
  - 5,897 cubic yards of fill brought to Site to fill the holes and restore the properties.
  - Septic systems were removed to access the waste. New systems were installed as part of restoration.
  - Mine Road was paved after the waste was removed to reduce dust from current and future activities.
- Restoration activities are almost complete.



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- PCB cleanup was completed for all areas identified during previous investigations and design.

	Volume of PCB contaminated soil			
	ROD Estimate	Design/Bid Development Refined Estimate	Actual Excavated volume	Truck Loads sent to off-site disposal facility
≥ 50 ppm PCBs	220	444	1,930	98
< 50 ppm PCBs	1,980	3,844	4,306	261
# samples	34	100		

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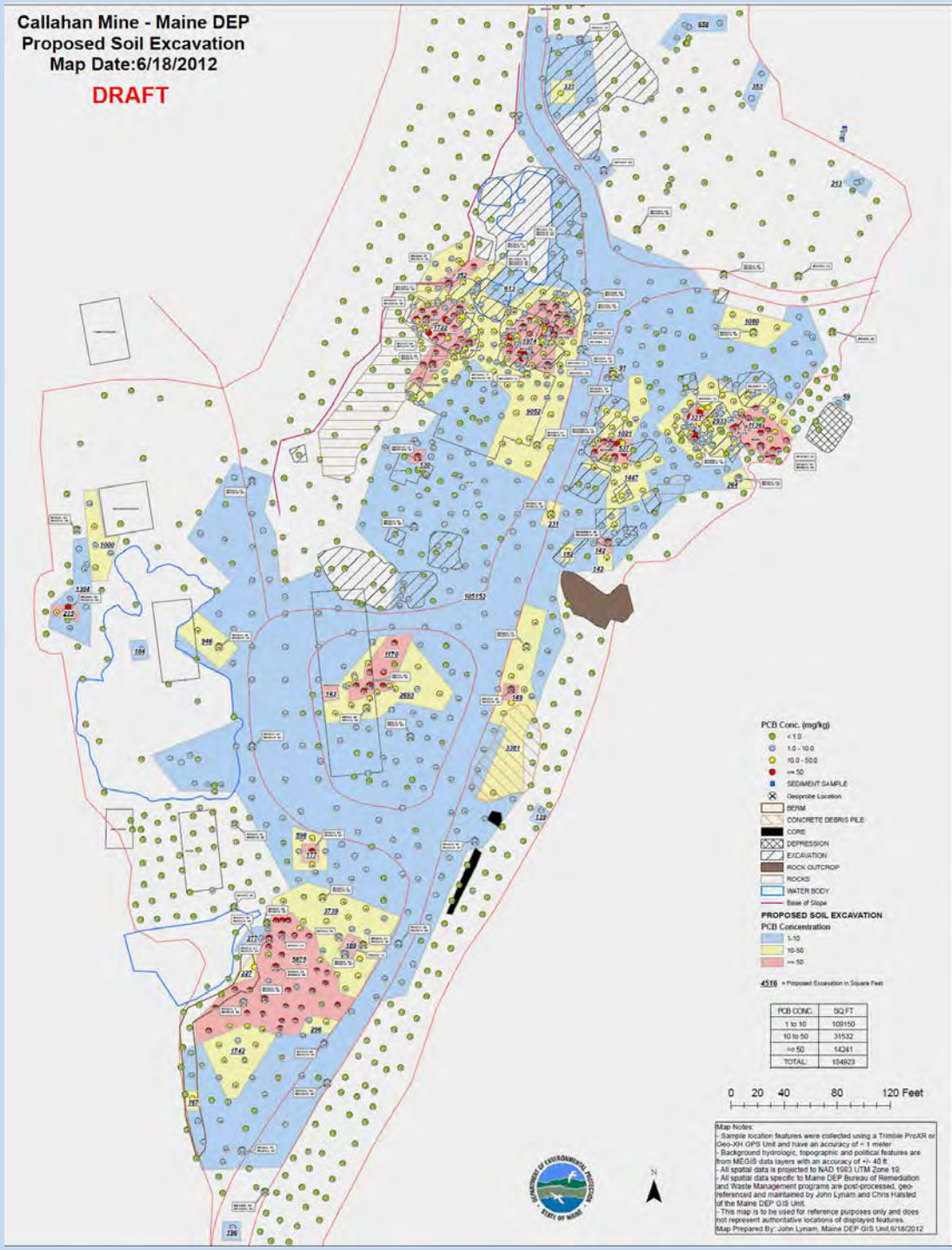
- Ore Pad was removed to prevent re-contamination of Mine Operations Area with arsenic and lead.

- Sampling during the cleanup identified additional areas of soil contaminated with PCBs.

  - Sampling performed in late Fall 2011 and Spring 2012 to identify areas outside the initial OU1 area that would require excavation.

  - Over 700 PCB samples collected to define this area. Surface and depth samples collected.



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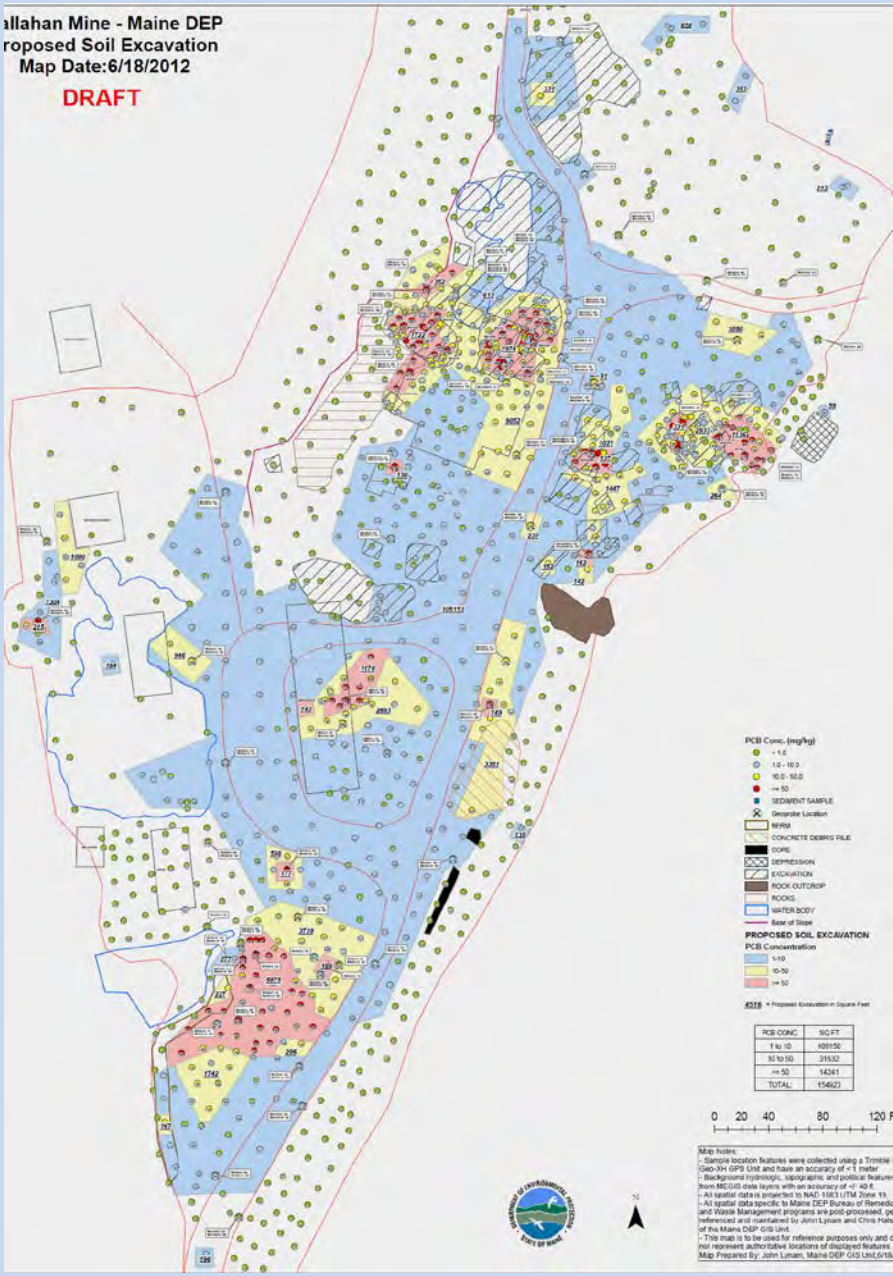
	Actual Excavated volume (cubic yards)	Truck Loads sent to off-site disposal facility	Range of estimated volume of PCB contaminated soil remaining (cubic yards)	Truck loads if it all is sent off-site
≥ 50 ppm PCBs	1,930	98	400 – 900 (550)	20 - 45
< 50 ppm > 10 ppm PCBs	4,306	261	1,200 – 3,000 (1,766)	75 – 188 (111)
< 10 ppm PCBs > 1ppm PCBs			2,800 – 7,000 (3,534)	175 – 437 (220)
# samples	100		>700	

Map colors:
White – less than 1 ppm PCB
Blue - 1 ppm PCB – 10 ppm PCB
Yellow – 10 ppm PCB – 49 ppm PCB
Red – greater than 50 ppm PCB



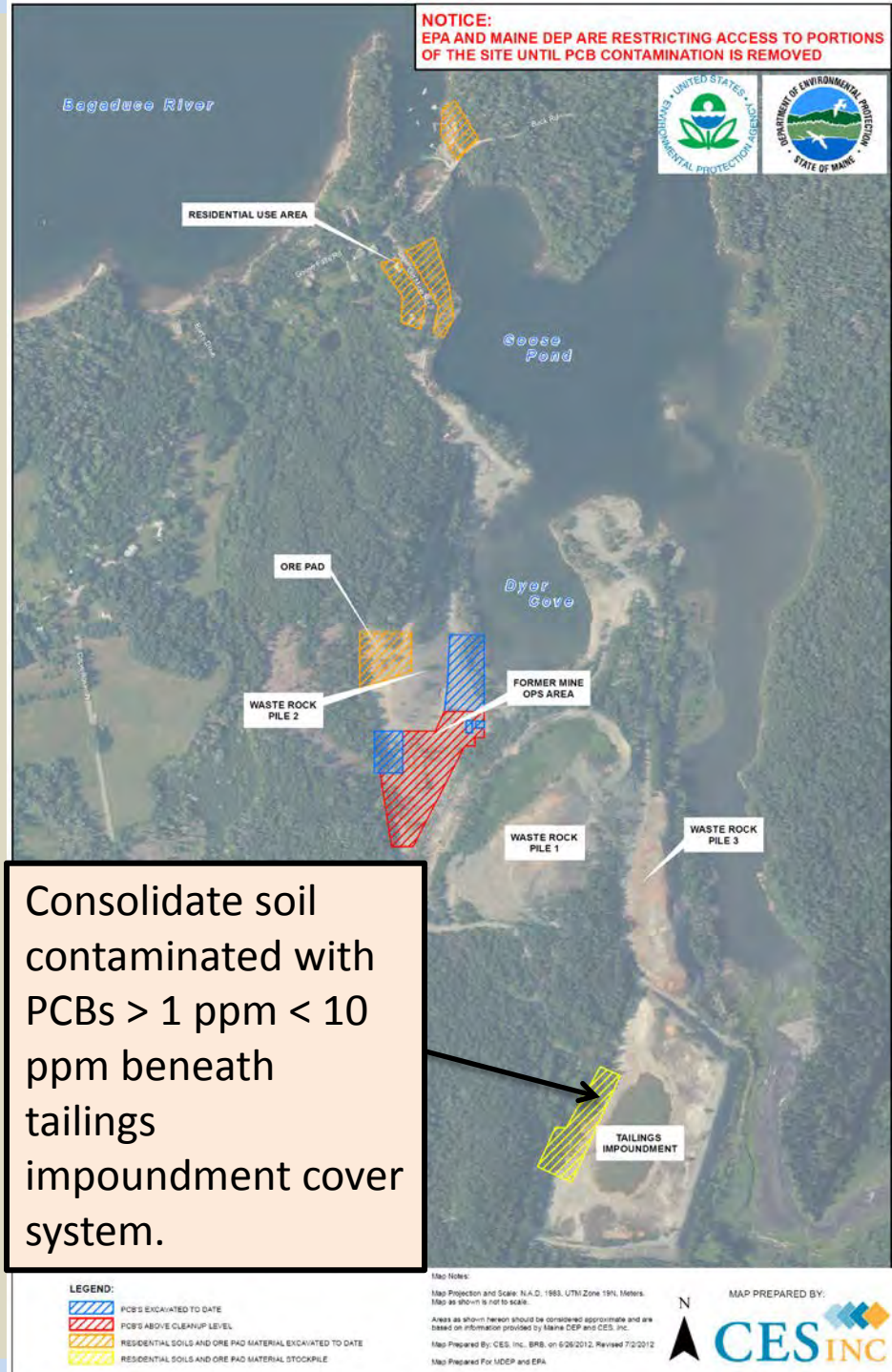
Possible change in Cleanup Plan

- If all PCB contamination soil is sent for off-site disposal the range of truck loads would be 290 – 670 loads.

- EPA and Maine DEP are considering on-site consolidation for PCB contaminated soil with a concentration less than 10 ppm.
  - The excavated material would be stored under a soil cover on the tailings impoundment until the cover system for OU3 is constructed.
  - Tailings Impoundment cover system will be part of the OU3 cleanup.

- It is estimated that 70% of the remaining contamination is less than 10 ppm.
  - Reduce truck volume on area roads by 175 – 437 loads.
  - Reduce cost.
  - Still highly protective because all of the high concentration material would be sent to an off-site disposal facility.
  - Cleanup level would remain 1 ppm.

- EPA would document change in an Explanation of Significant Difference (ESD) document.

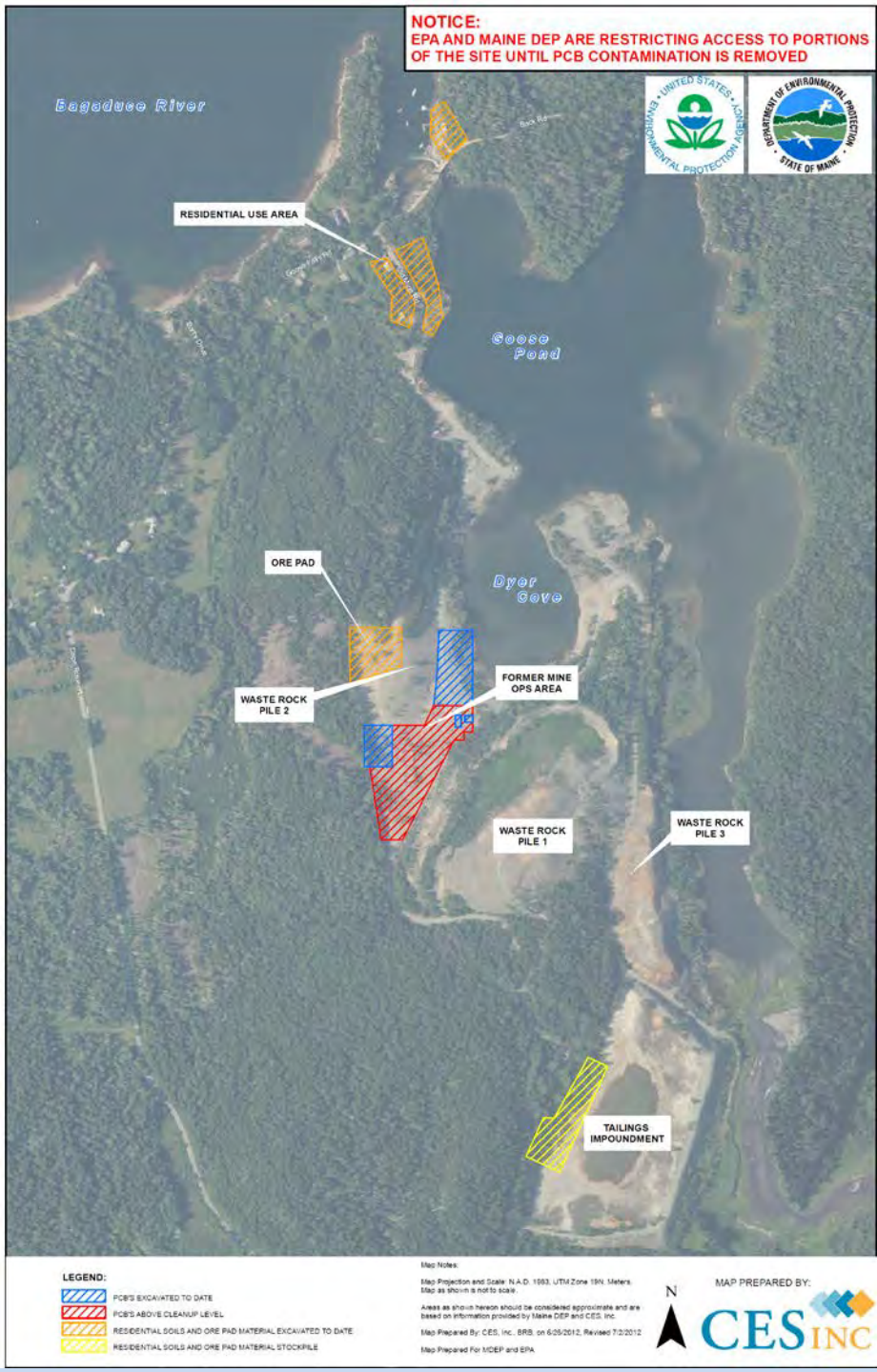


Consolidate soil contaminated with PCBs > 1 ppm < 10 ppm beneath tailings impoundment cover system.

Callahan Mine OU1 Update

- PCB cleanup will continue in 2012 and 2013.

- Please do not access the area with PCB contamination until the cleanup is complete.



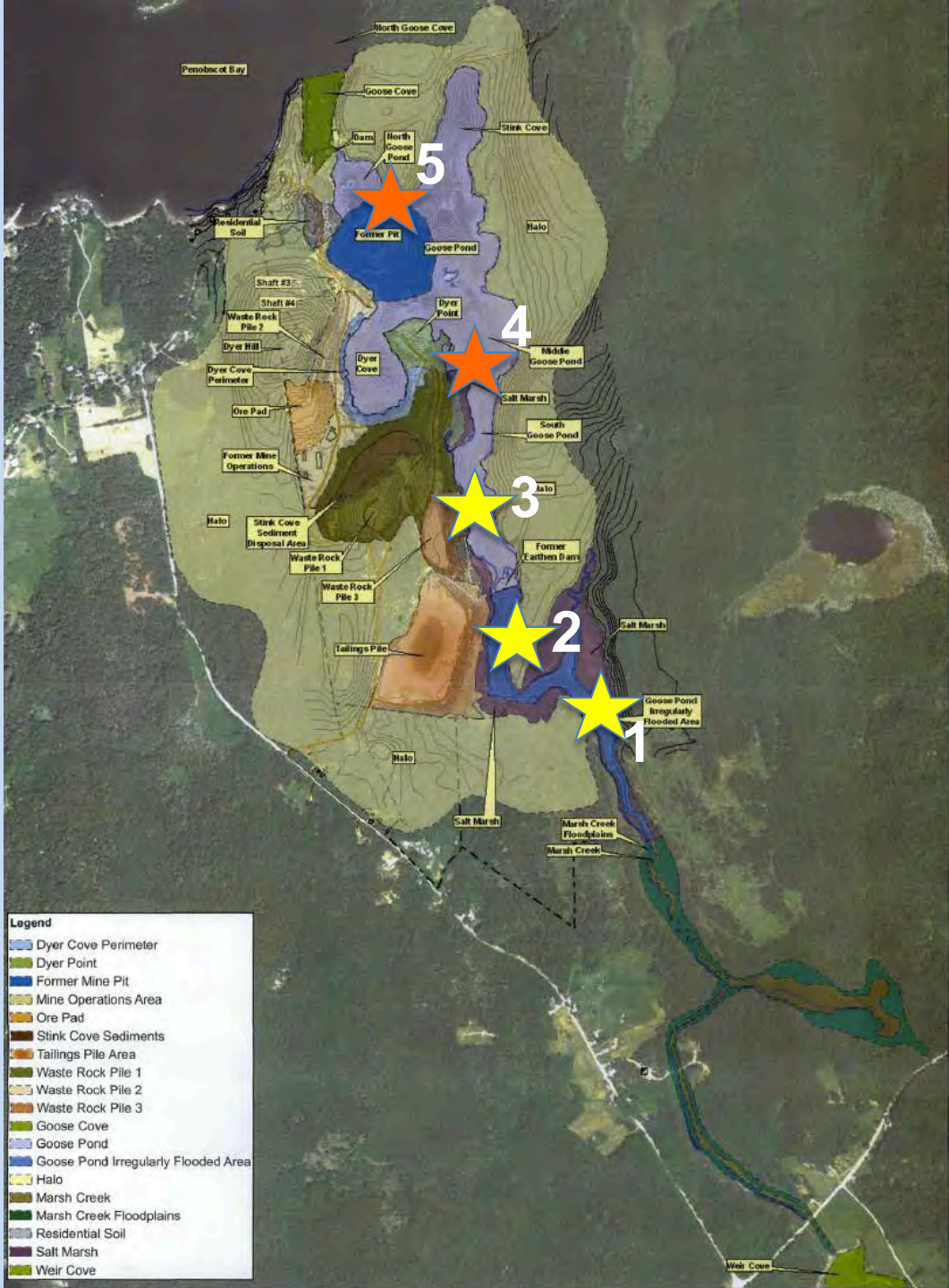
Summary of Dartmouth/Mount Desert Island Biological Lab Field Studies

Sampling Sites in Goose Pond

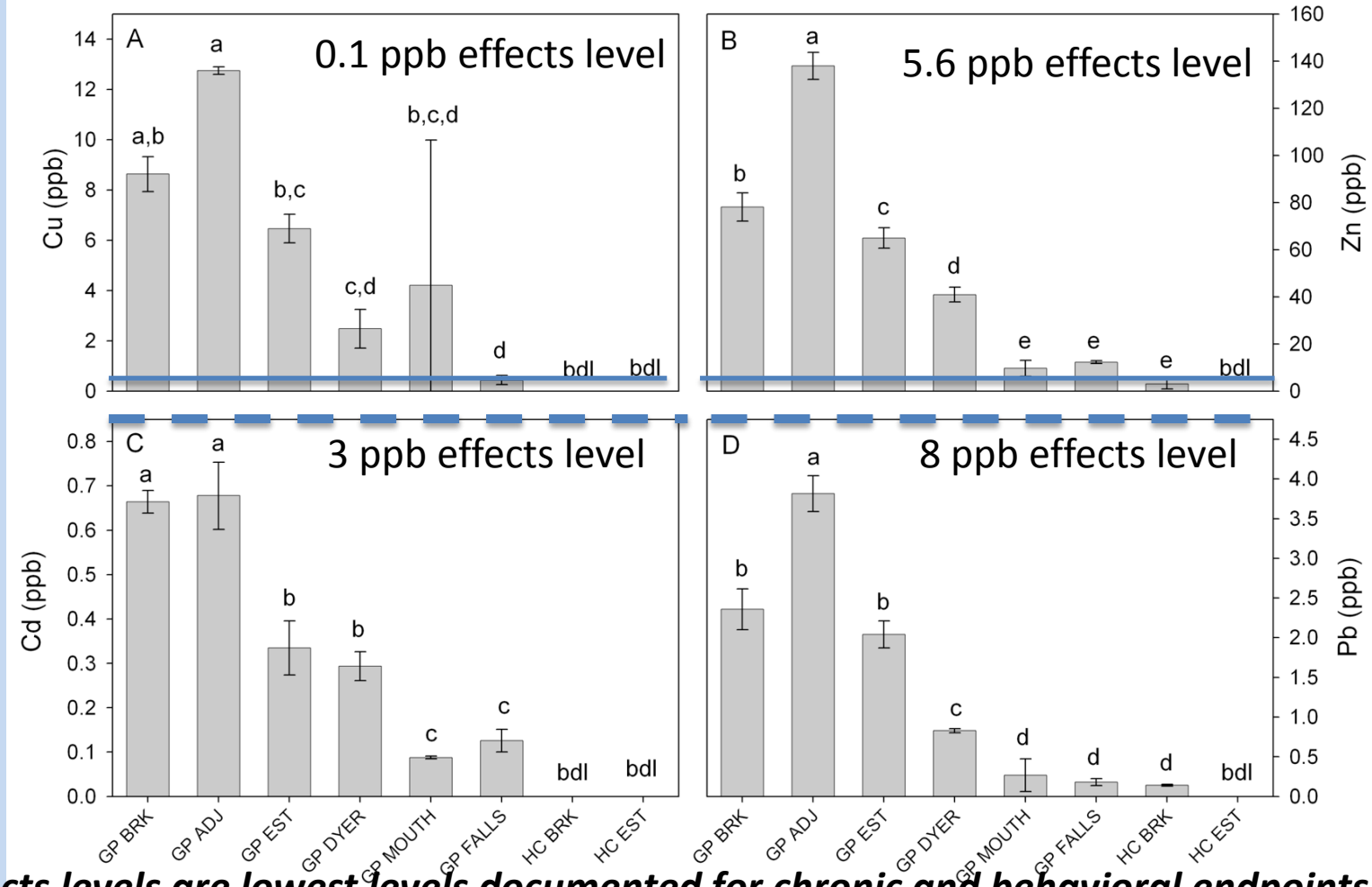
1. Goose Pond Brackish
2. Goose Pond Adjacent
3. Goose Pond Estuarine
4. Goose Pond Main
5. Goose Pond North

2010 field season

2011 sites added



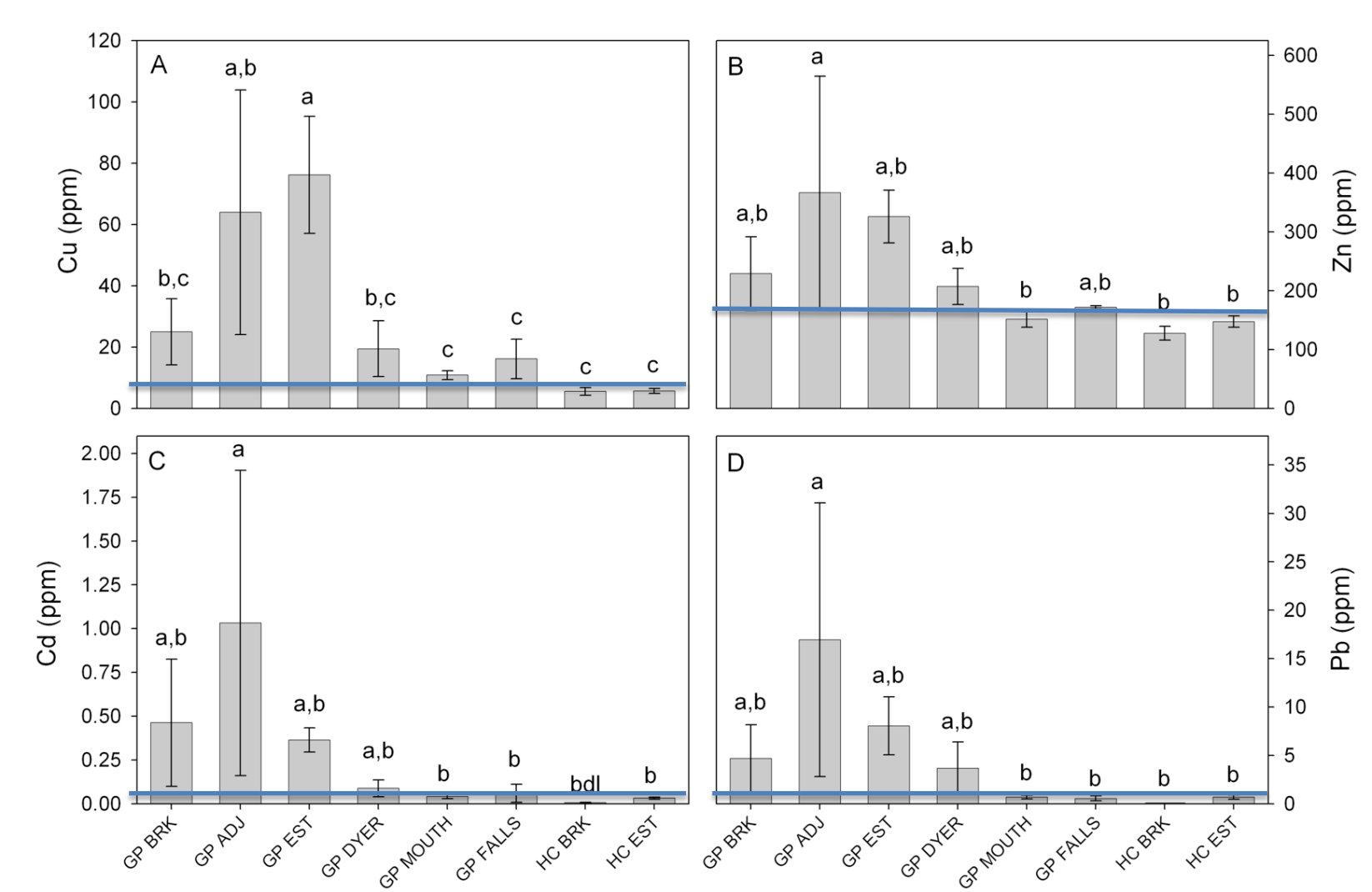
Lowest Effects Level for Fish*



**** Effects levels are lowest levels documented for chronic and behavioral endpoints (Atchison et al. 1987)***

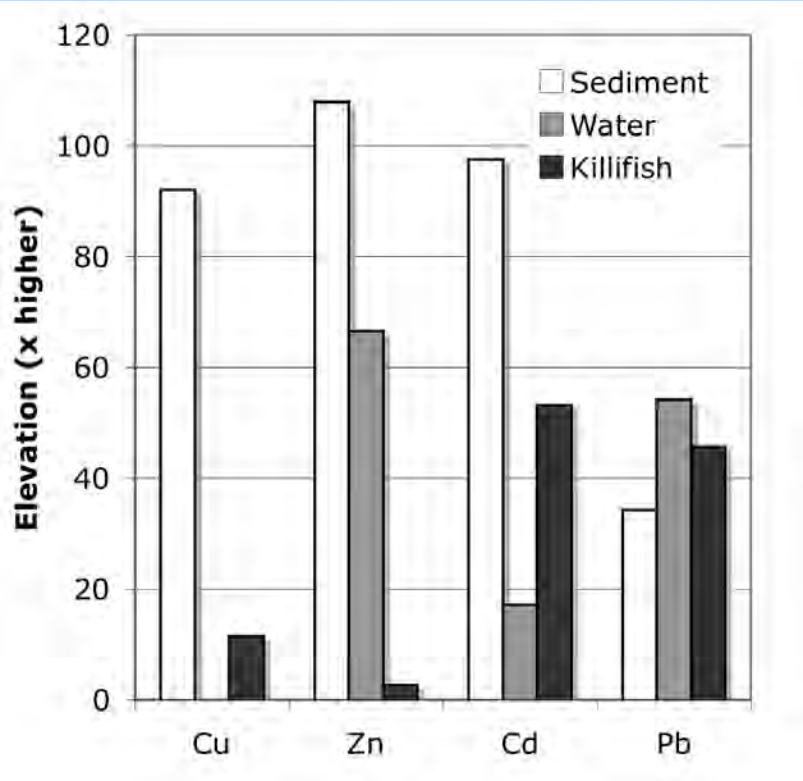
Whole water metal concentrations (triplicate mean ± SD) of (A) copper, (B) zinc, (C) cadmium, and (D) lead across six sites in Goose Pond and two sites in Horseshoe Cove. Lowercase letters indicate significantly similar multiple comparisons as determined by the Tukey-Kramer HSD test. bdl = below the detect limits of the instrument. The large standard deviation around GP MOUTH Cu represents values of bdl (<0.236), 1.83, and 10.80ppb.

Fish Tissue Concentrations in Goose Pond and Horseshoe Cove (reference site)



Killifish (0.4 – 0.8 g DW) whole body metal concentrations (triplicate mean ± SD) of (A) copper, (B) zinc, (C) cadmium, and (D) lead across six sites in Goose Pond and two sites in Horseshoe Cove. Lowercase letters indicate significantly similar multiple comparisons as determined by the Tukey-Kramer HSD test.

Sediment concentrations are 50-100 times higher in GP relative to reference site, 18-65 times in water, and 3-55 times higher in fish.



Mean (n=3) metal concentration elevation of GP ADJ indicated as times above the background level (n=6). Cu water was left blank because the background concentrations were below the instrument detection limit.

Conclusions

- Previous studies, reported in 2011, relating to the quantity of fish:
  - No significant reduction in the abundance of fish in Goose Pond vs other locations.
- Studies also focused on potential accumulation of contamination in fish:
  - Killifish tissue concentrations are elevated in Goose Pond up to 55X (Cu, Pb, Zn, Cd).
  - Fish concentrations of metals are related to water and sediment concentrations
  - Surface water concentrations in Goose Pond are above the lowest effects levels for Cu and Zn.
  - Sediment concentrations in Goose Pond are much higher than reference locations.

Acknowledgments

Dartmouth Collaborators:
Brian Jackson, Bruce Stanton

Other Collaborators:
Charley Wray, MDIBL
Joseph Shaw, Indiana University
Chris Petersen, College of the Atlantic

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US Navy Sediment Toxicity Study Goose Pond

- This study was designed to support the development of improved tools for assessment of Cu and Zn bioavailability and toxicity in Navy sediments.
- The primary focus of the study was to build on the recent results published by others (e.g. Simpson et al. 2008; Strom et al., 2011) which suggest that expressing sediment Cu concentrations in terms of the prediction of toxicity based on the organic carbon-normalized Cu concentration of the <63 µm sediment fraction (Strom et al., in press) using naturally contaminated sediments from US Navy sites.

Goose Pond Sampling Locations

Goose Pond Sediment Chemistry

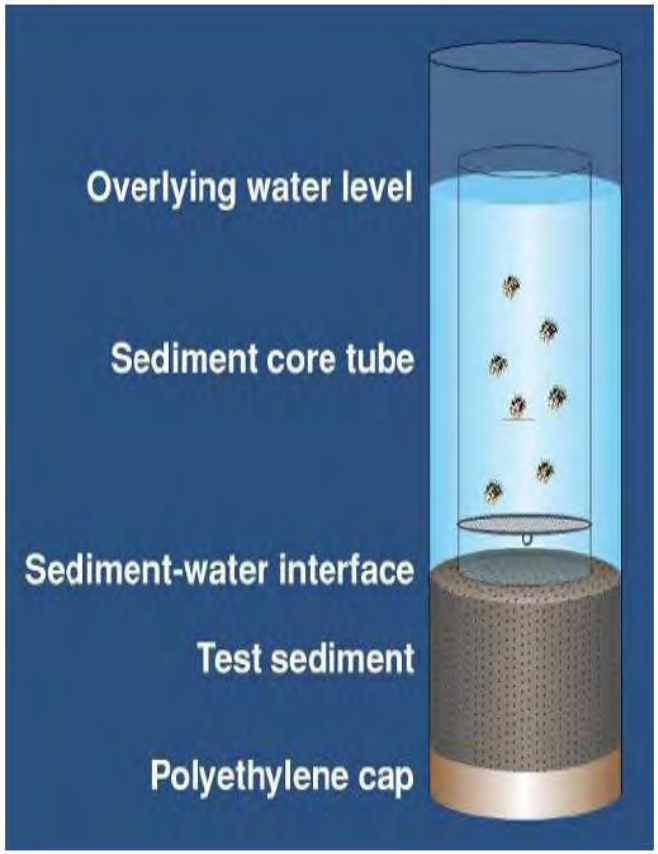
	Bulk Sediment				SEM-AVS (µmol/g)		
Sample ID	**Cu (mg/kg)**	**Zn (mg/kg)**	**TOC (%)**	**Silt & Clay (%)**	**ΣSEM**	**AVS**	**ΣSEM-AVS**
M1	2,240	6,450	1.0	77	4.40	0.76	3.64
M2	2,001	6,562	0.6	84	1.59	3.59	-2
M3	1,348	6,751	0.5	84	1.67	2.32	-0.65

Goose Pond Sediment Toxicity Tests

- Marine polychaete (*Neanthes arenaceodentata*) 28-day survival and growth (Farrar and Bridges 2011, modified from ASTM 2010)
- Laboratory toxicity test, 300 mL beaker with 75 mL sediment and 150 mL laboratory seawater (30 psu)
- Water exchange 2 times per week, followed by feedings with Tetramin
- Initiate with 2-week old emergent juvenile worms
- Quantify survival and growth (dry weight) upon termination

Goose Pond Sediment Toxicity Tests

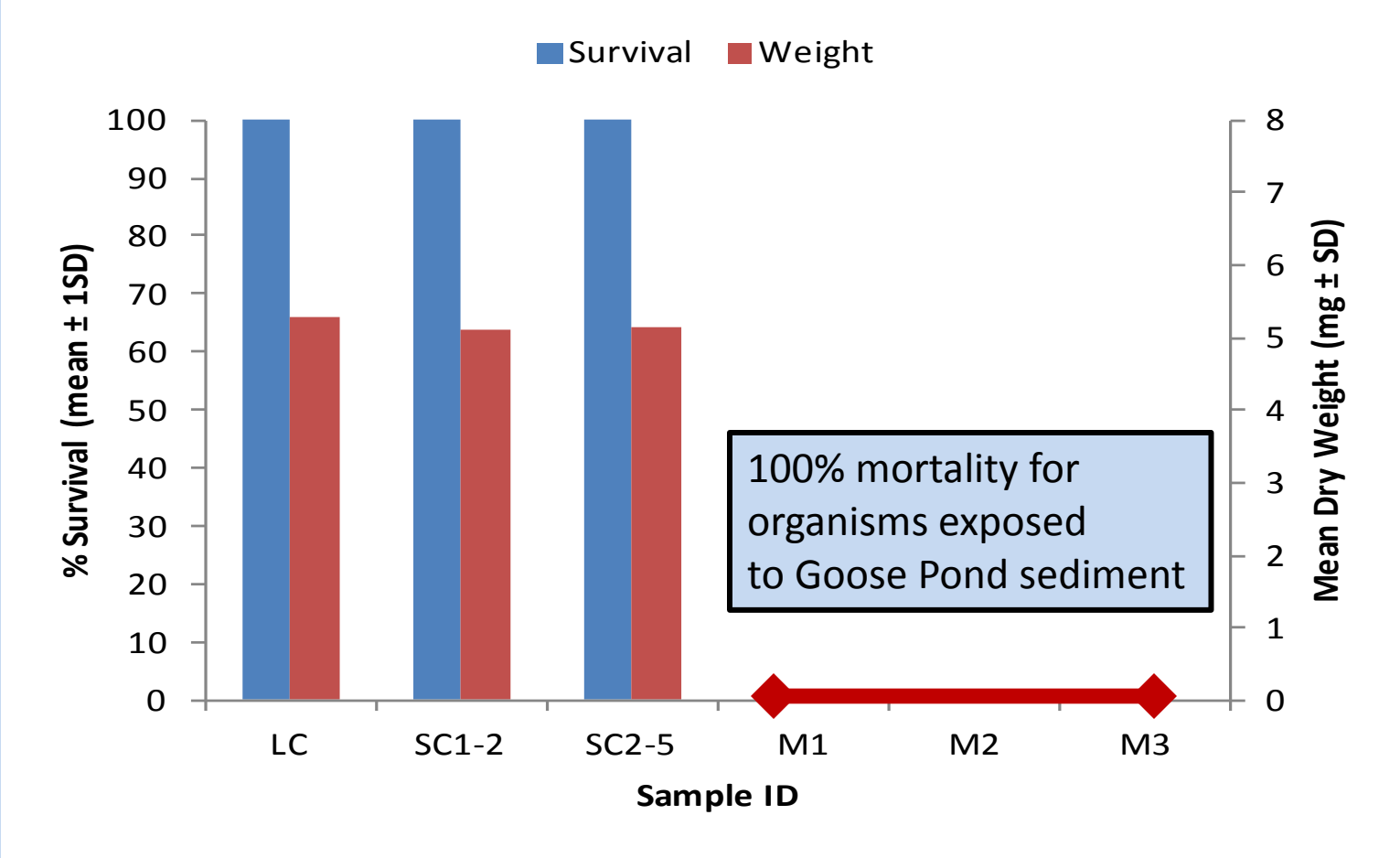
- Purple Sea Urchin (*Strongylocentrotus purpuratus*) 96-hour sediment-water interface exposure (Anderson et al. 1996, USEPA 1995)
- Endpoint: normal larval development
- Laboratory toxicity test, 5 cm sediment core with ~150 mL overlying laboratory seawater (34 psu), static conditions, aerated, no feeding
- Highly sensitive to divalent metals
- Realistic and relevant exposure of negatively buoyant eggs at sediment-water interface



Sediment-water interface toxicity test

Goose Pond Toxicity Results

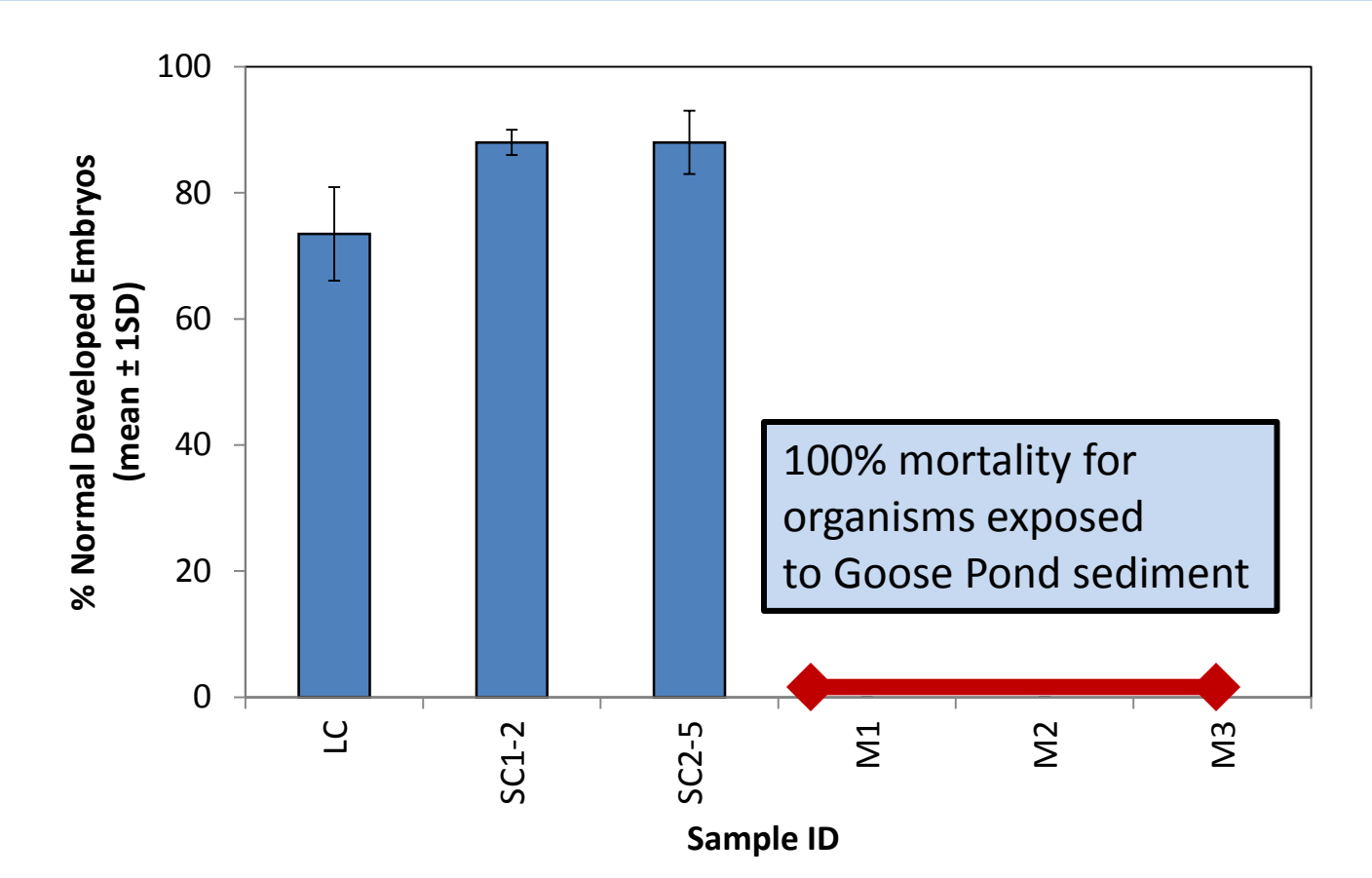
Neanthes arenaceodentata (28 day survival and growth)
Standard Marine Polychaete Bioassay



M1= Cove S3, M2= Cove S5, M3= Marsh 8
LC= Laboratory Control (Sequim Bay, WA)
SC1-2 and SC2-5 are two marine sediment stations in Pearl Harbor, HI, evaluated concurrently

Goose Pond Toxicity Results

Strongylocentrotus purpuratus (96 h embryo-larval development)
Sediment-Water Interface Bioassay



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Goose Pond Summary

- Elevated copper and zinc concentrations at Goose Pond sites relative to other evaluated study sites
- High toxicity at Goose Pond using polychaete and sea urchin test endpoints
- Goose Pond samples provided valuable data towards improved interpretation of copper toxicity in sediments based on organic carbon normalization of <63 µm grain size fraction

Callahan Mine Update

- Questions