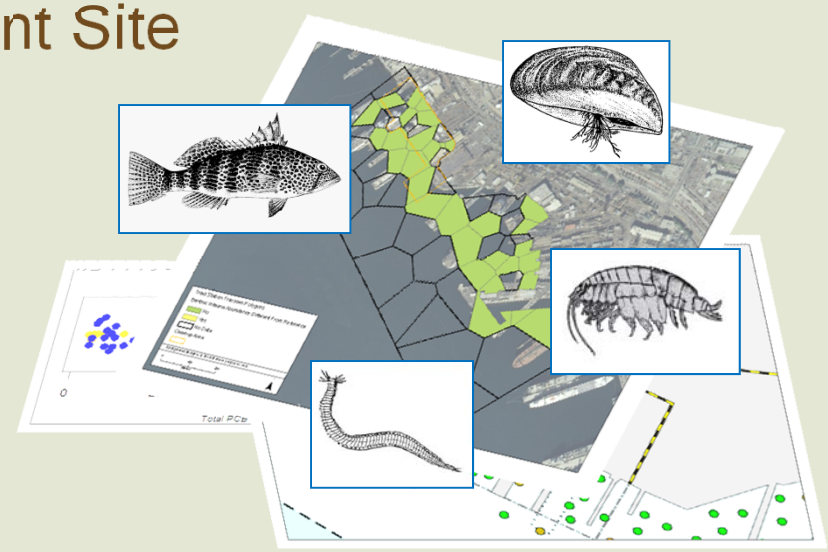
Economic Feasibility

San Diego Shipyard Sediment Site



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on behalf of BAE Systems

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Economic Feasibility

"Economic feasibility is an objective balancing of the incremental benefit of attaining further reductions in the concentrations of constituents of concern as compared with the incremental cost of achieving those reductions." (Resolution 92-49).

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Economic Feasibility Analysis

- What are the relative benefits of remedial alternatives?
- What are the relative costs of remedial alternatives?
- What is the balance between benefits and cost?
- Is the selected remedy cost effective?

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San Diego Bay Beneficial Uses

- Habitat
- Migration
- Threatened and endangered wildlife
- Recreation
- Shellfish harvesting
- Commercial and sport fishing

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Benefits for Economic Impact Analysis

- Risk reduction
- Ecosystem production
- Ecosystem function
- Recreation
- Aesthetics

Source: U.S. EPA. 2000. Guidelines for preparing economic analyses.

Protectiveness: Change in Beneficial Uses

- Beneficial uses are to be protected
- DTR did not quantify changes in beneficial uses
- DTR uses sediment chemistry as a surrogate
- FS evaluated changes in beneficial uses for different remedial alternatives

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Chemistry as a Surrogate for Biological Conditions

Correlation coefficients

Chemical	Amphipod Survival	Echinoderm Fertilization	Bivalve Development	Benthic Macroinvertebrate Total Abundance	Benthic Macroinvertebrate Total Richness
Arsenic	0.01	0.27	-0.02	0.13	0.05
Cadmium	0.31	0.38	-0.07	0.07	-0.08
Copper	0.03	0.32	-0.03	0.17	-0.01
Lead	0.03	0.39	0.00	0.08	-0.08
Mercury	-0.09	0.51	0.19	0.03	-0.10
Zinc	0.03	0.28	-0.07	0.19	0.03
Tributyltin	0.08	0.05	-0.02	0.12	-0.08
HPAH	-0.10	0.31	0.06	0.19	0.09
PCB homologs	0.01	0.35	-0.02	0.13	-0.06

There are no statistically significant correlations between COC concentrations and biological conditions

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Economic Impacts

- Remedial costs
- Indirect economic costs
  - Community impacts
  - Habitat impacts
  - Business impacts
- Indirect costs are difficult to put on the same scale
- As remedial costs increase, total costs are assumed to increase proportionally

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Are Alternative Cleanup Levels Protective?

- Pre-remedial ecological conditions
  - Adverse effects are mostly absent or minor
  - Effects are not related to COCs
- Pre-remedial human health risk
  - Risks are low or absent
- Proposed cleanup
  - Will remove areas of ecological effects
  - Will remove highest COC concentrations
- *Alternative cleanup levels are protective*

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Are Lower Cleanup Levels Cost-Effective?

- Effectiveness based on biological changes
  - Footprint covers locations of current effects
  - Further improvement not expected, not cost-effective
- Effectiveness based on chemical changes
  - DTR: minor improvements for large costs
  - Arcadis: minor improvements for large costs

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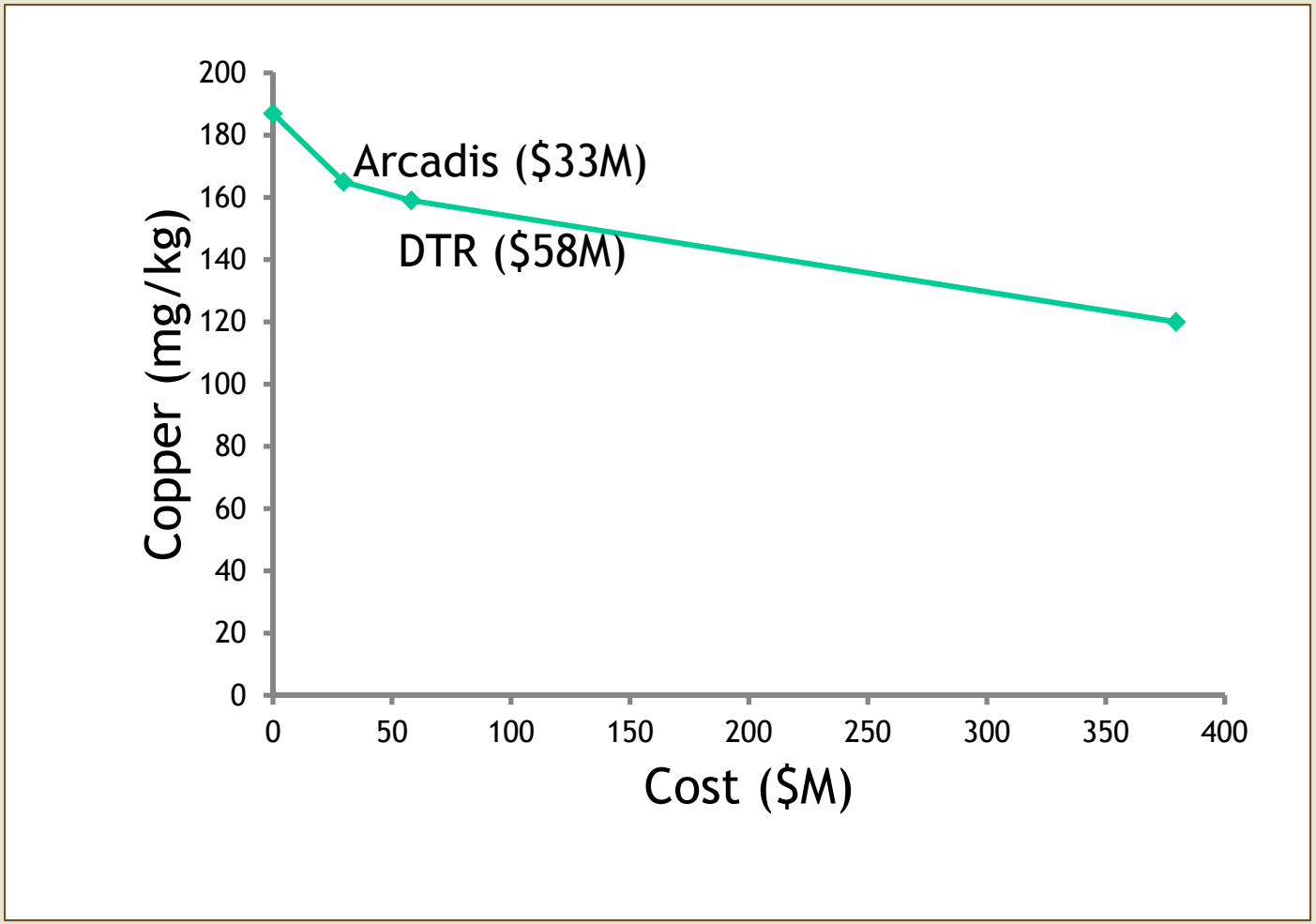
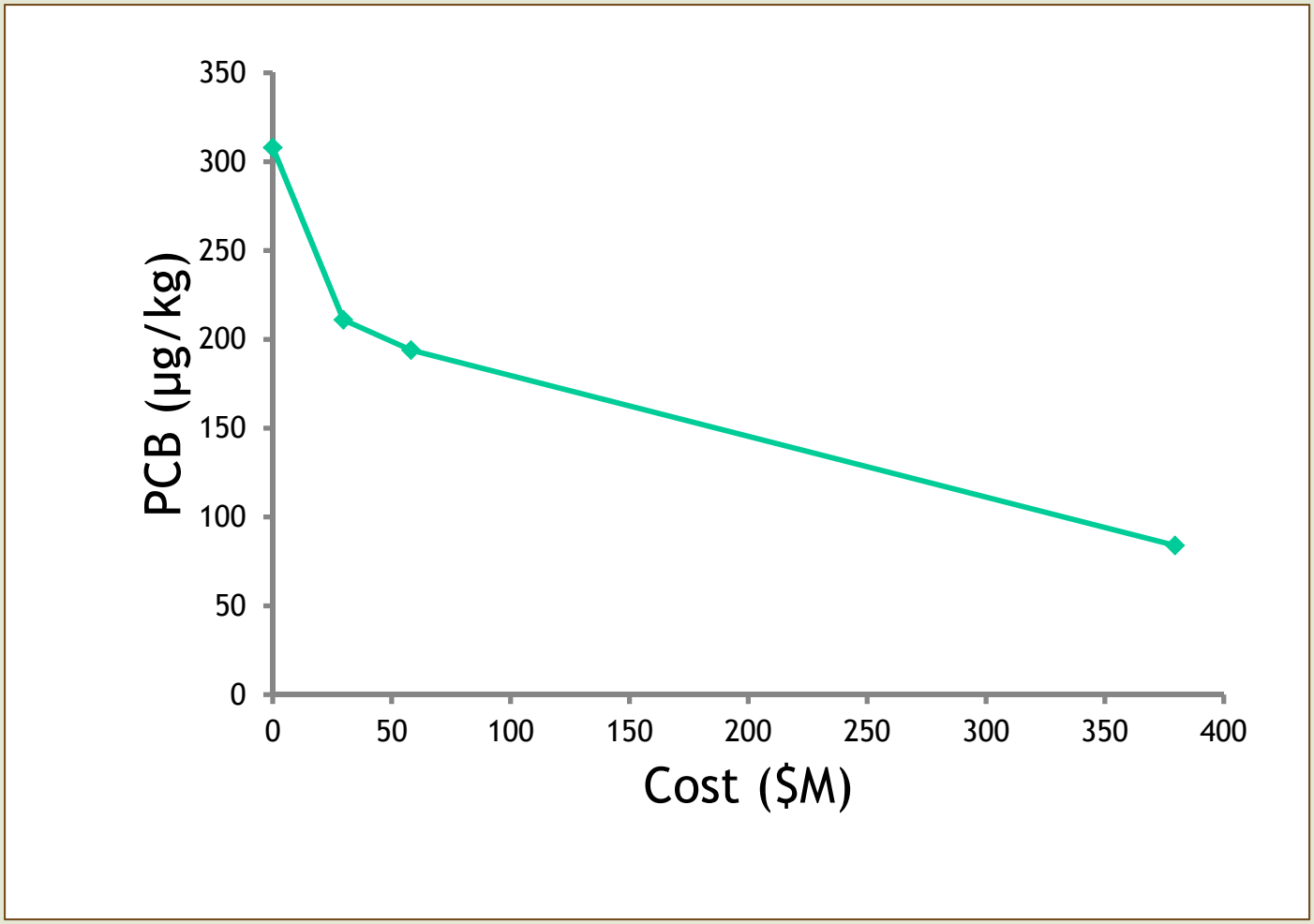
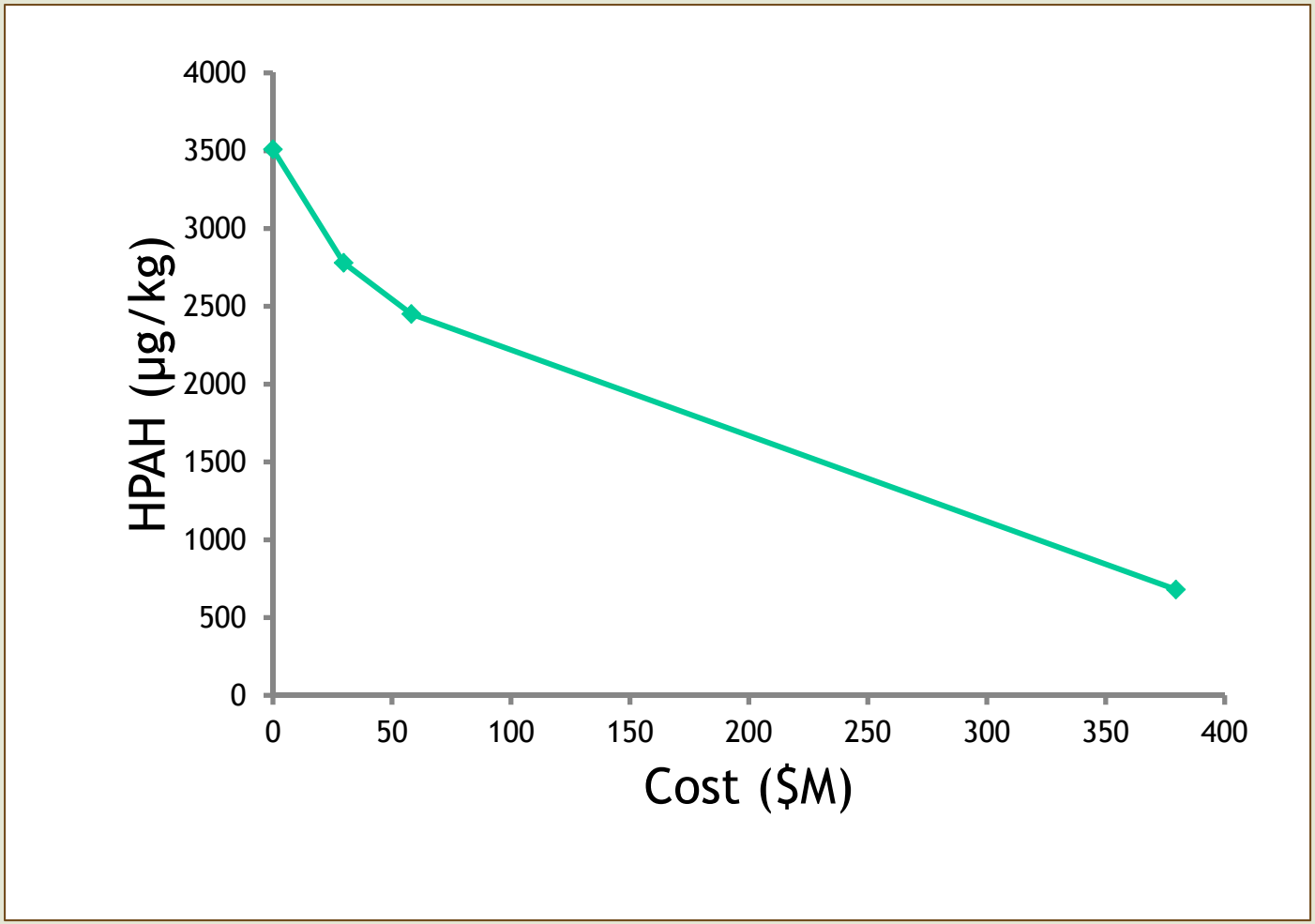
SWAC Reduction—Copper



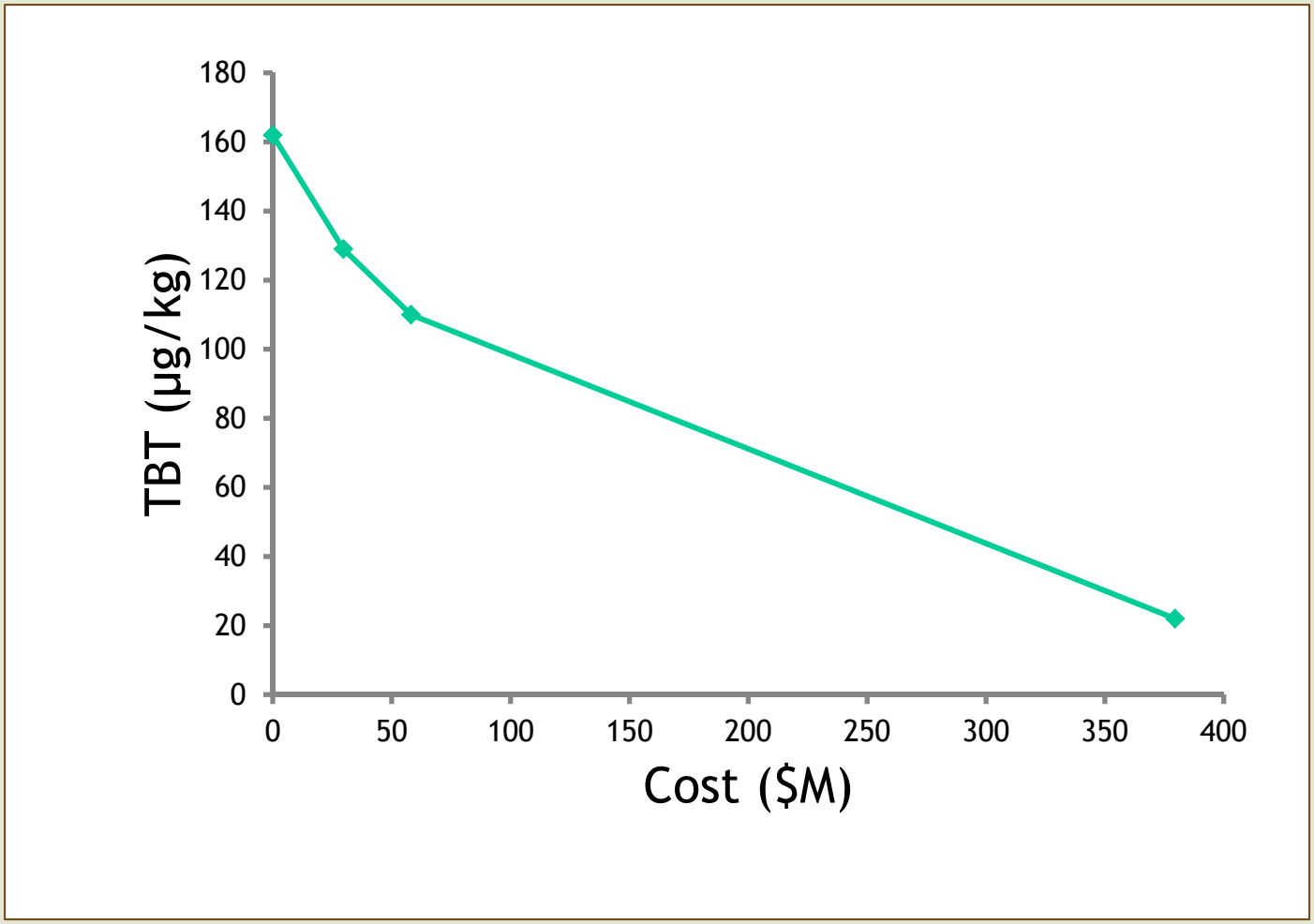
SWAC Reduction—PCBs



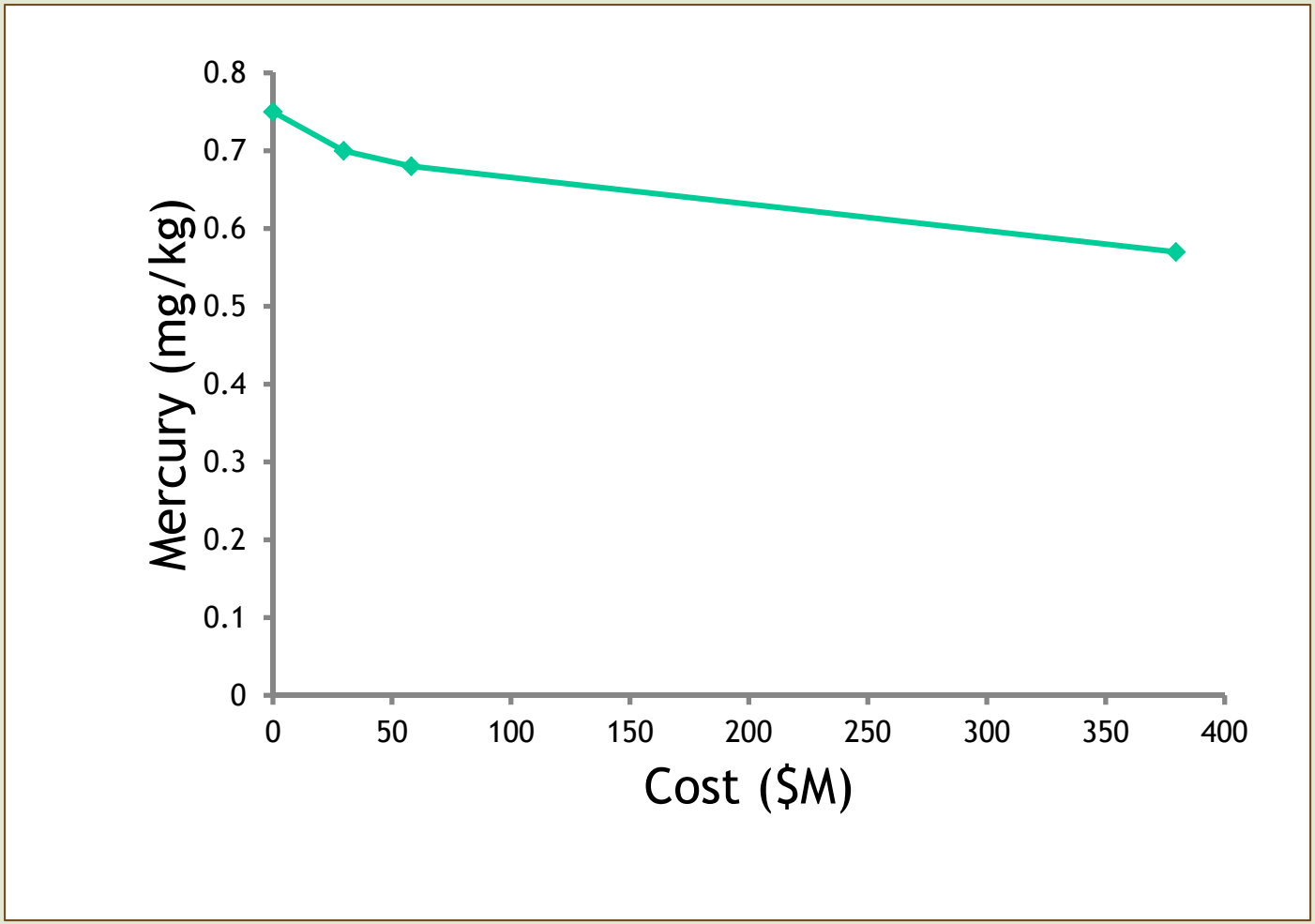
SWAC Reduction—HPAH



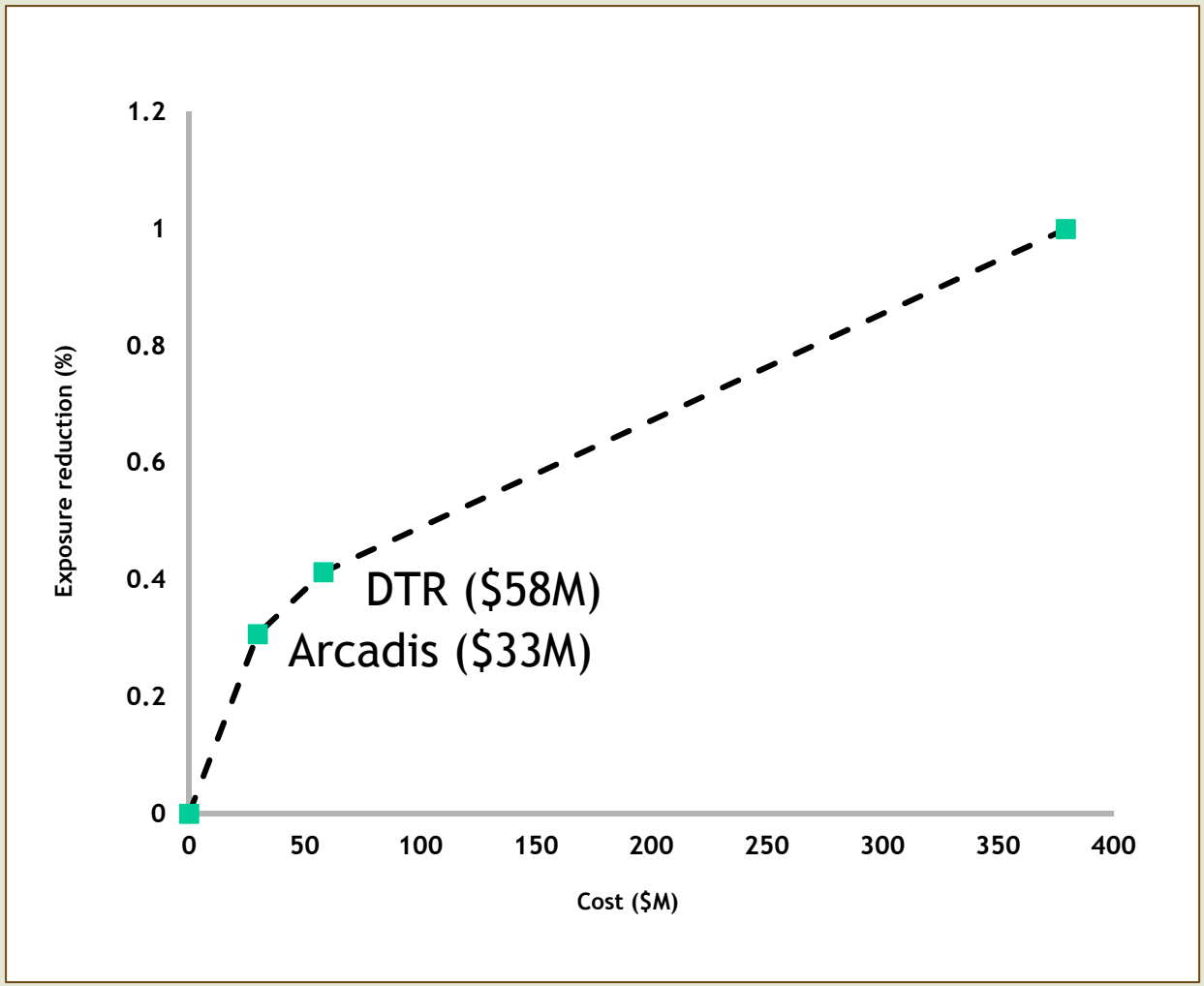
SWAC Reduction—TBT



SWAC Reduction—Mercury



Cost-Effectiveness Scenarios



Cost-Effectiveness of Proposed Remedy

- Arcadis' scenario is most cost-effective
- CAO footprint encompasses Arcadis scenario
- Cleanup to background is least cost-effective

		Fractional reduction in SWAC per million dollars expended				
Alternative	Cost ($M, non-discounted)	Cu (mg/kg)	Mercury (mg/kg)	HPAH (µg/kg)	PCB (µg/kg)	TBT (µg/kg)
Pre-remedial condition	$0.0					
Arcadis alternative	$29.7	0.0040	0.0022	0.0070	0.0106	0.0069
DTR recommended (SMU)	$58.1	0.0026	0.0016	0.0052	0.0064	0.0055
Background option	$379.5	0.0009	0.0006	0.0021	0.0019	0.0023

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Conclusion

- *Lower cleanup levels are not economically feasible because:*
  - No further improvement in biological conditions is expected
  - Further reductions in COC concentrations are not cost-effective

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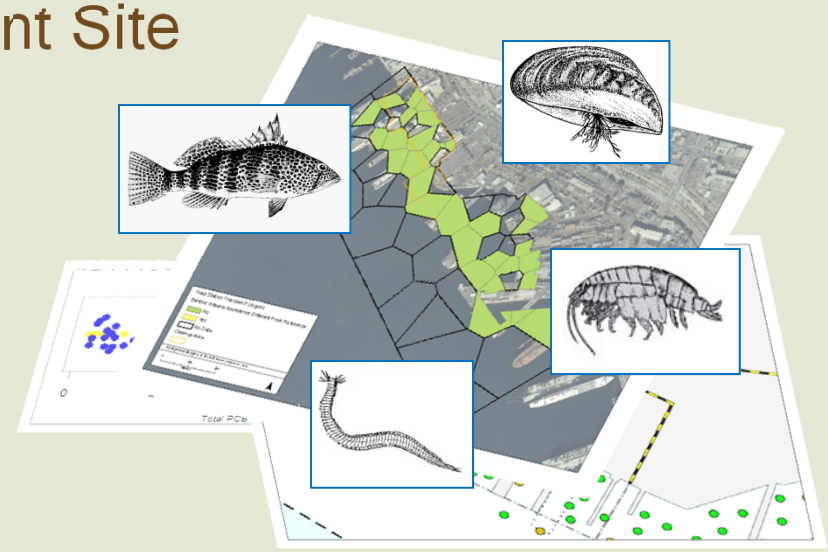

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