



Cleanup of Contaminated Sediment – “How Much Will It Cost?” and “Who Should Pay?”

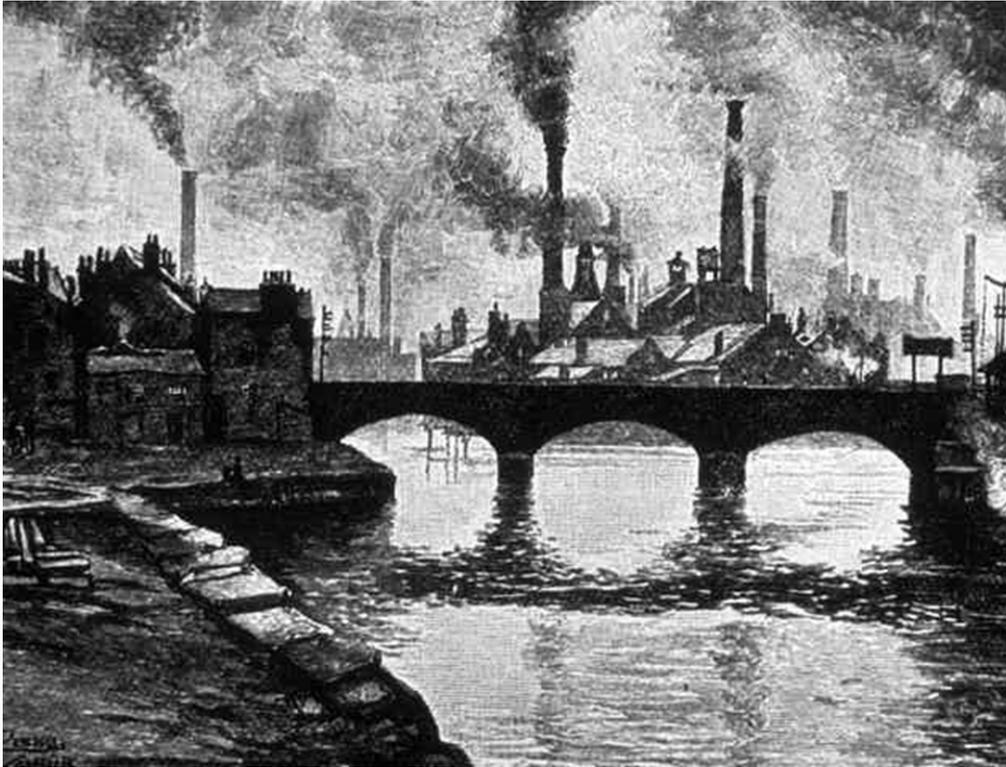
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- No clients are represented

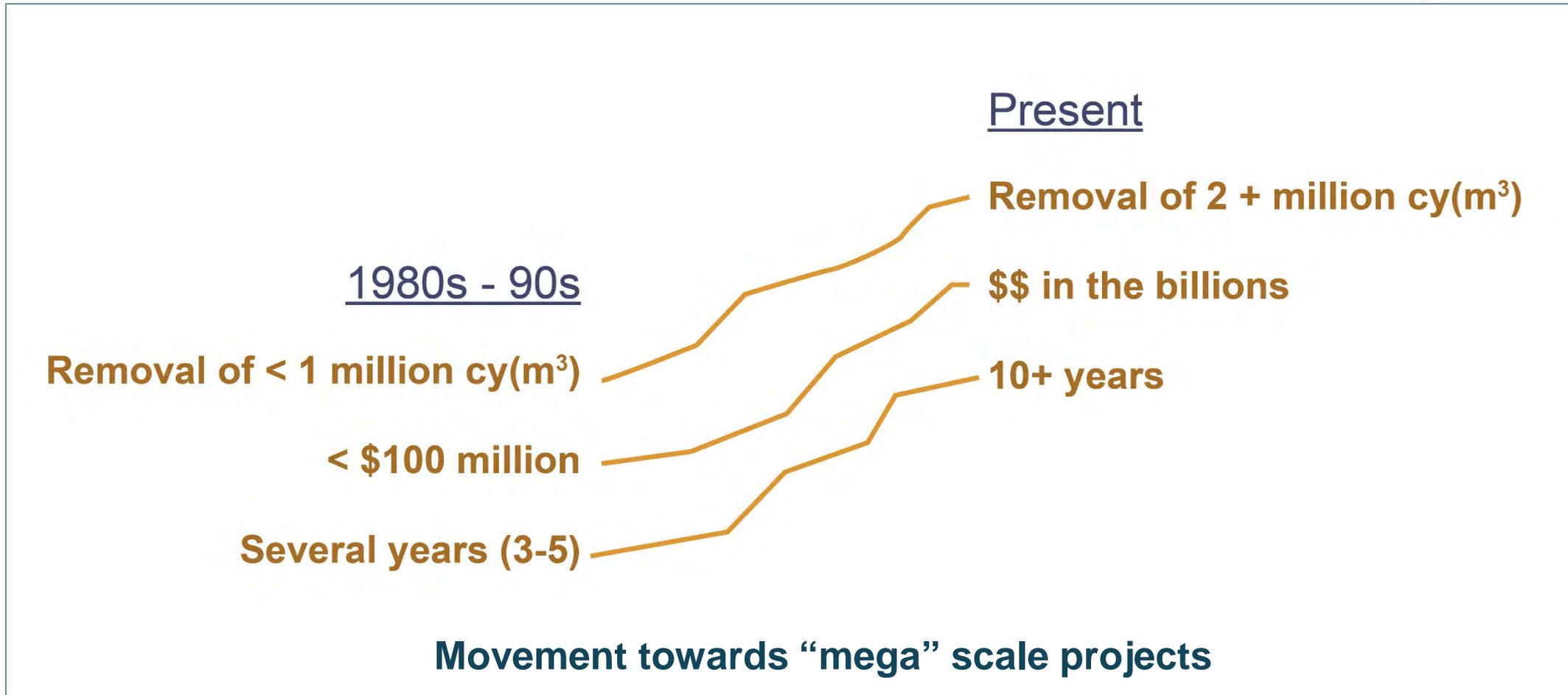
Main Messages

- Cleanup of contaminated sediment sites is often delayed over the questions of:
 - **How much will it cost?**
 - **Who should pay?**
- Probabilistic cost analysis incorporates uncertainties.
- Polluter-pays reaches practical limitations. Hybrid funding model can result in better incentives.
- Providing a realistic range of probable costs and modifying the paradigm of who should pay will lead to more and faster cleanups.

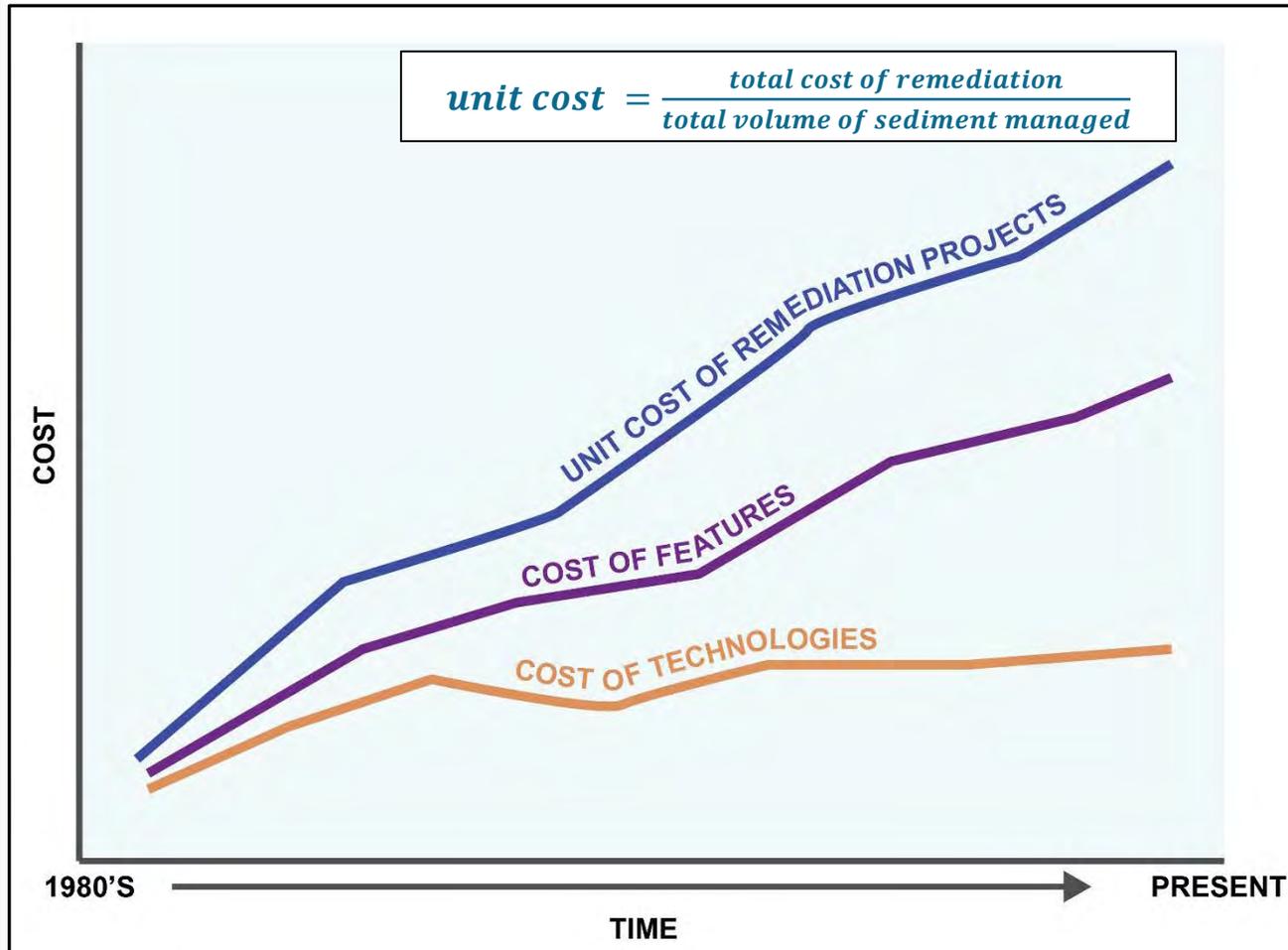
Cleanup of Contaminated Sediment Urban Waterways = Industrial Legacy



Sediment Remediation Costs



Sediment Remediation Costs



Cost Factors

- Advanced site investigation techniques
- More detailed analysis of source control, recontamination, and bioavailability, etc.
- Offsite disposal of moderately contaminated sediments
- Regulatory requirements

How Much Will It Cost?



How Much Will It Cost?

Cost Estimation

- Deterministic cost estimates are not accurate.
 - Current RI/FS paradigm is to generate more accurate costs during later project stages (design phase)
 - FS cost range in early project stages can range -30% to +50% (*generally worked when projects were smaller*)
- A more robust and accurate costing process is needed.
- Probabilistic costs should be developed, that take into account uncertainty, resulting in a much more realistic estimate of overall costs.

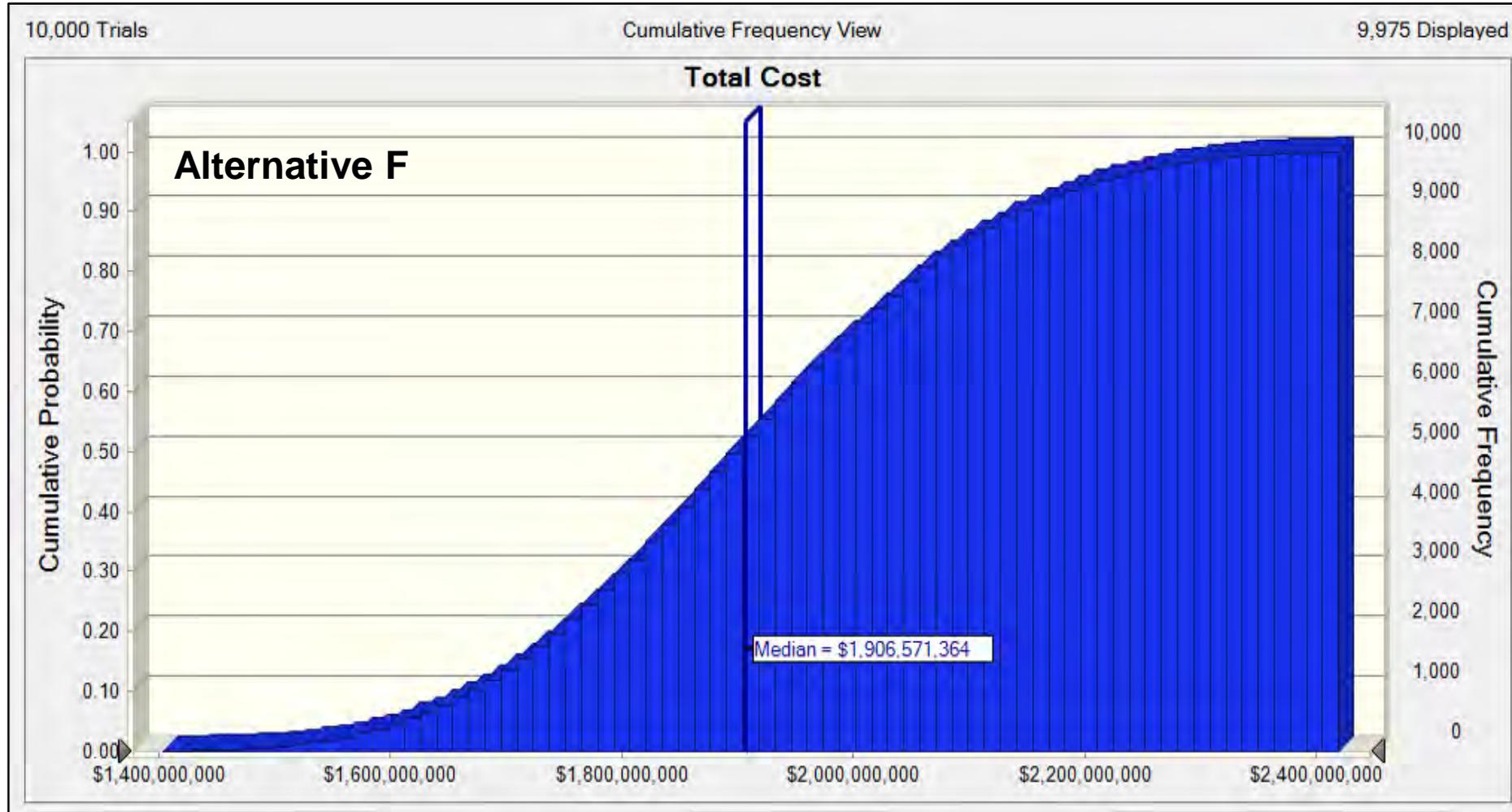
How Much Will It Cost?

Probabilistic Cost Estimation

- Manage cost risk and uncertainty
- Answer questions not typically included in cost estimation:
 - What if the time scale increases?
 - What if the volume increases?
- Allows uncertainty to be incorporated into the cost estimate
- Provides a range of costs
- Informs contingencies, cost drivers, and risk of cost increase
- Identifies high impact factors to refine overall costs
- Allows for transparent evaluation of actual costs for decision making

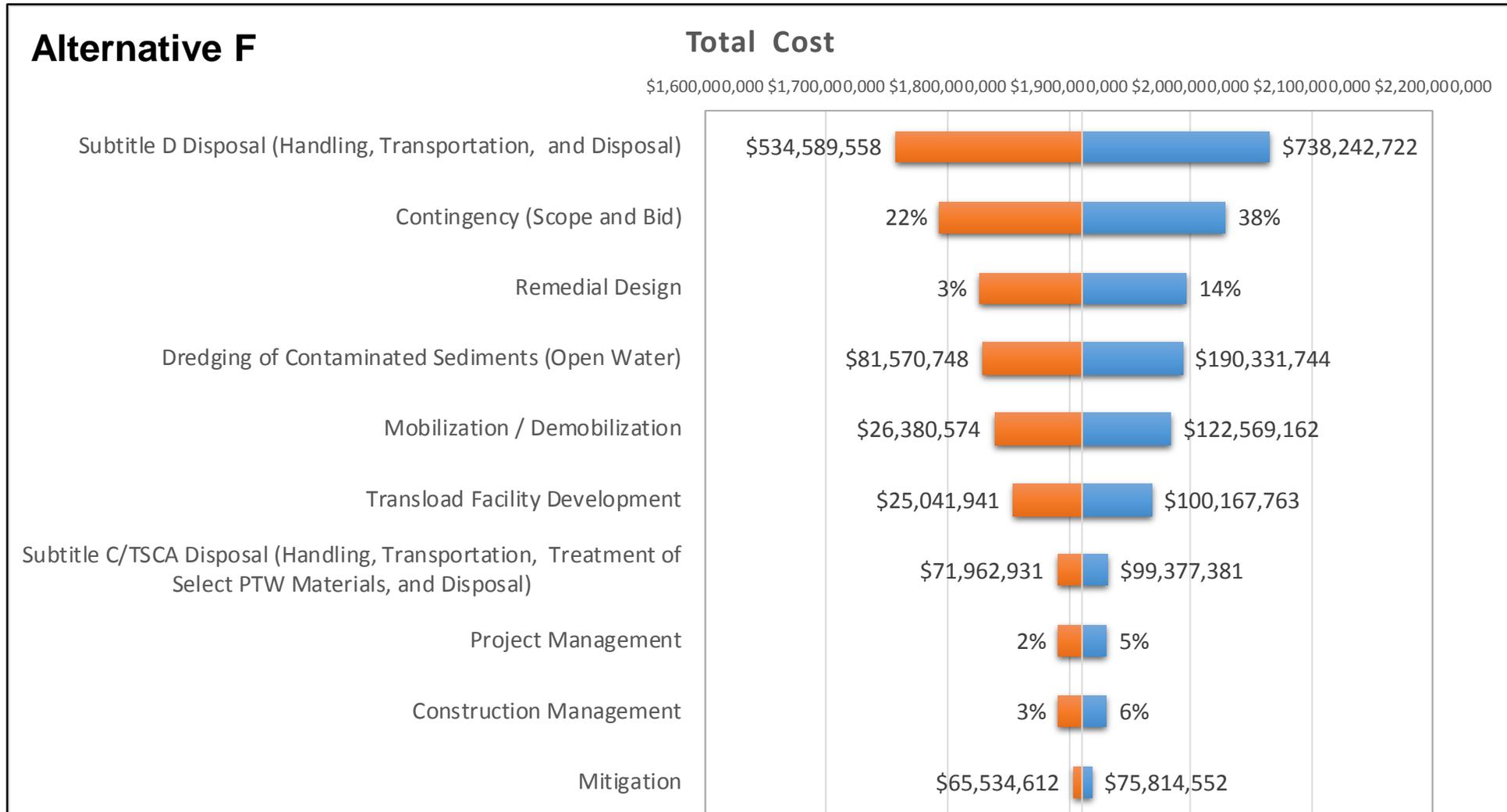
How Much Will It Cost?

Probabilistic Cost Estimate

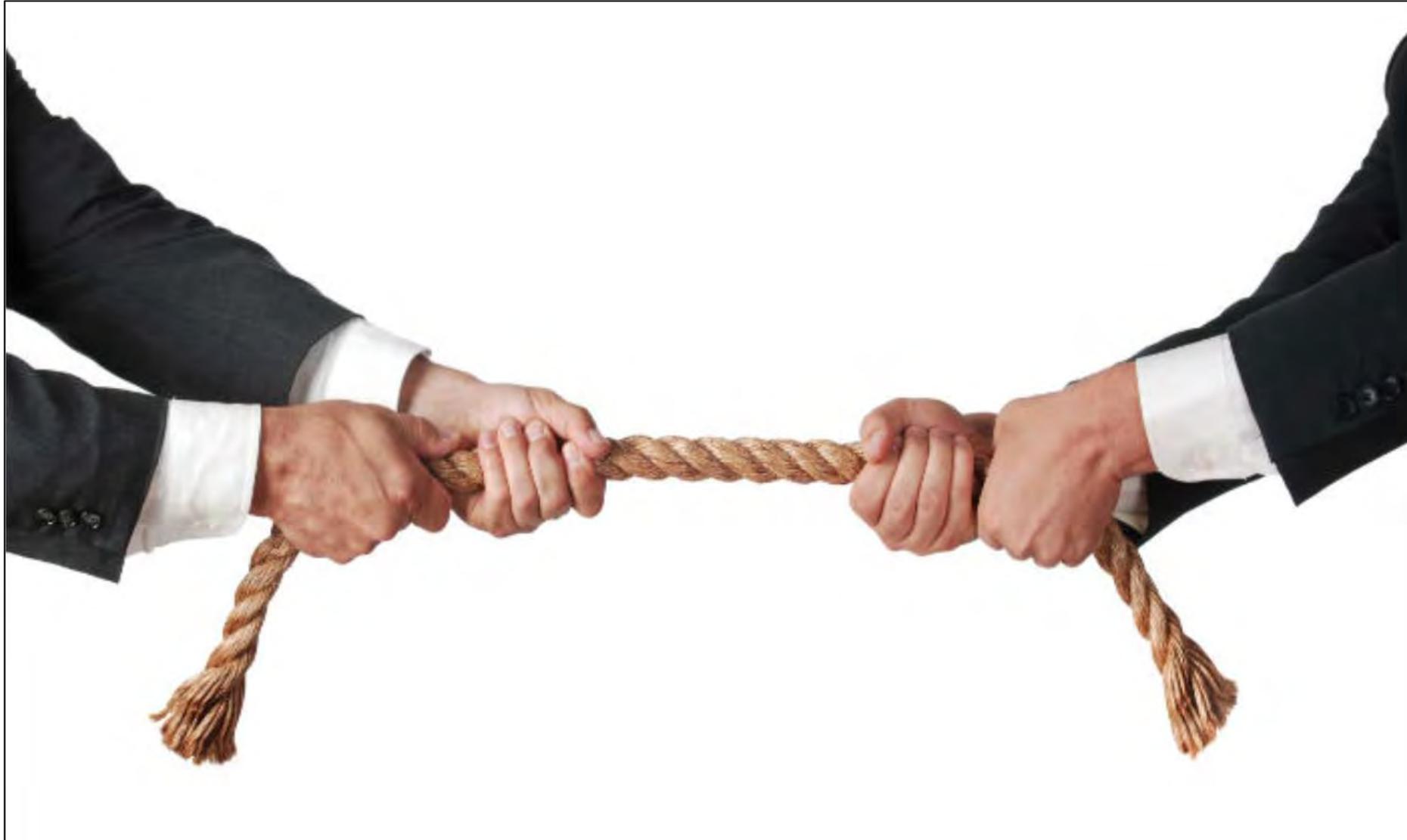


How Much Will It Cost?

Example – Portland Harbor Superfund Site



Who Should Pay?



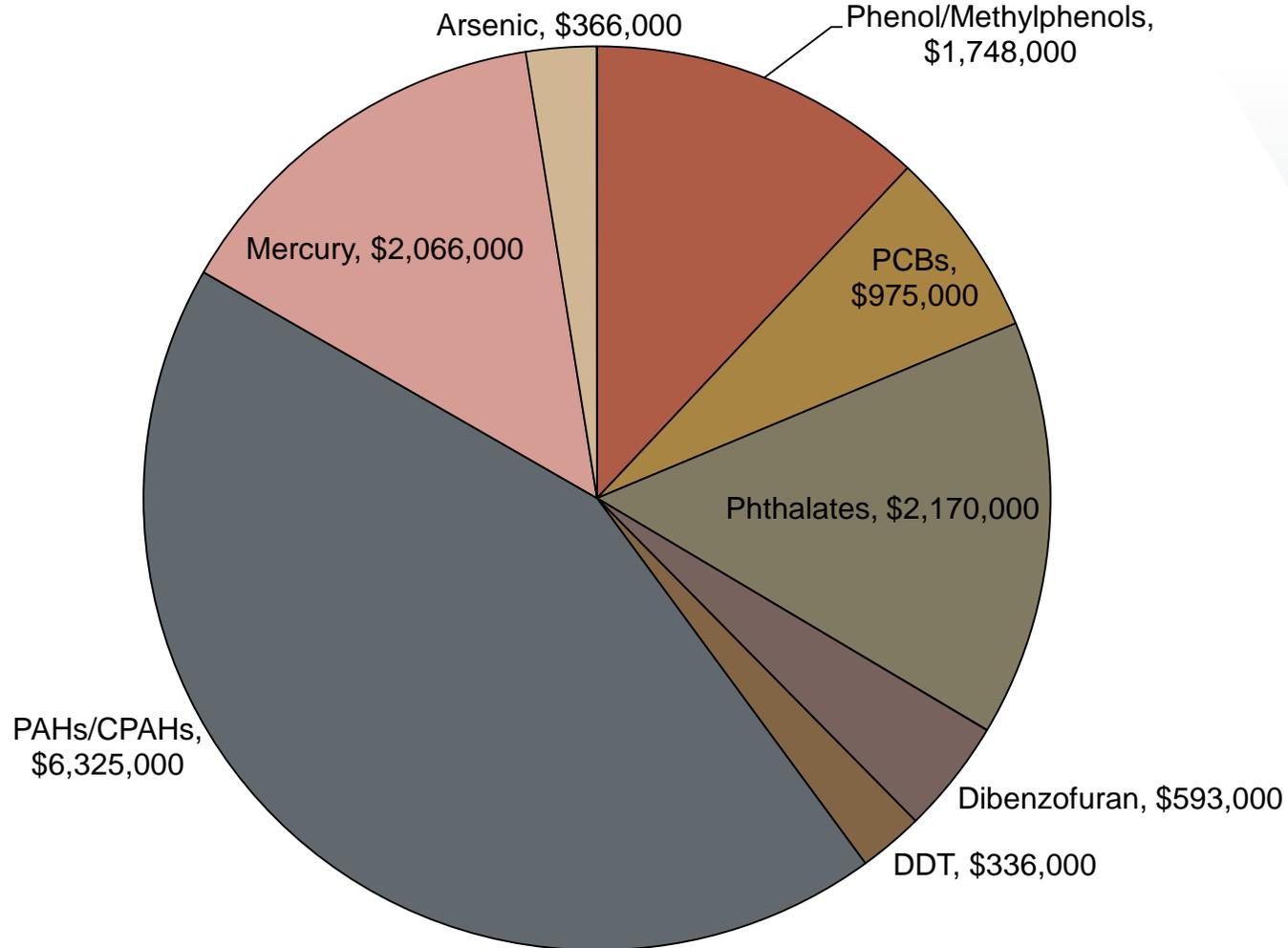
Who Should Pay?

Tools for Allocation Technical Support



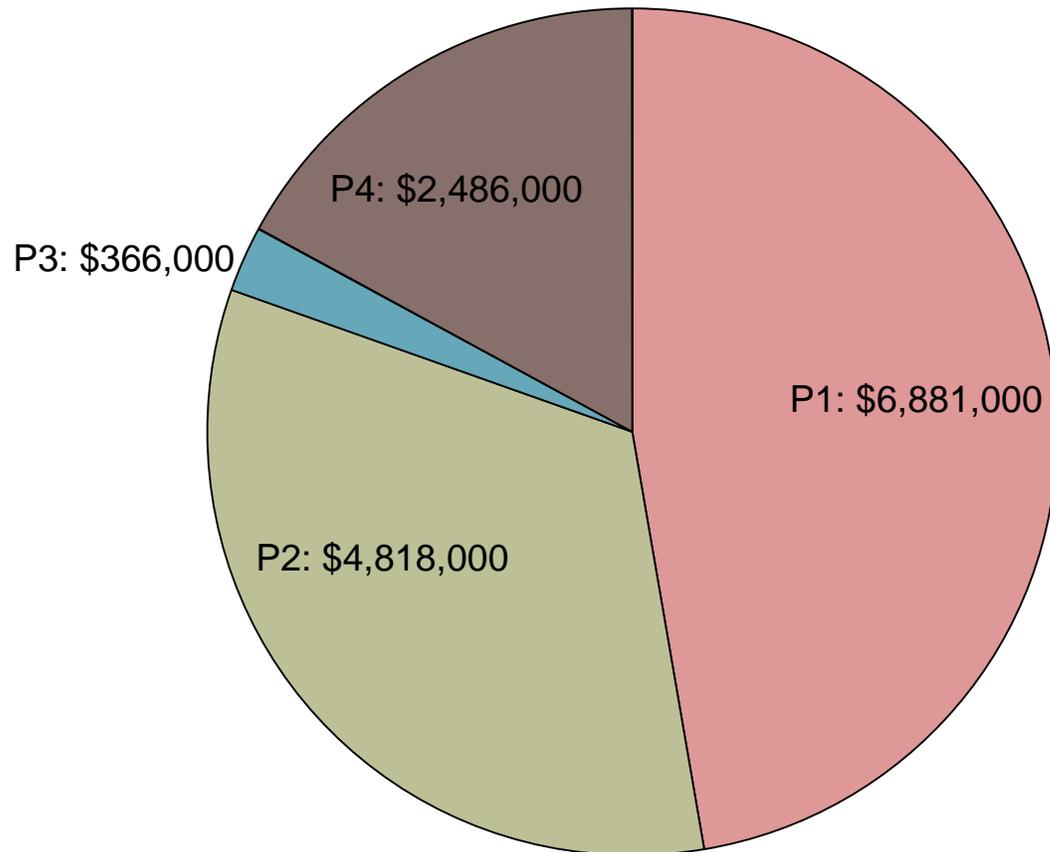
- Facility history and discharge characteristics
- Pathway analysis, fate and transport
- Nexus determination
- Industrial archeology (processes, wastes)
- Data review and management
- Forensic chemistry and statistical analysis
- Loading calculations and modeling
- Causation, divisibility, and the “but for” argument
- PRP identification and evidence development
- Costs and remedy appropriateness
- NRD support
- Expert reports/testimony

Who Should Pay? Allocation by Chemical



Who Should Pay? Allocation by Party

Allocation based on parties associated with each COC



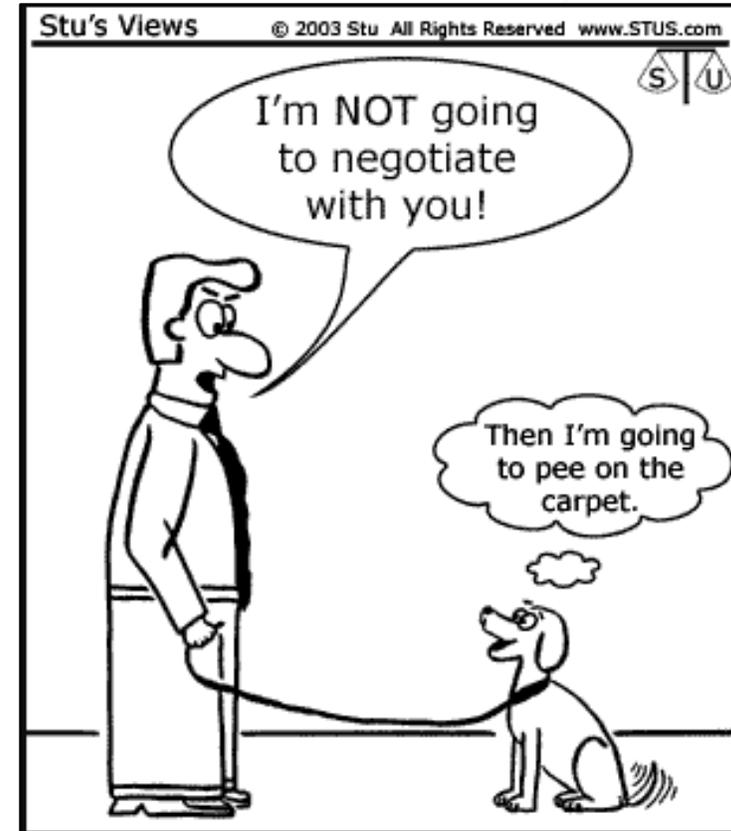
Party	Source and Associated COCs	Cost Share	Percent of Total Costs
P1	<ul style="list-style-type: none"> Stormwater and wastewater discharges – phenols, PAHs, phthalates Creosoted piles – PAHs Chloralkali- mercury 	\$6,881,000	47%
P2	<ul style="list-style-type: none"> Stormwater and wastewater discharges – phenols, PAHs, phthalates Diesel fueling and creosoted piles - PAHs 	\$4,818,000	33%
P3	<ul style="list-style-type: none"> Electrical transformer - PCBs 	\$366,000	3%
P4	<ul style="list-style-type: none"> Lumber mills – phenols Unknown – DDT, dibenzofuran, arsenic 	\$2,486,000	17%
Total		\$14,600,000	100%

Who Should Pay? Why Not “Polluter Pay All”?

- Forensic tools exist to identify sources, but it is not always possible to force historic polluters to pay
 - Legal limitations (e.g. time bars, permitted discharges, etc.)
 - Previously nationalized industries
 - Orphans (polluters who no longer exist)
 - Non-participants (polluters who avoid responsibility)
- Lengthy and costly disputes over liability and allocation
- Stakeholders can make unreasonable demands of “someone else’s money”
- Our approach is the problem, if we expect progress, we need to make a change

Hybrid Funding Model

- Hybrid Funding Model
 - Means for disagreeing parties to come to an agreement short of litigation
 - Includes technical and legal elements
 - Distributing costs to a wider group will result in better incentives to move forward
 - Outcomes may reap profits and tax incentives that appeal to developers and municipalities.
 - Unite parties and break gridlock
- Great Lakes Legacy Act as an example of collaboration



Focus on Redevelopment

- A longer range view of funding for large sediment cleanup projects would be more rational
- Sediment cleanup without a vision for the waterfront is less successful
- More explicit linkage between sediment cleanup and waterfront revitalization
- Polluters pay some, maybe most
- Beneficiaries of cleanup should contribute
- Long term players (cities and ports) take on leadership roles



Conclusions

- The missing expertise in the superfund allocation process is financial
- Any large, complex, long duration project needs a funding plan
- Successful environmental actions require:
 - Effective approaches to cost estimates
 - Realistic range of probable costs
 - A cooperative approach to funding and coordination of cleanup
 - Municipalities can play an important role in cleanup
 - Modifying the paradigm of who should pay will lead to a more proactive and informed process

Thank You

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