Economic Importance of the Portland Harbor Clean Up

September 2016

Natural Resource Economics

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Summary

A. The U.S. Environmental Protection Agency (EPA) has released its Proposed Plan for cleaning up the in-river portion of the Portland Harbor Superfund Site. It selected Alternative I as its Preferred Alternative for the plan.

B. EPA selected its Preferred Alternative through a hidden analytical process that:

- Failed to consider the impacts of different cleanup levels on the value of ecosystem services, counter to guidance from within the agency and a directive from an Executive Memorandum
- Considered only a narrow subset of the economic benefits that would flow from alternatives that would cleanup the harbor faster and more thoroughly.
- Biased the alternative-selection process so that EPA rejected alternatives that would yield greater net benefits for the overall community.

C. Implementation of EPA's Preferred Alternative will impose significant economic harm on families, businesses, and the overall community, harm that would be avoided if EPA were to clean up the harbor more quickly and thoroughly.

Supporting Material

A. EPA selected the Preferred Alternative through a hidden and biased analytical process

In the Proposed Plan, EPA describes nine alternatives for cleaning up the Portland harbor Superfund Site and explains why it has chosen Alternative I as its Preferred Alternative rather than one that would cleanup the site more aggressively. The document asserts that EPA made this choice based on a carefully constructed, unbiased comparison of benefits and costs to select Alternative I as its Preferred Alternative. This analytical process allegedly involved comparing:

Direct cleanup costs. EPA asserts that it did not consider other costs, including external costs, "e.g., economic impacts to residents or businesses as a result of remediation activity."[1]

vs.

Reductions in risks. EPA asserts that it considered only three types of cleanup benefits, indicated by reductions in the risk of:

1. Human cancer.
2. Non-cancer, human-health effects.
3. Ecosystem harm, indicated by the toxicity of benthic invertebrates and on the reproductive success of mink, river otter, spotted sandpiper, bald eagle, and osprey.

In reality, though, EPA did something different. Rather than using an objective, unbiased evaluative process, it used the value-judgments of the decision-makers within EPA to define and evaluate the alternatives, biasing the process to deliver Alternative I rather than a more aggressive cleanup effort as the Preferred Alternative.

The core element of this biased process is the definition [pp. 20-22] of nine remedial action objectives (RAOs) that represent "an *acceptable* contaminant concentration or range of concentrations" (Table 1). [italics emphasis added] EPA then sought the alternative that would achieve these objectives at the lowest direct cleanup cost. The key feature of this process is the determination of "*acceptable*" contamination levels.

EPA's commitment to achieving "*acceptable*" comtaminant levels is superficial, however. EPA has not demonstrated that it looked to the affected community, itself, to determine the acceptability of the agency's Preferred Alternative relative to alternatives that promise more aggressive cleanup. In particular, EPA has not demonstrated that it determined that the Preferred Alternative is "*acceptable*" to the local community for:

- "[F]ishing, occupational, recreational, and ceremonial uses." (RAO-1)
- "[H]uman consumption of COCs in fish and shellfish." (RAO-2)
- "[F]ishing, occupational, recreational, and potential drinking water supply." (RAO-3)
- "[H]uman exposure." (RAO-4)
- "[E]cological exposure." (RAO 8)
- "[H]uman health and ecological exposures." (RAO-9)

[1] EPA. 2000. *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study*. https://yosemite1.epa.gov/ee/epa/ria.nsf/vwAN/S200010.pdf/$file/S200010.pdf.

Table 1. EPA's Remedial Action Objectives (RAOs)

RAO 1 – Sediment	Reduce cancer and non-cancer risks to people from incidental ingestion of and dermal contact with COCs in sediment and beaches to exposure levels that are acceptable for fishing, occupational, recreational, and ceremonial uses
RAO 2 – Biota	Reduce cancer and non-cancer risks to acceptable exposure levels (direct and indirect) for human consumption of COCs in fish and shellfish
RAO 3 – Surface Water	Reduce cancer and non-cancer risks to people from direct contact (ingestion, inhalation, and dermal contact) with COCs in surface water to exposure levels that are acceptable for fishing, occupational, recreational, and potential drinking water supply
RAO 4 – Groundwater	Reduce migration of COCs in groundwater to sediment and surface water such that levels are acceptable in sediment and surface water for human exposure
RAO 5 – Sediment	Reduce risk to benthic organisms from ingestion of and direct contact with COCs in sediment to acceptable exposure levels
RAO 6 – Biota (Predators)	Reduce risks to ecological receptors that consume COCs in prey to acceptable exposure levels
RAO 7 – Surface Water	Reduce risks to ecological receptors from ingestion of and direct contact with COCs in surface water to acceptable exposure levels
RAO 8 – Groundwater	Reduce migration of COCs in groundwater to sediment and surface water such that levels are acceptable in sediment and surface water for ecological exposure
RAO 9 – River banks	Reduce migration of COCs in river banks to sediment and surface water such that levels are acceptable in sediment and surface water for human health and ecological exposures

Indeed, EPA's commitment to acceptability appears no more than an empty expression. For example, in defining RAO-1, the Proposed Plan expresses a commitment to reduce exposure to levels acceptable for "fishing, occupational, recreational, and ceremonial uses." Later, it includes a section, "Evaluation of Alternatives," in which EPA says, "the alternatives are evaluated in detail to determine which would be the most effective in achieving the goals of CERCLA and the RAOs for the Site." [p. 49] The contents of the Proposed Plan, however belie these assertions. Nowhere in the section—indeed, nowhere in the entire document!—does the EPA address the acceptability of the different alternatives to ceremonial uses. A word search of the document finds "ceremonial" mentioned only twice: on p.17, when it says, "The river provides a ceremonial and subsistence fishery for tribal members," and on p. 21, in the definition of RAO-1. The document never demonstrates that EPA, in fact, included ceremonial uses in its evaluation of alternatives. Had it done so, it likely would have concluded that resources have value beyond measurement when they play central roles in ceremonies that sustain the identity of a Tribal or other culture. In this context, it seems highly unlikely, if EPA had seriously investigated the matter, it would have found that Tribal and other fish-oriented communities do not find Alternative I to be *acceptable,* insofar as it allows contamination having negative impacts on fish and other resources having important ceremonial uses to persist in the environment.

In short, it appears that, after expressing a commitment to adopt and implement a Preferred Alternative that will reduce exposure to levels *acceptable* to ceremonial uses, EPA gave the matter no further thought.

Its concern for *acceptable* occupational uses was similarly superficial. A similar word search finds that the Proposed Plan mentions "occupational" uses only once: in its definition of RAO-1.

The absence of evidence showing that it explicitly determined what levels of cleanup are acceptable to the community indicates that EPA based this determination not on an open assessment of the community's preferences but on a hidden process that applied the value-judgments of the agency's decision-makers. This hidden process is biased against those whose harm from the contaminants is not reflected in the decision-makers' value-judgments. The discussion above suggests that, at a minimum, the bias disfavors those harmed by the impacts of contamination on occupational and ceremonial uses of affected resources. Information presented below suggests the bias extends specifically to Tribal members and others who experience harm from the contaminants' degradation of the environment.

B. EPA failed to follow applicable guidelines and executive directions for evaluating alternatives

In 2010, EPA published its *Guidelines for Preparing Economic Analyses* as "part of a continuing effort by U.S. Environmental Protection Agency (EPA) to develop improved guidance on the preparation and use of sound science in support of the decision-making process."[2] It explained the need for the document in these terms:

> "Underlying these efforts is the recognition that a thorough and careful economic analysis is an important component in informing sound environmental policies. Preparing high-quality economic analysis can greatly enhance the effectiveness of environmental policy decisions by providing policy makers with the ability to systematically assess the consequences of various actions. An economic analysis can describe the implications of policy alternatives not just in terms of economic efficiency, but also in terms of the magnitude and distribution of an array of impacts." [p. 1-2]

The Proposed Plan does not cite or reflect either the conceptual framework or the analytical requirements presents in the *Guidelines.* As a consequence, the Proposed Plan lacks economic justification for the agency's definition of alternatives, evaluation of the alternatives, and selection of Alternative I as the Preferred Alternative. Because of this gap, the Proposed Plan does not represent a science-based assessment of the alternatives.

EPA's *Guidelines for Preparing Economic Analyses* defines two primary criteria for evaluating the acceptability of environmental policy decisions: economic efficiency and equity. It offers (xii and 4-1) these definitions of economic efficiency:

- "[T]he optimal production and consumption of goods and services."
- "[T]he maximization of social welfare."

To achieve an efficient outcome, the *Guidelines* (4-2) calls on government analysts to "evaluate which of the various policy approaches under consideration maximizes the benefits of reducing environmental damages, net the resulting abatement costs." EPA has not demonstrated that it conducted such an evaluation in its preparation of the Proposed Plan. It never describes the full

[2] EPA. 2010. *Guidelines for Preparing Economic Analyses*. https://yosemite.epa.gov/ee/epa/eerm.nsf/vwAN/EE-0568-50.pdf/$file/EE-0568-50.pdf.

benefits of cleaning up the site to higher levels than those described in the Preferred Alternative. For example, EPA has not described the incremental benefits to fishing, occupational, recreational, and ceremonial uses (RAO-1) of higher levels of cleanup. It never compares the full incremental benefits against the incremental abatement costs to reassure the public that the Preferred Alternative "maximizes" the net benefits of cleanup.

EPA also has not fully assessed the equity impacts of its Preferred Alternative. In its *Guidelines* (xiii), the agency defines an equity assessment as an examination of "the distribution of benefits and costs associated…across specific sub-populations. Disadvantaged or vulnerable sub-populations, for example low-income households, may be of particular concern." In its Proposed Plan, EPA does not describe the distribution of the benefits and costs of cleaning up the site. This failure makes it impossible for decision-makers and the public to know who will enjoy the benefits and who will bear the costs if the agency implements the Preferred Alternative rather than one that would cleanup the site more aggressively. That is, EPA does not provide information showing who will enjoy the lower cleanup expenses (benefits of less aggressive cleanup), and who will experience the losses from degraded fishing, occupational, recreational, and ceremonial uses of resources (costs of less aggressive cleanup).

The *Guidelines* (xv) defines a process, known as a "social welfare function" that EPA could have used to develop a science-based assessment of the *acceptability* of the different alternatives:

> "A social welfare function establishes criteria under which efficiency and equity outcomes are transformed into a single metric, making them directly comparable. A potential output of such a function is a ranking of policy outcomes that have different aggregate levels and distributions of net benefits. A social welfare function can provide empirical evidence that a policy alternative yielding higher net benefits, but a less equitable distribution of wealth, ranks better or worse than a less efficient alternative with more egalitarian distributional consequences."

In developing the Proposed Plan, EPA made no effort to assemble anything resembling a social welfare function. As a result, it is impossible to assess the overall socio-economic effects of each alternative and weigh one alternative against the others.

More fundamentally, EPA failed to acknowledge the connection between science and community wellbeing. Thus, as part of its evaluation of alternatives, it apparently compared the Project costs against the ecosystem risks, without recognizing that some ecosystem risks are more important than others. Over the past several decades, scientists and economists have made great strides in measuring the importance of ecological risks. To do so, they focus on ecosystem services, i.e., the benefits that people get from nature. EPA's science coordinator for a panel on risk assessment described the importance of ecosystems services this way: "Bringing ecosystem services into EPA's risk assessment process will help stakeholders and decision makers understand the full value of ecosystems. … By including the assessment of ecosystem services in risk assessments, the cost-effectiveness of decisions is better understood to include the full value of the environment to society."[3]

[3] Martin, Lawrence. 2016. Including Ecosystems in Risk Assessments. https://blog.epa.gov/blog/2016/09/including-ecosystems-in-risk-assessments/.

The forum on risk assessment drives home the point more clearly: [4]

- "It has become increasingly apparent that decisions to protect the environment can be more effective when benefits to humans are considered."
- "Assessing risks to ecosystem services can (1) highlight potential assessment endpoints such as nutrient cycling, carbon sequestration, and soil formation that are not conventionally considered; (2) help communicate the importance of environmental protection to stakeholders and decision makers; and (3) provide input to subsequent ecological benefits assessments."
- "Ecosystem services endpoints can make ERAs (ecological risk assessments) more relevant to decision makers and stakeholders whose concerns may be anthropocentric and can provide an output that is more useful to economists who perform cost-benefit analyses than conventional endpoints alone."

This emphasis on integrating ecosystem services into ecological risk assessments stems, in part, from EPA's 2006 *Ecological Benefits Assessment Strategic Plan*, an EPA colloquium in 2010 on the use of ecosystem services in ecological risk assessments, and a 2015 assessment by the Ecological Processes and Effects Committee of EPA's Science Advisory Board (EPA, Risk Assessment Forum. 2016). Moreover, a 15 October 2015 Executive Memorandum directs EPA to consider "ecosystem services, where appropriate and practicable, in planning, investments and regulatory contexts."[5] The memorandum came from Director of the Office of Management and Budget (OMB), the Managing Director of the Council on Environmental Quality (CEQ), and the Director of the Office of Science and Technology Policy (OSTP). They observed that their goal was "to better integrate into Federal decision making due consideration of the full range of benefits and tradeoffs among ecosystem services associated with potential Federal actions, including benefits and costs that may not be recognized in private markets because of the public-good nature of some ecosystem services." They also observed that an ecosystem services approach can "organize potential effects of an action within a framework that explicitly recognizes the interconnectedness of environmental, social, and, in some cases, economic considerations, and fosters consideration of both quantified and unquantified information." The Executive Memorandum also clearly identifies when an ecological risk assessment or other analysis should incorporate an assessment of ecosystem services: **"should an agency's analysis require consideration of costs, the agency should consider ecosystem-services methods, where appropriate and feasible."** [bold emphasis added]

The Proposed Plan, however, mentions none of this. Instead, it compares Project costs against science-oriented assessments of the ecological and human-health risks, giving no consideration to the importance of the impacts on ecosystem services. It makes no effort to identify and apply appropriate and feasible methods for describing and weighing the impacts on ecosystem services.[6] This failure contradicts guidance that has accumulated for at least the past decade from within and outside the agency. More important, the failure to consider differences among the alternatives in their impacts on ecosystem services does a disservice to decision-makers and

[4] U.S. EPA, Risk Assessment Forum. 2016. *Generic Ecological Assessment Endpoints (GEAEs) For Ecological Risk Assessment: Second Edition With Generic Ecosystem Services Endpoints Added.* https://www.epa.gov/sites/production/files/2016-08/documents/geae_2nd_edition.pdf.

[5] Donovan, S; Goldfuss, C; Holdren, J. (2015). Incorporating Ecosystem Services into Federal Decision Making. (Memorandum for Executve Departments and Agencies). Washington, D.C.: Executive Office of the President. https://www.whitehouse.gov/sites/default/files/omb/memoranda/2016/m-16-01.pdf.

[6] These methods are discussed by EPA, Science Advisory Board. 2009. *Valuing the Protection of Ecological Systems and Services*. https://yosemite.epa.gov/sab/sabproduct.nsf/WebBOARD/ValProtEcolSys&Serv.

the public. It hides from them information necessary for assessing the relative *acceptability* of the different alternatives. It dismisses the concerns and preferences of those who will be most directly affected by the cleanup. And it strongly suggests that more aggressive cleanup will yield net benefits greater than those EPA described for Alternative I.

raises two possibilities. One, the authors of the Proposed Plan did not know about the emphasis that EPA, OMB, CEQ, and OSTP have been placing on incorporating ecosystem services into ecological risk assessments and cost assessments for at least the past decade. Two, they knew but looked the other way. In either event, it is clear that the Proposed Plan fails to satisfy

C. A more aggressive cleanup would yield significant benefits throughout the local community and region

EPA did not look at all the potential benefits from cleaning up the harbor's contaminants. Instead, to evaluate the different alternatives, EPA focused on a few indicators of risks to human health and the ecosystem. For human-health risks, it estimated the potential incidence of human cancer and some non-cancer diseases under each alternative. For ecological risks, it estimated the contaminants' impacts on the toxicity of benthic invertebrates and on the reproductive success of mink, river otter, spotted sandpiper, bald eagle, and osprey.

These indicators do not include other potentially important benefits that might materialize with contaminant removals and reductions. A useful framework for understanding the potential benefits from natural resource improvements distinguishes among different ways in which natural resources contribute to the wellbeing of individuals, families, and communities. Called the *Total Economic Value* framework, it recognizes that some benefits materialize as people use the resources, either directly or indirectly. Others materialize as people through what economists call passive use. Figure 1 illustrates the framework with a focus on fish.

EPA's assessment of fish-related benefits addressed only a portion of the direct use value: the health effects from eating fish. It ignored other components of direct use value, such as the pleasure anglers derive from fishing, or the spiritual renewal some people derive from fishing for and catching wild fish. EPA also ignored other components of value.

If EPA had looked, it would have discovered that any increase in fish populations resulting from a more aggressive cleanup of the site could yield multiple benefits for groups near and far. One assessment of this issue concluded, for example:[7]

> "This effort to characterize fish values in the basin ecosystem and economy confirms that fish constitute an extremely valuable source of commercial and recreational benefits whether they are based on native stocks, hatchery populations of salmon and trout, or introduced species. For Native Americans of the basin, the present low level of abundance of salmonids has major economic and cultural impacts. The basin ecosystem can be seen as a supplier of ecological services to a large region that extends, in the case of salmonids, to the

[7] Fluharty, David L. 2000. Characterization and assessment of economic systems in the interior Columbia basin: fisheries. Gen. Tech. Rep. PNW-GTR-451. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. http://www.fs.fed.us/pnw/pubs/pnw_gtr451.pdf.

whole northeast Pacific fisheries. More broadly, salmon are rapidly becoming symbols of quality of life as well as part of the cultural heritage of the region." [p. 52]

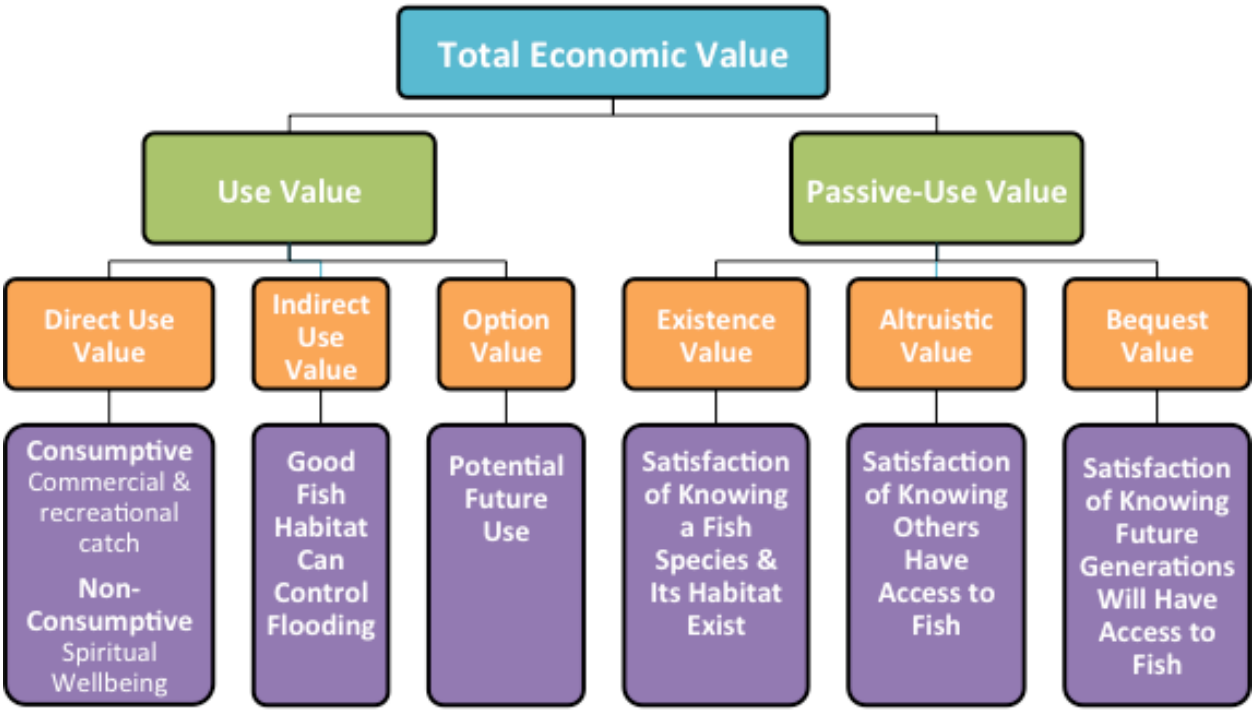

Figure 1. Components of the total economic value derived from fish resources

The author also observed:

"Because of the strong association of abundant stocks of anadromous fish and recreational fishing with quality of life in the Pacific Northwest, the nonuse and existence values of fish in the basin take on considerable importance. The presence of many species of fish not used by commercial and recreational fishers has ecological significance. Furthermore, some of these species have significant nonmarket values for Native Americans in the basin. Even species normally considered by anadromous aficionados as introduced 'trash fish' are gaining in popularity in the recreation sector, and some produce commercial value." [p. 5]

In other words, all species of fish adversely affected by contaminants at the site have value, in many ways to many groups. Having not considered these values, EPA cannot legitimately assert that Alternative I is the most acceptable to these groups. This conclusion applies especially to Tribal communities and others who value fish in ways that extend beyond recreational and commercial fishing. "It can be said without exaggeration that no aspect of nature in North America was so critically important in the economic life of a fishing folk as was

the salmon run in the West."[8] Other species—chubs, lamprey, sturgeon, trout, etc.—also have importance, for ceremonial and religious purposes as well as for subsistence.

Lamprey, for example, play many important roles. In existence for more than 500 million years, they contribute to the foundation of the Columbia River Basin's ecosystem, improving habitat for salmon and other species as juveniles filter algae and sediment from rocks,[9] and adult carcasses bring important nutrients from the ocean to the food web for aquatic and terrestrial species. Some evidence suggests that healthy lamprey populations are a necessary condition for successful restoration of salmon. Higher levels of contamination threaten the lampreys' continued contribution to the ecosystem. They also pose risks to the wellbeing of Tribal members (CRITFC 2011) through impacts that include:

- Loss of lamprey from the ecological circle and the tribal way of life. The tribes consider the lamprey as their sacred elder and without them the circle of life is unbalanced.
- Loss of cultural heritage, especially for young tribal members—many have never even seen a lamprey. As a consequence of declining harvest within interior Columbia River tributaries, many young tribal members have not learned how to harvest and prepare lamprey and are losing historically important legends associated with these fish.
- Loss of fishing opportunities in traditional fishing areas. Among other things tribal members are forced to travel long distances to lower Columbia River tributaries, such as the Willamette River, for severely limited lamprey harvest opportunities.

Contamination at the site also affects the behaviors and culture of other groups: African American, Latino, Asian American, and Russian/Slavic.[10]

EPA, in general terms, recognized the potential economic importance of increases in subsistence, recreational, commercial fishing that might result from more aggressive cleanup of the site, but it failed to fully quantify this potential. It also failed to consider other components of the total value, as indicated by Figure 1. This failure reflects the agencies failure to look for relevant information rather than from a lack of such information.

A recent assessment of the economic value of salmon in the Columbia River Basin found, for example, that Spring Chinook salmon caught commercially have an economic use value of $50-$60 for the ocean and Lower Columbia River fisheries, respectively, and those caught recreationally have a value of $120-$330.[11] The researchers also found that recreational and commercial fishing represented no more than 10 percent of the total value Washingtonians and Oregonians place on an increase in salmon populations. This percentage indicates the general magnitude of the potential error in EPA's decision to measure cleanup benefits looking only at its small subset of benefits. Moreover, ECONorthwest et al. (2012) found that Washingtonians and Oregonians would realize a benefit of $5.0–$7.4 billion from implementation of a program that would increase salmon populations in the Columbia River by 180,000–470,000 adults per year.

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[8] Rostlund, Erhard. 1952. *Freshwater Fish and Fishing in Native North America.* University of California. Cited in Fluharty (2000; 8).

[9] Columbia River Intertribal Fish Commission (CRITFC). 2011. *Tribal Pacific Lamprey Restoration Plan for the Columbia River Basin.* http://www.critfc.org/wp-content/uploads/2012/12/lamprey_plan.pdf.

[10] Sunding, David, and Steven Buck. 2011. *Fish Consumption in Portland Harbor.*

[11] ECONorthwest, Natural Resource Economics, and ESA. 2012. *Yakima River Basin Integrated Water Resource Management Plan: Four Accounts Analysis of the Integrated Plan.*

These numbers raise the very real possibility that the incremental benefits from a more aggressive cleanup of the site would outweigh the incremental Project costs. The Proposed Plan, however, is so inadequate that it never raises the question or points toward an answer.

These numbers also suggest that, if it had considered the full benefits of additional cleanup, EPA might have selected as its Preferred Alternative one that promises more aggressive cleanup than what is contained in Alternative I. Moreover, if it had considered the full set of cleanup benefits, EPA likely would have evaluated Alternative H and/or other alternatives that aim for a more robust cleanup.

In sum, by focusing on only a small subset of cleanup benefits, it is reasonable to conclude that EPA looked at the wrong alternatives and selected the wrong Preferred Alternative.