Butte Priority Soils RI/FS

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> The object of our profession is to destroy hazardous waste, whenever possible, and to permanently dispose that which cannot be destroyed. Our obligation is to free subsequent generations of the responsibility for caretaking our hazardous residues, not to saddle them with housekeeping chores which, if neglected, will result in the re-pollution of the environment that we worked so hard to clean. (Jack A Caldwell and Charles C. Reith, *Principles and Practice of Waste Encapsulation*.)

Superfund's purpose is to clean up hazardous waste sites that pose a ***threat*** to human health and the environment. Remedies under Superfund should provide a permanent cleanup remedy not temporary containment. Simply, cleanup is the "act of cleaning up" and the term clean means "pure, free from dirt, contamination, impurities." According to the EPA, Superfund's mission is to "make sites safe, make sites clean, and bring new technology to bear on the problem."

If one carefully examines the major laws and regulations pertaining to Superfund, one finds that they all emphasize the following:

1. **Cleanup** as the **primary goal** of any Superfund activity.
2. The **reduction of toxicity, volume and mobilit**y of hazardous substances, pollutants, and contaminants at a site. For example, the NCP mandates that the overriding goal of the Superfund remedy selection process is: "to select remedies that are protective of human health and the environment, that maintain protection over time, and that minimize untreated waste." [40 CFR 300.430(a)(1)(i)] Treatment is the preferred approach to dealing with contaminants.
3. **Permanent** cleanup remedies. Section 121(b) of CERCLA mandates that: "Treatment which 'permanently and significantly reduces' the hazardous substances involved is to be 'preferred' over other remedies and EPA must select remedies that utilize 'permanent solutions'. . . ." (Quoted in *Environmental Law Handbook*, Arbuckle, et. al, 10th Edition, p. 88) During the Senate debate on SARA, Senator George Mitchell (D-Maine) argued that permanent treatment means that EPA cleanup plans must result in the permanent and major reduction in the toxicity, volume, and mobility of hazardous substances, pollutants, and contaminants at a site and that this reduction must be to the "lowest level achievable." Senator Mitchell stated: "In addition to the quantitative reduction implied, significant reduction in this context means the minimization of volume, toxicity and mobility of such substances to the lowest levels achievable with available technologies." (132 *Congressional Record*, S. 14914 (daily edition.

October 3, 1986) It is clear that the legislative intent was permanent, real cleanups of Superfund sites.

4. **Cost** is **not the major factor** in selecting a cleanup remedy under Superfund. Cost is secondary to protecting human health and the environment. Under Superfund, human health and the environment must be protected from potential threats regardless of cost. During Senate debate on SARA, Senator John H. Chafee (R-RI) noted: "the extent to which a particular technology or solution is feasible or practicable is not a function of cost. A determination that a particular solution is not practicable because it is too expensive would be unlawful." (132 *Congressional Record*, S. 14925 (daily edition, October 3, 1986) The way in which cost is supposed to figure into Superfund decisions is that a determination is first made as to what is the level of protection for human health and the environment which the remedy should achieve and then selecting the most cost effective means of achieving that level of protection. Cost as a balancing criterion does not mean selecting the cheapest remedy. It is clear that the law mandates that the EPA designs a remedy which will be permanently protective of human health and the environment and then finds the most cost effective method of implementing that remedy. "The EPA is never justified in selecting a short-term, impermanent remedy (like landfilling or capping) simply because it is cheaper than a permanent alternative. The law could hardly be clearer." (Environmental Research Foundation, "More Lessons from Superfund.")
5. The use of **institutional controls** is not a substitute for cleanup of a site. "Institutional controls. . . generally shall not substitute for more active measures (e.g. treatment and/or containment of source material) as the sole remedy. . . . (40 CFR 300.430(a)(1)(iii)(D). See: OSWER Directive 9355.0-69, EPA 540-R-97-013-"Rules of Thumb for Superfund Remedy Selection."

Superfund was designed not only to deal with actual harms to human health and the environment but also with threatened harms and potential threats. CERCLA specifically deals not only with release of hazardous substances but also with the "threat of" release "into the environment of a hazardous substance or pollutant or contaminant. CERCLA defines each of these terms quite broadly." (*Environmental Law Handbook*, p. 76.) Also, Superfund places an emphasis on treatment rather than containment for hazardous waste. [EPA, "Rules of Thumb for Superfund Remedy Selection," 40 CFR 300.430 (a)(1)(iii)(A)]

This paper considers the following issues of significance for the Butte Priority Soils OU RI/FS process:

1. The contaminants found in Butte Priority Soils OU pose a significant threat to human health and the environment. The seriousness of these threats demands ***removal*** as the primary approach to cleaning up the Butte Priority Soils Operable Unit.
2. Reliance on capping will not remove these threats and is not adequately protective of human health and the environment.
3. Reliance on institutional controls will not remove these threats and is not adequately protective of human health and the environment.

4. Reliance on lime abatement will not remove these threats, is not adequately protective of human health and the environment and will create its own problems.
5. In-situ treatment, in general, will not remove these threats and is not adequately protective of human health and the environment.
6. Only ***contaminant removal*** will remove these threats. Only removal of the toxics found in the Butte Priority Soils Operable Unit will be adequately protective of human health and the environment as mandated by Superfund.
7. The RI/FS is inadequate in its consideration of treatment technologies for BPSOU contaminants.
8. The RI/FS process needs to give greater attention to the provisions of the Superfund Redevelopment Initiative.

Site Contaminants found in BPSOU

In considering the significant threats to human health and the environment which the Priority Soils' contaminants pose, one should be wary about any cleanup remedy which leaves substantial amounts of these contaminants in place and untreated to threaten human health and the environment in perpetuity. The public should look askance at any remedy which does not significantly provide for the permanent reduction in the mobility, toxicity and volume of contaminants. The only real ***cleanup*** remedy for these toxics found in the Butte Priority Soils Operable Unit is ***removal of contaminants***. Sometimes people become so involved in the discussion of how to remediate a site that they lose sight of the reasons for the remediation in the first place. All remediation activities should be conditioned by a continuing concern for removing the threats posed by the toxics to be remediated. The following briefly articulates the serious health and environmental threats posed by some of the contaminants found in the Butte Priority Soils OU.

Lead

> Since one molecule of lead, when it enters a cell, will change the state of that cell, the theoretical question: 'What is an adverse health effect?' becomes important. Dr. H. L. Neddleman

Lead acts the same once it gets into a child's body no matter what the route of exposure. Fifty percent of the lead swallowed by children enters their blood and other body parts even if their stomachs are full. For children, 73% of the lead in their body is in bones and teeth. Only 23% of the lead taken into a child's body will leave in the body's waste. (U.S. Department of Health and Human Services)

One must also consider the sub-clinical health effects of long term, chronic exposure to low levels of lead which have been shown to cause nervous system problems, renal problems, reproductive system problems, interference with enzyme activity, and cancer. *The New England Journal of Medicine* and the American Academy of Pediatrics have claimed that even exposure to amounts of lead considered safe for children have caused

lower scores on problem solving tests, lower perception levels, memory loss and learning and coordination disability. Another study found that "Children with only 5 to 7 ug/dl of lead show learning damage, damage to the central nervous system, stunted growth, reduced IQ and other neurobehavioral abnormalities." ("Establishing a Health Based Standard for Lead in Residential Soils," by Patrick Reagan and Dr. Ellen Silbergled, *Trace Substances in Environmental Health.*) The ASTDR (Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services) has noted: "Studies on the effect of lead in children have demonstrated a relationship between exposure to lead and a variety of adverse health effects. These effects include impaired mental and physical development, decreased heme biosynthesis, elevated hearing threshold, and decreased serum level of vitamin D. The neurotoxicity of lead is of particular concern, because evidence from prospective longitudinal studies has shown that neurobehavioral effects, such as impaired academic performance and deficits in other skills, may persist even after lead levels have returned to normal. (ASTDR, "Analysis Paper: Impact of Lead-Contaminated Soil on Public Health," May 1992) It is also reported that the harms are virtually permanent. No wonder the former head of the U.S. Public Health Service, James Mason has concluded: "The more we learn (about lead) the more toxic we find it to be."

Also, it takes very little exposure to lead to cause severe health problems. For example, a child can become severely lead poisoned (60-80 ug/dl) by ingesting only 1 milligram of lead contaminated dust. This is the equivalent of 3 granules of sugar. 35 ug/dl can occur by ingesting approximately 1/3 milligram of lead contaminated dust which is the equivalent of 1 granule of sugar. (*Newsweek*, July 15, 1991) The American Academy of Pediatrics has boldly stated that the only desirable amount of human lead exposure is zero. It is also important to remember that children normally ingest 1 to 3 tablespoons of dirt per day. (EPA and New York State Health Department) The ASTDR in its "The Nature and Extent of Lead Poisoning in Children in the United States: A Report to Congress" demonstrates that when lead is present in the soil, children **will** ingest it and we **will see** elevated lead levels in children. "A strong positive correlation is found between exposure to lead-contaminated soil and lead levels." (ASTDR)

No wonder that lead is ranked as "the number one priority hazardous substance" at NPL sites. (ASTDR, "Analysis Paper: Impact of Lead-Contaminated Soil on Public Health," May 1992)

Cadmium

Cadmium is as "probable carcinogen" which is likely to cause cancer of the prostate, kidney, testes, and lung. Apart from cancer, cadmium exposure can produce kidney disease, osteomalacia, progressive glomerular disorders, enteropathy, nutrient malabsorption problems, cardiomyopathy, anemia, depressed immune system, liver damage, increased blood pressure, and reproductive problems. (Lars Friberg, MD, Professor em. Institute of Environmental Medicine, Karolinska Institutet, Sweden; "Nutritional Toxicology of Heavy Metals: Cadmium and Mercury," Cornell University;

Environmental Health Education Center, University of Maryland School of Nursing; William H. Hallenbeck, School of Public Health, University of Illinois)

Mercury

Acute health effects of mercury exposure include: kidney damage, pneumonia. Chronic health effects of mercury exposure include: gum disease, mental deterioration, and harm to the central nervous system.

The reproductive system is also adversely affected by exposure to mercury. (New Jersey State Department of Health, Division of Occupational and Environmental Health) The North Carolina Division of Pollution Prevention and Environmental Assistance declares: "Mercury is toxic by ingestion, inhalation, and skin absorption, with acute and chronic exposure effects including central nervous system and kidney damage. Acute exposure includes nausea, blurred vision, painful breathing, excessive salivation and pneumonitis, while chronic or longer-term exposure includes memory disturbance, hypertension, vision problems, hallucinations, tremors and personality changes. Because mercury can cross the blood-brain barrier, and because it can affect brain development, its effects are of special concern to pregnant or lactating women and young children."

Arsenic

Arsenic has been designated a human carcinogen. Arsenic can cause cancer of the lungs, liver and skin. (*Staying Healthy in a Risky Environment*, New York University Medical Center, p. 365.) Arsenic exposure at low doses can cause nerve damage, cardiovascular problems, skin problems and constitutional complaints such as nausea, diarrhea, gastrointestinal upset, etc. (Johnson and DeRosa, ASTDR, "The Toxicologic Hazard of Superfund Hazardous Waste Sites") Arsenic targets most of the body's organs and is particularly harmful to the gastrointestinal tract and to the skin. Outdoor play is a common arsenic exposure route for children. .

Children are Particularly at Risk for the Pollutants found in Butte Priority Soils

It is important to remember that with all of the above contaminants found in the Butte Priority Soils, children are particularly at risk from exposure. "Metals are particularly toxic to the sensitive, rapidly developing systems of the fetus, infants and young children. Some metals, such as lead and mercury, easily cross the placenta and damage the fetal brain. Childhood exposure to some metals can result in learning difficulties, memory impairment, damage to the nervous system, and behavioral problems such as aggressiveness and hyperactivity. At higher doses, heavy metals can cause irreversible brain damage. Children may receive higher doses of metals from food than adults, since they consume more food for their body weight than adults." (Physicians for Social Responsibility, "Toxics and Health") Another publication by Physicians for Social Responsibility entitled "Children's Environment Health" notes that: "On a body weight

basis, infants and young children drink more water, eat more food, and breath more air than adults. In addition, a child's normal behavior can also put him or her at greater risk. Typical childhood behaviors such as eating exclusively one kind of food, crawling, digging in dirt, and putting objects in the mouth, can all lead to increased exposures to environmental contaminants."

The point of the above discussion of the health effects of some of the main contaminants found in the Butte Priority Soils Operable Unit, is to demonstrate that, given the serious health threats that these contaminants pose, they should not be left in place to effect current citizens of the area nor should they be left in place to threaten future generations of citizens. Discussion of cleanup technology cannot become so absorbed in the technology so as to neglect the threats the technology is supposed to alleviate.

Caps are not Permanently Protective of Human Health and the Environment.

Problems with caps:

1. Metals can be remobilized through bio-irrigation. (Dueri, Sibylle, et. al., University of Laval, Quebec, "Modeling the Transport of Heavy Metals through a Capping-Layer: The case Study of the Flood Sediments Deposited in the Saguenay Fjord, Quebec.")
2. The long term efficacy of caps can be compromised by advection "related to consolidation, diffusion, chemical reactions, and the effect of . . . burrowing activity." (*Ibid.*)
3. Desiccation can cause cracking of the cap cover. (David Daniel, Professor of Civil Engineering, University of Texas, *Geotechnical Practice for Waste Disposal*)
4. The freeze-thaw cycle can produce changes in the structure and fabric of the cover and a way that increases hydraulic conductivity. (*Ibid.*)
5. Caps are difficult to construct correctly. (*Ibid.*)
6. Caps are difficult to maintain and repair. (*Ibid.*)
7. Erosion is a serious problem. (Jack Caldwell, U.S. Department of Energy, *Principles and Practice of Waste Encapsulation.*)
8. Biointrusion can compromise the effectiveness of the cap. (*Ibid.*)
9. Differential settlement of the cap can cause cracking. (Oweis and Khera, New Jersey Institute of Technology, *Geotechnology of Waste Management.)*
10. Caps require regular and often expensive repair. (*Ibid.*)
11. Stabilization of the cap is a problem. (*Ibid.*)
12. Caps present long-term subsidence and settlement issues. (*Ibid.*)
13. Because of their susceptibility to "weathering, cracking and subsidence" caps have limited long term utility. "Wind, rain, and generalized erosion over time can severely damage even a well-designed . . . cover." (U.S. Department of Energy, Office of Environmental Management, "Remediation Technology Descriptions: Containment.") See also: Merritt, Frederick (ed.) *Standard Handbook for Civil Engineers*, McGraw-Hill, New York.

The extensive use of caps as a cleanup method for Butte Priority Soils would do nothing to reduce the toxicity and volume and mobility of contaminants. Caps do nothing to clean up a site. The extensive use of caps as a cleanup method for Butte Priority Soils would not provide a permanent remedy. The extensive use of caps as a cleanup method for BPSOU would violate the Superfund mandate for treatment over containment. In short, the extensive use of caps for the BPSOU would not be protective of human health and the environment.

Lime Treatment does not Work.

The use of lime abatement will be ineffective as a treatment technology for Priority Soils. A study conducted by Bethel Inc. showed that treatment of heavy metals with lime still allowed the release of 20% of the heavy metals into the environment. (Shimoda, Masao 1994. "Fixation Mechanisms of Toxic Heavy Metals with Cements. Proceedings of 15h U.S./Japan Experts Meeting," U.S. Army Corps of Engineers.) Lime treatment also increases the volume of contaminated material 50 to 100%. ("In-Situ Remediation Technologies for Contaminated Sites," Environment Canada, 11/19/02) The EPA itself in "Wastewater Technology Fact Sheet: Chemical Precipitation (Office of Water, EPA 832-F-00-018) lists numerous disadvantages of lime addition.

The Public should be concerned about too great a Reliance on Institutional Controls.

Institutional controls per se do nothing to reduce the mobility, toxicity, or volume of contaminants. Institutional controls do nothing to clean up a site. The institutional controls being considered in the EPA's RI/FS for Priority Soils would seriously limit productive land uses and greatly compromise the property rights of owners to use their land as they determine. The extensive reliance on institutional controls is also contrary to the Superfund mandate of preference for treatment over restricted land use. Institutional controls do nothing to treat a site. The EPA's own document "Rules of Thumb for Superfund Remedy Selection" states that the law mandates a clear preference for treatment over all other approaches. "EPA expects to use treatment to address the principal threats posed by a site. . . ." [40 CFR 300.430(a)(1)(iii)(A)]. The above document also notes: "Institutional controls. . .generally shall not substitute for more active measures. . . ." (pp. 12-13)

The EPA itself has found significant problems with institutional controls at its other sites. In an article entitled "EPA, Think Tank Studies Show Superfund Land-use Controls Flawed, December 10, 2001" which summarizes "Superfund Report via Inside EPA.com" by Resources for the Future, we find these conclusions, ***reached by the EPA itself***, which due to their significance, I will quote at length:

"EPA and environmental think tank studies have shown that the federal and state governments' land-use restrictions at Superfund sites, known as institutional controls (IC), are seriously flawed, with an agency study showing the controls are not reliably

implemented and the think tank report finding the controls are dramatically under-funded."

"During a November 27 land use control summit, sponsored by the International City/County Management Association (ICMA), EPA officials and the Environmental Law Institute (ELI), outlined numerous shortcomings they have found with EPA's IC monitoring and enforcement efforts nationwide. While EPA released the results of a study showing EPA has failed to ensure Superfund ICs are reliably implemented, and ELI study indicates that EPA's ICs are dramatically under-funded."

"Bruce Means, of EPA's Federal Facilities Restoration and Reuse Office, told attendees that preliminary studies show that half of the ICs implemented under Superfund records of decisions (ROD) were mischaracterized. During a study of RODs conducted during 1999 and 2000, the agency found that half of the ICs established under RODs were not implemented as the agency had planned."

"And Jay Pendergrass of ELI outlined the preliminary findings of ELI's study of state's IC programs, which showed that the programs are severely under-funded."
"In a draft version of the report, Pendergrass found that state environmental programs are underfunded and as a result the sites allocate very little time on IC implementation. The funding and staffing shortfall 'raises concerns about whether [ICs] are implemented as intended and [are] as protective as intended."

"An ICMA source agrees that EPA has serious problems with its IC program, saying that the agency has many RODs with vague or inconsistent references to such controls." (pages 1-2)

The greater the cleanup of the Butte Priority Soils Operable Unit, the more the site can be used productively. The less cleanup of the BPSOU, the less the site can be used for residences and recreational uses. Given the EPA's admission that institutional controls have failed it in the past, it is amazing that the remedies listed in the RI/FS for Priority Soils call for such extensive use of institutional controls.

<u>Other Problems with Institutional Controls:</u>

a. There is a tendency not to implement institutional controls as time passes. Frequently institutional control mandates are not carried to completion.
b. The effectiveness of institutional controls usually depends upon the ability, personnel and resources of the local government to implement. Often local governments do not have the personnel or resources to devote to the implementation and monitoring of institutional controls. Given the national administration's proposed cutbacks in Superfund allocations, resources will be increasingly unavailable on the national level to monitor implementation and effectiveness of institutional controls. Certainly the financial capacity of Butte's local government to implement and monitor institutional controls is greatly limited. Nowhere does the EPA's comprehensively address the above issue.

c. "Institutional controls rely heavily on humans to implement, oversee, and administer them. It is human nature to ignore tasks that no one else seems to care about or where the purpose is not readily apparent. Residual hazardous substances are a classic example of a problem that is not readily apparent." ("Protecting Public Health at Superfund Sites: Can Institutional Controls Meet the Challenge?" Environmental Law Institute, p. 2)
d. Although EPA must review the remedy every five years, the frequency of this review process may be insufficient to detect the failure of institutional controls.
e. The use of education as part of the institutional controls strategy is a substantial part of the EPA's approach to implementing institutional controls. Research of previous remedies under Superfund indicates that education programs fail to materialize.
f. "In addition to the direct costs of implementing institutional controls, their use can impose substantial indirect costs on communities, property owners, prospective purchasers and developers by limiting the ways a site may be used. The burden of the restrictions on use of the site falls on the property owner and the community, with the owner reaping potentially lower profits from use of the property and the community receiving lower social benefits from the allowed uses than would have been possible if no restrictions existed." (ELI, *Ibid.)*
g. Because the sites where institutional controls will be implemented will not be cleaned up and will present a continuing potential threat to human health, these sites will be off limits to development in perpetuity. It is difficult to see how the use of institutional controls meshes with the goals of the EPA's Superfund Redevelopment Initiative.
h. It is impossible to determine future possible land uses for the site nor is it possible to predict unanticipated land uses. (See: "Linking Land Use and Superfund Cleanups: Uncharted Territory," by Probst, Hersh, Wernstedy and Mazurek, *Summary of Findings*, RFF, p. 1)
i. "Institutional controls have more problems than just risk miscalculation. Breeches in the site because of future construction, or even animals may cause the control to fail. The lack of a required contingency plan, would not account for new remedies, new information, or failed institutional controls negatively impacts the effectiveness of the treatment. Institutional memory loss was well is an important factor. This memory loss occurs when a party decides to breach the original institutional control without its own knowledge. In fact, in the ICMA (International City/County Management Association) study, the majority of respondents (63%) said that breaches in the institutional controls on a site were highly or somewhat likely. Following up on that question, 30% of the respondents reported that no formal inspection schedule was set up to evaluate the site as require by law." (Erwin Tam, Environmental Science and Economics, UC Berkeley, "Analysis of Institutional Controls at California Superfund Sites.")
j. "Concern has been expressed about the long-term viability of institutional controls as a remediation tool. For example, they may be forgotten; enforcement agencies may not effectively review properties or land users' actions; or land users simply may take their chances. Decision makers should weigh the full costs of such options, including capital costs, costs of long-term sampling and analysis,

and costs of replacing equipment, as well as concerns about potential long-term risks associated with contaminants left in place, against the cost options that would remove the contaminants completely. Many local governments do not yet have the capacity and resources necessary to meet the challenges of long-term stewardship." ("Understanding the Role of Institutional Controls at Brownfields Sites: Major Concepts and Issues.")

k. Because institutional controls leave large amounts of contaminants in place, institutional controls will have to be perpetual. Who is to say what anticipated land uses come up for an institutionally controlled area? For example, fifty years after the record of decision for Butte Priority Soils is implemented, the contaminants will still be there threatening human health and the environment, but will the will be there to restrict land uses in order to prevent the release of contaminants. "Institutional controls 'work' only if they are complied with. And while this is true of any site remedy, institutional controls require monitoring and enforcement over long time periods." ("Linking Land Use and Superfund Cleanups: Unchartered Territory, Probst, et al., Resources for the Future Center for Risk Management.) Will the will to enforce institutional controls exist fifty to a hundred years in the future?
l. Legal, social and political pressures limit the effectiveness of institutional controls. (*Ibid.*)
m. The long-term effectiveness of institutional controls is unknown. "There has, however, been little investigation of what happens at sites on the National Priorities List (NPL) when land use plays a prominent role in the remedy selection process. There also has been little analysis of what institutions are involved in making land use decisions and maintaining land use restrictions over time. It is unclear what legal mechanisms are most effective, what institutions will be responsible for enforcing institutional controls, and who's going to pay for these additional responsibilities. We need to be able to answer these questions if land use-based remedies are to be protective over the long term." (*Ibid.*)

"Planners of long-term disposal systems have long recognized the difficulty of maintaining institutional control over property. . . ." (Jack A. Caldwell and Charles C. Reith, *Principles and Practice of Waste Encapsulation*, 1993, p. 35)

In-Situ Treatment, in general, would be an Inadequate Approach to the Problems of the Butte Priority Soils OU

Problems with in-situ treatment which treatment does nothing to reduce the toxicity or volume of contaminants.

(This discussion is provided to prove that, in general, the various types of in-situ treatment, which may be part of the remedy for the Butte Priority Soils Operable Unit, are inadequate compared to removal. Once these contaminants are removed to a safe

repository, they should be treated to reduce their toxicity, hopefully using innovative treatment technologies.)

a. Lacks permanence due to erosion problems.
b. Fails to address the issue that in order to prevent the leaching of metals a pH level greater than 7 must be maintained. Yet native vegetation requires a pH of no more than 5.5. There is a great disparity in in-situ treatment between the pH level necessary to prevent the leaching of heavy metals and the pH level necessary for native vegetation to flourish on the Priority Soils site.
c. Fails to deal with the problem of cadmium ingestion by animals and children.
d. There is little real world proof that in-situ treatment is a long term, effective remedy for hazardous waste problems In-situ treatment tends to be supported only by computer modeling which is unreliable. The long-term permanence of in-situ treatment is questionable. There is very little experience with the long-term effectiveness of in-situ treatment. There is experience with the failure of in-situ treatment to immobilize metals.
e. Would not adequately address the specific contamination problems caused by the presence of mercury and cadmium.
f. Could actually increase the volume of toxic materials.
g. "Future use of the site may weather the materials and affect ability to maintain immobilization contaminants." ("Remediation Technology Descriptions: Containment," U.S. Department of Energy, Office of Environmental Management, p. 22.)
h. "Reagent delivery and effective mixing are more difficult than for ex situ applications." (*Ibid.)*
i. Sampling and modeling to prove or evaluate effectiveness of in-situ treatment is difficult compared to ex-situ treatment.
j. "The treatment efficiency of in-situ treatment is almost always less than ex-situ treatment." ("In Situ Treatment of Contaminated Sediments," Jon Reynolds, National Network of Environmental Management Studies Fellow, prepared for U.S. EPA, p.6)
k. "One of the most important limitations (of in-situ treatment) is the difficulty with or lack of process control." (*Ibid.*)
l. "Since mixing and temperature control are difficult to control in-situ, in-situ solidification may be more limited than other in-situ treatments. In addition, in-situ solidification may not change the toxicity of the contaminants in the sediment. Therefore, long term performance is a concern because erosion and diffusion could eventually release the contaminants." (EPA, 1994) [*Ibid.*, p. 8}
m. The use of lime abatement, as discussed in the RI/FS for Priority Soils, will be ineffective. A study conducted by Bethel Inc. showed that treatment of heavy metals with lime still allowed the release of 20% of the heavy metals into the environment. (Shimoda, Masao 1994. "Fixation Mechanism of Toxic Heavy Metals with Cements. Proceedings of 15th U.S./Japan Experts Meeting," U. S. Army Corps of Engineers, 12 pages)
n. In-situ treatment may actually increase the solubility of metals. (Kita, D. and Dubo, H. 1983. "Several solidified sediment examples. Proceedings of the 7th U.S./Japan Experts Meeting," U.S. Army Corps of Engineers, pp.192-210)

o. In-situ solidification failed as a heavy metal treatment mechanism for the Manitowoc River in Wisconsin. (See Reynolds, *op. cit*, p. 18-20)
p. A study by the U.S. Army Corps of Engineers on mobility after stabilization found that "metal stabilization was not achieved, and in some cases, metal mobility was enhanced." (Meyers, et. al., 1994, "Solidification/stabilization technology for reducing the mobility of heavy metals in polluted sediments. Proceedings of the 15th U.S./Japan Experts Meeting," U.S. Army Corps of Engineers, pp. 273-281)
q. "The in-situ treatment in Hamilton Harbor and GE's Hudson River field study both resulted in approximately 50% treatment efficiencies. These are very low compared to ex-situ treatment. . . .'(EPA 1994) cited in Reynolds, "In-Situ Treatment of Contaminated Sediments," EPA, *op.cit*, pp. 9-15
r. There are problems with geomorphic stability and longevity and maintenance. (See: Caldwell and Reith, *Principles and Practice of Waste Encapsulation*, pp. 29-37.)
s. The varying depths of contamination in the Priority Soils area will make implementation of in-situ controls difficult.
t. There is little data to support the conclusion that in-situ treatment has long-term effectiveness.
u. There is not enough information about soil characteristics in the Butte Priority Soils site to make any kind of determination as to whether or not the proposed in-situ treatment will be effective. Little is known about factors such as void volume, soil pore size or about permeability—all of which are of critical importance in determining the effectiveness of the in-situ treatment.
v. There is the possibility that organic compounds found in the contaminants may interfere with the in-situ agents. (See: *In-Situ Remediation Technologies for Contaminated Sites*, Environment Canada, 10/24/2001, p. 5.)

Inadequacy of RI/FS Investigation of Treatment Technologies available for Cleanup of BPSOU

The current RI/FS document for BPSOU is inadequate in its discussion of treatment technologies. It only looks at lime abatement, a technology with significant problems, as a possible treatment method for the BPSOU. A greater investigation of alternative, innovative treatment technologies for the site needs to be conducted as part of the RI/FS process.

Butte Priority Soils and the Superfund Redevelopment Initiative

The Superfund Redevelopment Initiative's purpose, as summarized by EPA, is "to facilitate the return of the country's most hazardous waste sites to productive use by selecting cleanup remedies that are consistent with the anticipated further use of the

sites." (*Superfund Redevelopment Initiative, Frequently Asked Questions*, USEPA, July 2000, p. 1) EPA is committed to returning remediated sites to productive uses. (*Superfund Redevelopment Initiative Overview Summary*, USEPA, September 2002, p. 1) Productive uses can be "commercial, residential, ecological, recreational, agricultural, governmental or other new uses. . ." (*Superfund Redevelopment Initiative: Summary of Benefits,* USEPA, March 2000, p. 1) After communities have determined what they want the future use of the remediated site to be, EPA's goal is to work with the affected communities to develop remedies that will "protect that use." (*Ibid.*) Consistent with the overriding goal of protection of human health and the environment, EPA will select remedies that facilitate future productive uses of a site.

Community involvement is an integral part of the Redevelopment Initiative process. "The Superfund Redevelopment Initiative makes it possible for communities to have a strong voice in local land use decisions that affect them, helps to ensure the effectiveness of our clean ups, generates jobs and increases property value.' (*Superfund Redevelopment Initiative, 2002 Pilot Snapshots*, USEPA, July 2002, p. 1) EPA will work with communities to determine what are the preferred uses of the sites after cleanup. (*Ibid.*) For example, Milltown has received a $40,000 pilot grant "to prepare and submit to EPA a report on the anticipated future uses of the site." (*Ibid.*, p. 5)

Susan Bromm (Deputy Director, Office of Site Remediation Enforcement, USEPA and James Lofton (Senior Counsel, U.S. Department of Justice, Environmental and Natural Resources Division, Environmental Enforcement Section) summarize the Superfund Redevelopment Initiative:

> "Although reuse had been an important part of the cleanup of many sites, this Initiative created a coordinated, nationwide effort to ensure that reuse was considered at every site. The initiative also ensured that processes and tools were in place to enable redevelopment to occur. Another important element of the initiative was to ensure that consideration of future use occurred early enough in the cleanup process so that remedy decisions could be made that were consistent with this future use. Finally, this initiative was designed to promote an early public dialogue on re-use issues to provide timely public input into the decision-making process. EPA considers itself an active partner with other stakeholders in returning sites to productive uses." (*Negotiations in Superfund Cases-The Role of Communities in Site Redevelopment*, p. 3)

The RI/FS process needs to culminate in a proposed remedy that explicitly relates to and incorporates the features of the Superfund Redevelopment Initiative as outlined above. Specifically, a reuse assessment should be conducted for the BPSOU. Removal of contaminants is the remedy most attuned to the mandates of the Superfund Redevelopment Initiative.

Summary

Given that the contaminants found in the Butte Priority Soils Operable Unit pose a significant threat to human health and the environment, given that the purpose of Superfund is to deal with these threats through a cleanup which permanently reduces the mobility, toxicity and volume of contaminants in order to protect human health and the environment, given that capping and institutional controls do not provide a permanent cleanup remedy for Butte Priority Soils, given that EPA has a preference for treatment over containment, given that in-situ treatment has serious problems, given that, through the Superfund Redevelopment Initiative, EPA is committed to promoting future productive land uses for cleaned up sites, removal and future treatment of the contaminants found is the Butte Priority Soils Operable Unit should be the preferred remedy for the Butte Priority Soils Operable Unit. "The people's safety is the highest law." (Roman law maxim)