Comments on US EPA Lava Cap Mine Superfund Site Document, "US EPA Proposes Cleanup Plan for Mine Area Operable Unit," Dated February 2004

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In October 2003 the US EPA issued a "Draft Mine Area Feasibility Study," which discussed various alternatives for remediation of the mine area of the Lava Cap Mine Superfund site. Detailed comments on this draft were submitted on November 14, 2003, to SYRCL by G. Fred Lee, TAG Advisor to the public on the Lava Cap Mine Superfund site. Recently the US EPA has responded to G. F. Lee's comments. Dr. Lee is providing SYRCL with comments on the adequacy of the US EPA's responses, in a separate discussion. Summary background information on the Lava Cap Mine Superfund site remediation has been provided by Lee and Jones-Lee (2003a).

Recently the US EPA released the Public Release Draft Mine Area Feasibility Study (FS) for the Lava Cap Mine Superfund site, Nevada County, California, dated February 2004. This document is the final version of the October 2003 draft FS for the mine area. In mid-February 2004 the US EPA scheduled a public hearing for February 26th, which was to be held in Grass Valley, California, in which the Agency staff briefly summarized the options for remediation of the mine area of the Lava Cap Mine Superfund site. Associated with this meeting, the US EPA released a 16-page summary of the alternatives for remediation of the mine area and, for the first time, made available the US EPA's "preferred" alternative. The US EPA has repeatedly made it clear that this is just the first phase of the remediation of the Lava Cap Mine Superfund site. Additional phases will be devoted to the deposition/Lost Lake area and the groundwaters. Provided below are comments on some of the issues covered in the 16-page document, "US EPA Proposes Cleanup Plan for Mine Area Operable Unit" that may be of concern to stakeholders in the Lava Cap Mine Superfund site remediation.

Overall, the US EPA's 16-page write-up, which was the focal point of discussions at the February 26th public hearing, presents a good overview discussion of the nature of the problems and the various alternatives that can be used to control them in the mine area operable unit. The US EPA's preferred alternative for the mine tailings and waste rock, tailings dam, mine buildings and surface water involves

- consolidating, regrading and capping the tailings at the site with an "impermeable membrane"
- covering tailings and waste rock with soil and revegetating
- replacing the log dam with a rock buttress
- diverting clean surface water flow around the mine tailings

- collecting and treating contaminated water draining from the mine shaft and from the tailings
- removing all of the former mine processing tanks, vats, sumps and contaminated soil from the mine buildings
- disposing of this material with the mine tailings or as hazardous waste where necessary.

For the residences in the mine area, the preferred alternative is to

- demolish the residence closest to the tailings pile
- remove soil around two other residences and replace it with clean soil
- move excavated material to the mine tailings pile for long-term management.

For Little Clipper Creek to Greenhorn Road, the preferred alternative is to excavate the tailings and contaminated sediment accumulations and haul excavated material to the mine tailings pile for long-term management.

Based on my professional experience and expertise, I find that the US EPA's proposed approach for remediation of the Mine Area Operable Unit is appropriate. With high-quality construction, the proposed remediation approach for the mine area will greatly reduce the near-term threat that the tailings and contaminated soils in the mine area and along Little Clipper Creek upstream of Greenhorn Road represents to public health and the environment. Basically, the US EPA has adopted an approach of an acceptable least-cost remediation of the immediate threat caused by the tailings and runoff waters, where the long-term costs associated with maintaining the capped tailings and contaminated soils and treatment of mine discharges and runoff waters will have to be paid by future generations.

Drs. Anne Jones-Lee and I have been involved in review of a number of Superfund sites, with respect to the adequacy of investigation and remediation relative to providing a high degree of public health and environmental protection for as long as the hazardous and non-hazardous/deleterious chemicals present at the site are a threat. We have found that Superfund/hazardous chemical site investigations do not necessarily obtain the technical information needed to adequately assess the hazards to public health and the environment. Further, there is pressure on the US EPA and state regulatory agencies to relax Superfund site investigation and remediation requirements, especially as they relate to initial remediation of the site. While long-term effectiveness is one of the primary criteria by which the remediation approach is to be evaluated, frequently on-site and some off-site remediation approaches that are used are only temporary containment of the hazardous chemicals left at the site after remediation. Lee and Jones (1991a,b), Lee and Jones-Lee (1994; 1996; 1997; 1998; 1999; 2000a,b; 2003b; 2004) and Lee (1997; 2003a,b) have discussed problems with approaches that are being used in Superfund and hazardous chemical site remediation and brownfield redevelopment of hazardous chemical sites.

Presented below is a discussion of some of the Lava Cap Mine area remediation issues that the public and regulatory agencies may wish to consider in supporting the US EPA's February 2004 proposed remediation of the mine area.

Cleanup Objectives

The US EPA has selected 10 µg/L as the arsenic cleanup objective for contaminated waters at the Lava Cap Mine Superfund site. This value is the same as the US EPA drinking water maximum contaminant level (MCL) for arsenic in domestic water supplies. The US EPA Lava Cap Mine Superfund site staff have characterized this cleanup objective as "protective" without discussing the degree of protection provided. In my previous discussion of the appropriateness of using this value as a cleanup objective, I have characterized this value as a politically based MCL. This value is not a risk-based value but was selected to reduce the cost of water treatment to remove arsenic from drinking water for small domestic water supplies.

Adopting this value at the Lava Cap Mine Superfund site as the water arsenic cleanup objective is not in accord with the Central Valley Regional Water Quality Control Board approach for establishing water cleanup objectives for waste-derived pollutants. At other Superfund sites background or a true risk-based value is used as the cleanup objective for waste-derived pollutants. A review of the literature on the cancer risk in drinking water shows that the National Research Council (NRC, 2001) arsenic review estimated that a drinking water MCL for arsenic of 3 µg/L would produce a cancer risk of one additional cancer in 1,000 people. Normally the additional cancer risk established for drinking water is one additional cancer in a million people who consume 2 liters (about 2 quarts) of water per day over their lifetime. The NRC states that the 10 µg/L arsenic MCL is estimated to lead to 23 additional bladder cancers and 18 additional lung cancers in 10,000 people. In the spring of 2003 the California Office of Environmental Health Hazard Assessment (OEHHA, 2003) established a public heath drinking water goal for arsenic of 0.004 µg/L.

The US EPA (2002) established a water quality criterion for arsenic in water of 0.018 µg/L for drinking water and consumption of organisms that are taken from the water of concern. The drinking water component was the primary factor in establishing this water quality criterion. It is clear that the US EPA 10 µg/L drinking water MCL carries a much higher cancer risk than the US EPA normally accepts for drinking water. The reason the US EPA established an arsenic drinking water MCL of 10 µg/L was the projected costs to small domestic water supplies. The US EPA did not want to confront the political pressure of increasing the cost of water treatment for small domestic water supplies.

It has been found that arsenic naturally occurs in many surface and groundwaters at a few µg/L. This arsenic may be part of the cause of why 1 in 3 people will acquire cancer during their lifetime. About half of those who acquire cancer will die from it. At the Lava Cap Mine Superfund site the "background" arsenic in surface waters is about 2 µg/L.

Using the 10 µg/L as a cleanup objective at the Lava Cap Mine Superfund site will be protective since the arsenic derived from the mine and the tailings will be diluted by low-arsenic water before the runoff from the area will be consumed as drinking water on a regular basis. It will be important that no one establish an individual water supply based on surface waters of Little Clipper Creek, Clipper Creek, or Little Greenhorn Creek.

The 20 mg/kg for soil and the 25 mg/kg for sediments selected by the US EPA as cleanup objectives for tailings-contaminated soils and sediments is in accord with typical Superfund soil and sediment cleanup objectives. These values are protective of human health for those who have occasional contact with the soil or sediment. They are also expected to be protective of wildlife.

Remediation of the Tailings Pile

The primary remediation approach for the mine tailings area is to regrade the surface of the current tailings pile, add the contaminated soil and sediments from the mine area and along Little Clipper Creek, cover the upgraded tailings pile with a plastic sheeting liner, cover the plastic sheeting with a couple of feet of low-arsenic soil and vegetate the soil layer. Basically the US EPA is proposing to create an upgraded tailings pile. It will not be a regular landfill without a bottom liner and leachate collection system. It has been found that the moisture (water) in the existing tailings pile leaches high levels of arsenic that can pollute groundwaters. The US EPA's recommended approach relies on the ability of the plastic sheeting liner in the cover to prevent water from entering the tailings pile. A key issue that should be addressed is the ability of the plastic sheeting liner in the cover to keep moisture out of the tailings.

The US EPA, in its February 26, 2004, summary of the mine area remediation approaches, has a category called "Long-Term Effectiveness." However, no information is provided on what the US EPA staff who developed the evaluation of the effectiveness of the various approaches considered for the mine area remediation with the plastic sheeting cover liner meant by Long-Term Effectiveness. The only true term of reference for long-term effectiveness should be for as long as the wastes that are left at the site are a threat. This is the regulatory requirement for landfilling of wastes in California. The proposed approach of capping the tailings and contaminated soils with a plastic sheeting cover liner is known to be effective for a short term compared to the length of time that the waste tailings and polluted soils placed under the plastic sheeting will be a threat.

The US EPA has indicated that the plastic sheeting covered tailings pile will be "*Very Effective"* and "*Would provide long term treatment of mine discharges and tailing seeps and long term containment of mine tailings.*" The Feasibility Study (FS) document states on page 5-27, "*Based on the performance of existing landfill liner and cover materials, it is estimated that little or no deterioration of the HDPE membrane would occur for a period in excess of 200 years.*" No citation is given for this statement. At the February 26, 2004, pubic hearing, D. Seter, in response to a question from the audience, stated that he understood that the liner manufacturers claim that the liner will last 100 years. I pointed out that the liner manufacturers warrant an HDPE landfill liner for only 20 years. Further, this warranty is based on the landfill owner removing the wastes over the point in the liner where there is deterioration. Basically this warranty is of no value.

Based on my over 20 years of work on landfill liner performance, I know of no valid support for the hundreds of years period of time for the expected performance of the plastic sheeting liner in the tailings pile cover to keep water out of the tailings pile. There is considerable unreliable information on the projected performance of HDPE liners in landfills. They are based on unreliable application of the Arrhenius equation. The actual performance of

the plastic sheeting layer in the tailings cover could readily be much shorter than that projected by the US EPA consultants (CH2M Hill, 2004).

One of the major deficiencies of the US EPA final document that discusses the various approaches for the remediation of the mine area is the failure to reliably discuss the consequences of the eventual failure of the plastic sheeting liner in the cover to prevent moisture from entering the landfill that would leach arsenic that can pollute groundwater under and down groundwater gradient from the capped tailings area.

Independent of how long the plastic sheeting layer in the cover is an effective barrier to water entering the tailings pile, there is no doubt that it will eventually fail to prevent large amounts of water from entering the tailings pile. The tailings in the tailings pile will be a threat to pollute groundwaters forever. A question that has not been addressed is how this failure will be detected. Since the plastic sheeting layer is buried under two feet of soil, it cannot be visually inspected for points of deterioration. Leak detectable covers are available that could indicate when the tailings pile plastic sheeting layer fails to prevent water from entering the tailings pile. However, this type of cover is typically not used because of the additional expense of operating and maintaining the system and the eventual cost of having to replace the cover when the leak detection system indicates that the low-permeability layer in the cover has failed to keep moisture out of the tailings pile.

Basically, the US EPA's recommended approach for remediation of the tailings and contaminated soils at the mine site is to temporarily contain the tailings in a plastic sheeting covered tailings pile and thereby pass the problems with true long-term maintenance of the tailings pile integrity to future generations.

50-Year Budget Period

The US EPA has used a 50-year period to estimate the costs of the various remediation approaches. While this approach is the "traditional" US EPA approach, it can greatly distort the relative costs of some remediation approaches. Of particular concern is the comparison of leaving the waste (tailings) at the site versus offsite disposal at a properly sited, designed, constructed, monitored and maintained disposal site. Fifty years is a very small part of the time that monitoring and maintenance funds will be needed to be devoted to the Lava Cap Mine tailings pile. If, in fact, the true cost of remediation were calculated, the onsite tailings pile would prove to be the most expensive. The difference is that the costs to the US EPA are less with the plastic sheeting covered tailings pile. The primary costs of this remediation will have to be borne by the state of California and the people within the sphere of influence of the Lava Cap Mine Superfund site.

Shift Responsibility for Monitoring and Stored Waste Containment System Maintenance to State of California

The US EPA's shifting of the near-term and especially the long-term monitoring and maintenance of the capped tailings and soils that will be left at the site after the proposed remediation has been carried out to the State is typical Superfund site procedure. As I understand the situation, the US EPA and the California Department of Toxic Substances Control (DTSC) must develop an agreement on the funding arrangement for near-term and long-

term remediated site monitoring and maintenance. Because of the chronic problems of the state of California underfunding of its environmental agencies, there is concern that DTSC will be adequately funded to carry out the required monitoring and maintenance for as long the tailings and contaminated soils in the capped wastes are a threat – i.e., forever. DTSC should explicitly state its obligation for ad infinitum high-quality Lava Cap Mine Superfund site mine area monitoring and maintenance for as long as the wastes tailings and contaminated soils left at the site under a plastic sheeting liner and cover will be a threat. Specific information should be provided by DTSC on the resources that it will commit to this responsibility. Also, DTSC should indicate how it will keep the local stakeholders informed about the results of the monitoring and maintenance at the site.

Five-Year Review

The Superfund regulations provide for the US EPA to review "remediated" sites every five years. This review is to address any problems at the site as well as to review any new technology that has been developed for site remediation. In principal, this approach should be effective in addressing problems that develop at a remediated site. However, there have been problems in implementing the five-year review at some Superfund sites. The US Congress General Accounting Office (GAO) conducted an investigation of how well the US EPA has been carrying out its five-year review responsibility. The GAO reported that in some areas, the five-year review had not been carried out because of insufficient funds being available. While it appears that the US EPA Region 9, which is responsible for the Lava Cap Mine Superfund site, has thus far been conducting its five-year reviews, there are significant questions about whether this Region will be funded to carry out future five-year reviews for as long as the wastes in the covered tailings pile will be a threat.

New Treatment Technology Will Evolve

The US EPA staff have indicated that it may be possible that new treatment technology will evolve that will be used to treat the tailings pile tailings and soils and thereby reduce the long-term threat and costs of the remediation of the mine area tailings and contaminated soils. I have been involved in evaluating and reviewing new technologies for treatment of waste solids, contaminated soils and polluted waters for about 20 years. My work in this topic included teaching graduate level courses on remediation technology and serving as the director of a multi-university hazardous waste research center remediation division. While many tens of millions of dollars have been devoted to developing new hazardous waste treatment technology, and a number of new approaches for waste treatment have been developed, none of this technology can compete with the initially cheaper than real cost covered tailings pile approach. It is inappropriate to think that some yet undiscovered technology will likely evolve to significantly reduce the costs of tailings pile remediation.

Public Acceptance of Remediation Approach

One of the evaluation criteria that must be used in developing a Superfund site remediation approach is "community acceptance." At the February 26, 2004, public hearing on the proposed remediation approach for the mine area, I raised a question about how the US EPA proposes to gain the community's acceptance of the proposed plan for remediation of the mine area. I specifically asked if the public would have the opportunity to review the draft record of decision (ROD) for the mine area remediation approach that was proposed to the public on

February 26, 2004. There are significant questions about the validity of the approach that the US EPA Community Involvement Coordinator (D. Hodge) indicated would be followed in adopting the ROD for the mine area, where the public would not be given the opportunity to review the draft ROD. US EPA will use some undefined approach involving review of the questions asked at the February 26, 2004, public hearing and the comments submitted within the one-month comment period. At this time the US EPA has only provided the public with a general outline of the US EPA "preferred alternative" approach for remediation of the mine area. The public should be given the opportunity to review the details of the ROD, caucus among stakeholders and then express their views on the acceptability of the remediation approach for the mine area.

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