

Health Consultation

US DEPARTMENT OF AGRICULTURE
FREMONT NATIONAL FOREST
WHITE KING/LUCKY LASS
URANIUM MINES
LAKEVIEW, LAKE COUNTY, OREGON

EPA FACILITY ID: OR7122307658

AUGUST 21, 2007

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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Prepared By:

Site and Radiological Assessment Branch
Division of Health Assessment and Consultation

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FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. The public health assessment program allows the scientists flexibility in the format or structure of their response to the public health issues at hazardous waste sites. For example, a public health assessment could be one document or it could be a compilation of several health consultations - the structure may vary from site to site. Nevertheless, the public health assessment process is not considered complete until the public health issues at the site are addressed.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further public health actions are needed.

Conclusions: The report presents conclusions about the public health threat, if any, posed by a site. When health threats have been determined for high risk groups (such as children, elderly, chronically ill, and people engaging in high risk practices), they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan.

ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Agency for Toxic Substances and Disease Registry
ATTN: Records Center
1600 Clifton Road, NE (Mail Stop E-60)
Atlanta, GA 30333

Summary and Statement of Issues

The Fremont National Forest in south-central Oregon was the site of uranium mining from 1955 to 1965. The two mines in the area, White King Mine and Luck Lass Mine, are approximately 12 miles from the nearest permanent residential area and 17 miles from Lakeview, Oregon. In 1995, these mine sites were added to the US Environmental Protection Agency (EPA) National Priorities List of contaminated sites (Superfund). Under a consent order, the mines' owner, the Kerr-McGee Corporation agreed to assist in the remediation of the mine areas. In 2001, the EPA issued their Record of Decision which selects the appropriate process to remediate and reclaim the contaminated areas. By 2007, the sites had been remediated.

The Agency for Toxic Substances and Disease Registry (ATSDR) is required by the Superfund law to prepare public health documents discussing the impacts on public health by the presence of hazardous materials in the community's environment.

Background

Site Description and History

The Fremont National Forest is in south-central portion of Oregon and east of the Cascade Mountains. The forest was designated a National Forest in 1908 and covers over 1 million acres. In 2002, the US Forest Service combined Fremont National Forest with the Winema National Forest for administrative purposes. The new area covers approximately 2.3 million acres of heavily forested lands. However, within the forest boundaries, about 500,000 acres are privately owned. The forest is managed by the US Forest Service (USFS) (1).

In 1955, uranium mining began in the forest with the opening of the White King mine by the Lakeview Mining Company. The mine site was about 18 miles northwest of Lakeview, Oregon. Initially the mine operated using underground shafts, but in 1959 open-pit mining was used. The Lucky Lass Mine is about 1 mile from the White King Mine and mining techniques there also included open-pit mining. Both mines operated until 1965. As a result of these operations, mine wastes and overburden were stockpiled on site. The open pit areas over time became ponds as groundwater filled the open pits (2).

The White King Mine is on both U.S. Forest Service and private land while the Lucky Lass Mine is entirely on Forest Service land. The owner of the mines is the Kerr-McGee Corporation (KMC) who obtained the mines through a series of corporate mergers (2).

Available records indicate the White King Mine produced about 138,146 tons of ore and Lucky Lass produced about 5,450 tons of ore during their period of operation. A total of 140 acres have been disturbed by mining, 120 acres at the White King Mine and 20 acres at the Lucky Lass Mine (2).

In 1994, the USFS, the US Environmental Protection Agency (EPA), and the state of Oregon agreed to implement a removal action and develop a remedial investigation and feasibility study for the sites. In 1995, the site was added to the National Priorities List (NPL). Since inclusion on the NPL in 1995, EPA has been

¹ US Forest Service Web site <http://www.fs.fed.us/r6/frewin/> last accessed on June 5, 2007.

² USEPA (2001). EPA Superfund Record of Decision: Fremont National Forest/White King and Lucky Lass Uranium Mines (USDA) EPA ID: OR7122307658 OU 02 Lakeview County, OR 09/28/2001

the lead regulatory agency. In April 1995, EPA entered into an Administrative Order on Consent (AOC) with KMC, under which KMC agreed to perform the RI/FS for the site. The administrative order was also signed by the USFS and representative regulatory agency from the State of Oregon. In May 1995, a Memorandum of Understanding was signed between EPA and the USFS to facilitate coordination between the two Federal agencies during the RI/FS (2).

At the time of listing on the NPL, the primary hazards associated with the wastes included external exposure to gamma radiation, release of radon gas, and environmental contamination by heavy metals and the radioactive constituents in surface and ground water. Surface water and sediments in Auger Creek and nearby wetlands have been contaminated by mining activities. The creek and surface water bodies downstream of the site are used as a source of recreational fishing. KMC completed all work under the AOC in June 2000 (2).

The EPA issued the Record of Decision (ROD) in 2001 that describes the selected method for site remediation to protect the public and the environment. The Agency for Toxic Substances and Disease Registry (ATSDR) is required by the Comprehensive Environmental Response, Liability, and Compensation Act (CERCLA) to prepare a public health document for this site as it is listed on the NPL.

This public health consultation addresses the CERCLA requirements and discusses the remediation actions chosen by the EPA and makes specific recommendations, if needed, to further protect the public from the contaminants at this site.

Demographics and Land Use

The nearest population center to the mines is Lakeview, Oregon, located approximately 18 miles from the mines. In 2000, the population was 2,474 individuals of which 51.5% were females. Of the total population, 91.5% are considered white by the US Census Bureau. The remaining population consists of native Americans and those of multiracial backgrounds. The age composition of the city indicates that 74.1% are at least 18 years of age (3).

The EPA ROD states that the closest permanent residents to the site live approximately 12 miles to the southeast (Figure 1). The area around the Mines site is used for recreational purposes, including hunting, and snowmobiling. Wood-cutting and cattle grazing also occur in the general area of the site.

The nearest body of water is Augur Creek. The White King Mine lies west of Augur Creek and within the 100 year flood plain; the Lucky Lass mine is approximately one mile northwest and upgradient of the White King Mine. The Lucky Lass area drains to the Augur Creek valley, intercepting Augur Creek upstream from the White King Mine. The White King Mine also drains to the Augur Creek Valley and Augur Creek.

The major features at the White King Mine included a water-filled excavation pit covering 13.4 acres (pond), a waste stockpile covering 17 acres at a depth ranging from 8 to 27 feet, an overburden stockpile 7 to 33 feet high covering 24 acres, areas where overburden and ore were dumped or spilled during the mining operations including haul roads, and Augur Creek which flows adjacent to the two White King stockpiles. The stockpiles contain soil and mineralized rock that were removed from the mine pit. The estimated total volume of the material in these piles is 950,000 cubic yards.

The major features at the Lucky Lass Mine include a 5 acre water-filled excavation pit (pond) that is about 70 feet deep with an approximate 90-foot-high wall at the south end, a 14 acre overburden stockpile

³ US Census statistics available at <http://www.census.gov> last accessed on June 5, 2007.

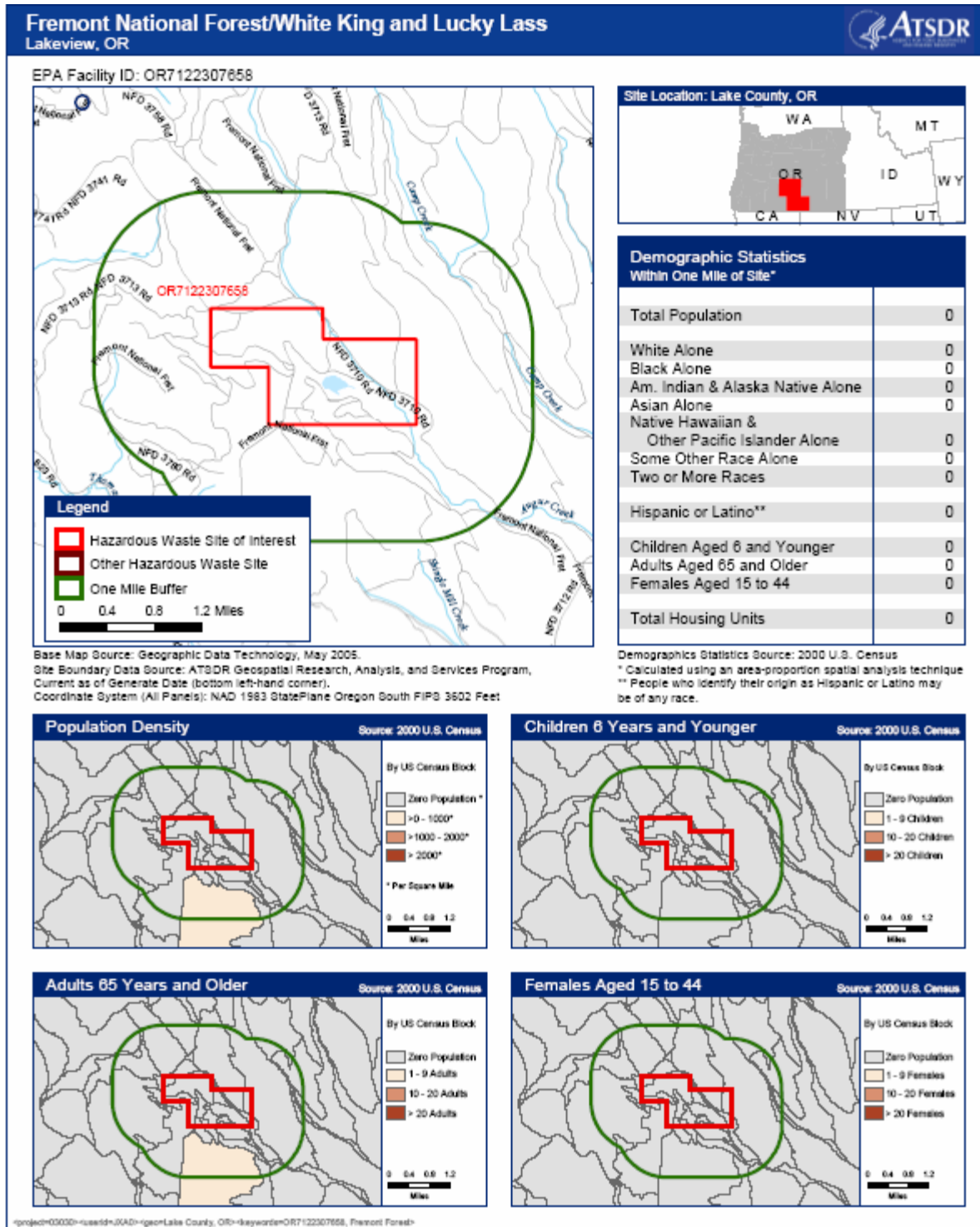


Figure 1. Site Location and Demographics surrounding mining sites.

ranging in height from 10 to 40 feet to the north, east and west of the pond, and an adjacent meadow on the east side of the area with wetlands in which the pond drains (2).

Other prominent site features include collapsed wooden structures, metal debris, gravel and dirt roads from mining activities, and barbed wire fences currently maintained by the USFS. Forest Service Road 3780 is the main road in the area and joins paved county Road 16B approximately 12 miles to the southeast. Access to this road is controlled by a gate and is the responsibility of the USFS. There are no structures or buildings at the Mines site which are on or eligible to be listed on the National Register of Historic Places.

Community Health Concerns

ATSDR requested through its state cooperative agreement program officers and the Oregon Department of Human Services information on community concerns related to these sites. We received neither public health concerns from the community nor from the state. As part of the ROD process, EPA requested and received community input on the selected remedy. The EPA received many comments regarding the selected remedy of the mine sites. As expected, many comments were in regard to remedy, others related to the safety of the environment and related issues. The comments directly related to public health related to the safety of drinking water in the vicinity of the mines as well as water quality in the environment and the potential impact on downstream areas (2).

Discussion

Selected EPA Remedy

The contaminants detected at the mine sites included heavy metals and radionuclides. ATSDR reviewed the list of contaminants included in the ROD and compared the values to the ATSDR Environmental Media Evaluation Guides (EMEG) if available for the specific contaminant. The radionuclide concentrations were compared to the Federal Regulations for uranium mill tailing sites (40 CFR 192). The EPA selected as its contaminants of concern the metal arsenic and the radionuclide radium-226. These same contaminants exceeded ATSDR screening. Table I gives the concentrations of the contaminants at the White King Mine Site as well as the ATSDR EMEG value used for screening.

From the data supplied in the ROD, the environmental media driving the selected remediation is the presence of contamination in surface soils and surface waters associated with the White King Mine. In the case of arsenic, environmental concentrations greatly exceed the ATSDR EMEG value for both adults and children. The concentration of radium-226 is well above the Federal guidelines for uranium mills which can also be applied to abandoned uranium mines. In the case of the contamination detected in Augur Creek, only arsenic was detected at levels exceeding the ATSDR EMEG. The radium-226 concentrations are below the current drinking water standards.

Although the creek does not appear to be impacted by the piles at the White King Mine, the 100-year flood plain map indicates the piles lie within this zone. Therefore, any significant flood has the propensity to leach additional contaminants into the water, contaminating downstream potential drinking water areas.

The Lucky Lass Mine Site, however, does not have contaminants present at levels that exceeded the ATSDR EMEG values. ATSDR does agree with the EPA decision to combine the piles because the Lucky Lass overburden pile borders the wetlands area and this area drains into Augur Creek.

The selected remedy consolidates the Lucky Lass stockpile, where possible, with the White King waste piles. The benefit of this action will be that the piles are removed from the floodplain and the potential for erosion will be released. Once the piles are consolidated, a 7.5 foot thick packed clay cap will be added and this cap will be covered with 2 feet of clean soil planted with local plant species.

Both on-site ponds will be remediated by the addition of limestone or other similar material to decrease the acidity of the water and ultimately return biota to the ponds. In addition to the pond neutralization, the Lucky Lass pile removal will assist in the recovery of the impacted wetlands.

EPA states that following completion of the remedy, annual inspections (2) will be performed to ensure the remediation is functioning as designed and to determine the amount of soil and vegetation that may require replacement. The EPA will also monitor groundwater, surface waters, and sediments to ensure there is no migration via erosion from the consolidation pile. The environmental levels to which the remediation will strive to meet are given in Table 2.

Table 1. Contaminants of Concern at the White King Mine Site

<i>Contaminant</i>	<i>White King surface soils*</i>	<i>White King surface water†</i>	<i>Augur Creek soils, sediments and water</i>	<i>ATSDR EMEG</i>	<i>Percent Above EMEG</i>
Arsenic	4140 ppm (442 ppm background)	128 ppb	159 ppm	200 ppm adult (soil) 10 ppb adult (water)	1849 159
Radium-226	291 pCi/g‡		0.28 pCi/L	5 pCi/gpCi/g above background of 6.8 pCi/gpCi/g	2466

*Data from Table 7-1 and 7-4 of Record of Decision; ppm = parts per million or milligrams per kilogram

† Data from Table 7-6 of Record of Decision; ppb = parts per billion or micrograms per liter

‡ A pCi/g is picocuries per gram. A picocurie equals 1 trillionth of a curie and a curie equals 37 billion Becquerels (disintegrations per second)

The Record of Decision for the White King/Lucky Lass addresses four environmental media around the mine areas that have been impacted by mine operations: the soils; ground water; sediment; and surface water. The selected remedy includes those remedial actions necessary to protect human health and the environment. EPA selected the best remedy that would mitigate, reduce, or abate the hazards associated

with the site contamination. The method selected combines the waste piles from both mines into one consolidated area. Although the contamination will remain on-site, EPA states the potential to adversely impact human health and the environment will be mitigated by isolating contaminated soils beneath a soil cover. This consolidation would reduce or eliminate any continued migration through erosion which could impact surface water and the surrounding wetlands. The consolidated pile will have a clay top covered with clean soils planted with native grasses. The soil cover in combination with institutional controls will prevent future human contact with the contaminated soils and the soil cover will reduce potential animal exposure to contamination. The institutional controls will prevent future human contact with shallow ground water beneath the stockpile.

Table 2. EPA Remediation Levels*

<i>Location</i>	<i>Contaminant</i>	<i>Remediation Parameter</i>	<i>ATSDR Comments</i>
White King Soils	Arsenic	442 mg/kg	Although the listed concentration for arsenic is in excess of ATSDR health based screening values, this is the background concentration for the mine site. Exposure parameters based on water intake of 2 liters per day (approximately ½ gallon).
	Radium-226	6.8 pCi/g	
White King Pond; Augur Creek Surface Water; Groundwater	Arsenic	0.033 mg/L	Value exceeds Maximum Contaminant Level of 0.01 mg/L; currently not a public water source. The listed concentration is within the range of regional backgrounds in streams.
Augur Creek Sediment	Arsenic	6 mg/kg	Values below ATSDR media specific evaluation guides
	Manganese	1610 mg/kg	
Lucky Lass Soils	Arsenic	38 mg/kg	Values below ATSDR media specific evaluation guides
	Radium-226	3.6 pCi/g	

* Data from ROD

Besides consolidating the waste piles and ensuring neutralization of the water bodies impacted, both the EPA and the Forest Service plan to institute controls in the area. The areas will be fenced and under controlled access. Those areas that are totally within Forest Service property will be removed from public access, all mineral rights removed from mineral entry and timber harvesting will not be allowed except when necessary to preserve the integrity of the remediated areas.

Child Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, for access to medical care, and for risk identification. Thus adults need as much information as possible to make informed decisions regarding their children's health.

The Fremont Forest mine sites are sufficiently isolated from the public that children would not be present in the forest areas without adult supervision. The Forest Service has designated the area as a non-mining or non-forestry area which further reduces the time individuals may spend in the area. Furthermore, institutional controls present at the sites should prohibit both the inadvertent as well as deliberate trespasser from gaining site access.

Conclusions

To protect human health, isolation or removal of contamination from pathways that could impact public areas is very important. ATSDR evaluates the pathways of past, current, and future exposures to determine if adverse health impacts could be expected. These evaluations take into account fate and transport of the contaminants, population dynamics, and potential levels of exposure. Where there is no or little exposure, adverse health impacts are not expected to occur.

The purpose of the cap over the consolidation piles serves several important purposes including the reduction of erosion off the pile, removal from the flood plain of Augur Creek, reclamation of the wetlands adjacent to the Lucky Lass Mine, reduction in the spread of contamination by burrowing animals, reduction of radon, and institutional controls.

ATSDR believes that the concentration of radium to which the EPA proposes to clean the site to is protective of public health as adverse health effects have not been observed at this level of human exposure (4). In the case of manganese which the EPA did not consider a contaminant of concern, the clean up level of 1610 mg/kg is also below a level that ATSDR would consider a public health hazard.

Arsenic is classified as a known human carcinogen yet the remediation goals are 3 times above the EPA drinking water standard and the proposed soil concentration (as expressed as the upper 95% confidence level) is approximately 2 times higher than the ATSDR EMEG. Nonetheless, ATSDR considers the

⁴ Rowland, R. E. (1995). Radium in humans: A review of U.S. studies. ANL/ER--3

proposed concentrations as not a public health hazard since the institutional controls, limited access, and remoteness of the sites.

Recommendations

ATSDR believes that the selected remedy for the White King Mine and Lucky Lass Mine sites is protective of public health although the levels of arsenic to which the clean up will meet exceeds the health based criteria established by ATSDR. To ensure the public health is not adversely affected by these remedial actions, ATSDR makes the following recommendations to the EPA and the Forest Service, where appropriate.

1. maintain institutional controls around the White King Mine Site;
2. for those portions of the Lucky Lass Mine Site that are on private lands not controlled by the Forest Service, maintain institutional controls and postings in the area to inform land users or intermittent users of the hazard. This would include hikers, campers, and potential hunters; and
3. because the levels of arsenic in Augur Creek water are in excess of the EPA drinking water standards, ATSDR recommends that the creek be posted as chemically contaminated.

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