SDMS # 54272 ⇒ Clifford

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service
Agency for Toxic Substances
and Disease Registry

SFUND RECORDS CTR
1652-00273

Memorandum

Date SEP 12 1986

Jerry - We need to discuss as soon as you are able to flesh out as HQ is proceeding with the RCD!

Kei

AR0699

From Acting Director
Office of Health Assessment

Subject SI-86-196, Iron Mountain Mine-Acid Mine Drainage
Redding, California

To Mr. Donald W. Hawkins
Public Health Advisor
EPA Region IX

EXECUTIVE SUMMARY

The Agency for Toxic Substances and Disease Registry (ATSDR) was requested to review the final remedial investigation report and the draft endangerment assessment final report for Iron Mountain Mine, Redding, California.

We do not concur with the conclusions reached concerning consumption of fish or contact with certain surface waters. The material submitted for review was incomplete in that an analysis of the impact of a slug of contaminated water upon the public was not presented. We also found that measurements of the degree of contamination in river sediments were not made and their impact upon aquatic organisms and humans was not assessed.

BACKGROUND

The Iron Mountain Mine has been mined for a variety of minerals from the late 1800s to 1963. The site is located on 4,400 acres of property which includes underground workings, an open pit mining area, waste rock dumps, and tailings piles. Acid mine drainage is produced at the site as water, mainly from precipitation, and passes through the sulfide-bearing ores, which are exposed due to open pit and underground mining. The water discharges through mine portals and seeps to the Spring Creek watershed.

The creeks in the watershed, Spring, Boulder, and Slickrock, eventually drain into the Sacramento River, a major fishery for salmon and trout. The creeks are heavily contaminated with zinc, cadmium, copper, sulfates, and are very acidic.

Spring Creek Reservoir and Dam were developed to control the outflow from the contaminated watershed. Releases from the reservoir were designed to coincide with releases from Shasta Lake, an upstream lake, so that Shasta Lake waters would dilute the contaminants to acceptable levels. However, the volume from the watershed and the irrigation and electrical power needs for the water from Shasta Lake are such that dilution requirements cannot always be met. This results in periodic episodes of contaminant discharge into the Keswick Reservoir, which leads to the Sacramento River.

DATA SUMMARY

The following data are presented according to the water body source from which they were collected, and in the order in which the contaminants appear in surface waters leading to the Sacramento River.

1. Boulder Creek.

	Copper (mg/L)	Cadmium (mg/L)	Zinc (mg/L)	Sulfate (mg/L)
Above AMD input	LT 0.05	0.0116	0.912	6
Below AMD input	3.52	1.640	302.0	3460

2. Slickrock Creek.

	Copper (mg/L)	Cadmium (mg/L)	Zinc (mg/L)	Sulfate (mg/L)
Above AMD input	LT 0.05	LT 0.001	LT 0.01	6.1
Below AMD input	27.10	0.210	18.50	1.65

3. Spring Creek.

	Copper (mg/L)	Cadmium (mg/L)	Zinc (mg/L)	Sulfate (mg/L)
Above AMD input	0.062	0.001	0.120	16
Below AMD input	1.940	0.1	2.5	0.59
Below Reservoir	1.590	0.078	10.0	0.46

4. Sacramento River.

	Copper (mg/L)	Cadmium (mg/L)	Zinc (mg/L)	Sulfate (mg/L)
Above Spring Creek	0.0035	0.00029	0.0148	3.7
Below Keswick Dam	0.0085	0.00041	0.037	5.2
at Redding intake	0.0158	0.00023	0.0374	6.3

For comparison, the relevant water quality criteria are presented below.

	Copper (mg/L)	Cadmium (mg/L)	Zinc (mg/L)	Sulfate (mg/L)
California Safe Drinking Water	1	0.01	5	500
EPA Water Quality Criteria for Human Health for drinking water only	1	0.01	5	---
EPA Maximum Contaminant Level	---	0.01	---	---
EPA Health Advisory				
1-day	---	---	12	---
10-day	---	---	1.2	---
chronic	---	---	0.62	---
California Basin Plan Objectives	0.0056	0.00022	0.016	---

The data show that there is significant contamination of waters downstream of the acid mine drainage until the Sacramento River below the Keswick Reservoir is reached. At present, portions of Spring Creek, Boulder Creek, and Slickrock Creek are devoid of aquatic life. Heavy metal concentrations in excess of EPA and State of California regulations are

found in the receiving waters of these creeks, Spring Creek Reservoir, and Keswick Reservoir. Through a complex series of physical and chemical interactions (coprecipitation of metal ions with iron hydroxides, precipitation of metal carbonates, and dilution), concentrations are reduced to acceptable levels below the Keswick Dam. Levels of contaminants at the City of Redding Sacramento River public water supply intake meet all criteria.

Fish liver (rainbow trout, a resident fish of the Sacramento River) samples collected from the Keswick Reservoir showed metal concentrations ranging from 3-4.6 ppm Cadmium, 150-287 ppm Copper, and 26-57 ppm Zinc, over the years 1979 to 1983.

HEALTH ASSESSMENT

The pathways to human exposure from acid mine drainage are dermal exposure, eye contact with and/or ingestion of contaminated surface water, and consumption of contaminated fish. The potentially exposed populations are any hikers or backpackers which venture onto the mining site or into the Spring Creek watershed, persons who consume fish from impacted waters of the Keswick Reservoir and the Sacramento River, and the public serviced by the water supply for the City of Redding.

The number of persons entering the Spring Creek Watershed area is judged to be small due to the remoteness of the site, and the likelihood of them using the contaminated surface waters for bathing or consumption is lessened by the aesthetically unpleasant iron precipitate in the water. The possibility of someone falling into contaminated water cannot be dismissed. Trespassing on the Iron Mountain site is discouraged by locked gates at the main entrance and warning signs. Surface water from the Keswick Reservoir downstream will not present a dermal contact hazard.

We cannot comment on the public health significance of the fish heavy metal concentrations, and we cannot agree with the endangerment assessment statement that "It appears that consumption of flesh from fish caught below the Keswick Dam represents a minor risk to human health." We would need to know the levels in edible tissue before this conclusion could be supported.

The public water supply for the City of Redding does not seem to be affected during normal flows from Spring Creek and Shasta Lake, as evidenced by the measurement of 10 ug/L cadmium (equalling the MCL) in a single pretreatment sample, although it would be better to base the conclusion upon more data. However, no data is presented concerning the levels present at the city intake during excessive flows from Spring Creek or the contingency plan for either treating or bypassing the affected water, if necessary. We note that, when comparing Sacramento River above Spring Creek to Sacramento River below Keswick Dam, the data from Table 6-8 of the remedial investigation report indicate that, during spill events in Spring Creek, contaminant levels rose on the average of about 700 percent. The following table shows this analysis.

	Sacramento River above Spring Creek	Sacramento River below Keswick Dam (average)	Ratio
Cadmium	0.29 ug/L	2.5 ug/L	8.6:1
Copper	4.6 ug/L	24 ug/L	5.2:1
Zinc	26.3 ug/L	196 ug/L	7.5:1
		Mean	= 7.1
		Std. Dev.	= 3.2

In addition, the exposure scenario developed does not address the possibility of persons consuming or coming in contact with these contaminant slugs or a means of preventing contact. We cannot agree with the conclusion that "consumption of the water poses virtually no risk to human health."

RECOMMENDATIONS

1. The Spring Creek watershed area should be posted at all common access areas, warning all potential visitors/trespassers of the hazards of ingestion and dermal or eye contact with surface waters.

2. Samples of top-of-the-food-chain fish and bottom feeders should be collected in areas of the Keswick Reservoir and Sacramento River where people fish, and the edible flesh analyzed for heavy metal concentrations. The fish sampling survey should comply with the general guidelines of the Food and Drug Administration regarding number, size, age, and distribution, and for preparing and analyzing edible fish samples. EPA has used 6.5 grams edible fish tissue as a low average estimate of a fish meal, 20 grams as a high estimate, and 165 grams as an estimate of what 0.1 percent of the population who are economically and/or geographically dependent upon fish would eat in a meal.

3. Data should be collected during events (excessive output from Spring Creek Reservoir coupled with insufficient dilution from Shasta Lake) which could allow contaminant slugs to go downriver. If data collection is not possible, then a model should be developed which predicts the concentrations to be found. This would form the basis for the decision whether or not to restrict river activity during these events.

4. Sediment samples from the Keswick Reservoir and the Sacramento River below the Keswick Dam should be sampled and their impact on humans and aquatic organisms should be assessed. The metals contamination in the

fish sampled are probably coming from the sediments rather than the water column. Sediment samples should also be collected from below the Spring Creek Debris Dam.

I hope this information is useful to you.

Edwin Kent Hray
for Jeffrey A. Lybarger, M.D.

9/86
TA

SUPERFUND PROGRAMS BRANCH

TOXICS AND WASTE MANAGEMENT DIVISION

IMMEDIATE OFFICE (T-4)

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Lang ___
Owyang ___
Paredes ___
Waters ___

PROGRAM MANAGEMENT TEAM (T-4-A)

Kohnert ___
Hadlock ___
La Courreye ___

STATE PROGRAMS SECTION (T-4-1)

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Blevins ___
Cleary ___
Dunn ___
LaBaw ___
Masters ___
Rendall ___
Saunders ___
Ziemba ___

Let's talk about IRM mtg. with McKee on Fri.

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Hirabayashi ___
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Mitani ___
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Morgan ___
Ullensvang ___

ENFORCEMENT PROGRAMS SECTION (T-4-4)

Grove ___
Curnow ___
S. Johnson ___
Kemmerer ___
Kistner ___
Nash ___
Young ___

PURPOSE OF MEETING

1) Discuss ROD contents
2) Status of IAG; terms of agreement

Meeting w/Keith at 11:00 on 9/30. P/Z bring this, Agenda for BR mtg, attendees etc. Find out What they're coming for specifically. Jay

Find out Who's coming before 11:00 w/KT — Bring this