



State of Utah

DEPARTMENT OF ENVIRONMENTAL QUALITY DIVISION OF RADIATION CONTROL

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June 20, 1997

Mr. Myron Fliegel
Uranium Recovery Branch
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Re: Atlas Uranium Mill Tailings Near Moab, Utah: January 7, 1997 Utah DEQ Intensive
Colorado River Water Quality Sampling Results - Need for Additional Studies.

Dear Mr. Fliegel:

The purpose of this letter is to convey results of intensive water quality sampling of the Colorado River conducted by the Utah Department of Environmental Quality (DEQ) on January 7, 1997. The attached water quality results are from grab samples collected near the river's edge in the vicinity of the Atlas tailings facility at the Moab Bridge and nine (9) sampling locations on the Atlas side of the Colorado River, i.e., DEQ sites A-1 thru A-9.

These nine sampling locations correspond to the same nine river locations DEQ sampled on September 5, 1996, and reported to you in a December 11, 1996 Division of Radiation Control submittal. A copy of this map is attached for your reference. In short, DEQ sites A-1 and A-2 are located upstream of the confluence with Moab Wash, whereas the remaining DEQ sites are found downstream.

In an effort to improve our intensive sampling efforts, the January 7, 1997 DEQ sampling event was designed with a larger number of water quality parameters than the previous September, 1996 event, including: nutrients, general inorganic chemistry, heavy metals, and several radiologic parameters.

River flow rate on January 7, 1997 was 3,980 cfs, or 750 cfs higher than the discharge observed during the September 5, 1996 sampling event, 3,230 cfs (Cisco USGS gauging station, David Allen, USGS-WRD, Salt Lake City, personal communication).

Review of the attached results shows the river's ammonia (as N) profile of January 7, 1997 is similar to that seen during in the September 5, 1996 sampling event, in that upstream stations at the Moab Bridge and DEQ sites A-1 and A-2 show the lowest ammonia (N) values, with concentrations of 0.095, 0.113 and 0.145 mg/l, respectively. The remaining downstream stations show larger values.

*SWL
Anne - Please
check in
Atlas file
Mike
Anne*

40-3453

1/1

MLP 5

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with a peak concentration of 15.8 mg/l at site A-4 declining to 0.818 mg/l at site A-9. In contrast to the September, 1996 intensive sampling event, the January 7, 1997 samples showed the peak ammonia (as N) concentration at station A-4 instead of A-3 (compare September 5, 1996 data). Further, the magnitude of this peak concentration was higher than the September, 1996 event, with ammonia (as N) reported at 15.8 mg/l versus 10.8 mg/l.

Besides ammonia (as N), 12 other contaminants were found in the January 7, 1997 sampling event that follow this same pattern, i.e., increasing concentrations downstream of the Atlas tailings, with peak concentrations at DEQ station A-4, followed by declining concentrations to station A-9, see Table 1, below and attached laboratory reports.

Table 1. January 7, 1997 Colorado River Contaminants that Increase Downstream of Atlas

Contaminant ⁽¹⁾	Concentrations at DEQ River Stations (mg/l, or as noted)			
	Moab Bridge ⁽²⁾ (upstream)	A-1 (upstream)	A-4 (downstream peak)	A-9 (downstream)
Ammonia (as N)	0.095	0.113	15.8	0.818
Aluminum (d)	0.23	1.9	2.2	2.3
Iron (d)	0.319	3.32	3.84	4.0
Magnesium (d)	24.5	24.4	42.2	26.2
Manganese (d)	0.022	0.17	0.23	0.22
Molybdenum (d)	0.0072	0.0038	0.0114	0.0024
Nitrite + Nitrate (as N)	0.54	0.64	2.34	0.65
Sulfate	204.8	228.4	420.9	223.8
Total Dissolved Solids (TDS)	628	636	1,006	668
Total Kjeldahl Nitrogen (TKN)	1.443	1.083	18.038	2.348
Gross Alpha (pCi/l)	22.6 +/- 1.0	84 +/- 2.1	79.5 +/- 1.4	30 +/- 1.2
Gross Beta (pCi/l)	10.7 +/- 4.6	42.2 +/- 5.4	68 +/- 6.7	19.9 +/- 5.0
Total Uranium (pCi/l)	2.9 +/- 0.7	37.6 +/- 0.6	51.1 +/- 2.5	5.4 +/- 0.9

Footnotes: 1) (d) = dissolved contaminant
2) Moab bridge sample described on laboratory report as "Colorado R. at US191 xing near Moab".

From the January 7, 1997 upstream and downstream river contaminant data several conclusions are apparent (see Table 1):

1. Tailings Pile is an Apparent Contamination Source - earlier NRC sampling of the Atlas tailings leachate indicates that the 13 contaminants in Table 1 are known tailings contaminants. The January 7, 1997 increased concentration trends seen in the river below the pile, suggest that pile is a source of river contamination.
2. Possible Millsite Contamination - three (3) contaminants, aluminum, iron, and manganese increase across the tested region of the river by more than one-order of magnitude and remained high, even at the most downstream site, station A-9. Close review shows the greatest increase in these contaminants occurred between the Moab Bridge and site A-1. Similar abrupt increases were also observed between these locations in gross alpha, gross beta, and total uranium activities. Such increases suggest that a groundwater contamination source may be present below the bridge and above the Atlas tailings. One explanation may be groundwater contamination from the former millsite.
3. Larger Mixing Zone or Other Points of Contamination Influx - all the contaminants in Table 1 increased in concentration between the upstream sites (Moab Bridge or DEQ site A-1), and the peak downstream site A-4. Below site A-4, decreased concentrations were found, however, most did not return to background values. Such elevated concentrations at the most downstream site, A-9, suggests:
 - A. Extent of the river's mixing zone extends farther downstream, and/or
 - B. Other points of influx exist below site A-4 where contaminated groundwater enters the river's channel.

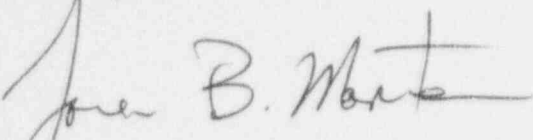
In either case, additional hydrogeologic and water quality studies are warranted to determine the cause of the trends observed. If the latter possibility does exist, such groundwater contamination would have to pass under private property found south of the Atlas tailings, invoking the need to investigate off-site groundwater contamination at the facility.

As a result of these data, it appears prudent for the NRC to require Atlas to conduct additional hydrogeologic and water quality studies. We would expect that these studies would be completed and all related issues resolved during the upcoming NRC re-evaluation of the Atlas Groundwater Corrective Action Plan.

Mr. Myron Fliegel
June 20, 1997
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If you have any questions regarding the above findings or of the attached water quality data, please feel free to call me at (801) 536-4250. Thanks for your assistance in this matter.

Sincerely,



Loren B. Morton
Hydrogeologist

LBM:lm

attachments

cc: Larry Mize, DWQ (w/attach.)
Richard Denton, DWQ (w/attach.)
Bruce Rodgers, NPS-Canyonlands (w/attach.)
Roy Irwin, NPS-Fort Collins (w/attach.)
Ronette Reisenberg, U.S.F.W.S-SLC (w/attach.)
Mike Layton, NRC-Washington, D.C. (w/attach.)
Robert Reed, ORNL (w/attach.)
Richard Blubaugh, Atlas (w/attach.)
Grant Ohland, Harding Lawson & Assoc. (w/attach.)

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File: Atlas Surface Water Quality Studies



UTAH STATE DEPARTMENT OF HEALTH
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

UDEQ - DRC

ATTN:

168 N 1950 W BLDG 2

PO BOX 144850

SLC

UT

84114-4850

801-536-4250

Lab Number: 9700201 Sample Type: 04 Cost Code: 342
Description: COLORADO R AT US191 XING NEAR MOAB

Site ID: 495700 Source No: 03
Sample Date: 01/07/97 Time: 17:10

Organic Review:
Inorganic Review: 01/28/97
Radiochemistry Review: 05/29/97
Microbiology Review:

Tot. Cations: 199 mg/l 10.0 me/l
Tot. Anions: 381 mg/l 9.6 me/l
Grand Total: 580 mg/l %D = 2.0

TEST RESULTS:

L-pH *	7.62	T.Sus.Sol	844.0 mg/l
NO2+NO3, N	0.54 mg/l	T.K.N.	1.443 mg/l
Ammonia N	0.095 mg/l	D-Arsenic	<5.0 ug/l
D-Barium	79.0 ug/l	D-Cadmium	<1.0 ug/l
D-Calcium	73 mg/l	D-Chromium	<5.0 ug/l
D-Copper	<12.0 ug/l	D-Iron	319.0 ug/l
D-Lead	<3.0 ug/l	D-Magnesium	24.5 mg/l
D-Mangan	22.0 ug/l	D-Nickel	<10.0 ug/l
D-Potassium	4.11 mg/l	D-Selenium	3.9 ug/l
D-Silver	<2.0 ug/l	D-Sodium	96.8 mg/l
D-Zinc	<30.0 ug/l	Bicarbonate	160 mg/l
Carb. Diox	6 mg/l	Carbonate	0 mg/l
Chloride	97 mg/l	Fluoride	0.319 mg/l
Hydroxide	0 mg/l	Sulfate	204.8 mg/l
T. Phos.	0.35512 mg/l	Tot. Alk.	131 mg/l
T. Hardns.	282.9 mg/l	Turbidity	440.0 NTU
L-Sp. Cond	1001 umhos	TDS @ 180C	628 mg/l
Alpha, grs	22.6 pCi/l +/-1.0	Beta gross	10.7 pCi/l +/-4.6
Radium 226	1.9 pCi/l +/-1.0	Radium 228	<1 pCi/l +/-3.6
D-Aluminum	230.0 ug/l	D-Beryllium	<1.0 ug/l
D-Molybdenum	7.2 ug/l	D-Vanadium	<30.0 ug/l
T-Uranium	2.9 pCi/l +/-0.7	D-Thallium	<1.0 ug/l
D-Antimony	<3.0 ug/l	D-Mercury	<0.2 ug/l
CO3 Solids	79 mg/l		

Comments (*) on test results:

L-pH.....pH should be performed as a field test.

END OF REPORT

UTAH STATE DEPARTMENT OF HEALTH
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

UDEQ - DRC

ATTN:

168 N 1950 W BLDG 2

PO BOX 144850

SLC

UT

84114-4850

801-536-4250

Lab Number: 9700192 Sample Type: 04 Cost Code: 342
Description: COLORADO R A-1 200 YDS AB MILL TAILINGS

Site ID: Source No: 03
Sample Date: 01/07/97 Time: 16:43

Organic Review:
Inorganic Review: 01/28/97
Radiochemistry Review: 05/02/97
Microbiology Review:

Tot. Cations: 205 mg/l 10.2 me/l
Tot. Anions: 413 mg/l 10.4 me/l
Grand Total: 618 mg/l %D = 1.0

TEST RESULTS:

L-pH *	8.25	T.Sus.Sol	986.0 mg/l
NO2+NO3, N	0.64 mg/l	T.K.N.	1.083 mg/l
Ammonia N	0.113 mg/l	D-Arsenic	<5.0 ug/l
D-Barium	150.0 ug/l	D-Cadmium	<1.0 ug/l
D-Calcium	72.2 mg/l	D-Chromium	<5.0 ug/l
D-Copper	<12.0 ug/l	D-Iron	3320.0 ug/l
D-Lead	7.9 ug/l	D-Magnesium	24.4 mg/l
D-Mangan	170.0 ug/l	D-Nickel	<10.0 ug/l
D-Potassium	3.93 mg/l	D-Selenium	4.3 ug/l
D-Silver	<2.0 ug/l	D-Sodium	104.0 mg/l
D-Zinc	<30.0 ug/l	Bicarbonate	179 mg/l
Carb. Diox	2 mg/l	Carbonate	0 mg/l
Chloride	97 mg/l	Fluoride	0.327 mg/l
Hydroxide	0 mg/l	Sulfate	228.4 mg/l
T. Phos.	0.32705 mg/l	Tot. Alk.	147 mg/l
T. Hardns.	280.5 mg/l	Turbidity	537.6 NTU
L-Sp. Cond	1000 umhos	TDS @ 180C	636 mg/l
Alpha, grs	84 pCi/l +/-2.1	Beta gross	42.2 pCi/l +/-5.4
Radium 226	1.6 pCi/l +/-0.7	Radium 228	<1 pCi/l +/-1.0
D-Aluminum	1900.0 ug/l	D-Beryllium	<1.0 ug/l
D-Molybdenum	3.8 ug/l	D-Vanadium	<30.0 ug/l
T-Uranium	37.6 pCi/l +/-0.6	D-Thallium	<1.0 ug/l
D-Antimony	<3.0 ug/l	D-Mercury	<0.2 ug/l
CO3 Solids	88 mg/l		

Comments (*) on test results:

L-pH.....pH should be performed as a field test.

END OF REPORT

UTAH STATE DEPARTMENT OF HEALTH
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

UDEQ - DRC

ATTN:

168 N 1950 W BLDG 2

PO BOX 144850

SLC

UT

84114-4850

801-536-4250

Lab Number: 9700193 Sample Type: 04 Cost Code: 342
Description: COLORADO R A-2 200 YDS AB MILL TAILINGS

Site ID: Source No: 03
Sample Date: 01/07/97 Time: 16:34

Organic Review:
Inorganic Review: 01/28/97
Radiochemistry Review: 05/22/97
Microbiology Review:

Tot. Cations: 200 mg/l 10.1 me/l
Tot. Anions: 393 mg/l 10.0 me/l
Grand Total: 593 mg/l %D = .5

TEST RESULTS:

L-pH *	8.27	T.Sus.Sol	760.0 mg/l
NO2+NO3, N	0.64 mg/l	T.K.N.	1.238 mg/l
Ammonia N	0.145 mg/l	D-Arsenic	<5.0 ug/l
D-Barium	140.0 ug/l	D-Cadmium	<1.0 ug/l
D-Calcium	73.1 mg/l	D-Chromium	<5.0 ug/l
D-Copper	<12.0 ug/l	D-Iron	3320.0 ug/l
D-Lead	7.5 ug/l	D-Magnesium	24.4 mg/l
D-Mangan	170.0 ug/l	D-Nickel	<10.0 ug/l
D-Potassium	3.87 mg/l	D-Selenium	4.1 ug/l
D-Silver	<2.0 ug/l	D-Sodium	98.8 mg/l
D-Zinc	<30.0 ug/l	Bicarbonate	174 mg/l
Carb. Diox	1 mg/l	Carbonate	0 mg/l
Chloride	96 mg/l	Fluoride	0.312 mg/l
Hydroxide	0 mg/l	Sulfate	210.7 mg/l
T. Phos.	0.31921 mg/l	Tot. Alk.	143 mg/l
T. Hardns.	282.8 mg/l	Turbidity	393.0 NTU
L-Sp. Cond	1017 umhos	TDS @ 180C	626 mg/l
Alpha, grs	29 pCi/l +/-1.0	Beta gross	16 pCi/l +/-4.6
Radium 226	2.1 pCi/l +/-0.7	Radium 228	<1 pCi/l +/-3.0
D-Aluminum	2670.0 ug/l	D-Beryllium	<1.0 ug/l
D-Molybdum	2.4 ug/l	D-Vanadium	<30.0 ug/l
T-Uranium	11.3 pCi/l +/-0.3	D-Thallium	<1.0 ug/l
D-Antimony	<3.0 ug/l	D-Mercury	<0.2 ug/l
CO3 Solids	86 mg/l		

Comments (*) on test results:

L-pH.....pH should be performed as a field test.

END OF REPORT

UTAH STATE DEPARTMENT OF HEALTH
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

UDEQ - DRC

ATTN:

168 N 1950 W BLDG 2

PO BOX 144850

SLC

UT 84114-4850

801-536-4250

Lab Number: 9700194 Sample Type: 04 Cost Code: 342
Description: COLORADO R A-3 100 YDS BL MILL TAILINGS

Site ID: Source No: 03 Organic Review:
Sample Date: 01/07/97 Time: 15:18 Inorganic Review: 01/28/97
Radiochemistry Review: 05/22/97
Microbiology Review:
Tot. Cations: 213 mg/l 10.6 me/l
Tot. Anions: 429 mg/l 10.7 me/l
Grand Total: 642 mg/l %D = .5

TEST RESULTS:

L-pH *	8.22	T.Sus.Sol	916.0 mg/l
NO2+NO3, N	0.92 mg/l	T.K.N.	2.608 mg/l
Ammonia N	1.4 mg/l	D-Arsenic	<5.0 ug/l
D-Barium	140.0 ug/l	D-Cadmium	<1.0 ug/l
D-Calcium	73.5 mg/l	D-Chromium	<5.0 ug/l
D-Copper	<12.0 ug/l	D-Iron	3850.0 ug/l
D-Lead	8.1 ug/l	D-Magnesium	26 mg/l
D-Mangan	170.0 ug/l	D-Nickel	<10.0 ug/l
D-Potassium	4.28 mg/l	D-Selenium	4.0 ug/l
D-Silver	<2.0 ug/l	D-Sodium	108.0 mg/l
D-Zinc	<30.0 ug/l	Bicarbonate	179 mg/l
Carb. Diox	2 mg/l	Carbonate	0 mg/l
Chloride	97 mg/l	Fluoride	0.322 mg/l
Hydroxide	0 mg/l	Sulfate	244.1 mg/l
T. Phos.	0.41006 mg/l	Tot. Alk.	146 mg/l
T. Hardns.	290.4 mg/l	Turbidity	491.0 NTU
L-Sp. Cond	1087 umhos	TDS @ 180C	662 mg/l
Alpha, grs	27 pCi/l +/-1.0	Beta gross	22 pCi/l +/-5.1
Radium 226	0.9 pCi/l +/-0.7	Radium 228	<1 pCi/l +/-3.0
D-Aluminum	2200.0 ug/l	D-Beryllium	<1.0 ug/l
D-Molybdum	3.8 ug/l	D-Vanadium	<30.0 ug/l
T-Uranium	11.7 pCi/l +/-0.3	D-Thallium	<1.0 ug/l
D-Antimony	<3.0 ug/l	D-Mercury	<0.2 ug/l
CO3 Solids	88 mg/l		

Comments (*) on test results:

L-pH.....pH should be performed as a field test.

END OF REPORT

UTAH STATE DEPARTMENT OF HEALTH
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

UDEQ - DRC

ATTN:

168 N 1950 W BLDG 2

PO BOX 144850

SLC

UT

84114-4850

801-536-4250

Lab Number: 9700195 Sample Type: 04 Cost Code: 342
Description: COLORADO R A-4 BL MILL TAILINGS

Site ID: Source No: 03
Sample Date: 01/07/97 Time: 15:25

Organic Review:
Inorganic Review: 01/28/97
Radiochemistry Review: 05/22/97
Microbiology Review:

Tot. Cations: 327 mg/l 15.6 me/l
Tot. Anions: 681 mg/l 16.6 me/l
Grand Total: 1008 mg/l %D = 3.1

TEST RESULTS:

L-pH *	7.74	T.Sus.Sol	1518.0 mg/l
NO2+NO3, N	2.34 mg/l	T.K.N.	18.038 mg/l
Ammonia N	15.8 mg/l	D-Arsenic	<5.0 ug/l
D-Barium	130.0 ug/l	D-Cadmium	<1.0 ug/l
D-Calcium	84 mg/l	D-Chromium	<5.0 ug/l
D-Copper	<12.0 ug/l	D-Iron	3840.0 ug/l
D-Lead	7.5 ug/l	D-Magnesium	42.2 mg/l
D-Mangan	230.0 ug/l	D-Nickel	<10.0 ug/l
D-Potassium	7.72 mg/l	D-Selenium	4.1 ug/l
D-Silver	<2.0 ug/l	D-Sodium	177.0 mg/l
D-Zinc	<30.0 ug/l	Bicarbonate	198 mg/l
Carb. Diox	6 mg/l	Carbonate	0 mg/l
Chloride	162.5 mg/l	Fluoride	0.37 mg/l
Hydroxide	0 mg/l	Sulfate	420.9 mg/l
T. Phos.	0.43322 mg/l	Tot. Alk.	163 mg/l
T. Hardns.	383.2 mg/l	Turbidity	840.0 NTU
L-Sp. Cond	1652 umhos	TDS @ 180C	1006 mg/l
Alpha, grs	79.5 pCi/l +/-1.4	Beta gross	62 pCi/l +/-6.7
Radium 226	0.5 pCi/l +/-0.7	Radium 228	<1 pCi/l +/-3.0
D-Aluminum	2200.0 ug/l	D-Beryllium	<1.0 ug/l
D-Molybdenum	11.4 ug/l	D-Vanadium	<30.0 ug/l
T-Uranium	51.1 pCi/l +/-2.5	D-Thallium	<1.0 ug/l
D-Antimony	<3.0 ug/l	D-Mercury	<0.2 ug/l
CO3 Solids	98 mg/l		

Comments (*) on test results:

L-pH.....pH should be performed as a field test.

END OF REPORT

UTAH STATE DEPARTMENT OF HEALTH
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

UDEQ - DRC

ATTN:

168 N 1950 W BLDG 2

PO BOX 144850

SLC

UT

84114-4850

801-536-4250

Lab Number: 9700196 Sample Type: 04 Cost Code: 342
Description: COLORADO R A-5 BL MILL TAILINGS

Site ID: Source No: 03 Organic Review:
Sample Date: 01/07/97 Time: 15:30 Inorganic Review: 01/28/97
Radiochemistry Review: 05/22/97
Microbiology Review:
Tot. Cations: 232 mg/l 11.5 me/l
Tot. Anions: 470 mg/l 11.8 me/l
Grand Total: 702 mg/l %D = 1.3

TEST RESULTS:

L-pH *	7.85	T.Sus.Sol	920.0 mg/l
NO2+NO3, N	0.95 mg/l	T.K.N.	4.938 mg/l
Ammonia N	3.33 mg/l	D-Arsenic	<5.0 ug/l
D-Barium	140.0 ug/l	D-Cadmium	<1.0 ug/l
D-Calcium	75.5 mg/l	D-Chromium	<5.0 ug/l
D-Copper	<12.0 ug/l	D-Iron	3900.0 ug/l
D-Lead	8.0 ug/l	D-Magnesium	29.5 mg/l
D-Mangan	200.0 ug/l	D-Nickel	<10.0 ug/l
D-Potassium	5.05 mg/l	D-Selenium	4.0 ug/l
D-Silver	<2.0 ug/l	D-Sodium	119.0 mg/l
D-Zinc	<30.0 ug/l	Bicarbonate	198 mg/l
Carb. Diox	4 mg/l	Carbonate	0 mg/l
Chloride	113 mg/l	Fluoride	0.35 mg/l
Hydroxide	0 mg/l	Sulfate	259.8 mg/l
T. Phos.	0.39773 mg/l	Tot. Alk.	162 mg/l
T. Hardns.	309.8 mg/l	Turbidity	490.0 NTU
L-Sp. Cond	1158 umhos	TDS @ 180C	728 mg/l
Alpha, grs	32.2 pCi/l +/-0.9	Beta gross	38.5 pCi/l +/-5.8
Radium 226	1.1 pCi/l +/-0.6	Radium 228	2.8 pCi/l +/-2.0
D-Aluminum	1500.0 ug/l	D-Beryllium	<1.0 ug/l
D-Molybdum	4.8 ug/l	D-Vanadium	<30.0 ug/l
T-Uranium	22.5 pCi/l +/-0.5	D-Thallium	<1.0 ug/l
D-Antimony	<3.0 ug/l	D-Mercury	<0.2 ug/l
CO3 Solids	97 mg/l		

Comments (*) on test results:

L-pH.....pH should be performed as a field test.

END OF REPORT

UTAH STATE DEPARTMENT OF HEALTH
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

UDEQ - DRC

ATTN:

168 N 1950 W BLDG 2

PO BOX 144850

SLC

UT

84114-4850

801-536-4250

Lab Number: 9700197 Sample Type: 04 Cost Code: 342
Description: COLORADO R A-6 BL MILL TAILINGS

Site ID: Source No: 03
Sample Date: 01/07/97 Time: 15:40

Organic Review:
Inorganic Review: 01/28/97
Radiochemistry Review: 05/22/97
Microbiology Review:

Tot. Cations: 224 mg/l 11.1 me/l
Tot. Anions: 443 mg/l 11.1 me/l
Grand Total: 667 mg/l %D = .0

TEST RESULTS:

L-pH *	7.97	T.Sus.Sol	896.0 mg/l
NO2+NO3, N	0.73 mg/l	T.K.N.	2.873 mg/l
Ammonia N	1.84 mg/l	D-Arsenic	<5.0 ug/l
D-Barium	150.0 ug/l	D-Cadmium	<1.0 ug/l
D-Calcium	75.7 mg/l	D-Chromium	<5.0 ug/l
D-Copper	<12.0 ug/l	D-Iron	3850.0 ug/l
D-Lead	9.2 ug/l	D-Magnesium	27.4 mg/l
D-Mangan	200.0 ug/l	D-Nickel	<10.0 ug/l
D-Potassium	4.65 mg/l	D-Selenium	4.0 ug/l
D-Silver	<2.0 ug/l	D-Sodium	114.0 mg/l
D-Zinc	<30.0 ug/l	Bicarbonate	182 mg/l
Carb. Diox	3 mg/l	Carbonate	0 mg/l
Chloride	106 mg/l	Fluoride	0.322 mg/l
Hydroxide	0 mg/l	Sulfate	246.7 mg/l
T. Phos.	0.24431 mg/l	Tot. Alk.	149 mg/l
T. Hardns.	301.6 mg/l	Turbidity	451.0 NTU
L-Sp. Cond	1063 umhos	TDS @ 180C	692 mg/l
Alpha, grs	32.4 pCi/l +/-0.8	Eeta gross	16 pCi/l +/-5.0
Radium 226	1.6 pCi/l +/-0.6	Radium 228	<1 pCi/l +/-2.0
D-Aluminum	2300.0 ug/l	D-Beryllium	<1.0 ug/l
D-Molybdenum	3.0 ug/l	D-Vanadium	<30.0 ug/l
T-Uranium	16.9 pCi/l +/-1.6	D-Thallium	<1.0 ug/l
D-Antimony	<3.0 ug/l	D-Mercury	<0.2 ug/l
CO3 Solids	90 mg/l		

Comments (*) on test results:

L-pH.....pH should be performed as a field test.

END OF REPORT

UTAH STATE DEPARTMENT OF HEALTH
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

UDEQ - DRC

ATTN:

168 N 1950 W BLDG 2

PO BOX 144850

SLC

UT

84114-4850

801-536-4250

Lab Number: 9700198 Sample Type: 04 Cost Code: 342
Description: COLORADO R A-7 BL MILL TAILINGS

Site ID:	Source No: 03	Organic Review:
Sample Date: 01/07/97	Time: 15:49	Inorganic Review: 01/28/97
		Radiochemistry Review: 05/22/97
		Microbiology Review:

Tot. Cations:	215 mg/l	10.7 me/l
Tot. Anions:	426 mg/l	10.8 me/l
Grand Total:	641 mg/l	%D = .5

TEST RESULTS:

L-pH *	8.18	T.Sus.Sol	968.0 mg/l
NO2+NO3, N	0.67 mg/l	T.K.N.	2.2755 mg/l
Ammonia N	1.05 mg/l	D-Arsenic	<5.0 ug/l
D-Barium	150.0 ug/l	D-Cadmium	<1.0 ug/l
D-Calcium	74.1 mg/l	D-Chromium	<5.0 ug/l
D-Copper	<12.0 ug/l	D-Iron	3820.0 ug/l
D-Lead	9.4 ug/l	D-Magnesium	25.8 mg/l
D-Mangan	210.0 ug/l	D-Nickel	<10.0 ug/l
D-Potassium	4.44 mg/l	D-Selenium	4.1 ug/l
D-Silver	<2.0 ug/l	D-Sodium	110.0 mg/l
D-Zinc	<30.0 ug/l	Bicarbonate	181 mg/l
Carb. Diox	2 mg/l	Carbonate	0 mg/l
Chloride	108 mg/l	Fluoride	0.35 mg/l
Hydroxide	0 mg/l	Sulfate	229.4 mg/l
T. Phos.	0.40693 mg/l	Tot. Alk.	148 mg/l
T. Hardns.	291.0 mg/l	Turbidity	501.0 NTU
L-Sp. Cond	1044 umhos	TDS @ 180C	676 mg/l
Alpha, grs	29.5 pCi/l +/-1.1	Beta gross	19.4 pCi/l +/-5.0
Radium 226	0.9 pCi/l +/-0.6	Radium 228	1 pCi/l +/-2.0
D-Aluminum	2300.0 ug/l	D-Beryllium	<1.0 ug/l
D-Molybdum	2.8 ug/l	D-Vanadium	<30.0 ug/l
T-Uranium	7.8 pCi/l +/-1.1	D-Thallium	<1.0 ug/l
D-Antimony	<3.0 ug/l	D-Mercury	<0.2 ug/l
CO3 Solids	89 mg/l		

Comments (*) on test results:

L-pH.....pH should be performed as a field test.

END OF REPORT

UTAH STATE DEPARTMENT OF HEALTH
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

UDEQ - DRC

ATTN:

168 N 1950 W BLDG 2

PO BOX 144850

SLC

UT

84114-4850

801-536-4250

Lab Number: 9700199 Sample Type: 04 Cost Code: 342
Description: COLORADO R A-8 BL MILL TAILINGS

Site ID: Source No: 03
Sample Date: 01/07/97 Time: 15:56

Organic Review:
Inorganic Review: 01/28/97
Radiochemistry Review: 05/22/97
Microbiology Review:

Tot. Cations: 215 mg/l 10.7 me/l
Tot. Anions: 436 mg/l 11.0 me/l
Grand Total: 651 mg/l %D = 1.4

TEST RESULTS:

L-pH *	8.13	T.Sus.Sol	976.0 mg/l
NO2+NO3, N	0.64 mg/l	T.K.N.	2.238 mg/l
Ammonia N	0.92 mg/l	D-Arsenic	<5.0 ug/l
D-Barium	160.0 ug/l	D-Cadmium	<1.0 ug/l
D-Calcium	74.2 mg/l	D-Chromium	<5.0 ug/l
D-Copper	<12.0 ug/l	D-Iron	4190.0 ug/l
D-Lead	11.0 ug/l	D-Magnesium	25.4 mg/l
D-Mangan	260.0 ug/l	D-Nickel	28.0 ug/l
D-Potassium	4.34 mg/l	D-Selenium	4.0 ug/l
D-Silver	<2.0 ug/l	D-Sodium	110.0 mg/l
D-Zinc	<30.0 ug/l	Bicarbonate	177 mg/l
Carb. Diox	2 mg/l	Carbonate	0 mg/l
Chloride	108 mg/l	Fluoride	0.344 mg/l
Hydroxide	0 mg/l	Sulfate	241.3 mg/l
T. Phos.	0.4278 mg/l	Tot. Alk.	145 mg/l
T. Hardns.	289.6 mg/l	Turbidity	505.0 NTU
L-Sp. Cond	1034 umhos	TDS @ 180C	680 mg/l
Alpha, grs	33.3 pCi/l +/-1.3	Beta gross	20 pCi/l +/-5.0
Radium 226	1.6 pCi/l +/-0.6	Radium 228	1 pCi/l +/-2.0
D-Aluminum	2400.0 ug/l	D-Beryllium	<1.0 ug/l
D-Molybdum	3.2 ug/l	D-Vanadium	<30.0 ug/l
T-Uranium	11.5 pCi/l +/-1.3	D-Thallium	<1.0 ug/l
D-Antimony	<3.0 ug/l	D-Mercury	<0.2 ug/l
CO3 Solids	87 mg/l		

Comments (*) on test results:

L-pH.....pH should be performed as a field test.

END OF REPORT

UTAH STATE DEPARTMENT OF HEALTH
DIVISION OF LABORATORY SERVICES
Environmental Chemistry Analysis Report

UDEQ - DRC

ATTN:

168 N 1950 W BLDG 2

PO BOX 144850

SLC

UT

84114-4850

801-536-4250

Lab Number: 9700200 Sample Type: 04 Cost Code: 342
Description: COLORADO R A-9 BL 495656 1/4 MILE

Site ID: Source No: 03
Sample Date: 01/07/97 Time: 16:11

Organic Review:
Inorganic Review: 01/28/97
Radiochemistry Review: 05/29/97
Microbiology Review:

Tot. Cations: 222 mg/l 11.0 me/l
Tot. Anions: 419 mg/l 10.6 me/l
Grand Total: 641 mg/l %D = 1.9

TEST RESULTS:

L-pH *	8.15	T.Sus.Sol	1112.0 mg/l
NO2+NO3, N	0.65 mg/l	T.K.N.	2.348 mg/l
Ammonia N	0.818 mg/l	D-Arsenic	<5.0 ug/l
D-Barium	150.0 ug/l	D-Cadmium	<1.0 ug/l
D-Calcium	76.4 mg/l	D-Chromium	<5.0 ug/l
D-Copper	<12.0 ug/l	D-Iron	4000.0 ug/l
D-Lead	9.6 ug/l	D-Magnesium	26.2 mg/l
D-Mangan	220.0 ug/l	D-Nickel	<10.0 ug/l
D-Potassium	4.47 mg/l	D-Selenium	4.0 ug/l
D-Silver	<2.0 ug/l	D-Sodium	114.0 mg/l
D-Zinc	<30.0 ug/l	Bicarbonate	174 mg/l
Carb. Diox	2 mg/l	Carbonate	0 mg/l
Chloride	109 mg/l	Fluoride	0.35 mg/l
Hydroxide	0 mg/l	Sulfate	223.8 mg/l
T. Phos.	0.48324 mg/l	Tot. Alk.	143 mg/l
T. Hardns.	298.4 mg/l	Turbidity	572.0 NTU
L-Sp. Cond	1034 umhos	TDS @ 180C	668 mg/l
Alpha, grs	30 pCi/l +/-1.2	Beta gross	19.9 pCi/l +/-5.0
Radium 226	1.2 pCi/l +/-0.6	Radium 228	<1 pCi/l +/-3.0
D-Aluminum	2300.0 ug/l	D-Beryllium	<1.0 ug/l
D-Molybdenum	2.4 ug/l	D-Vanadium	<30.0 ug/l
T-Uranium	5.4 pCi/l +/-0.9	D-Thallium	<1.0 ug/l
D-Antimony	<3.0 ug/l	D-Mercury	<0.2 ug/l
CO3 Solids	86 mg/l		

Comments (*) on test results:

L-pH.....pH should be performed as a field test.

END OF REPORT