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Mr. Ramon E. Hall
United States Nuclear Regulatory Commission
Region IV
Uranium Recovery Field Office
P.O. Box 25325
Denver, Colorado 80225

RE: License SUA-1482, Johnny M Site, August 16, 1991, NRC Letter

Dear Mr. Hall:

After your office received my letter dated October 9, 1991, I received a telephone call from Mr. Gary Kowlinski of your staff indicating that additional information would be needed concerning the effect of the Johnny M backfilled tailings on the aquifer. An attempt was made to review the New Mexico Environmental Improvement Division (NMEID) files. However, the NMEID indicated that the files were in a complete state of disarray due to a combination of many office moves and a general lack of having the site information properly filed in the first place. They stated that any attempt to retrieve information from the files would be futile.

At the about time the Johnny M was shut-down, there was interest in conducting tests to assess any impact the tailings might have on the groundwater. Apparently, however, when the bottom dropped out of the uranium market and the mines began to close, regulatory interest by the NMEID also diminished and the scientific studies started in the early 80's were not finished. Be that as it may, in this letter we believe we have provided you with the additional information you requested.

The Johnny M Mine actually intercepted two aquifers, the Dakota and the Westwater Canyon. The Dakota aquifer is located between 130 and 150 feet above the sandfill. The mine shafts were grouted and cemented through the Dakota. Because the backfilled tailings were deposited below the Dakota, there would be no effect on this aquifer. In fact, one of the primary reasons the backfilled tails were put in place was to ensure the integrity of the overlying Dakota aquifer.

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Approximately 286,000 tons of backfilled tailings were placed in the mine at depths of about 1100-1300 feet. The sands were described in the license application as such:

> "Particle size ranges from 75-500 micron, or 200-38 mesh. The material has various constituents but consists mainly of SiO_2. There are minor amounts present of Al, Fe, Ca, Mg, Mn, Na, K, Ni, Mo, Zn, U, and V. The sand will range from 26-100 pCi/gm (dry) of Ra-226 and 0.005-0.01% of U_3O_8. The Th content is about 600 pCi/gm."

The ore bodies, and therefore also the mining activities, were located in two areas, the Poison Canyon Tongue, which is approximately 25 feet above the main Westwater Member, and at the top of the Westwater Member. The backfilled tailings were placed into the stopes while the drifts were left open. Mine water was used to slurry the tailings, and after the tails were in place the water was drained off, thereby entering into the mine water collection system and pumped to the surface. The mine was dewatered at a rate of 700-800 gpm. The source of the water was identified as seepage from the mine drifts, drill holes, and stopes. The first backfill sand was delivered around mid-August 1977.

Water quality monitoring was conducted on the mine dewatering activities. This monitoring was conducted in accordance with Radioactive Materials License conditions 16 and 17. We have located the mine dewatering and backfill slurry decant monitoring results from July 1977 to December 1978. Copies of the results are included as Attachments A and B. It is believed that additional samples were collected after these dates and probably until the mine closed; however, we have not been able to locate any other data. Analyses were conducted for metals, total dissolved solids, chlorides, sulfates, uranium, nitrate, phenols, pH, flouride, cyanide, radium-226, thorium-230, lead-210, gross alpha, and gross beta. The mine water samples are designated as UG-4 (midway between north and south ore bodies), UG-5 (in northern ore body), and UG-6 (in southern ore body), while the backfill slurry decant is designated as MWS-3. Sampling of UG-4 was discontinued in mid-1978, and sampling points DN-1 (mine drainage ditch on the north side of the shaft prior to the intersection of the main underground sump), and DS-2 (mine drainage ditch on the south side of the shaft prior to the intersection of the main underground sump) were added. The sampling was designed to show the impact of the sandfill decant solution on the mine water, as samples from locations UG-4, UG-5, and UG-6 were to be collected as closely as possible to the completion of the backfilling of each stope. Other sampling points were also designated. These were MW-1 (at the discharge of the second of two settling ponds), MW-2 (at the discharge drainage canal prior to entry into San Mateo Creek, GW-7 (monitor well near mine discharge canal), and GW-8 (monitor well further distant from the mine discharge ditch). (These two monitor wells were located in the Dakota formation.)

A sample was collected in each of the three underground sampling locations on July 5, 1977, before backfilling was started. This sample was probably intended to show background conditions; however, it must be realized that a one-time sampling may not fully characterize the background water quality conditions. In particular, it would not demonstrate any of the natural variability of the constituents of concern. Also, analysis for many of the parameters did not begin until July 1978, and therefore, there are no pre-backfill analyses for these parameters. Specifically, analysis began in July 1978 for barium, boron, cadmium, chloride, chromium, cobalt, copper, cyanide, flouride, iron, lead, manganese, mercury, nickel, nitrate, pH, phenols, silver, sulfate, uranium, and zinc. The concentrations of constituents in the decant solution would represent a worse case condition when compared to what might be expected to be removed by groundwater that would infiltrate the backfilled tails after the mine was closed. The mine water was used to slurry the sands, thus maximizing the mixing of the water and the tails and thereby also maximizing the amount of constituents that would be removed from the tails by the water. Because mine water was used to slurry the tailings, the water quality of the slurry decant could not be expected to be better than the mine water quality; realistically it could only be the same quality or worse. After the decant water was drained from the tails and pumped to the surface, only minor amounts of this water would be retained in the tails for possible later release to infiltrating groundwater. Groundwater seeping into the backfilled stopes would not be mixed with the tails in this manner, and therefore it would be expected that lesser amounts of constituents would be released to the water. Also, water that has gone through the mining cycle would be expected to be of lower quality than groundwater permeating into the stopes. It would also be expected that this initial mixing would remove a significant amount of readily available constituents, in essence purging the sands of these readily available constituents. This should additionally reduce the amount of constituents that would have the potential to be released to any infiltrating groundwater.

Even with this in mind, the data collected by Ranchers indicates little impact from the decant solution on the water quality of the mine. Although the data show higher concentrations for a few of the parameters analyzed in the decant solution when compared to the mine water samples, there are no identifiable upward trends in any of the data collected from the underground water sampling locations.

The aluminum, arsenic, barium, cadmium, chromium, cobalt, copper, cyanide, lead, mercury, nickel, phenols, silver, vanadium, and zinc concentrations demonstrated in underground water samples and the backfill decant analyzed were for the most part consistently below analytical detection level or at de-minimus concentrations. The iron, manganese, molybdenum, nitrate, and selenium concentrations were at below detectable limits or at de-minimus concentrations in all the underground water samples analyzed indicating no impact from the slurry decant solution.

Boron concentrations range from 0.25 mg/l to 3.05 mg/l for samples collected in the underground sampling locations through September 1978. Samples collected from October through December indicate much lower boron concentrations, generally below the analytical detection limit. However, the boron concentrations of the sandfill decant are much lower in concentration, ranging from below analytical detection to 0.8 mg/l. This would indicate that the boron in the underground water was from natural or mining sources and not attributable to backfilled sands.

The total dissolved solids (TDS), sulfate, and chloride concentrations were higher in the decant solution than was demonstrated in the underground water samples. Even so, the TDS levels were generally consistent throughout the sampling period in the underground sampling results. The monitored TDS range of 407 mg/l to 1076 mg/l in all the underground water samples (a total of 31 samples were analyzed) are consistent with the published TDS levels of 600 to 1400 mg/l in the Westwater Canyon aquifer. Additionally, of the 16 sulfate analyses conducted on the underground water samples, 14 were below the EPA Secondary Maximum Contaminant Level (nonenforceable - designed for taste, odor, or appearance guidelines) for drinking water of 250 mg/l. The two excursions were just slightly higher at 325 and 350 mg/l. The chloride concentrations ranged from 2.0 to 10.4 mg/l, all well below the EPA Secondary Maximum Contaminant Level for drinking water of 250 mg/l. Flouride concentrations were about the same for all samples analyzed indicating no impact from the backfilled tailings.

The backfill slurry decant solution demonstrated pH values ranging from 5.4 to 8.22 standard units, while a pH range of 6.36 to 9.01 standard units was obtained on the underground water samples.

More data scatter is demonstrated for the radiochemistry for all sampling locations. However, this would be expected in a uranium mine. The radiochemistry would be affected by many variables in the mining environment such as changes in the areas being mined, exploration activity, drill holes and stopes producing water, and general changes in the mine activities. With the exception of thorium-230, all radionuclide concentrations are higher in the slurry decant solution than is found in the underground water samples. There is no readily apparent correlation between the slurry decant and the mine water samples based on the radiochemistry. However, if the TDS, sulfate, and chloride concentrations are used as representative of the impact of the slurry decant solution on the overall mine water quality, it can be inferred that the mine slurry decant should have minimal effect on the underground water quality for the radionuclides also. Specifically, the sulfate, chloride, and TDS analyses clearly show elevated concentrations in the backfill slurry decant but no identifiable impact on the mine water quality. If the radionuclide concentrations in the mine water were due to the slurry decant then there would not be the clear lack of impact from the sulfates, chlorides and TDS from the slurry decant that is apparent. Therefore, it is our conclusion that the variability in the radiochemistry in the underground water samples analyzed is primarily natural fluctuations due to the uranium mineralization in the mine and from the mining activity.

The analytical results of water samples collected by Ranchers indicate a significant dilution of the backfilled tails slurry decant solution when it reached the mine water. It can be assumed that the amount of water that would seep from the stopes after the mine was closed would be less than what was decanted from the sands after they were slurried into the stope. This is because the bulk of the decant water was added with the sands, and would be a combination of the added mine water and the stope seepage water. Once the sands were drained, only the water seeping into the stopes would accumulate in the stopes or filter through and leave the stopes into the drifts. However, the water seeping from other areas of the mine should remain constant both during the backfilling activities and after mine closure. Thus the ratio of backfill contaminated water to other mine water would decrease significantly after all the initial backfill sand slurry water was drained. Therefore, the amount of constituents that would be found in the groundwater that might be attributable to the backfilled sands would be substantially less after the mine closure than what was encountered during the water quality tests conducted during the actual backfilling operations.

In addition to the data described above, column rinsing tests were conducted by the NMEID in 1981-82 on samples of backfilled tails from the mine. Unfortunately, this study was not completed and a report was never written. However, we do have a table of the column rinsing data generated by the NMEID and is included as Attachment C. Mine backfilling tailings were obtained from the stopes at the Johnny M and placed into a glass column. Distilled water was passed through the column and the effluent was analyzed for the listed parameters. A total of 52 pore volumes were passed through the glass column. All 52 effluent samples were analyzed for conductivity (umhos), magnesium (mg/l), bicarbonate (mg/l), calcium (mg/l), chloride (mg/l), sodium (mg/l), sulfate (mg/l), total filterable residue, i.e. total dissolved solids (mg/l), barium (ug/l), molybdenum (ug/l), selenium (ug/l), uranium (ug/l), and vanadium (ug/l). In addition, there were 18 effluent samples analyzed for potassium (mg/l), 29 effluent samples analyzed for hardness (mg/l), 28 effluent samples analyzed for carbonate (mg/l), 7 effluent samples analyzed for arsenic (ug/l), and 25 effluent samples analyzed for aluminum (ug/l) and iron (ug/l). (However, holes punched into the last line of results, located on the first line of the second page of data, make the data for some of the parameters on this line unrecoverable.)

The average concentrations for each parameter analyzed is presented in Attachment D. No EPA Primary Maximum Contaminant Level was exceeded in any of the concentration averages from the column effluent. In addition, when the analyses from the leaching column effluent are compared with the slurry decant data, it is readily apparent that the leaching column effluent yielded substantially lower concentrations for the parameters analyzed. The column leaching results are lower than or comparable to the mine underground water concentrations.

With respect to the direction of groundwater flow, you will find as Attachment E a figure from the report "Hydrogeology and Water Resources of the Ambrosia Lake-San Mateo Area, McKinley and Valencia Counties, New Mexico", written by Robert C. Brod in June 1979. This figure shows the potentiometric-surface contour which demonstrates the groundwater direction flow based on water level measurements in the Westwater Canyon sandstone. As shown in this figure, groundwater flow is to the northeast. In this same report, the average hydraulic conductivity in the aquifer in the region is estimated at 20 gpd/ft^2 and the natural flow velocity is estimated at 0.01 meter/day. Based on this velocity it would take the groundwater now currently in the mine approximately 275 years to migrate 1000 meters to the northeast of the mine or approximately 450 years to move a mile northeast of the mine.

Regarding land and water use, the land to the northeast of the Johnny M Mine is used for livestock grazing. No irrigation is known to occur on this land. The soil and climatological conditions in the area generally restrict agriculture activity. Additionally, there are no population centers in the area in this direction. In fact, to the best of our knowledge there are no people residing in this area. Our inquiries to the USGS, NMEID, and the State Engineer's office did not indicate any wells located in the Westwater Canyon Member in the northeast direction from the mine. Based on this available information, there does not appear to be any current consumptive use of Westwater Canyon water in the immediate vicinity in the northeast direction from the mine. We have no information that suggests the aquifer water use will change in the future.

I believe we have addressed your additional concerns about the effect of the backfilled uranium tails on the aquifer at the Johnny M Mine. We believe we have demonstrated that there is no significantly increased risk to the public health and safety from the backfilled tails. In fact, it would seem that tails deposited in a deep mine such as this would be a most attractive option, posing the least risk to the public health and safety when compared to other options available. The tails are deposited at a substantial depth underground and occupy areas that have always contained naturally radioactive materials. The groundwater monitoring results from tails backfilling activities did not indicate that the decant water from the tails had any significant effect on the water quality of the mine. Also, column rinsing experiments conducted of the mine tails demonstrate there should be no detectable impact on the overall water quality of the aquifer. In addition, except for sulfate and total dissolved solids, analyzed constituents met levels set as drinking water standards. It is estimated that it will take the groundwater currently infiltrating the old workings approximately 450 years to travel one mile northeast of the mine where there are no identified consumptive uses of the Westwater Canyon aquifer water. In addition, there are no known uses of the water in the direction of groundwater flow within miles of the Johnny M Mine site, diminishing any potential risk that there might be or perceived to be.

Very truly yours,

Gary R. Gamble
Environmental Engineer

Attachments

cc: Larry Drew, HMC
George Wilhelm, HMC

Attachment A

Ranchers Mine Water Sampling Results 9/30/77 to 5/8/78

UG-4 940 TRACK DRIFT

SAMPLE LOCATION	ARSENIC	SELENIUM	TOTAL DISSOLVED SOLIDS	MOLBDENUM	VANADIUM	RADIUM	THORIUM	LEAD		
(UG-4)	As	Se	TDS	Mo	Va	Ra 226	Th 230	Pb 210	GROSS (ALPHA)	GROSS (BETA)
DATE	mg/l	mg/l	mg/l	mg/l	mg/l	PCi/l	PCi/l	PCi/l	PCi/l	PCi/l
7/5/77	<0.01	<0.01	452	0.009	0.03	2.7 ± 0.3	-	-	19 ± 5	5 ± 1
9/30/77	<0.01	<0.01	-	<0.1	<0.1	2.7 ± 0.29	-	-	11 ± 7	0 ± 2.0
10/14/77	<0.01	<0.01	469	<0.1	<0.1	3.29 ± 0.35	-	-	5 ± 3	7 ± 3.0
10/24/77	<0.01	<0.01	-	<0.1	<0.1	2.09 ± 0.28	-	-	9 ± 6	22 ± 10
11/14/77	<0.01	<0.01	468	<0.1	<0.1	3.16 ± 0.41	-	-	10 ± 5	35 ± 8
12/7/77	<0.01	<0.01	-	<0.1	<0.1	0.49 ± 0.29	-	-	0 ± 5	0 ± 5
1/6/78	<0.01	<0.01	430	<0.1	<0.1	0 ± 0.05	-	-	0 ± 5	49 ± 18
2/8/78	<0.01	<0.01	—	<0.1	<0.1	2.98 ± 0.47	—	—	18 ± 3	38 ± 6
3/9/78	<0.01	<0.01	454	<0.1	<0.1	1.49 ± 0.40	—	—	16 ± 5	19 ± 9
4/3/78	<0.01	<0.01		<0.1	<0.1					
5/3/78	<0.01	<0.01		<0.1	<0.1					
1/25/78	<0.01	<0.01		<0.1	<0.1	5.75 ± 0.59			18 ± 9	23 ± 20

UG-5 900 TRACK DRIFT

SAMPLE LOCATION	ARSENIC	SELENIUM	TOTAL DISSOLVED SOLIDS	MOLBDENUM	VANADIUM	RADIUM	THORIUM	LEAD	GROSS (ALPHA)	GROSS (BETA)
UG-5	As	Se	TDS	Mo	Va	Ra_{226}	Th_{230}	Pb_{210}		
DATE	mg/l	mg/l	mg/l	mg/l	mg/l	PCi/l	PCi/l	PCi/l	PCi/l	PCi/l
7/5/77	<0.01	<0.01	567	0.008	0.03	5.9 ± 0.6	-	-	11 ± 8	3 ± 1
9/30/77	<0.01	<0.01	-	<0.1	<0.1	1.09 ± 0.22	-	-	11 ± 7	0 ± 2.0
10/14/77	<0.01	<0.01	609	<0.1	<0.1	0.66 ± 0.17	-	-	3 ± 3	9 ± 4
10/[illegible]/77	<0.01	<0.01	-	<0.1	<0.1	1.70 ± 0.35	-	-	9 ± 9	23 ± 10
11/[illegible]/77	<0.01	<0.01	640	<0.1	<0.1	4.94 ± 0.49	-	9.7 ± 7.7	11 ± 4	37 ± 7
12/7/77	<0.01	<0.01	-	<0.1	<0.1	1.01 ± 0.22	-	0 ± 2.0	0 ± 5	23 ± 17
1/6/78	<0.01	<0.01	570	<0.1	<0.1	0.80 ± 0.15	-	-	0 ± 5	41 ± 17
6/5 m 2/[illegible]/78	<0.01	<0.01		<0.1	<0.1	1.86 ± 0.25	/	/	0 ± 5	0 ± 5
2/8/78	<0.01	<0.01		<0.1	<0.1	2.05 ± 0.99	2.4 ± 0.40	6 ± 22	103 ± 11	24 ± 19
3/7/78	<0.01	<0.01	650	<0.1	<0.1	0.79 ± 0.36		/	2 ± 7	18 ± 10
4/4/78	<0.01	<0.01		<0.1	<0.1					
5/8/78	<0.01	<0.01		<0.1	<0.1					

UG 5 2/2 TRACK DRIFT

SAMPLE LOCATION	ARSENIC	SELENIUM	TOTAL DISSOLVED SOLIDS	MOLYBDENUM	VANADIUM	RADIUM	THORIUM	LEAD		
UG 5?	As	Se	TDS	Mo	V	Ra_{226}	Th_{232}	Pb_{210}	GROSS (ALPHA)	GROSS (BETA)
DATE	mg/l	mg/l	mg/l	mg/l	mg/l	PCi/l	PCi/l	PCi/l	PCi/l	PCi/l
7/5/77	<0.01	<0.01	407	0.054	0.03	3.8 ±0.6	-	-	47 ±8	9 ±2
9/30/77	<0.01	<0.01	-	<0.1	<0.1	6.17 ±0.48	-	9.9±6.7	40 ±8	29 ±7
10/4/77	<0.01	<0.01	459	<0.1	<0.1	6.28 ± .47	-	-	15 ±8	17 ±3
10/24/77	<0.01	<0.01	-	<0.1	<0.1	7.39 ±0.50	-	-	23 ±3	29 ±4
11/14/77	<0.01	<0.01	440	<0.1	<0.1	[illegible] ±0.3	-	12 ±8	28 ±6	49 ±9
12/7/77	<0.01	<0.01	-	<0.1	<0.1	[illegible] ±0.39	-	12 ±6	0 ±5	29 ±17
[illegible]	<0.01	<0.01	414	<0.1	<0.1	4.89 ±0.61	-	-	14 ±9	61 ±18
1/25/78	<0.01	<0.01		<0.1	<0.1	97.8 ±4.4	9.9 ±0.39	[illegible]	175±31	136±32
2/8/78	<0.01	<0.01		<0.1	<0.1	4.17±0.57	-	5±2	37±5	55±12
3/5/78	<0.01	<0.01	516	<0.1	<0.1	5.3±0.76			28±5	43±10
4/3/78	<0.01	<0.01		<0.1	<0.1					
5/4/78	<0.01	<0.01		<0.1	<0.1					

0.57

MWS-3 SANDFILL DECANT

SAMPLE LOCATION	ARSENIC	SELENIUM	TOTAL DISSOLVED SOLIDS	MOLYBDENUM	VANADIUM	RADIUM	THORIUM	LEAD	GROSS (ALPHA)	GROSS (BETA)
[illegible]	As	Se	TDS	Mo	V	Ra_{226}	Th_{230}	Pb_{210}		
DATE	mg/l	mg/l	mg/l	mg/l	mg/l	PCi/l	PCi/l	PCi/l	PCi/l	PCi/l
(0851) 9/30/77	.059	.30	-	.24	9.0	177 ± 5	191 ± 6	160 ± 12	1360 ± 60	8460 ± 80
10/14/77	.08	.12	44.0	0.1	.40	245 ± 10	267 ± 30	0 ± 2	589 ± 34	5272 ± 132
(0400) 11/24/77	0.01	.16		6.7	< 0.1	640 ± 9	417 ± 18		801 ± 65	7695 ± 215
(1200) 1/6/78	0.08	.17		3.5	< 0.1	192 ± 7	160 ± 58	50 ± 15	2494 ± 73	3842 ± 91
1/25/78	< 0.01	.06	—	4.5	< 0.1	132 ± 4	6.72 ± .90	[illegible]	2894 ± 99	3207 ± 81
(1400 hrs) 2/13/78	< 0.01	< .01	—	1.3	< 0.1	242 ± 4	11.5 ± 3.8	36.2	1385 ± 41	1412 ± 134
3/9/78	< 0.01	.06	856	0.1	< 0.1	19.9 ± 1.5	4.19 ± 2.37	10 ± 11	1014 ± 114	729 ± 95
Run #3 5/8/78	< 0.01	.16		1.1	< 0.1	—				

Attachment B

Ranchers Mine Water Sampling Results 7/18/78 to 12/21/78

SAMPLE NUMBER	DATE	UG-5	UG-6	DS-2	DN-1	MW-1	MWS-3 S.F.	MWS-3 S.F.	GW-7	GW-8A	GW-9
ALUMINUM	7/18/78	<.1	<.1	<.1	<.1	<.1	-	-	0.2	<.1	21.2
LIMIT: 5.0 mg/l	8/14/78	-	-	-	-	<.1	-	-	<.1	<.1	5.0
	9/13/78	<.2	<.2	<.2	0.5	<.2	(008) <.2	(014) 2.2	-	-	-
	9/20/78	-	-	-	-	<.2	-	-	<.2	<.2	25.2
	10/19/78	-	-	1.1	≤.05	≤.05	(1400¹) ≤.05	(1400²) ≤.05			24.0
	11/16/78	-	-	<0.2	≤.02	≤.02	(1200¹) ≤.02	-	-	-	15.0
	12/21/78	≤.05	≤.05	≤.05	≤.05	≤.05	(800³) ≤.05		<.05	≤.05	8.1

SAMPLE NUMBER	DATE	DG-5	DG-6	DS-2	DN-1	MW-1	MWS-3 S.F.	MWS-3 S.F.	GW-7	GW-8A	GW-9
ARSENIC	7/18/78	<.1	0.2	<.1	<.1	<.1	-	-	.1	<.1	1.0
LIMIT 0.1 mg/l	8/14/78	-	-	-	-	<.1	-	-	<.1	<.1	0.1
	9/13/78	<.05	<.05	<.05	<.05	<.05	(008) <.05	(014) <.05	-	-	-
	9/20/78	-	-	-	-	<.01	-	-	<.01	<.01	<.01
	10/19/78	-	-	<.05	<.05	<.05	(1400') <.05	(1400') <.05	-	-	<.05
	11/16/78	-	-	<.02	<.02	<.02	(1000') <.02	-	-	-	<.02
	12/21/78	<.05	<.05	<.05	<.05	<.05	(800') <.05	-	<.09	<.05	<.09

SAMPLE NUMBER	DATE	DG-5	DG-6	DS-2	DW-1	MW-1	MWS-3 R.F.	MWS-3 S.F.	GW-7	GW-8A	GW-9
BARIUM	7/18/78	2.2	0.8	4.3	[illegible]	1.2	-	-	2.8	13.1	11.8
LIMIT: 1.0 mg/l.	8/14/78	-	-	-	-	2.6	-	-	<1	8.6	6.3
	9/13/78	<.2	<.2	<.2	<.2	<.2	(008) <.2	(014) 2.1	-	-	-
	9/20/78	-	-	-	-	<.05	-	-	<.05	<.05	<.05
	10/19/78	-	-	<.1	<.1	<.1	(1400') 1.27	(1400') .91	-	-	<.1
	11/16/78	-	-	1.7	0.8	0.8	(1200') 14.1	-	-	-	4.8
	12/21/78	<.02	<.02	<.02	<.02	<.02	(800') 17.2	-	<.02	17.2	<.02

SAMPLE NUMBER	DATE	US-5	US-6	US-7	BU-1	MW-1	MWS-3 S.F.	MWS-3 S.F.	GW-7	GW-8A	GW-9
BORON	9/18/78	1.00	2.66	2.05	3.05	2.55	-	-	[illegible]	3.0	2.10
LIMIT .75 mg/l	9/14/78	-	-	-	-	1.80	-	-	[illegible]	[illegible]	[illegible]
	9/13/78	.60	1.50	1.50	.25	[illegible]	(008) .60	(014) .80	-	-	-
	9/20/78	-	[illegible]	-	-	.25	-	-	[illegible]	[illegible]	[illegible]
	10/18/78	-	-	<.03	<.03	.03	(1400) .03	(1400*) .08	-	-	[illegible] .45
	11/16/78	-	-	-	<.1	<.1	(800) <.1	-	-	-	-
	12/21/78	<.05	<.05	.5	1.0	<.05	(800*) <.05	-	.2	.1	1.0

SAMPLE NUMBER	DATE	UG-5	UG-6	GT-2	DW-1	MW-1	MWS-1 S.F.	MWS-1 D.F.	GW-7	GW-8A	GW-9
CADMIUM	7/18/78	<.01	<.01	<.01	<.01	.01	-	-	.005	.02	.04
LIMIT: .01 mg/l	8/14/78	-	-	-	-	<.002	-	-	.020	.005	.306
	9/12/78	<.004	<.004	<.01	<.004	<.004	(500') .05	(014) .08	-	-	-
	9/20/78	-	-	-	-	<.01	-	-	<.01	<.01	<.01
	10/19/78	-	-	<.01	<.01	<.01	(1400') <.01	(1400') <.01	-	-	<.01
	11/16/78	-	-	<.01	<.01	<.01	(1200') .38	-	-	-	.07
	12/21/78	<.01	<.01	<.01	<.01	<.01	(600') <.01	-	<.01	<.01	<.01

SAMPLE NUMBER	DATE	[illegible]	[illegible]	[illegible]	[illegible]	MW-1	MWS-2 [illegible]	MWS-2 [illegible]	[illegible]	[illegible]	[illegible]
CHROMIUM	7/18/78	<.02	<.02	<.02	<.02	<.02	-	-	.02	.15	.15
LIMIT 0.05 mg/l	8/14/78	-	-	-	-	<.02	-	-	<.02	.10	.22
	9/13/78	<.02	<.02	<.02	<.02	<.02	(.002) <.02	(014) <.05	-	-	-
	?/20/78	-	-	-	-	<.02	-	-	.05	.02	.13
	10/19/78	-	-	<.02	<.02	<.02	(1400') <.02	(1400') <.02	-	-	.10
	11/16/78	-	-	<.02	<.02	<.02	(1200') <.02	-	-	-	<.02
	12/21/78	<.02	<.02	<.02	<.02	<.02	(845') <.02	-	<.02	<.02	<.02

SAMPLE NUMBER	DATE	DS-5	DS-6	DS-2	DS-1	MW-1	MWS-3 S.F.	MWS-3 S.F.	GW-7	GW-6A	GW-8
COBALT	7/18/78	<.01	.02	<.02	.18	.22	-	-	<.01	<.01	.02
LIMIT 0.05 mg/l	8/13/78	-	-	-	-	<.02	-	-	<.02	<.02	.80
	9/14/78	<.02	<.02	<.02	<.02	<.02	(005) <.02	(014) <.02	-	-	-
	9/20/78	-	-	-	-	<.02	-	-	<.02	<.02	.03
	10/11/78	-	-	<.02	<.02	<.02	(1400*) <.02	(1402*) <.02	-	-	.8
	11/14/78	-	-	<.02	<.02	<.02	(1200*) <.02	-	-	-	<.02
	12/27/78	<.02	<.02	<.02	.02	.16	(800*) <.02	-	<.02	<.02	.8

SAMPLE NUMBER	DATE	DG-3	DG-5	DS-2	DW-1	MW-1	MWS-3 S.F.	MWS-3 S.P.	GW-7	GW-8A	GW-9
COPPER	7/18/78	<.02	<.02	<.02	<.02	<.02	-	-	<.02	<.02	<.02
LIMIT: 1.0 mg/l	9/13/78	<.02	<.02	<.02	.02	<.02	(008) <.02	(014) <.02	-	-	-
	9/20/78	-	-	-	-	<.02	-	-	<.02	<.02	<.02
	10/19/78	-	-	<.02	<.02	<.02	(1400') <.02	(1400') <.02	-	-	<.02
	11/16/78	-	-	<.02	<.02	<.02	(1200') <.02	-	-	-	<.02
	12/21/78	<.02	<.02	<.02	<.02	<.02	(800') <.02	-	.25	<.02	<.02

SAMPLE NUMBER / DATE		US-5	UG-6	DS-2	DN-1	MW-1	MWS-3 S.F.	MWS-3 S.F.	GW-7	GW-8A	GW-9
CHLORIDE	7/18/78	6.0	6.0	9.0	12.0	9.0	-	-	12.2	73.6	91.4
LIMIT 250.0 mg-l	9/13/78	10.4	9.2	6.0	13.0	11.0	(009) 94.4	(014) 232.0	-	-	-
	9/20/78	-	-	-	-	14.0	-	-	152.6	13.8	88.0
	10/19/78	-	-	4.0	9.0	11.0	(1400*) 230	(1400*) 36	-	-	23.0
	11/16/78	-	-	3.0	12.0	10.0	(1200*) 176	-	-	-	5.0
	12/21/78	6.0	4.0	2.0	8.0	12.	(800*) 54.0	-	4.0	18.0	ND

SAMPLE NUMBER / DATE		UG-5	UG-6	DS-2	DW-1	MW-1	MWS-? S.F.	MWS-? S.F.	GW-7	GW-8A	GW-9
CYANIDE	7/28/78	<.01	.03	<.01	<.01	<.01	-	-	<.01	<.01	<.01
LIMIT 0.2 mg/l	9/13/78	<.01	.01	<.01	<.01	<.01	(508) .01	(014) .01	-	-	-
	9/20/78	-	-	-	-	.03	-	-	<.01	<.01	<.01
	10/19/78	-	-	<.005	<.005	<.005	(1400') .014	(1400') .005	-	-	.02
	11/?/78	-	-		0.1	.2	(1800') .03	.02	-	-	.027
	12/2?/78	<.001	<.001	<.001	<.001	<.001	(800') <.001	-	.001	.002	.004

SAMPLE NUMBER	DATE	UG-5	UG-6	DS-2	DW-1	MW-1	MWS-3 S.F.	MWS-3 S.F.	GW-7	GW-8A	GW-9
FLOURIDE	7/18/78	1.02	0.60	0.92	1.00	0.88	-	-	0.69	1.45	7.60
LIMIT: 1.6 mg/l	-	-	-	-	-	-	-	-	-	-	-
	8/14/78	-	-	-	-	.83	-	-	.55	3.40	8.40
	9/13/78	.87	.62	.85	.94	.74	(600) 2.5	(0)': 2.5	-	-	-
	9/20/78	-	-	-	-	1.0	-	-	5.7	2.75	6.5
	10/19/78	-	-	.95	.99	.95	(1400') 1.22	(1400') 1.0	-	-	7.75
	11/16/78	-	-	1.0	1.1	1.12	(1200') 1.7	-	-	-	2.0
	12/21/78	.91	.67	.93	.98	.90	(800') 1.15	-	6.0	1.65	.59

SAMPLE NUMBER	DATE	UG-5	UG-6	OS-2	OW-1	MW-1	MWS-3 S.F.	MWS-3 S.F.	GW-7	GW-8A	GW-9
GROSS ALPHA	7/10/78	26±3	42±4	1092±95	416±21	618±12	-	-	52±5	22±3	25±4
LIMIT	9/13/78	44±6	27±3	907±33	405±16	485±17	2686±90	194±10	-	-	-
	9/20/78	-	-	-	-	706±11	-	-	38±2	76±2	20±1
	10/19/78	-	-	190±25	161±20	789±65	(1400') 989±90	(1400') 609±60	-	-	6.5±5
	11/16/78	-	-	591±60	387±46	165±20	(1200') 862±80		-	-	19.4±10
	[illegible]	70±10	20±1	410±45	790±90	170±[illegible]	(800') 60±50		960±100	130±20	1040±70

SAMPLE NUMBER / DATE		US-5	US-6	DS-2	DN-1	MW-1	MWS-3 S.F.	MWS-3 D.F.	GW-7	GW-8A	GW-9
GROSS BETA	7/18/78	9±1	19±2	502±24	201±21	267±13	-	-	16±4	8±1	10±1
LIMITS	8/13/78	18±2	10±1.5	486±21	247±15	306±20	(008) 972±32	(014) 53±8	-	-	-
	9/20/78	-	-	-	-	258±14			20±3	78±24	6±1
	10/19/78	-	-	105±12	95±10	355±34	(1400') 660±52	(1400') 320±30	-	-	<5±2
	11/16/78	-	-	310±106	199±80	105±60	(1200') 694±175	-	-	-	<5±2
	12/21/78	5±2	5±2	116±10	325±109	213±25	(800') 580±190	-	208±61	80±20	187±60

SAMPLE NUMBER	DATE	UG-5	UG-6	DS-2	DN-1	MW-1	MWS-3 S.F.	MWS-3 S.F.	GW-7	GW-8A	GW-9
IRON	7/18/78	.20	.28	.05	< .01	<.01	-	-	<.01	.16	.92
LIMIT 1.0 mg/l	8/14/78	-	-	-	-	<.02	-	-	.10	.25	.42
	9/13/78	<.02	<.02	<.02	.40	<.02	(008) <.02	(014) .06	-	-	-
	9/20/78	-	-	-	-	<.02	-	-	.10	.05	.18
	10/19/78	-	-	1.2	1.8	1.2	(1400') 1.1	(1400') .04	-	-	1.0
	11/16/78	-	-	<.02	<.02	<.02	(1200') <.02	-	-	-	<.02
	12/21/78	<.02	<.02	.25	<.02	.1	(800') <.02	-	<.02	<.02	1.2

SAMPLE NUMBER	DATE	UG-5	UG-6	DS-2	DN-1	MW-1	MWS-3 S.F.	MWS-3 S.F.	SW-7	GW-8A	GW-9
LEAD	7/18/78	<.02	<.02	<.02	<.02	<.02	-	-	<.02	.02	[illegible]
LIMIT: 0.05 mg/l	8/14/78	-	-	-	-	<.02	-	-	<.02	.35	21.5
	9/13/78	<.02	<.02	<.02	<.02	<.02	(008) <.02	(014) <.02	-	-	-
	9/20/78	-	-	-	-	.08	-	-	.40	.05	.0585
	10/19/78	-	-	<.02	<.02	<.02	(1400') <.02	(1400*) <.02	-	-	.2
	11/16/78	-	-	<.02	<.02	<.02	(1200') <.02	-	-	-	.5
	12/21/78	<.02	.1	<.02	<.02	<.02	(800*) <.02	-	.04	.06	.72

SAMPLE NUMBER	DATE	UG-5	UG-6	DS-2	DN-1	MW-1	MWS-3 S.F.	MWS-3 S.F.	GW-7	GW-8A	GW-9
LEAD 210	7/18/78	<1±.5	<1±.5	29±8±6.4	7.6±4.2	9.7±5.1	-	-	<1±.5	<1±.5	<1±.5
LIMIT:	9/13/78	<1±.5	<1±.5	22.6±2.4	11.4±1.9	12.6±2.1	36.4±7.8	13.2±4.0	-	-	-
	9/20/78	-	-	-	-	9.9±5	-	-	<1±.5	<1±.5	<1±.5
	10/19/78	-	-	3.5± 2	3.1±2	5.2±3	(1400*) 27.3±7	(1400*) 17±5	-	-	<1±.5
	11/16/78	-	-	5.3±4	7.1±4.5	4.7±3	(1200) 21.9±8	-	-	-	<1±.5
	12/21/78	<1±.5	<1±.5	6.8±6	8.3±5	5±6	(800*) 5.8±7	-	7.±5	2.7±5	4.3±5.5