40-8783

PDR
RETURN TO
D. CRIMER
39655

URANERZ U.S.A., INC.

800 Werner Court
Suite 140
CASPER, WYOMING 82601

July 7, 1981

Mr. John J. Linehan, Section Leader
Operating Facilities Section I
Uranium Recovery Licensing Branch
Division of Waste Management
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Docket No. 40-8783
Application for Source Material
License

Dear Mr. Linehan:

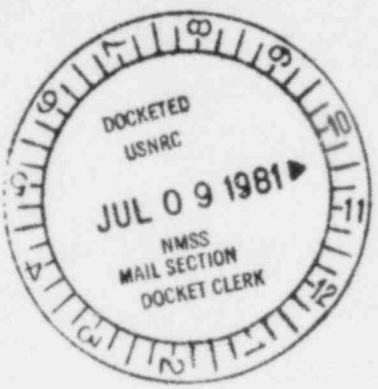
Attached is the material you requested in your letter of June 16, 1981.

Please note our new address above.

Very truly yours,

URANERZ U.S.A., INC.

Dr. Christof Schmidt
Manager of Solution Mining



Attachment:
As stated

cc: M. Hulbert, WDEQ

10207

Add'l Info

URANERZ U.S.A., INC.

Response to:

USNRC Letter dated June 16, 1981

Docket No. 40-8783

Uranerz Source Material License Application

July 7, 1981

NRC Comment 1. (6/16/81):

Submit the actual well completion data for well 7-M-20 as was done for other wells in Table D-6.4.

Response:

Revised Table D-6.4 is included giving well completion data for well 7-M-20 and well 1-M-51.

Table D-6.4

List of Hydrologic Test Wells

Well No.	Aquifer	Completed Interval below ground ft.	(m)	Ground ft.	(m)	Hydraulic Head Elevation on 7/8/80 ft	(m)	
3L	20-Sand	502-509	(153.1-155.2)	4829.33	(1491.98)	(Now abandoned) (Will be plugged)		
4L	20-Sand	500-507	(152.2-154.6)	4828.62	(1471.76)	4859.24	(1481.10)	
5L	20-Sand	505-511	(154.0-155.8)	4833.73	(1473.32)	4859.27	(1481.11)	
6L	20-Sand	503-507	(153.4-154.6)	4836.73	(1474.24)	--	--	
8L	20-Sand	508-519	(154.9-158.3)	4821.83	(1672.74)	4859.11	(1481.06)	
1-M-20	20-Sand	492-554	(150.1-169.0)	4828.90	(1471.85)	4858.55	(1480.89)	
4-M-20	20-Sand	517-575	(157.7-175.4)	4847.44	(1477.50)	4857.88	(1480.68)	
5-M-20	20-Sand	493-563	(150.4-171.7)	4834.91	(1473.68)	4859.85	(1481.28)	
1-M-10	10-Sand	566-666	(172.6-203.1)	4829.90	(1472.15)	4892.79	(1491.32)	
1-M-30	30-Sand	419-455	(127.8-138.8)	4836.43	(1474.14)	4856.42	(1480.24)	
1-W-51	51-Sand	85-188	(25.9- 57.3)	4836.50	(1474.17)	4800.47	(1463.18)	
7-M-20	20-Sand	492-555	(150.1-169.3)	4822.50	(1469.90)	4859.46	(1481.16)	(6/24/81)
1-M-51	51-Sand	87-187	(26.5- 57.0)	4830.00	(1472.18)	4800.60	(1463.22)	(6/24/81)

(Revised 7/6/81)

NRC Comment 2. (6/16/81)

Submit results of the well integrity testing program.

Response:

Results of the well integrity testing program will be submitted after the leaching wells have been permitted and drilled.

(Revised 7/6/81)

NRC Comment 3. (6/16/81):

Submit a map showing the location and extent of the uranium ore body in relation to the Ruth ISL site and hydrologic test wells.

Response:

Map is attached as Figure D-6.4-1.

(Revised 7/6/81)

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NRC Comment 4. (6/16/81):

Does Figure D-10.1 represent the radiation assessment sample location map which the text refers to as "not included"?

Response:

Figure D-10.1 does represent the radiation assessment sample location map. The text on page RA-1, paragraph 1 should be corrected by deleting the last two sentences.

(Revised 7/6/81)

NRC Comment 5. (6/16/81)

A. First Part

There are obvious errors in Table D-6.9, p. (i), (ex: fluoride mean concentration of 154 mg/l). These should be corrected.

Response:

Table D-6.9, all parts, have been reviewed, proof read, corrections made as needed, and the revised table is submitted.

A. Second Part.

In addition, the text states (p. D-6.17) "...comparing the baseline water quality of the proposed leach field as represented by samples from wells 8L and 4L...". If baseline water quality of the ore zone is to be based on data from wells 8L and 4L the data for wells 1-M-20 and 5-M-20 should be segregated from Table D-6.9, p (i).

Response:

Baseline data for well 8L is given on Table D-6.9, p. 6, and for well 4L on Table D-6.9, p.5. Table D-6.9 (i) is included only for general information.

(Revised 7/6/81)

NRC Comment 5 (6/16/81)

B. It appears other errors exist in other parts of Table D-6.9, (ex: D-6.9, p.5, the standard deviation of total hardness is listed as 41 mg/l). These tables should be further proof read and corrections made and copies resubmitted for substitution.

Response:

Table D-6.9, all parts, have been reviewed, proof read, corrections made as needed, and the revised table is submitted.

NRC Comment 5 (6/16/81)

C. In Table D-6.9 (all parts) the split sample obtained on January 21, 1981, is treated as two independent samples. These are not two independent samples representative of the natural variation in water quality but are representative of the variation in lab analyses. The inclusion of both sets of data in the baseline determination will not be accepted.

Response:

The PAL analyses for the split sample, obtained on January 21, 1981 have been removed from Table D-6.9, all parts, and the table has been recalculated, and is attached.

(Revised 7/6/81)

NRC Comment 5 (6/16/81)

D. Both the NRC and DEQ agree that all data must be screened for outliers. As an example refer to TD-6.9, p.5. The WAMCO analysis for radium (January 21, 1981), appears consistent with previous samples while PAL's analysis of the sample is rather high (even ignoring the fact this was a split sample). Excluding the high value (223.43) from baseline determination would not be an unreasonable judgement. Have all the data been analyzed for outliers?

Response:

Table D-6.9, and all other tables, have been examined for potential outliers. Outliers have been underlined on the tables, and have not been included in the calculations. Table D-6.9, and all other tables, are attached.

(Revised 7/6/81)

Table D-6.2

Baseline Surface Water Quality
Upstream Sampling Point
(Revised 7/6/81)

DATE SAMPLED	3/11/80	6/12/80	7/18/80	10/1/80	12/15/80	5/8/81
Temperature, °C, Field	8	20	20	--	0	13
pH, Unites Field	7.6	7.5	7.6		8.3	8.9
pH, Units, Lab at 25°	8.08	7.87	8.19	7.77	7.53	8.30
Conductivity, µmhos, Field Ambient	2000	3150	3500			1200
Conductivity, µmhos, Lab at 25°	2610	2990	3220	3635	3600	1509
TDS, Evaporation at 180°C	2347	2852	3050	3322	3580	1163
Sodium	375	422	489	503	551	125
Potassium	12	16	5	41	23	11
Calcium	235	377	257	232	405	133
Magnesium	78	68	129	161	120	37
Sulfate	1300	1750	1980	2050	2050	660
Chloride	45	45	48	38	50	12
Carbonate					0	TR
Bicarbonate	439	354	171	280	659	75
Hydroxide						
Total Milliequivalent Major Cations	35.65	43.17	44.82	47.74	53.63	15.40
Total Milliequivalent Major Anions	35.51	43.48	45.33	48.30	54.86	15.17
Absolute Value, Charged, Balance	0.20	0.36	0.57	0.59	.21	0.42
Ammonia as N	ND	ND	ND	ND	2.38	ND
Nitrate as N (0.05)	0.03	ND	0.02	ND	ND	ND
Fluoride (0.1)	0.51	0.65	0.22	0.30	0.28	ND
Total Alkaninity as $CaCO_3$	360	290	140	230	540	60
Total Hardness as $CaCO_3$	950	1220	1170	1240	1504	484
Boron (0.01)	ND	0.08	0.1	ND	ND	ND
Aluminum (0.05)	0.02	0.07	ND	ND	ND	ND
Arsenic (0.005)	ND	0.002	0.008	0.008	0.025	ND
Barium (0.03)	0.04	0.05	ND	ND	ND	ND
Cadmium (0.002)	ND	0.015	0.010	0.010	ND	ND
Chromium (0.01)	ND	ND	ND	ND	ND	ND
Copper (0.01)	ND	0.02	ND	0.02	0.01	.05
Iron, Total (0.01)	0.15	0.04	0.04	0.11	0.12	.23
Lead (0.01)	ND	0.03	ND	ND	ND	ND
Manganese (0.01)	0.23	0.17	0.07	1.22	9.8	.19
Mercury (0.0005)	ND	ND	ND	ND	ND	ND
Nickel (0.02)	ND	0.03	ND	ND	ND	ND
Selenium (0.005)	ND	ND	ND	ND	ND	ND
Zinc (0.005)	ND	0.39	0.07	0.04	0.021	ND
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND
Uranium, U_3O_8, (0.001)	0.058	0.025	0.046	0.149	0.045	0.006
Vanadium V_2O_5, (0.05)	ND	0.06	ND	ND	ND	ND
Radium 226 PIC/L (0.5)	3.8	0.34	0.5	1.3	2.5	3.2
Radium, Precision, PIC/L	±0.6	±0.3	±0.4	±0.6	±0.8	±0.7

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

Table D-6.3

Baseline Surface Water Quality
Downstream Sampling Point
(Revised 7/6/81)

DATE SAMPLED	3/13/80	6/12/80	7/18/80	10/1/80	12/15/80	5/8/81
Temperature, °C Field	7	20	25		4.8	9
pH, Units Field	7.4	7.5	7.0		8.2	7.8
pH, Units, Lab at 25°C	7.61	7.64	8.06	7.41	7.6	7.88
Conductivity µmhos, Field Ambient	1900	3800	6000			3000
Conductivity, µmhos, Lab at 25°C	2610	3481	--	5396	3425	4171
TDS, Evaporation at 180°C	2448	3328	4588	5526	3862	3947
Sodium	360	480	634	758	529	554
Potassium	9	15	33	35	15	17
Calcium	261	401	477	521	433	377
Magnesium	95	124	203	215	73	142
Sulfate	1495	2060	2925	3475	1960	2320
Chloride	35	52	62	60	59	56
Carbonate					0	0
Bicarbonate	293	415	403	211	500	305
Hydroxide						
Total Milliequivalent Major Cations	36.72	51.68	68.81	77.54	51.00	55.02
Total Milliequivalent Major Anions	36.90	51.13	69.20	77.33	50.63	54.84
Absolute Value, Charged, Balance	0.24	0.53	-0.21	0.14	0.36	0.16
Ammonia as N	ND	ND	ND	ND	0.45	ND
Nitrate as N (0.05)	0.03	ND	1.0	ND	ND	ND
Fluoride (0.1)	0.27	0.54	0.24	0.74	0.23	0.27
Total Alkalinity as $CaCO_3$	240	340	330	173	410	250
Total Hardness as $CaCO_3$	1040	1510	2025	2184	1380	1524
Boron (0.01)	0.07	0.08	ND	ND	ND	ND
Aluminum (0.05)	0.03	0.07	ND	ND	0.06	0.16
Arsenic (0.005)	ND	0.003	0.010	.012	ND	ND
Barium (0.03)	ND	0.09	ND	ND	ND	ND
Cadmium (0.002)	ND	0.012	0.020	0.009	ND	0.011
Chromium (0.01)	ND	ND	ND	ND	ND	ND
Copper (0.01)	ND	0.01	ND	0.02	0.01	ND
Iron, Total (0.01)	0.07	0.03	0.07	0.21	0.96	0.23
Lead (0.01)	ND	0.03	ND	0.02	ND	ND
Manganese (0.01)	2.3	1.49	2.51	0.41	4.0	0.16
Mercury (0.0005)	ND	ND	ND	ND	ND	ND
Nickel (0.02)	ND	0.03	ND	0.03	ND	ND
Selenium (0.005)	ND	ND	ND	ND	ND	ND
Zinc (0.005)	ND	0.31	0.07	0.06	0.026	0.025
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND
Uranium U_3O_8 (0.001)	0.046	0.029	0.007	0.009	0.045	0.002
Vanadium V_2O_5 (0.05)	ND	0.23	ND	ND	ND	ND
Radium 226, PiC/L (0.5)	0.7	0.23	0.7	1.5	2.5	1.9
Radium, Precision, PiC/L	±0.2	±0.3	±0.7	±0.7	±0.8	±0.5

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

Table D-6.9 (i)
Baseline Water Quality Data
4L, 8L, 1-M-20, 4-M-20, 5-M-20, 7-M-20
20-Sand Aquifer (Revised 7/6/81)

DATE SAMPLED	No. of Samples	Maximum Observed	Minimum Observed	Mean	Std. (σ) Deviation
Temperature, °C, Field	32	15	11	13.3	1.2
pH, Units Field	32	9.8	8	8.7	0.5
pH, Units, Lab at 25°C	32	9.25	7.78	8.18	0.35
Conductivity, µmhos, Field-Ambient	24	605	390	442	50
Conductivity, µmhos, Lab at 25°C	32	636	445	523	41
TDS, Evaporation at 180°C	32	374	289	326	20
Sodium	32	121	98	108	6
Potassium	32	9	3	4.5	1.4
Calcium	32	10	1	6.4	2.0
Magnesium	32	7	1	2.5	1.7
Sulfate	32	128	68	97	16
Chloride	32	14	3	6.9	2.8
Carbonate	24	67	0	15.5	17
Bicarbonate	32	195	22	164	35
Hydroxide					
Total Milliequivalent Major Cations					
Total Milliequivalent Major Anions					
Absolute Value, Charged, Balance					
Ammonia as N	32	0.3	ND	0.09	0.07
Nitrate as N (0.05)	30	0.21	ND	0.06	0.04
Fluoride (0.1)	31	0.85	0.14	0.51	0.16
Total Alkalinity as $CaCO_3$	32	172	130	154	8
Total Hardness as $CaCO_3$	32	33	7	23.9	6.0
Boron (0.01)	32	0.1	ND	0.03	0.03
Aluminum (0.05)	32	0.4	ND	0.12	0.11
Arsenic (0.005)	26	0.094	ND	0.014	0.019
Barium (0.03)	32	-	ND	0.03	-
Cadmium (0.002)	32	0.012	ND	0.003	0.002
Chromium (0.01)	32	0.02	ND	0.01	0.002
Copper (0.01)	32	0.02	ND	0.011	0.003
Iron, Total (0.01)	32	0.2	ND	0.077	0.067
Lead (0.01)	31	-	ND	0.01	-
Manganese (0.01)	32	0.07	ND	0.018	0.013
Mercury (0.0005)	32	-	ND	0.0005	-
Nickel (0.02)	32	-	ND	0.02	-
Selenium (0.005)	30	0.005	ND	0.005	-
Zinc (0.005)	28	0.34	ND	0.046	0.082
Molybdenum (0.05)	32	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	32	0.071	<0.001	0.010	0.015
Vanadium, V_2O_5, (0.05)	32	-	ND	0.05	-
Radium 226, PiC/L (0.5)	31	225	0.5	56.2	71.5
Radium, Precision, PiC/L					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

TABLE D-6.9,p.1.
Baseline Water Quality Data For
20-Sand Aquifer
(Revised 7/6/81)

WELL	1-M-20											
DATE SAMPLED	2/11/80	6/12/80	7/18/80	10/1/80	12/16/80	1/21/81	5/11/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	12	12	14	14	14	13	14.5	7	14.5	12	13.50	0.87
pH, Units Field	8.3	8.4	[illegible]	8.5	8.7	8.8	8.7	7	8.8	8.2	8.51	0.23
pH, Units, Lab at 25°C	8.24	8.0	8.40	8.09	8.28	7.95	8.65	7	8.65	7.95	8.23	0.24
Conductivity, µmhos, Field-Ambient	390	410	450		410	400	400	6	450	390	410	21
Conductivity, µmhos, Lab at 25°C	460	500	509	477	512	552	525	7	552	460	505	30.3
TDS, Evaporation at 180°C	320	329	308	289	295	303	306	7	329	289	307	14
Sodium	110	109	104	98	101	104	108	7	110	98	105	4.4
Potassium	3	5	4	3	5	3	3	7	5	3	3.7	0.95
Calcium	6	5	6	5	6	6	3	7	6	3	5.3	1.1
Magnesium	3	2	3	3	1	1	1	7	3	1	2.0	0.93
Sulfate	91	115	89	68	86	88	70	7	115	68	87	16
Chloride	10	7	8	14	3	6	7	7	14	3	7.9	3.4
Carbonate	10	9	17		31	0	26	6	31	0	15.5	11.5
Bicarbonate	181	151	151	188	120	183	151	7	188	120	161	25
Hydroxide												
Total Milliequivalent Major Cations	5.42	5.28	5.17	4.84	4.90	4.98	5.01					
Total Milliequivalent Major Anions	5.47	5.30	5.13	4.89	4.87	5.00	5.01					
Absolute Value, Charged, Balance	0.46	0.19	0.39	0.58	0.31	0.2	-					
Ammonia as N	0.30	ND	0.11	ND	ND	ND	ND		0.30	ND	0.09	0.09
Nitrate as N (0.05)	0.21	ND	1.0	ND	ND	ND	ND	6	0.21	ND	0.08	0.07
Fluoride (0.1)	0.54	0.40	0.04	0.74	0.40	0.61	0.30	6	0.74	0.3	0.498	0.162
Total Alkalinity as $CaCO_3$	165	140	152	154	150	150	168	7	168	140	154	10
Total Hardness as $CaCO_3$	28	21	28	25	19	19	12	7	28	12	22	6
Boron (0.01)	0.02	0.1	ND	ND	0.06	ND	ND	7	0.10	ND	0.031	0.035
Aluminum (0.05)	ND	0.40	ND	ND	.19	ND	ND	7	0.40	ND	0.12	0.13
Arsenic (0.005)	0.002	0.006	0.010	0.004	ND	ND	ND	5	0.01	ND	0.006	0.002
Barium (0.03)	ND	ND	ND	ND	ND	ND	ND		-	ND	.03	-
Cadmium (0.002)	ND	ND	ND	0.005	ND	0.002	ND		0.005	ND	0.0024	0.0011
Chromium (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.01	-
Copper (0.01)	ND	ND	ND	ND	0.02	ND	.01	7	0.02	ND	0.0114	0.0038
Iron (0.01)	0.17	0.12	0.01	0.02	.19	0.06	.08	7	0.19	0.01	0.093	0.070
Lead (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.01	-
Manganese (0.01)	0.07	0.03	ND	ND	0.02	0.01	.01	7	0.07	ND	0.023	0.022
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.02	-
Selenium (0.005)	ND	0.005	0.003	ND	ND	ND	ND	6	0.005	ND	0.005	-
Zinc (0.005)	0.07	0.43	0.02	0.03	.033	.024	ND	6	0.07	ND	0.03	0.02
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.003	0.011	0.001	0.003	.001	<0.001	<0.001	7	0.011	0.001	0.003	0.0037
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Radium 226, PIC/L (0.5)	1.3	0.68	0.8	0.4	3.7	5.8	1.6	6	5.8	0.68	2.3	2.0
Radium, Precision, PIC/L	±0.3	±0.4	±0.5	±0.3	1.0	±1.4	±0.5					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

The underlined data are considered as outliers and are not included in the calculations.

TABLE D-6.9, p.2.
Baseline Water Quality Data For
20-Sand Aquifer
(Revised 7/6/81)

WELL	4-M-20										
DATE SAMPLED	6/12/80	7/14/80	10/2/80	12/15/80	1/20/81	5/11/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	11.5	13.8	14.2	14.2	11	13	6	14.2	11.0	13	1.4
pH, Units Field	9.6	9.6	7.9	9.8	9.4	9.0	6	9.8	8.9	9.4	0.36
pH, Units, Lab at 25°C	9.25	8.56	8.67	8.25	8.36	8.85	6	9.25	8.25	8.65	0.36
Conductivity, µmhos, Field-Ambient	405	500			400	450	4	500	400	439	47
Conductivity, µmhos, Lab at 25°C	445	494	517	547	566	546	6	566	445	519	44
TDS, Evaporation at 180°C	343	338	305	331	345	320	6	345	305	330	15
Sodium	115	112	99	113	118	108	6	118	99	111	6.7
Potassium	7	9	3	6	4	5	6	9	3	5.7	2.2
Calcium	1	7	6	7	5	4	6	7	1	5.0	2.3
Magnesium	1	2	3	1	1	1	6	3	1	1.5	0.8
Sulfate	128	106	76	105	114	97	6	128	76	109	17
Chloride	9	10	13	3	6	4	6	13	3	7.5	3.8
Carbonate	67	34	TR	31	26	19	6	67	TR	29.5	22.0
Bicarbonate	22	120	185	129	132	137	6	185	22	121	54
Hydroxide											
Total Milliequivalent Major Cations	5.31	5.61	4.93	5.50	5.56	5.11					
Total Milliequivalent Major Anions	5.50	5.58	4.98	5.41	5.57	5.01					
Absolute Value, Charged, Balance	-1.76	0.03	0.53	0.82	0.09	.99					
Ammonia as N	0.22	0.14	ND	ND	0.12	ND	6	0.27	ND	0.11	0.07
Nitrate as N (0.05)	ND	0.6	ND	0.05	ND	ND	5	0.05	ND	0.05	-
Fluoride (0.1)	0.65	0.57	0.57	0.51	0.85	.36	6	0.85	0.36	0.59	0.16
Total Alkalinity as $CaCO_3$	130	155	152	158	152	144	6	158	130	149	10.2
Total Hardness as $CaCO_3$	7	25	27	22	16	14	6	27	7	18.5	7.6
Boron (0.01)	ND	0.1	ND	ND	ND	ND	6	0.1	ND	0.025	0.037
Aluminum (0.05)	0.25	ND	ND	ND	ND	ND	6	0.25	ND	0.083	0.082
Arsenic (0.005)	0.008	0.014	0.008	.004	ND	ND	5	0.014	ND	0.008	0.0037
Barium (0.03)	ND	ND	ND	ND	ND	ND	6	-	ND	0.03	-
Cadmium (0.002)	ND	0.012	ND	ND	0.005	ND	5	0.012	ND	0.0042	0.0040
Chromium (0.01)	0.01	ND	ND	ND	ND	ND	6	0.01	ND	0.01	-
Copper (0.01)	ND	ND	0.02	ND	0.01	ND	6	0.02	ND	0.0117	0.0043
Iron (0.01)	0.01	0.06	0.09	0.01	.20	.17	6	0.2	0.01	0.09	0.080
Lead (0.01)	ND	ND	ND	ND	ND	ND	6	-	ND	0.01	-
Manganese (0.01)	0.01	ND	ND	.01	.01	.01	6	0.01	ND	0.01	-
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	6	-	NC	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	6	-	ND	0.02	-
Selenium (0.005)	ND	ND	ND	ND	ND	ND	6	-	ND	0.005	-
Zinc (0.005)	0.31	0.04	0.04	.002	.013	ND	5	0.31	ND	0.082	0.129
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.020	0.005	0.007	0.007	.028	0.001	6	0.028	0.001	0.0113	0.0104
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Radium 226, PiC/L (0.5)	4.7	6.7	4.6	5.8	7.0	9.7	6	9.7	4.6	6.42	1.89
Radium, Precision, PiC/L	±1.3	±1.5	±1.2	±1.2	±1.5	±1.2					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

TR - trace.

The underlined data are considered as outliers and are not included in the calculations.

TABLE D-6.9, p.3
Baseline Water Quality Data For
20-Sand Aquifer
(Revised 7/6/81)

WELL	5-M-20										
DATE SAMPLED	6/12/80	7/15/80	10/6/80	12/15/80	1/21/81	5/8/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	13	14	14.4	14.3	14	14.5	6	14.5	13	14	0.6
pH, Units Field	8.4	8.0	8.6	9.3	8.4	8.4	6	9.3	8	8.5	0.4
pH, Units, Lab at 25°C	7.93	7.78	7.92	7.94	7.98	8.32	6	8.32	7.78	7.98	0.18
Conductivity, µmhos, Field-Ambient	450	500			450	440	4	500	440	460	27
Conductivity, µmhos, Lab at 25°C	480	497	534	558	579	636	6	636	480	547	57
TDS, Evaporation at 180°C	349	344	347	338	342	374	6	374	338	349	13
Sodium	121	114	107	110	115	111	6	121	107	113	5
Potassium	5	6	5	4	3	3	6	6	3	4.3	1.2
Calcium	8	8	10	8	7	4	6	10	4	7.5	2.0
Magnesium	1	3	1	2	2	3	6	3	1	2.0	0.9
Sulfate	120	108	106	105	116	92	6	120	92	108	10
Chloride	7	10	4	3	5	6	6	10	3	5.8	2.5
Carbonate				0	0	12	3	12	0	4	6.9
Bicarbonate	185	195	181	190	190	176	6	195	176	186	7
Hydroxide											
Total Milliequivalent Major Cations	5.87	5.76	5.36	5.45	5.59	5.36					
Total Milliequivalent Major Anions	5.73	5.73	5.29	5.38	5.67	5.37					
Absolute Value, Charged, Balance	1.21	0.26	0.75	0.65	0.71	0.09					
Ammonia as N	ND	0.16	0.13	ND	ND	ND	6	0.16	ND	0.08	0.05
Nitrate as N (0.05)	ND	0.2	ND	ND	ND	ND	6	0.2	ND	0.075	0.061
Fluoride (0.1)	0.61	0.57	0.85	0.51	0.74	0.36	6	0.85	0.36	0.607	0.172
Total Alkalinity as $CaCO_3$	152	160	148	156	156	165	6	165	148	156	6
Total Hardness as $CaCO_3$	24	32	29	28	26	22	6	32	22	27	3.6
Boron (0.01)	0.1	ND	ND	ND	ND	ND	6	0.1	ND	0.025	0.037
Aluminum (0.05)	0.16	ND	0.29	0.08	ND	ND	6	0.29	ND	0.113	0.097
Arsenic (0.005)	0.041	0.016	0.032	.008	ND	0.012	6	0.041	ND	0.019	0.014
Barium (0.03)	ND	ND	ND	ND	ND	ND	6	-	ND	0.03	-
Cadmium (0.002)	ND	0.003	0.004	ND	ND	ND	6	0.004	ND	0.0025	0.0008
Chromium (0.01)	0.02	ND	ND	ND	ND	ND	6	0.02	ND	0.0117	0.0042
Copper (0.01)	ND	ND	ND	.01	ND	ND	6	0.01	ND	0.01	-
Iron (0.01)	0.04	0.05	0.16	.01	0.09	0.07	6	0.16	0.01	0.07	0.052
Lead (0.01)	ND	ND	ND	ND	ND	ND	6	-	ND	0.01	-
Manganese (0.01)	0.04	ND	0.04	.03	0.01	0.02	6	0.04	ND	0.025	0.014
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	6	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	6	-	ND	0.02	-
Selenium (0.005)	ND	ND	ND	ND	ND	ND	6	-	ND	0.005	-
Zinc (0.005)	0.34	0.007	0.03	.005	0.024	ND	6	0.34	ND	0.0685	0.1334
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.045	0.003	0.003	<0.001	0.004	0.001	6	0.045	< 0.001	0.0095	0.0174
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Radium 226, PiC/L (0.5)	0.5	0.8	1.3	1.3	3.0	1.3	6	3.0	0.5	1.37	0.87
Radium, Precision, PiC/L	±0.4	±0.5	±0.7	±0.6	±1.0						

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

Table D-6.9, p. 4

Baseline Water Quality Data
20-Sand Aquifer (Revised 7/6/81)

WELL	7-M-20 (New)
DATE SAMPLED	5/8/81
Temperature, ^{o}C, Field	15
pH, Units Field	8.4
pH, Units, Lab at 25^{o}C	8.26
Conductivity, µmhos, Field-Ambient	440
Conductivity, µmhos, Lab at 25^{o}C	550
TDS, Evaporation at 180^{o}C	356
Sodium	106
Potassium	3
Calcium	4
Magnesium	2
Sulfate	78
Chloride	8
Carbonate	10
Bicarbonate	176
Hydroxide	
Total Milliequivalent Major Cations	5.05
Total Milliequivalent Major Anions	5.07
Absolute Value, Charged, Balance	.40
Ammonia as N	ND
Nitrate as N (0.05)	ND
Fluoride (0.1)	0.30
Total Alkalinity as $CaCO_3$	161
Total Hardness as $CaCO_3$	18
Boron (0.01)	ND
Aluminum (0.05)	ND
Arsenic (0.005)	ND
Barium (0.03)	ND
Cadmium (0.002)	ND
Chromium (0.01)	ND
Copper (0.01)	ND
Iron, Total (0.01)	.20
Lead (0.01)	ND
Manganese (0.01)	.02
Mercury (0.0005)	ND
Nickel (0.02)	ND
Selenium (0.005)	ND
Zinc (0.005)	.015
Molybdenum (0.05)	ND
Uranium, U_3O_8, (0.001)	.001
Vanadium, V_2O_5, (0.05)	ND
Radium 226, PiC/L (0.5)	7.8
Radium, Precision, PiC/L	±1.1

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

TABLE D-6. 9, p. 5.
Baseline Water Quality Data For
20-Sand Aquifer
(Revised 7/6/81)

WELL	4L										
DATE SAMPLED	6/12/80	10/8/80	10/8/80	12/16/80	1/21/81	5/14/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	12	14	14.6	12.0	11	13	6	14.6	11	12.8	1.4
pH, Units Field	8.5	8.6	8.6	8.4	8.5	8.4	6	8.6	8.4	8.5	0.1
pH, Units, Lab at 25°C	7.81	8.43	7.88	7.91	7.84	7.83	6	8.43	7.81	7.95	0.24
Conductivity, µmhos, Field-Ambient	605	500	-	440	390	410	5	605	390	469	87
Conductivity, µmhos, Lab at 25°C	453	524	512	529	572	535	6	572	453	521	39
TDS, Evaporation at 180°C	332	308	312	311	329	346	6	346	308	323	15
Sodium	112	102	104	107	112	112	6	112	102	108	5
Potassium	5	6	5	4	3	5	6	6	3	4.7	1.03
Calcium	8	7	6	8	8	9	6	9	6	7.67	1.03
Magnesium	2	3	2	1	1	2	6	3	1	1.83	0.75
Sulfate	110	85	75	96	105	117	6	117	75	98	16
Chloride	8	10	8	4	5	6	6	10	4	6.8	2.2
Carbonate		22		0	0	0	4	22	0	5.5	11
Bicarbonate	193	142	185	185	185	183	6	193	142	179	18
Hydroxide											
Total Milliequivalent Major Cations	5.65	5.19	5.11	5.23	5.43	5.61					
Total Milliequivalent Major Anions	5.69	5.17	5.03	5.14	5.35	5.60					
Absolute Value, Charge, Balance	0.35	0.19	0.16	0.87	0.74	0.09					
Ammonia as N	ND	0.18	ND	ND	ND	ND	6	0.18	ND	0.072	0.053
Nitrate as N (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Fluoride	0.51	0.51	0.14	0.43	0.57	0.51	6	0.57	0.14	0.445	0.156
Total Alkalinity as $CaCO_3$	159	153	152	152	151	150	6	159	150	153	3
Total Hardness as $CaCO_3$	33	30	23	24	24	30	6	33	23	27	4.2
Boron (0.01)	0.08	0.1	ND	ND	ND	ND	6	0.08	ND	0.037	0.042
Aluminum (0.05)	0.20	ND	ND	ND	ND	ND	6	0.20	ND	0.075	0.061
Arsenic (0.005)	0.014	0.014	0.012	0.001	ND	0.001	4	0.014	ND	0.011	0.004
Barium (0.03)	ND	ND	ND	ND	ND	ND	6	-	ND	0.03	-
Cadmium (0.002)	ND	ND	ND	ND	ND	0.003	6	0.003	ND	0.0022	0.0004
Chromium (0.01)	ND	ND	ND	ND	ND	ND	6	-	ND	0.01	-
Copper (0.01)	ND	ND	ND	ND	ND	ND	6	-	ND	0.01	-
Iron (0.01)	0.02	0.05	0.14	.03	0.04	ND	6	0.14	ND	0.048	0.047
Lead (0.01)	0.15	ND	ND	ND	ND	ND	5	-	ND	0.01	-
Manganese (0.01)	0.01	0.01	ND	.01	0.01	0.02	6	0.02	ND	0.011	0.004
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	6	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	6	-	ND	0.02	-
Selenium (0.005)	ND	0.003	ND	ND	ND	ND	5	-	ND	0.005	-
Zinc (0.005)	0.89	ND	0.01	.009	0.037	0.006	5	0.037	ND	0.013	0.013
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.006	0.010	0.011	0.003	0.004	<0.001	6	0.011	<0.001	0.0058	0.0040
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.058	-
Radium 226, PiC/L (0.5)	175	161	127	156	143	225	6	225	127	165	34
Radium, Precision, PiC/L	±7	±7	±7	±6	±7	±6					

Analyses reported in milligrams per liter except where noted

( ) detection limit.

ND - not detected.

The underlined data are considered as outliers and are not included in the calculations.

TABLE D-6.9, p. 6.
Baseline Water Quality Data For
20-Sand Aquifer
(Revised 7/6/81)

WELL	8L										
DATE SAMPLED	6/12/80	7/23/80	10/6/80	12/16/80	1/22/81	5/11/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	11.5	14	14.4	12.0	13	12	6	14.4	11.5	12.8	1.2
pH, Units Field	8.6	8.6	8.8	8.6	8.2	9.4	6	9.4	8.2	8.7	0.4
pH, Units, Lab at 25°C	7.82	8.25	8.12	7.98	7.90	8.48	6	8.48	7.82	8.09	0.25
Conductivity, µmhos, Field-Ambient	445	500	-		400	420	4	500	400	441	43
Conductivity, µmhos, Lab at 25°C	468	523	511	523	566	534	6	566	468	521	32
TDS, Evaporation at 180°C	352	299	321	310	335	328	6	335	299	321	14
Sodium	109	99	105	106	110	109	6	110	99	106	4
Potassium	5	5	5	4	3	4	6	5	3	4.3	0.8
Calcium	6	6	10	8	6	7	6	10	6	7.2	1.6
Magnesium	2	4	1	1	3	1	6	4	1	2	1.3
Sulfate	98	75	99	99	108	84	6	108	75	94	12
Chloride	6	9	9	4	5	4	6	9	4	6.2	2.3
Carbonate		17		0	0	41	4	41	0	14.5	19.4
Bicarbonate	193	163	178	183	185	127	6	193	127	172	24
Hydroxide											
Total Milliequivalent Major Cations	5.33	5.07	5.28	5.19	5.42	5.27					
Total Milliequivalent Major Anions	5.38	5.05	5.23	5.17	5.42	5.31					
Absolute Value, Charged, Balance	0.47	0.20	0.48	0.19	0	0.38					
Ammonia as N	ND	0.28	0.21	ND	ND	ND	6	0.28	ND	.115	0.103
Nitrate as N (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	.05	0.039
Fluoride (0.1)	0.43	0.38	0.51	0.43	0.65	0.27	6	0.65	0.27	0.45	0.128
Total Alkalinity as $CaCO_3$	159	162	146	150	151	172	6	172	146	157	10
Total Hardness as $CaCO_3$	23	32	29	24	28	21	6	32	21	26	4.2
Boron (0.01)	0.08	ND	ND	ND	ND	ND	6	0.08	ND	0.022	0.029
Aluminum (0.05)	0.38	ND	0.23	.15	ND	0.3	6	0.38	ND	0.19	0.14
Arsenic (0.005)	0.094	0.022	0.008	<u>.001</u>	ND	ND	5	0.094	ND	0.027	0.038
Barium (0.03)	ND	ND	ND	ND	ND	ND	6	-	ND	0.03	-
Cadmium (0.002)	ND	0.004	0.008	ND	ND	ND	6	0.008	ND	0.0033	0.0024
Chromium (0.01)	ND	ND	ND	ND	ND	ND	6	-	ND	0.02	-
Copper (0.01)	0.02	ND	ND	ND	ND	ND	6	0.02	ND	0.0117	0.0043
Iron (0.01)	ND	<.01	0.14	.02	0.01	0.16	6	0.16	ND	0.058	0.071
Lead (0.01)	ND	ND	ND	ND	ND	ND	6	-	ND	0.01	-
Manganese (0.01)	0.02	0.03	0.02	.01	0.01	ND	6	0.03	ND	0.0167	0.0082
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	6	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	6	-	ND	0.02	-
Selenium (0.005)	ND	ND	ND	ND	ND	ND	6	-	ND	0.005	-
Zinc (0.005)	0.08	0.04	0.06	<u>.004</u>	.019	ND	5	0.08	ND	0.041	0.030
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.071	0.026	0.019	.019	0.003	0.008	6	0.071	0.003	0.024	0.024
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Radium 226, PiC/L (0.5)	120	136	74	143	83	131	6	143	74	115	29
Radium, Precision, PiC/L	±6	±7	±5	±6	±5	±4					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

The underlined data are considered as outliers and are not included in the calculations.

Table D-6.10
Baseline Water Quality Data for
Well 1-M-30 - 30-Sand
(Revised 7/6/81)

DATE SAMPLED	2/11/80	6/12/80	7/18/80	10/8/80	12/18/80	1/20/81	5/13/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation
Temperature, °C, Field	8	13.5	13	14.6		13	14	6	14.6	8	12.7	2.4
pH, Units Field	10.0	9.8	10.4	10.2	9.8	9.6	9.6	7	10.4	9.6	9.9	0.3
pH, Units Lab at 25°C	9.60	9.51	9.54	9.26	9.14	8.88	9.43	7	9.6	8.88	9.34	0.26
Conductivity, µmhos, Field-Ambient	410	605	600	-	400	480	440	6	605	400	489	92
Conductivity, µmhos, Lab at 25°C	550	555	575	535	605	658	435	7	658	435	559	69
TDS, Evaporation at 180°C	359	381	362	336	378	366	326	7	381	326	358	21
Sodium	126	135	125	115	135	130	113	7	135	113	126	9
Potassium	7	10	13	7	7	5	5	7	13	5	7.7	2.9
Calcium	2	1	4	2	2	3	2	7	4	1	2.3	1.0
Magnesium	1	1	1	4	1	2	1	7	4	1	1.57	1.13
Sulfate	85	98	70	76	105	86	88	7	105	70	87	12
Chloride	14	14	18	14	9	9	9	7	18	9	12.4	3.5
Carbonate	96	108	126	86	96	85	67	7	126	65	92	22
Bicarbonate	39	22		46	39	122	49	6	122	22	53	35
Hydroxide												
Total Milliequivalent Major Cations	5.84	6.26	6.05	5.61	6.23	6.10	5.18					
Total Milliequivalent Major Anions	6.00	6.39	6.17	5.58	6.27	6.20	5.11					
Absolute Value, Charged Balance	1.35	1.03	0.98	0.27	.32	0.81	0.66					
Ammonia as N	0.30	ND	0.20	ND	ND	ND	ND	7	0.3	ND	0.11	0.10
Nitrate as N (0.05)	0.17	ND	0.4	ND	ND	ND	ND	7	0.4	ND	0.117	0.133
Fluoride (0.1)	1.07	1.16	0.74	1.38	0.99	1.07	0.65	7	1.38	0.65	1.01	0.25
Total Alkalinity as $CaCO_3$	192	198	210	180	192	208	151	7	210	151	190	20
Total hardness as $CaCO_3$	8	7	14	22	9	16	7	7	22	7	12	5.7
Boron (0.01)	ND	0.1	ND	ND	ND	ND	ND	7	0.1	ND	0.023	0.034
Aluminum (0.05)	0.01	0.28	ND	ND	ND	ND	ND	6	0.28	ND	0.09	0.094
Arsenic (0.005)	ND	ND	0.008	ND	ND	ND	ND	7	0.008	ND	0.0054	0.0011
Barium (0.03)	0.04	ND	ND	ND	ND	ND	ND	7	0.04	ND	0.0314	0.0038
Cadmium (0.002)	ND	ND	ND	ND	.003	.003	ND	7	0.003	ND	0.0023	0.0005
Chromium (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.01	-
Copper (0.01)	ND	ND	ND	ND	.01	ND	0.02	7	0.02	ND	0.0114	0.0038
Iron, Total (0.01)	0.06	0.03	0.03	0.17	.07	0.04	0.06	7	0.17	0.03	0.066	0.049
Lead (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.01	-
Manganese (0.01)	0.02	0.02	ND	ND	ND	ND	ND	7	0.02	ND	0.013	0.005
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.02	-
Selenium (0.005)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.005	-
Zinc (0.005)	0.01	0.24	0.12	0.01	.012	.021	0.004	6	0.24	0.01	0.069	0.094
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.003	0.022	0.004	0.002	0.007	0.041	0.001	7	0.041	0.001	0.0114	0.0149
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Radium 226, PiC/L (0.5)	0.3	0.56	13	1.3	1.1	3.1	1.3	6	13	0.56	3.39	4.78
Radium, Precision, PiC/L	±0.2	±0.4	±0.7	±0.7	±0.6	±1.0	±0.5					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

Table D-6.11

Baseline Water Quality Data for

Well 1 - W - 51 - 51-Sand

(Revised 7/6/81)

DATE SAMPLED	6/12/80	7/18/80	10/2/80	1/22/81	5/13/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	12.5	14	11.0	11	11	5	14	11	11.9	1.3
pH Units Field	8.5	8.2	8.2	8.3	8.2	5	8.5	8.2	8.28	0.13
pH Units Lab at 25°C	8.33	8.57	7.78	8.01	8.29	5	8.57	7.78	8.20	0.31
Conductivity µmhos, Field-Ambient	395	420	443	360	360	5	443	360	396	37
Conductivity µmhos, Lab at 25°C	410	467	500	513	385	5	513	385	455	56
TDS, Evaporation at 180°C	286	283	261	268	298	5	298	261	279	15
Sodium	108	110	90	96	107	5	110	90	102	
Potassium	4	4	3	3	3	5	4	3	3.4	0
Calcium	6	4	7	7	4	5	7	4	5.6	1.
Magnesium	3	1	3	3	3	5	3	1	2.6	0.9
Sulfate	15	21	46	18	17	5	46	15	23.4	12.8
Chloride	10	10	6	5	7	5	10	5	7.6	2.3
Carbonate	31	22		0	20	4	31	0	18.3	13.1
Bicarbonate	228	224	212	266	240	5	266	212	234	21
Hydroxide										
Total Milliequivalent Major Cations	5.35	5.17	4.59	4.86	5.18					
Total Milliequivalent Major Anions	5.36	5.12	4.60	4.87	5.15					
Absolute Value, Charged Balance	0.09	0.49	0.16	0.10	0.29					
Ammonia as N	ND	0.13	ND	ND	ND	5	0.13	ND	0.07	0.04
Nitrate as N (0.05)	ND	0.5	ND	ND	ND	5	0.5	ND	0.14	0.20
Flouride (0.1)	0.36	0.75	1.68	1.24	0.65	5	1.68	0.36	0.94	0.52
Total Alkalinity as $CaCO_3$	239	220	174	218	230	5	239	174	216	25
Total Hardness as $CaCO_3$	28	15	30	30	22	5	30	15	25	6.5
Boron (0.01)	ND	ND	ND	ND	ND	5	-	ND	0.01	-
Aluminum (0.05)	0.12	ND	ND	ND	ND	5	0.12	ND	0.064	0.031
Arsenic (0.005)	ND	0.006	0.004	ND	ND	4	0.006	ND	0.0053	0.0005
Barium (0.03)	ND	ND	ND	ND	ND	5	-	ND	0.03	-
Cadmium (0.002)	ND	ND	ND	0.002	ND	5	0.002	ND	0.002	-
Chromium (0.01)	ND	ND	ND	ND	ND	6	-	ND	0.01	-
Copper (0.01)	0.01	ND	ND	ND	ND	5	0.01	ND	0.01	-
Iron, Total (0.01)	ND	0.01	0.08	0.03	0.09	5	0.09	ND	0.044	0.039
Lead (0.01)	ND	ND	ND	ND	ND	5	-	ND	0.01	-
Magnese (0.01)	0.01	ND	0.02	0.02	0.02	5	0.02	ND	0.016	0.0055
Mercury (0.0005)	ND	ND	ND	ND	ND	5	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	5	-	ND	0.02	-
Selenium (0.005)	ND	ND	ND	ND	ND	5	-	ND	0.005	-
Zinc (0.005)	0.66	0.12	0.01	.034	0.008	5	0.66	0.008	0.166	0.280
Molybdenum (0.05)	ND	ND	ND	ND	ND	5	-	ND	0.05	-
Uranium, U_3O_8 (0.001)	0	0.003	0.002	< 0.001	0.002	4	0.003	<0.001	0.002	0.0008
Vanadium, V_2O_5 (0.05)	ND	ND	ND	ND	ND	5	-	ND	0.05	
Radium 226 PiC/L (0.5)	1.0	0.8	1.5	6.4	2.6	5	6.4	0.8	2.46	2.31
Radium, Precision, PiC/L	±0.6	±0.5	±0.7	±1.5	±0.6					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected

Table D-6.11, p. 2
Baseline Water Quality Data
51-Sand Aquifer (Revised 7/6/81)

WELL	1-M-51
DATE SAMPLED	5/13/81
Temperature, ^{o}C, Field	13.5
pH, Units Field	8.3
pH, Units, Lab at 25^{o}C	8.25
Conductivity, µmhos, Field-Ambient	450
Conductivity, µmhos, Lab at 25^{o}C	472
TDS, Evaporation at 180^{o}C	394
Sodium	139
Potassium	4
Calcium	7
Magnesium	2
Sulfate	56
Chloride	9
Carbonate	14
Bicarbonate	290
Hydroxide	
Total Milliequivalent Major Cations	6.66
Total Milliequivalent Major Anions	6.64
Absolute Value, Charged, Balance	0.15
Ammonia as N	ND
Nitrate as N (0.05)	ND
Fluoride (0.1)	0.65
Total Alkalinity as $CaCO_3$	261
Total Hardness as $CaCO_3$	26
Boron (0.01)	ND
Aluminum (0.05)	ND
Arsenic (0.005)	ND
Barium (0.03)	ND
Cadmium (0.002)	ND
Chromium (0.01)	ND
Copper (0.01)	ND
Iron, Total (0.01)	.05
Lead (0.01)	ND
Manganese (0.01)	.02
Mercury (0.0005)	ND
Nickel (0.02)	ND
Selenium (0.005)	ND
Zinc (0.005)	.010
Molybdenum (0.05)	ND
Uranium, U_3O_8, (0.001)	<.001
Vanadium, V_2O_5, (0.05)	ND
Radium 226, PiC/L (0.5)	3.8
Radium, Precision, PiC/L	±0.9

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

Table D-6.12
Baseline Water Quality Data for
Well 1-M-10 - 10-Sand
(Revised 7/6/81)

DATE SAMPLED	2/11/80	6/12/80	7/24/80	10/31/80	12/17/81	1/22/81	5/8/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation
Temperature, °C, Field	7.5	13.0	13	13.4	12.6	10	10	7	13.4	7.5	11.4	2.2
pH, Units Field	8.10	8.6	7.6	8.8	9.0	8.6	8.7	7	9.0	7.6	8.5	0.5
pH, Units, Lab at 25°C	8.61	8.31	8.62	8.12	8.3	8.14	8.53	7	8.62	8.12	8.38	0.2
Conductivity, µmhos, Field-Ambient	330	405	400	-	390	320	400	6	405	320	374	39
Conductivity, µmhos, Lab at 25°C	415	464	457	477	465	487	509	7	509	415	468	29
TDS, Evaporation at 180°C	319	305	278	297	278	276	311	7	319	276	295	18
Sodium	117	100	102	98	104	98	117	7	117	98	105	8
Potassium	5	5	5	3	4	3	3	7	5	3	4	1
Calcium	5	2	6	6	7	6	6	7	7	2	5.4	1.6
Magnesium	2	4	1	9	1	2	2	7	9	1	3.0	2.8
Sulfate	12	27	26	30	27	32	33	7	33	12	27	7
Chloride	10	8	8	10	3	4	6	7	10	3	7	2.8
Carbonate	39	29	31		53	0	31	5	53	29	36.6	9.9
Bicarbonate	244	198	195	268	161	240	232	7	268	161	220	37
Hydroxide												
Total Milliequivalent Major Cations	5.63	4.91	4.95	5.38	5.05	4.80	5.63					
Total Milliequivalent Major Anions	5.83	5.01	5.00	5.30	5.04	4.72	5.69					
Absolute Value, Charged Balance	1.75	1.01	0.50	0.73	0.10	0.84	0.53					
Ammonia as N	0.33	0.22	0.24	ND	ND	0.12	ND	7	0.33	ND	0.151	0.113
Nitrate as N (0.05)	0.10	ND	0.3	ND	ND	ND	ND	7	0.3	ND	0.093	0.093
Fluoride (0.1)	0.79	0.45	0.65	1.07	0.61	0.99	0.45	7	1.07	0.45	0.72	0.25
Total Alkalinity as $CaCO_3$	265	211	212	220	220	197	242	7	265	197	224	23
Total Hardness as $CaCO_3$	20	22	19	52	21	23	23	7	52	19	26	12
Boron (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.01	-
Aluminum (0.05)	0.01	0.31	ND	ND	0.06	ND	0.07	6	0.31	ND	0.093	0.104
Arsenic (0.005)	ND	0.006	ND	0.004	ND	ND	ND	6	0.006	ND	0.0052	0.0004
Barium (0.0[illegible])	0.04	ND	ND	ND	ND	ND	ND	7	0.04	ND	0.031	0.0038
Cadmium (0.002)	ND	0.00[illegible]	ND	ND	.003	0.002	ND	7	0.003	ND	0.0023	0.0005
Chromium (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.02	-
Copper (0.01)	ND	0.02	ND	0.02	.01	ND	0.01	7	0.02	ND	0.013	0.005
Iron, Total (0.01)	0.14	0.05	0.02	0.03	.27	0.05	0.08	7	0.27	0.02	0.091	0.088
Lead (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.01	-
Manganese (0.01)	0.06	0.01	0.02	ND	.02	0.02	0.02	7	0.06	ND	0.023	0.017
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.02	-
Selenium (0.005)	ND	0.005	ND	0.004	ND	ND	ND	6	0.005	ND	0.005	-
Zinc (0.005)	0.01	0.33	0.06	0.04	.035	.035	ND	7	0.33	ND	0.074	0.115
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.007	0.008	0.003	0.003	0.005	0.002	0.001	7	0.008	0.001	0.0041	0.0026
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Radium 226, PiC/L (0.5)	0.3	0.95	3.9	1.8	3.4	1.4	3.6	6	[illegible]	0.95	2.51	1.27
Radium, Precision, PiC/L	±0.2	±0.6	±0.2	±0.8	±1	±0.7	±0.7					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

Table D-6.13, p.1
Baseline Water Quality Data For
Stock Wells
(Revised 7/6/81)

WELL	Moore S.											
DATE SAMPLED	2/12/80	6/12/80	7/18/80	10/31/80	12/15/80	1/19/81	5/13/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	7	13.5	13.5	13.5	13.5	13	14	7	14	7	12.6	2.5
pH, Units Field	8.6	8.4	8.0	7.9	8.6	8.4	8.0	7	8.6	7.9	8.3	0.3
pH, Units, Lab at 25°C	8.21	7.79	8.02		7.89	7.97	8.18	6	8.21	7.79	8.01	0.16
Conductivity, µmhos, Field-Ambient	420	445	480	-		440	420	5	480	420	441	25
Conductivity, µmhos, Lab at 25°C	470	481	590	518	535	592	453	7	592	453	520	56
TDS, Evaporation at 180°C	336	335	363	299	327	359	351	7	363	299	339	22
Sodium	112	113	111	98	107	120	119	7	120	98	111	7.5
Potassium	3	4	5	3	4	3	3	7	5	3	3.6	0.8
Calcium	8	6	10	8	9	9	6	7	10	6	8.0	1.5
Magnesium	2	4	2	2	3	2	2	7	4	2	2.43	0.8
Sulfate	105	108	110	78	105	123	115	7	123	78	107	14
Chloride	10	8	10	8	5	6	1	7	10	1	6.9	3
Carbonate	5				0	0	0	4	5	0	1.25	2.5
Bicarbonate	185	190	183	185	190	193	198	7	198	183	189	5.3
Hydroxide												
Total Milliequivalent Major Cations	5.51	5.65	5.62	4.90	5.45	5.91	5.72					
Total Milliequivalent Major Anions	5.66	5.60	5.57	4.88	5.44	5.90	5.67					
Absolute Value, Charged Balance	1.3%	0.44	0.45	0.22	0.09	0.08	0.44					
Ammonia as N	0.31	ND	ND	ND	ND	ND	ND	7	0.31	ND	0.087	0.098
Nitrate as N (0.05)	ND	ND	1.2	ND	ND	ND	ND	6	-	ND	0.05	-
Fluoride (0.1)	0.74	1.38	0.40	0.65	0.51	0.74	0.33	7	1.38	0.33	0.68	0.35
Total Alkalinity as $CaCO_3$	160	156	150	152	156	158	162	7	162	150	156	4
Total Hardness as $CaCO_3$	28	32	33	28	35	30	23	7	35	23	29.9	4
Boron (0.01)	0.02	0.1	ND	ND	ND	ND	ND	7	0.1	ND	0.024	0.034
Aluminum (0.05)	ND	0.22	ND	ND	ND	ND	ND	7	0.22	ND	0.074	0.064
Arsenic (0.005)	0.020	0.036	0.024	0.016	.027	0.02	0.034	7	0.036	0.016	0.025	0.0075
Barium (0.03)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.03	-
Cadmium (0.002)	ND	0.005	0.005	0.003	ND	0.005	ND	7	0.005	ND	0.0034	0.0015
Chromium (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.02	-
Copper (0.01)	ND	0.09	ND	0.02	ND	0.01	0.04	7	0.09	ND	0.027	0.030
Iron, Total (0.01)	0.14	0.11	0.11	0.13	.09	0.23	0.18	7	0.23	0.09	0.141	0.0485
Lead (0.01)	ND	0.13	ND	ND	ND	ND	ND	6	-	ND	0.01	-
Manganese (0.01)	0.06	0.02	0.03	0.02	.03	0.03	0.04	7	0.06	0.02	0.033	0.014
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.02	-
Selenium (0.005)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.005	-
Zinc (0.005)	0.07	0.43	0.09	0.06	.012	0.026	0.007	7	0.43	0.007	0.099	0.149
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.004	0.016	0.004	0.010	<0.001	<0.001	<0.001	7	0.016	<0.001	0.0053	0.0057
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Radium 226, PiC/L (0.5)	3.2	0.84	0.5	1.0	1.2	0.8	4.0	7	4	0.5	1.69	1.37
Radium, Precision, PiC/L	±0.4	±0.5	±0.4	±0.6	±.6	±0.5	±0.9					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND = not detected.

The underlined data are considered as outliers and are not included in the calculations.

TABLE D-6.13, p.2
Baseline Water Quality Data For
Stock Wells
(Revised 7/6/81)

WELL	Moore N.												
DATE SAMPLED	2/12/80	6/12/80	7/16/80	10/2/80	12/15/81	12/15/80	1/19/81	5/11/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	7	14	16		13	10.6	10	12	7	16	7	11.8	2.9
pH, Units Field	8.8	8.3	8.3		8.0	8.7	8.3	8.4	7	8.8	8.0	8.4	0.3
pH, Units, Lab at 25°C	8.24	7.24	7.82	7.99	7.88	7.91	7.91	8.18	8	8.24	7.24	7.90	0.30
Conductivity, µmhos, Field-Ambient	380	445	500				400	410	5	500	380	427	47
Conductivity, µmhos, Lab at 25°C	460	451	469	500	500	512	539	555	8	555	451	498	37
TDS, Evaporation at 180°C	320	316	310	284	287	293	320	330	8	330	284	308	17
Sodium	113	109	105	97	97	102	112	107	8	113	97	105	6
Potassium	4	4	6	3	3	4	2	3	8	6	2	3.6	1.2
Calcium	5	5	9	7	6	6	7	6	8	9	5	6.4	1.3
Magnesium	2	2	2	2	4	1	1	1	8	4	1	1.9	0.99
Sulfate	77	79	70	58	71	68	80	69	8	80	58	72	7.2
Chloride	10	10	10	8		6	6	7	8	10	6	8.0	1.8
Carbonate	10					0	0	0	4	10	0	2.5	5.0
Bicarbonate	195	212		207	202	203	212	215	7	215	195	207	7.0
Hydroxide													
Total Milliequivalent Major Cations	5.43	5.25	5.33	4.81	4.92	4.92	5.35	5.11					
Total Milliequivalent Major Anions	5.41	5.40	5.27	4.83	4.99	4.91	5.31	5.17					
Absolute Value, Charged, Balance	0.18	1.41	0.57	0.17	0.63	0.1	0.38	0.58					
Ammonia as N	ND	ND	0.18	ND	ND	ND	ND	ND	8	0.18	ND	0.066	0.046
Nitrate as N (0.05)	0.06	ND	ND	ND	ND	ND	ND	ND	8	0.06	ND	0.051	0.004
Fluoride (0.1)	0.65	0.51	1.38	0.65	0.74	0.61	0.85	0.45	8	1.38	0.45	0.73	0.29
Total Alkalinity as $CaCO_3$	177	174	176	170	166	166	174	180	8	180	166	173	5
Total Hardness as $CaCO_3$	20	21	31	26	31	19	21	19	8	31	19	23.5	5.1
Boron (0.01)	0.02	ND	ND	ND	ND	ND	ND	ND	8	0.02	ND	0.011	0.0035
Aluminum (0.05)	0.01	0.21	ND	ND	ND	ND	ND	ND	7	0.21	ND	0.073	0.061
Arsenic (0.005)	0.002	0.006	0.008	0.004	0.004	ND	ND	ND	5	0.008	ND	0.0058	0.0013
Barium (0.03)	ND	ND	ND	ND	ND	ND	ND	ND	8	-	ND	0.03	-
Cadmium (0.002)	ND	ND	ND	0.003	ND	.002	ND	ND	8	0.003	ND	0.0021	0.0004
Chromium (0.01)	ND	ND	ND	ND	ND	ND	ND	ND	8	-	ND	0.02	-
Copper (0.01)	ND	0.02	ND	0.01	ND	ND	ND	ND	8	0.02	ND	0.011	0.0035
Iron, Total (0.01)	0.20	0.05	0.10	0.16	0.11	.06	0.09	0.32	8	0.32	0.05	0.136	0.089
Lead (0.01)	ND	0.12	ND	ND	ND	ND	ND	ND	8	0.12	ND	0.024	0.039
Manganese (0.01)	0.17	0.02	ND	0.04	0.02	.02	0.03	0.02	8	0.17	ND	0.041	0.053
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	ND	ND	8	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	ND	ND	8	-	ND	0.02	-
Selenium (0.005)	ND	ND	0.002	ND	ND	ND	ND	ND	7	-	ND	0.005	
Zinc (0.005)	0.05	0.06	0.05	0.02	0.06	.013	.017	0.006	8	0.06	0.006	0.0345	0.0226
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	ND	ND	8	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.003		0.017	0.007	ND	0.058	0.004	<0.001	7	0.058	ND	0.013	0.021
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	ND	ND	8	-	ND	0.05	-
Radium 226, PiC/L (0.5)	1.1	1.5	0.8	1.3	0.5	0.9	1.3	1.9	8	1.9	0.5	1.16	0.44
Radium, Precision, PiC/L	±0.3	±0.7	±0.5	±0.6	±0.4	±0.5	±0.7	±0.5					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

NRC Comment 5 (6/16/81)

E. First Part

What is your quality assurance program, including that of any outside lab used, regarding water quality sampling and analyses?

Response:

a. Quality Assurance Programs will be maintained by the Radiation Safety Officer of UUS, who is reporting directly to the Manager Solution Mining. All QA programs will be conducted according to the Regulation Guide 4.15. Standard QA procedures will be maintained through the operational plan.

Laboratory

Outside labs will be contracted based upon their response to requirements of 4.15. All labs will be required to file QA documents with UUS prior to contract finalization.

In-house labs will be placed under the same QA requirements with audits, inspections, etc. as the outside labs, again following the 4.15 requirements.

All lab work will be performed using Standard Methods as required by EPA and the Clean Water.Act. Certifications and qualifications will be on file with UUS as part of the QA program. All labs will be audited through spike samples, split samples and inspections to assure quality control of data.

NRC Comment 5 (6/16/81)

E. Second Part

We note that for all samples split on January 21, 1981, measurable amounts of zinc were reported by WAMCO and in no cases did PAL report detectable amounts. In some instances PAL reports concentrations (of other elements) below their own published detection limits.

Response:

As to the problem of the 21 January 1981 split samples, PAL laboratory were not satisfactory. They will not be used in the future.

NRC Comment 5 (6/16/81)

F. On page D-6.19 you state "baseline groundwater quality will be defined just before start-up on the basis of average concentrations, their standard deviations and maximum and minimum values". Please explain the exact procedure you propose for this determination.

Response:

UUS does not propose, at this time, a procedure for baseline determination. Results of future analysis will be added to the tables until operation start-up. Data and the calculations of average concentrations, maximum and minimum values, and standard deviations made after the inclusion of the final sample prior to start-up, will then be used as criteria for baseline definition.

(Revised 7/6/81)

NRC Comment 5 (6/16/81)

G. On page D-6.17 you state "elements that cannot be detected in four consecutive samples from the same well will be removed from the list of analyses required for that particular well unless a particular element should be mobilized in the leaching zone during the proposed test". Because we would require an analysis for the full suite of parameters only on a quarterly basis during leaching operations we would not permit elimination of such elements from the required list. Only the excursion parameters are required biweekly during leaching.

Response:

Analysis for all baseline parameters will be made and reported on a quarterly basis. The excursion parameters will be sampled, analyzed and reported biweekly.

NRC Comment 5 (6/16/81)

H. What are you proposing as the upper control limit for vanadium considering the fact it is listed as "not detected" in all baseline samples?

Response:

New Tables M-5 and M-6 are submitted giving an Upper Control Limit for vanadium.

(Revised 7/6/81)

Table M-5

Upper Control Limits
Excursion Monitoring For
Well 1-M-20 - Production Zone

	Baseline Mean	Baseline Maximum	Baseline Std Deviation (σ)	Mean Plus 2 σ
pH - Lab at 25°C	8.23	8.65	0.24	7.75-8.71
Conductivity, µmhos Lab at 25°C	505	552	30.3	565.6
Total Alkalinity as $CaCO_3$ mg/l	154	168	10	174
Uranium mg/l**	0.003	0.011	0.0037	1*
Vanadium mg/l**	ND	ND	-	0.10
Chloride	7.9	14	3.4	14.7

Upper Control Limits
Excursion Monitoring For
Well 4-M-20 - Production Zone

	Baseline Mean	Baseline Maximum	Baseline Std. Deviation (σ)	Mean Plus 2 σ
pH - Lab at 25°C	8.65	9.25	0.36	7.93-9.37
Conductivity, µmhos Lab at 25°C	519	566	44	607
Total Alkalinity as $CaCO_3$ mg/l	149	158	10.2	169.4
Uranium mg/l**	0.0113	0.028	0.0104	1*
Vanadium mg/l**	ND	ND	-	0.10
Chloride	7.5	13	3.8	15.1

Upper Control Limits
Excursion Monitoring For
Well 5-M-20 - Production Zone

	Baseline Mean	Baseline Maximum	Baseline Std. Deviation (σ)	Mean Plus 2 σ
pH - Lab at 25°C	7.98	8.32	0.18	7.62-8.34
Conductivity, µmhos Lab at 25°C	547	636	57	661
Total Alkalinity as $CaCO_3$ mg/l	156	165	6	168
Uranium mg/l**	0.0095	0.045	0.0174	1*
Vanadium gm/l**	ND	ND	-	0.10
Chloride	5.8	10	2.5	10.8

* Upper Control Limit for U_3O_8 suggested by DEQ.
**Uranium as U_3O_8
Vanadium as V_2O_5

(Revised 7/6/81)

Table M-6

Upper Control Limits
Excursion Monitoring For
Well 1-M-10 - Lower Aquifer

	Baseline Mean	Baseline Maximum	Baseline Std. Deviation (σ)	Mean Plus 2 σ
pH - Lab at 25°C	8.38	8.62	0.2	7.98-8.78
Conductivity, µmhos Lab at 25°C	468	509	29	526
Total Alkalinity as $CaCO_3$ mg/l	224	265	23	270
Uranium mg/l**	0.0041	0.008	0.0026	1*
Vanadium mg/l**	ND	ND	-	0.10
Chloride	7	10	2.8	12.6

Upper Control Limits
Excursion Monitoring For
Well 1-M-30 - Upper Aquifer

	Baseline Mean	Baseline Maximum	Baseline Std. Deviation (σ)	Mean Plus 2 σ
pH - Lab at 25°C	9.34	9.60	0.26	8.82-9.86
Conductivity, µmhos Lab at 25°	559	658	69	697
Total Alkalinity as $CaCO_3$ mg/l	190	210	20	230
Uranium mg/l**	0.0114	0.041	0.0149	1*
Vanadium mg/l**	ND	ND	-	0.10
Chloride	12.4	18	3.5	19.4

Upper Control Limits
Excursion Monitoring For
Well 1-W-51 - Domestic Water Supply

	Baseline Mean	Baseline Maximum	Baseline Std. Deviation (σ)	Mean Plus 2 σ
pH - Lab at 25°C	8.20	8.57	0.31	7.58-8.82
Conductivity, µmhos Lab at 25°	455	513	56	567
Total Alkalinity as $CaCO_3$ mg/l	216	239	25	266
Uranium mg/l**	0.002	0.003	0.0008	1*
Vanadium mg/l**	ND	ND	-	0.10
Chloride	7.6	10.0	2.3	12.2

* Upper Control Limit for U_3O_8 suggested by DEQ.
** Uranium as U_3O_8
Vanadium as V_2O_5

(Revised 7/6/81)

NRC Comment 5 (6/16/81)

I. How will use of an NH_4HCO_3 eluant instead of $NaCl/Na_2CO_3$ affect the choice of Cl as an excursion parameter?

Response:

Uranerz U.S.A., Inc. will test both $NaCl/Na_2CO_3$ and NH_4CO_3 as eluants during the pilot plant operation. $NaCl/Na_2CO_3$ will be used first. While this is used as the eluant, Cl is an appropriate excursion parameter.

NRC Comment 5 (6/16/81)

J. Referring to p. M-27, what do you propose as a course of action if the two analyses (split sample) obtained as excursion confirmation samples differ markedly?

Response:

If the two analyses of a split sample differ markedly, the following procedure would be followed.

1. Any unusual result would be compared to previous data to determine its potential as an outlier.

2. The sample would be rerun by UUS lab and the outside lab to determine if the results were caused by a procedural error.

3. Following the procedure, described on page M-27, a second control sample will be taken three days after an excursion is suspected.

NRC Comment 5 (6/16/81)

K. It is not clear what water quality parameters you propose to measure during an excursion.

Response:

The water quality parameters to be measured during an excursion are listed on Tables M-5 and M-6. Upper control limits for HCO_3 and CO_3 will be added prior to start-up. The parameters were proposed by WDEQ.

NRC Comment 5 (6/16/81)

L. Referring to pages M-28, M-29 regarding corrective action, it is not clear what the proposed sampling schedule is after the first 2 weeks of an excursion.

Response: Add the following to paragraph 1, Page M-29.

Weekly sampling of the monitor well in excursion status, and of all other monitor wells, with analysis for all UCL parameters, will be done continuously after the first two weeks. This will continue until recovery from excursion has been achieved and maintained for a continuous period of at least one month.

NRC Comment 5 (6/16/81)

M. Referring to paragraphs No. 3 and 4 on p. M-29, what is meant by a "substantial decrease" in concentration?

Response:

A 50%, or more, decrease in concentration.

(Revised 7/6/81)

NRC Comment 6 (6/16/81)

Referring to your statement on page M-26, "The leak detection system will be checked daily for leakage solution during initial filling of a pond. The time intervals will later be extended to two weeks", we require leak detection systems to be checked on a daily basis.

Response:

Paragraph 2, page M-26, first sentence is revised to read:

The leak detection system will be checked daily for leakage solutions, as part of the daily walk through by the RST.

(Revised 7/6/81)

NRC Comments 7.A through 7.I (6/16/81)

Due to the complexity of and detail required to respond to Comment 7, all parts, the responses are submitted as a supplement to follow page D-6.15.

(Revised 7/6/81)

NRC Comment 7 (6/16/81)

The following questions refer to hydrologic test No. 9.

A. What "borehole damage" exists in wells 5L and 6L as noted on the graphs? No mention of this exists in the text. Were or are repair measures necessary?

Response:

Bore hole damage is caused when drilling mud or cement invade the producing formation, thus causing reduced permeability in the immediate vicinity of the completed interval. No repair measures are necessary.

NRC Comment 7 (6/16/81)

B. The M-20 wells have different completion intervals than pumped well 4L. Were the data corrected for the effects or partial penetration? If not, provide justification. The subject is not addressed in the text.

Response:

Transmissivities appear slightly lower in the center of the proposed test area than in the outlying monitor wells. This may be due to the partial penetration of the pumped well and of those observation wells that are labeled "L". The "L" wells are located within a radius of 110 ft. of the pumped well which is twice the thickness (55 ft.) of the aquifer. Within this area vertical flow components will theoretically influence the observed drawdown readings during pump tests. The sedimentary environment in roll front aquifers is, however, so varied that differences in transmissivity have to be expected. The variations in Table D-6.5 may be an account of the varying transmissivity through the roll front. The differences, however, are small enough to be explained as well by errors that are inherent in the pumping test methods. Correcting for possible partial penetration effects would not increase the accuracy of the results. The range of transmissivity values given in Table D-6.5 describes the transmissivity at the test site in general. It is not practical to assign transmissivity values to any particular volume of the aquifer smaller than the test site.

NRC Comments 7.C, 7.E and 7.I (6/16/81)

C. There are inconsistencies in the text regarding the log-log plot for well 4L.

* p. D-6.10: The heterogeneous nature of the transmissivity can also be considered responsible for the abnormal shape of the drawdown curve of the pumped well 4L in hydro test No. 9.

* p. D-6.10: The most plausible explanation for the curves shape is a change in transmissivity at a certain distance from the pumped well.

* p. D-6.10: As there are not such deformities (re: obs. well curves) the conclusions can be made that there are no hydraulic boundaries within the area between the monitor wells.

* p. D-6.14: 4L: The early flattening out of the drawdown curve is due to a slightly falling flow rate at the time (200-930-min). The flowrate was then readjusted.

* During our site visit Mr. Froehlich stated that the declining flow rate was a deliberate measure taken to keep the water level above the level of the pump.

The following apply to part C, above.

c1: The text needs clarification on the above items.

c2: Why wasn't the test initially run at a lower Q to eliminate drawdown problems at the pump well?

c3: Was the drawdown data corrected for a variable Q? If not, this should be done.

(Revised 7/6/81)

E. On page D-6.10 and again on D-6.15 it states there were no pressure changes in the upper and lower aquifers. Data provided indicated a .5 psi reduction in the lower aquifer and a .2 psi reduction in the upper aquifer. In addition, the drawdown curve for well 4-M-20 shows a break from the Theis curve of a nature often indicative of leakage. Provide a detailed explanation of this observation.

I. Based on all parts of question 7, justify the validity of hydrologic test No. 9.

Response: 7.C, 7.E, and 7.I:

Long term pump tests like test No. 9 in this context are conducted to provide evidence on two possible hydraulic situations that would impair a solution mining project:

A. Hydraulic boundaries
B. Leaky aquifer conditions.

Hydraulic boundaries can be negative like tight faults or bedrock contacts. This condition would be observed as increased slopes in all drawdown curves. There is no indication of this in all the pump test data.

A positive boundary would be an area of recharge to the pumped aquifer which would be observed as a decline of the slope in all drawdown curves. Such decline has been observed in only one well (4L). Other reasons for declining slopes of drawdown curves are:

- improving hydraulics in the pumped well.
- changing transmissivity in the distance.
- declining flow rates.

These factors are extremely difficult to be quantified exactly. The need to do so would only be justified if there were doubts about the confinement of the target aquifer in an area within the monitored leaching zone. Complete confinement of the leaching zone is assured by the pumping test results as the upper and lower monitor wells did not react to the pumping of the target aquifer. The small pressure reduction in both 1-M-30 and 1-M-10 at a late point of time during test No. 9 can be explained by various other factors:

- a change in barometric pressure.
- elastic reactions to pressure changes in the 20-sand which is sandwiched between the 10- and 30- sands (Noorbergum Effect*).

Otherwise the pressure changes are small enough to be explained by reading error:

Observation Well No.	Pressure Gauge	Marked Intervals	Readings
1-M-10	0-60 psi	2 psi	25.5 - 25.0 psi
1-M-30	0-15 psi	0.5 psi	8.0 - 7.8 psi

(1 psi = 0.0703 kp/cm^2)

If in fact the observed pressure changes were caused by a hydraulic connection between the aquifers, this connection would be outside of the monitored area of the 20-sand aquifer as the pressure changes were observed at a time when the radius of influence from the pumped well had already reached far beyond the outling monitor wells (M-20 wells). The drawdown curve 4-M-20 is considered a good approximation of the Theis-Curve within the limits of accuracy of the method.

*Verruigt, A. 1969, Elastic Storage of Aquifers, in: Flow through Porous Media; R. DeWeist, Ed.: Acad. Press, NY, pp. 331-376.

(Revised 7/6/81)

During test No. 9 the pumping rate was held as constant as possible under field conditions in order to facilitate test interpretation. The average flow rate was 10.91 gpm ($0.69\ 10^{-3}\ m^3\ sec^{-1}$) over a period of 2130 minutes. During that time the extremes were +1.51 gpm ($0.063\ 10^{-3}\ m^3\ sec^{-1}$)(13.8%) and -0.24 gpm ($0.015\ 10^{-3}\ m^3\ sec^{-1}$)(2.2%). This accuracy is considered adequate for this purpose. Drawdown data from the pumped well were not included into the average calculations of transmissivity and storage coefficient for this and other reasons stated above. Drawdown observations in the other wells are not affected by the slight variations in the pumping rate.

(Revised 7/6/81)

NRC Comments 7 (6/16/81)

D. Why wasn't recovery data used in the analysis of test No. 9? This data should be analyzed.

Response:

Recovery data from test No. 9 was analyzed (see attached Graph 4L) but was not considered relevant.

NRC Comments 7 (6/16/81)

F. Why wasn't recovery data obtained for the upper and lower aquifers?

Response:

During test No.9, water pressures in the upper and lower aquifers remained at ±2% of the readings they had shown for weeks before the test and were therefore not measured during the recovery phase of the test.

NRC Comments 7 (6/16/81)

G. Why weren't water levels (or pressures) taken prior to starting of the pump test and taken into account during analysis?

Response:

The 0-minute readings of water pressures of each well were taken before start-up of the pumping tests. They are not included on the graph sheets as no attempt was made to quantify the casing capacity and skin effects which become negligible in the later parts of the curves.

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NRC Comments 7 (7/16/81)

H. Why weren't barometric data obtained prior to and during the test and taken into account during analysis?

Response:

Barometric variations may reach extremes of 25 inches (0.635 m) of water or less than 1 psi (0.0703 kp/cm^2). No extreme weather situations were observed during test No. 5 Any possible effects on the observed drawdown curves would have negligible extent.

NRC Comment 8 (6/16/81)

Referring to figure M-7A, Fluid Flow Path, why are negative values assigned to injection wells and positive values to production wells relating to relative water level differences.

Response:

Head pressures are given in feet drawdown. Injection pressures are therefore negative drawdown.

(Revised 7/6/81)

NRC Comment 9 (6/16/81)

Submit additional information regarding the nature of the fluid flow model.

Response:

The computer model that was used for Figure M-7A was developed by the U.S. Bureau of Mines for the purpose of simulating uranium solution mining. Following is an abstract of their Report of Investigation No. 8479* describing the model:

> This Bureau of Mines report describes the development and application of a computer model for simulating the hydrological activity associated with in situ leaching. The model is intended to provide uranium resource developers with a description of the flow behavior of leachants and ground water during the development, production, and restoration phases of leaching operation involving an arbitrary pattern of injection and recovery wells.
>
> Different aquifer environments are modeled, using a closed-form solution to the partial differential equation that describes three-dimensional changes in piezometric head as a result of pumping from leachant injection and recovery wells. The computer program can model a maximum of 50 arbitrarily located wells.

*Computer Modeling of Fluid Flow During Production and Environmental Restoration Phases of In Situ Uranium Leaching,
US Bureau of Mines Report of Investigations 8479,
Robert D. Schmidt, 1980

Numerical techniques involving difference quotients and Taylor expansions about time points are used to derive time, velocity, areal sweep, and fluid volume parameters associated with leaching hydraulics. These parameters are output by the program in graphic and tabular formats. Other numeric methods insure that the program running time is minimized without significantly affecting the accuracy of results.

(Revised 7/6/81)

NRC Comment 10 (6/16/81)

Regarding your statement on page R-2 (part III, reclamation), "the purified water from these processes (R.O.) may be reinjected into the 20-sand or could be discharged to the Dry Fork of the Powder River", any such proposed discharges would have to be supported by an analysis alternatives, including the alternative of discharge to a lined evaporation pond, covering the environmental and economic impacts associated with each alternative. Prior approval by the NRC through the issuance of a special license amendment would be required. Our experience with similar matters indicates an NPDES permit would also be required.

Response:

Uranerz U.S.A., Inc. acknowledges that an analysis covering the environmental and economic impacts must be made for any alternative disposal of water during restoration, and, that appropriate permits and amendments would need to be obtained.

NRC Comment 10 (6/16/81)

Regarding your statement on page R-2 (part III, reclamation), "the purified water from these processes (R.O.) may be reinjected into the 20-sand or could be discharged to the Dry Fork of the Powder River", any such proposed discharges would have to be supported by an analysis alternatives, including the alternative of discharge to a lined evaporation pond, covering the environmental and economic impacts associated with each alternative. Prior approval by the NRC through the issuance of a special license amendment would be required. Our experience with similar matters indicates an NPDES permit would also be required.

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Response:

Uranerz U.S.A., Inc. acknowledges that an analysis covering the environmental and economic impacts must be made for any alternative disposal of water during restoration, and, that appropriate permits and amendments would need to be obtained.

NRC Comment 10 (6/16/81)

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Response:

Uranerz U.S.A., Inc. acknowledges that an analysis covering the environmental and economic impacts must be made for any alternative disposal of water during restoration, and, that appropriate permits and amendments would need to be obtained.

NRC Comment 11 (6/16/81)

The NRC routinely requires all solid process residues to be disposed of in a licensed tailings impoundment. Anv alternative proposals shall require an analysis of alternative methods as indicated by appropriate criteria of Appendix A of 10 CFR 40.

Response:

Uranerz U.S.A., Inc. acknowledges that all solid process residues must be disposed in a licensed tailings impoundment, and will follow the proper procedures for their disposal.

(Revised 7/6/81)

NRC Comment 12 (6/16/81)

Any proposal to dispose of contaminated material (clothing, spent filters, etc.) on-site would require approval of the NRC through issuance of a special license.

Response:

The Uranerz U.S.A., Inc. procedure for the disposal of all contaminated material, including clothing, spent filters, etc.) will be in an approved NRC disposal site.

(Revised 7/6/81)

Docket 40-8783

URANERZ U.S.A., INC.

800 Werner Court
Suite 140
CASPER, WYOMING 82601

July 7, 1981

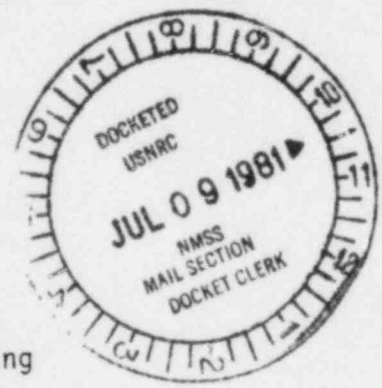
Mr. John J. Linehan, Section Leader
Operating Facilities Section I
Uranium Recovery Licensing Branch
Division of Waste Management
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Docket No. 40-8783
Application for Source Material
License

Dear Mr. Linehan:

Attached is the material you requested in your letter of June 16, 1981.

Please note our new address above.



Very truly yours,

URANERZ U.S.A., INC.

Schmidt

Dr. Christof Schmidt
Manager of Solution Mining

Attachment:
As stated

cc: M. Hulbert, WDEQ

10207

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Add'l Info

URANERZ U.S.A., INC.

Response to:

USNRC Letter dated June 16, 1981

Docket No. 40-8783

Uranerz Source Material License Application

July 7, 1981

NRC Comment 1. (6/16/81):

Submit the actual well completion data for well 7-M-20 as was done for other wells in Table D-6.4.

Response:

Revised Table D-6.4 is included giving well completion data for well 7-M-20 and well 1-M-51.

(Revised 7/6/81)

Table D-6.4

List of Hydrologic Test Wells

Well No.	Aquifer	Completed Interval below ground ft.	(m)	Ground ft.	(m)	Hydraulic Head Elevation on 7/8/80 ft.	(m)	
3L	20-Sand	502-509	(153.1-155.2)	4829.33	(1491.98)	(Now abandoned) (Will be plugged)		
4L	20-Sand	500-507	(152.2-154.6)	4828.62	(1471.76)	4859.24	(1481.10)	
5L	20-Sand	505-511	(154.0-155.8)	4833.73	(1473.32)	4859.27	(1481.11)	
6L	20-Sand	503-507	(153.4-154.6)	4836.73	(1474.24)	--	--	
8L	20-Sand	508-519	(154.9-158.3)	4821.83	(1672.74)	4859.11	(1481.06)	
1-M-20	20-Sand	492-554	(150.1-169.0)	4828.90	(1471.85)	4858.55	(1480.89)	
4-M-20	20-Sand	517-575	(157.7-175.4)	4847.44	(1477.50)	4857.88	(1480.68)	
5-M-20	20-Sand	493-563	(150.4-171.7)	4834.91	(1473.68)	4859.85	(1481.28)	
1-M-10	10-Sand	566-666	(172.6-203.1)	4829.90	(1472.15)	4892.79	(1491.32)	
1-M-30	30-Sand	419-455	(127.8-138.8)	4836.43	(1474.14)	4856.42	(1480.24)	
1-W-51	51-Sand	85-188	(25.9- 57.3)	4836.50	(1474.17)	4800.47	(1463.18)	
7-M-20	20-Sand	492-555	(150.1-169.3)	4822.50	(1469.90)	4859.46	(1481.16)	(6/24/81)
1-M-51	51-Sand	87-187	(26.5- 57.0)	4830.00	(1472.18)	4800.60	(1463.22)	(6/24/81)

(Revised 7/6/81)

NRC Comment 2. (6/16/81)

Submit results of the well integrity testing program.

Response:

Results of the well integrity testing program will be submitted after the leaching wells have been permitted and drilled.

NRC Comment 3. (6/16/81):

Submit a map showing the location and extent of the uranium ore body in relation to the Ruth ISL site and hydrologic test wells.

Response:

Map is attached as Figure D-6.4-1.

(Revised 7/6/81)

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NRC Comment 4. (6/16/81):

Does Figure D-10.1 represent the radiation assessment sample location map which the text refers to as "not included"?

Response:

Figure D-10.1 does represent the radiation assessment sample location map. The text on page RA-1, paragraph 1 should be corrected by deleting the last two sentences.

(Revised 7/6/81)

NRC Comment 5. (6/16/81)

A. First Part

There are obvious errors in Table D-6.9, p. (i), (ex: fluoride mean concentration of 154 mg/l). These should be corrected.

Response:

Table D-6.9, all parts, have been reviewed, proof read, corrections made as needed, and the revised table is submitted.

A. Second Part.

In addition, the text states (p. D-6.17) "...comparing the baseline water quality of the proposed leach field as represented by samples from wells 8L and 4L...". If baseline water quality of the ore zone is to be based on data from wells 8L and 4L the data for wells 1-M-20 and 5-M-20 should be segregated from Table D-6.9, p (i).

Response:

Baseline data for well 8L is given on Table D-6.9, p. 6, and for well 4L on Table D-6.9, p.5. Table D-6.9 (i) is included only for general information.

(Revised 7/6/81)

NRC Comment 5 (6/16/81)

B. It appears other errors exist in other parts of Table D-6.9, (ex: D-6.9, p.5, the standard deviation of total hardness is listed as 41 mg/l). These tables should be further proof read and corrections made and copies resubmitted for substitution.

Response:

Table D-6.9, all parts, have been reviewed, proof read, corrections made as needed, and the revised table is submitted.

NRC Comment 5 (6/16/81)

C. In Table D-6.9 (all parts) the split sample obtained on January 21, 1981, is treated as two independent samples. These are not two independent samples representative of the natural variation in water quality but are representative of the variation in lab analyses. The inclusion of both sets of data in the baseline determination will not be accepted.

Response:

The PAL analyses for the split sample, obtained on January 21, 1981 have been removed from Table D-6.9, all parts, and the table has been recalculated, and is attached.

(Revised 7/6/81)

NRC Comment 5 (6/16/81)

D. Both the NRC and DEQ agree that all data must be screened for outliers. As an example refer to TD-6.9, p.5. The WAMCO analysis for radium (January 21, 1981), appears consistent with previous samples while PAL's analysis of the sample is rather high (even ignoring the fact this was a split sample). Excluding the high value (223.43) from baseline determination would not be an unreasonable judgement. Have all the data been analyzed for outliers?

Response:

Table D-6.9, and all other tables, have been examined for potential outliers. Outliers have been underlined on the tables, and have not been included in the calculations. Table D-6.9, and all other tables, are attached.

(Revised 7/6/81)

Table D-6.2

Baseline Surface Water Quality
Upstream Sampling Point
(Revised 7/6/81)

DATE SAMPLED	3/11/80	6/12/80	7/18/80	10/1/80	12/15/80	5/8/81
Temperature, °C, Field	8	20	20	--	0	13
pH, Units Field	7.6	7.5	7.6		8.3	8.9
pH, Units, Lab at 25°	8.08	7.87	8.19	7.77	7.53	8.10
Conductivity, µmhos, Field Ambient	2000	3150	3100			1200
Conductivity, µmhos, Lab at 25°	2610	2990	3210	3635	3600	1509
TDS, Evaporation at 180°C	2347	2852	3050	3322	3580	1163
Sodium	375	422	489	503	551	125
Potassium	12	16	5	41	23	11
Calcium	235	377	257	232	405	133
Magnesium	78	68	129	161	120	37
Sulfate	1300	1750	1980	2050	2050	660
Chloride	45	45	48	38	50	12
Carbonate					0	18
Bicarbonate	439	354	171	280	659	73
Hydroxide						
Total Milliequivalent Major Cations	35.65	43.17	44.82	47.74	53.63	15.43
Total Milliequivalent Major Anions	35.51	43.48	45.33	48.30	54.86	15.27
Absolute Value, Charged, Balance	0.20	0.36	0.57	0.59	.21	0.42
Ammonia as N	ND	ND	ND	ND	2.38	ND
Nitrate as N (0.05)	0.03	ND	0.02	ND	ND	ND
Fluoride (0.1)	0.51	0.65	0.22	0.30	0.28	ND
Total Alkaninity as $CaCO_3$	360	290	140	230	540	60
Total Hardness as $CaCO_3$	950	1220	1170	1240	1504	480
Boron (0.01)	ND	0.08	0.1	ND	ND	ND
Aluminum (0.05)	0.02	0.07	ND	ND	ND	ND
Arsenic (0.005)	ND	0.002	0.008	0.008	0.025	ND
Barium (0.03)	0.04	0.05	ND	ND	ND	ND
Cadmium (0.002)	ND	0.015	0.010	0.010	ND	ND
Chromium (0.01)	ND	ND	ND	ND	ND	ND
Copper (0.01)	ND	0.02	ND	0.02	0.01	.05
Iron, Total (0.01)	0.15	0.04	0.04	0.11	0.12	.23
Lead (0.01)	ND	0.03	ND	ND	ND	ND
Manganese (0.01)	0.23	0.17	0.07	1.22	9.8	.19
Mercury (0.0005)	ND	ND	ND	ND	ND	ND
Nickel (0.02)	ND	0.03	ND	ND	ND	ND
Selenium (0.005)	ND	ND	ND	ND	ND	ND
Zinc (0.005)	ND	0.39	0.07	0.04	0.021	ND
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND
Uranium, U_3O_8, (0.001)	0.058	0.025	0.046	0.149	0.045	0.006
Vanadium V_2O_5, (0.05)	ND	0.06	ND	ND	ND	ND
Radium 226 PIC/L (0.5)	2.8	0.34	0.5	1.3	2.5	3.2
Radium, Precision, PIC/L	±0.6	±0.3	±0.4	±0.6	±0.8	±0.7

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

Table D-6.3

Baseline Surface Water Quality
Downstream Sampling Point
(Revised 7/6/81)

DATE SAMPLED	3/13/80	6/12/80	7/18/80	10/1/80	12/15/80	5/8/81
Temperature, °C Field	7	20	25		4.8	9
pH, Units Field	7.4	7.5	7.0		8.2	7.8
pH, Units, Lab at 25°C	7.61	7.64	8.06	7.41	7.6	7.88
Conductivity µmhos, Field Ambient	1900	3800	6000			3000
Conductivity, µmhos, Lab at 25°C	2610	3481	--	5396	3425	4171
TDS, Evaporation at 180°C	2448	3328	4588	5526	3862	3947
Sodium	360	480	634	758	529	554
Potassium	9	15	33	35	15	17
Calcium	261	401	477	521	433	377
Magnesium	95	124	203	215	73	142
Sulfate	1495	2060	2925	3475	1960	2320
Chloride	35	52	62	60	59	56
Carbonate					0	0
Bicarbonate	293	415	403	211	500	305
Hydroxide						
Total Milliequivalent Major Cations	36.72	51.68	69.81	77.54	51.00	55.02
Total Milliequivalent Major Anions	36.90	51.13	69.20	77.33	50.63	54.84
Absolute Value, Charged, Balance	0.24	0.53	-0.21	0.14	0.36	0.16
Ammonia as N	ND	ND	ND	ND	0.45	ND
Nitrate as N (0.05)	0.03	ND	1.0	ND	ND	ND
Fluoride (0.1)	0.27	0.54	0.24	0.74	0.23	0.27
Total Alkalinity as $CaCO_3$	240	340	330	173	410	250
Total Hardness as $CaCO_3$	1040	1510	2025	2184	1380	1524
Boron (0.01)	0.07	0.08	ND	ND	ND	ND
Aluminum (0.05)	0.03	0.07	ND	ND	0.06	0.16
Arsenic (0.005)	ND	0.003	0.010	.012	ND	ND
Barium (0.03)	ND	0.09	ND	ND	ND	ND
Cadmium (0.002)	ND	0.012	0.020	0.009	ND	0.011
Chromium (0.01)	ND	ND	ND	ND	ND	ND
Copper (0.01)	ND	0.01	ND	0.02	0.01	ND
Iron, Total (0.01)	0.07	0.03	0.07	0.21	0.96	0.23
Lead (0.01)	ND	0.03	ND	0.02	ND	ND
Manganese (0.01)	2.3	1.49	2.51	0.41	4.0	0.16
Mercury (0.0005)	ND	ND	ND	ND	ND	ND
Nickel (0.02)	ND	0.03	ND	0.03	ND	ND
Selenium (0.005)	ND	ND	ND	ND	ND	ND
Zinc (0.005)	ND	0.31	0.07	0.06	0.026	0.025
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND
Uranium U_3O_8 (0.001)	0.046	0.029	0.007	0.009	0.045	0.002
Vanadium V_2O_5 (0.05)	ND	0.23	ND	ND	ND	ND
Radium 226, PiC/L (0.5)	0.7	0.23	0.7	1.5	2.5	1.9
Radium, Precision, PiC/L	±0.2	±0.3	±0.7	±0.7	±0.8	±0.5

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

Table D-6.9 (i)
Baseline Water Quality Data
4L, 8L, 1-M-20, 4-M-20, 5-M-20, 7-M-20
20-Sand Aquifer (Revised 7/6/81)

DATE SAMPLED	No. of Samples	Maximum Observed	Minimum Observed	Mean	Std. (σ) Deviation
Temperature, °C, Field	32	15	11	13.3	1.2
pH, Units Field	32	9.8	8	8.7	0.5
pH, Units, Lab at 25°C	32	9.25	7.78	8.18	0.35
Conductivity, µmhos, Field-Ambient	24	605	390	442	50
Conductivity, µmhos, Lab at 25°C	32	636	445	523	41
TDS, Evaporation at 180°C	32	374	289	326	20
Sodium	32	121	98	108	6
Potassium	32	9	3	4.5	1.4
Calcium	32	10	1	6.4	2.0
Magnesium	32	7	1	2.5	1.7
Sulfate	32	128	68	97	16
Chloride	32	14	3	6.9	2.8
Carbonate	24	67	0	15.5	17
Bicarbonate	32	195	22	164	35
Hydroxide					
Total Milliequivalent Major Cations					
Total Milliequivalent Major Anions					
Absolute Value, Charged, Balance					
Ammonia as N	32	0.3	ND	0.09	0.07
Nitrate as N (0.05)	30	0.21	ND	0.06	0.04
Fluoride (0.1)	31	0.85	0.14	0.51	0.16
Total Alkalinity as $CaCO_3$	32	172	130	154	8
Total Hardness as $CaCO_3$	32	33	7	23.9	6.0
Boron (0.01)	32	0.1	ND	0.03	0.03
Aluminum (0.05)	32	0.4	ND	0.12	0.11
Arsenic (0.005)	26	0.094	ND	0.014	0.019
Barium (0.03)	32	-	ND	0.03	-
Cadmium (0.002)	32	0.012	ND	0.003	0.002
Chromium (0.01)	32	0.02	ND	0.01	0.002
Copper (0.01)	32	0.02	ND	0.011	0.003
Iron, Total (0.01)	32	0.2	ND	0.077	0.067
Lead (0.01)	31	-	ND	0.01	-
Manganese (0.01)	32	0.07	ND	0.018	0.013
Mercury (0.0005)	32	-	ND	0.0005	-
Nickel (0.02)	32	-	ND	0.02	-
Selenium (0.005)	30	0.005	ND	0.005	-
Zinc (0.005)	28	0.34	ND	0.046	0.082
Molybdenum (0.05)	32	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	32	0.071	<0.001	0.010	0.015
Vanadium, V_2O_5, (0.05)	32	-	ND	0.05	-
Radium 226, PiC/L (0.5)	31	225	0.5	56.2	71.5
Radium, Precision, PiC/L					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

TABLE D-6.9,p.1.
Baseline Water Quality Data For
20-Sand Aquifer
(Revised 7/6/81)

WELL	1-M-20											
DATE SAMPLED	2/11/80	6/12/80	7/18/80	10/1/80	12/16/80	1/21/81	5/11/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	12	13	14	14	14	13	14.5	7	14.5	12	13.50	0.87
pH, Units Field	8.3	8.4	8.2	8.5	8.7	8.8	8.7	7	8.8	8.2	8.51	0.23
pH, Units, Lab at 25°C	8.24	8.0	8.40	8.09	8.28	7.95	8.65	7	8.65	7.95	8.23	0.24
Conductivity, µmhos, Field-Ambient	390	410	450		410	400	400	6	450	390	410	21
Conductivity, µmhos, Lab at 25°C	460	500	509	477	512	552	525	7	552	460	505	30.3
TDS, Evaporation at 180°C	320	329	308	289	295	303	306	7	329	289	307	14
Sodium	110	109	104	98	101	104	108	7	110	98	105	4.4
Potassium	3	5	4	3	5	3	3	7	5	3	3.7	0.95
Calcium	6	5	6	5	6	6	3	7	6	3	5.3	1.1
Magnesium	3	2	3	3	1	1	1	7	3	1	2.0	0.93
Sulfate	91	115	89	68	86	88	70	7	115	68	87	16
Chloride	10	7	8	14	3	6	7	7	14	3	7.9	3.4
Carbonate	10	9	17		31	0	26	6	31	0	15.5	11.5
Bicarbonate	181	151	151	188	120	183	151	7	188	0	161	25
Hydroxide												
Total Milliequivalent Major Cations	5.42	5.28	5.17	4.84	4.90	4.98	5.01					
Total Milliequivalent Major Anions	5.47	5.30	5.13	4.89	4.87	5.00	5.01					
Absolute Value, Charged, Balance	0.46	0.19	0.39	0.58	0.31	0.2	-					
Ammonia as N	0.30	ND	0.11	ND	ND	ND	ND	7	0.30	ND	0.09	0.09
Nitrate as N (0.05)	0.21	ND	1.0	ND	ND	ND	ND	6	0.21	ND	0.08	0.07
Fluoride (0.1)	0.54	0.40	0.04	0.74	0.40	0.61	0.30	6	0.74	0.3	0.498	0.162
Total Alkalinity as $CaCO_3$	165	140	152	154	150	150	168	7	168	140	154	10
Total Hardness as $CaCO_3$	28	21	28	25	19	19	12	7	28	12	22	6
Boron (0.01)	0.02	0.1	ND	ND	0.06	ND	ND	7	0.10	ND	0.031	0.035
Aluminum (0.05)	ND	0.40	ND	ND	.19	ND	ND	7	0.40	ND	0.12	0.13
Arsenic (0.005)	0.002	0.006	0.010	0.004	ND	ND	ND	5	0.01	ND	0.006	0.002
Barium (0.03)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	.03	-
Cadmium (0.002)	ND	ND	ND	0.005	ND	0.002	ND	7	0.005	ND	0.0024	0.0011
Chromium (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.01	-
Copper (0.01)	ND	ND	ND	ND	0.02	ND	.01	7	0.02	ND	0.0114	0.0038
Iron (0.01)	0.17	0.12	0.01	0.02	.19	0.06	.08	7	0.19	0.01	0.093	0.070
Lead (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.01	-
Manganese (0.01)	0.07	0.03	ND	ND	0.02	0.01	.01	7	0.07	ND	0.023	0.022
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.02	-
Selenium (0.005)	ND	0.005	0.003	ND	ND	ND	ND	6	0.005	ND	0.005	-
Zinc (0.005)	0.07	0.43	0.02	0.03	.033	.024	ND	6	0.07	ND	0.03	0.02
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.003	0.011	0.001	0.003	.001	<0.001	<0.001	7	0.011	0.001	0.003	0.0037
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Radium 226, PiC/L (0.5)	1.3	0.68	0.8	0.4	3.7	5.8	1.6	6	5.8	0.68	2.3	2.0
Radium, Precision, PiC/L	±0.3	±0.4	±0.5	±0.3	1.0	±1.4	±0.5					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

The underlined data are considered as outliers and are not included in the calculations.

TABLE D-6.9, p.2.
Baseline Water Quality Data For
20-Sand Aquifer
(Revised 7/6/81)

WELL	4-M-20										
DATE SAMPLED	6/12/80	7/14/80	10/2/80	12/15/80	1/20/81	5/11/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	11.5	13.8	14.2	14.2	11	13	6	14.2	11.0	13	1.4
pH, Units Field	9.6	9.6	8.9	9.8	9.4	9.0	6	9.8	8.9	9.4	0.36
pH, Units, Lab at 25°C	9.25	8.56	8.61	8.25	8.36	8.85	6	9.25	8.25	8.65	0.36
Conductivity, µmhos, Field-Ambient	405	500			400	450	4	500	400	439	47
Conductivity, µmhos, Lab at 25°C	445	494	517	547	566	546	6	566	445	519	44
TDS, Evaporation at 180°C	343	338	305	331	345	320	6	345	305	330	15
Sodium	115	112	99	113	118	108	6	118	99	111	6.7
Potassium	7	9	3	6	4	5	6	9	3	5.7	2.2
Calcium	1	7	6	7	5	4	6	7	1	5.0	2.3
Magnesium	1	2	3	1	1	1	6	3	1	1.5	0.8
Sulfate	128	106	76	105	114	97	6	128	76	104	17
Chloride	9	10	13	3	6	4	6	13	3	7.5	3.8
Carbonate	67	34	TR	31	26	19	6	67	TR	29.5	22.0
Bicarbonate	22	120	185	129	132	137	6	185	22	121	54
Hydroxide											
Total Milliequivalent Major Cations	5.31	5.61	4.93	5.50	5.56	5.11					
Total Milliequivalent Major Anions	5.50	5.58	4.98	5.41	5.57	5.01					
Absolute Value, Charged, Balance	-1.76	0.03	0.53	0.82	0.09	.99					
Ammonia as N	0.22	0.14	ND	ND	0.12	ND	6	0.27	ND	0.11	0.07
Nitrate as N (0.05)	ND	0.6	ND	0.05	ND	ND	5	0.05	ND	0.05	-
Fluoride (0.1)	0.65	0.57	0.57	0.51	0.85	.36	6	0.85	0.36	0.59	0.16
Total Alkalinity as $CaCO_3$	130	155	152	158	152	144	6	158	130	149	10.2
Total Hardness as $CaCO_3$	7	25	27	22	16	14	6	27	7	18.5	7.6
Boron (0.01)	ND	0.1	ND	ND	ND	ND	6	0.1	ND	0.025	0.037
Aluminum (0.05)	0.25	ND	ND	ND	ND	ND	6	0.25	ND	0.083	0.082
Arsenic (0.005)	0.008	0.014	0.008	.004	ND	ND	5	0.014	ND	0.008	0.0037
Barium (0.03)	ND	ND	ND	ND	ND	ND	6	-	ND	0.03	-
Cadmium (0.002)	ND	0.012	ND	ND	0.005	ND	6	0.012	ND	0.0042	0.0040
Chromium (0.01)	0.01	ND	ND	ND	ND	ND	6	0.01	ND	0.01	-
Copper (0.01)	ND	ND	0.02	ND	0.01	ND	6	0.02	ND	0.0117	0.0043
Iron (0.01)	0.01	0.06	0.09	0.01	.20	.17	6	0.2	0.01	0.09	0.080
Lead (0.01)	ND	ND	ND	ND	ND	ND	6	-	ND	0.01	-
Manganese (0.01)	0.01	ND	ND	.01	.01	.01	6	0.01	ND	0.01	-
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	6	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	6	-	ND	0.02	-
Selenium (0.005)	ND	ND	ND	ND	ND	ND	6	-	ND	0.005	-
Zinc (0.005)	0.31	0.04	0.04	.002	.013	ND	5	0.31	ND	0.082	0.129
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.020	0.005	0.007	0.007	.02	0.001	6	0.028	0.001	0.0113	0.0104
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Radium 226, PiC/L (0.5)	4.7	6.7	4.6	5.8	7.0	9.7	6	9.7	4.6	6.42	1.89
Radium, Precision, PiC/L	±1.3	±1.5	±1.2	±1.2	±1.5	±1.2					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

TR - trace.

The underlined data are considered as outliers and are not included in the calculations.

TABLE D-6.9, p.3
Baseline Water Quality Data For
20-Sand Aquifer
(Revised 7/6/81)

WELL	5-M-20										
DATE SAMPLED	6/12/80	7/15/80	10/6/80	12/15/80	1/21/81	5/8/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	13	14	14.4	14.3	14	14.5	6	14.5	13	14	0.6
pH, Units Field	8.4	8.0	8.6	9.3	8.4	8.4	6	9.3	8	8.5	0.4
pH, Units, Lab at 25°C	7.93	7.78	7.92	7.94	7.96	8.32	6	8.32	7.78	7.98	0.18
Conductivity, μmhos, Field-Ambient	450	500			450	440	4	500	440	460	27
Conductivity, μmhos, Lab at 25°C	480	497	534	558	579	636	6	636	480	547	57
TDS, Evaporation at 180°C	349	344	347	338	342	374	6	374	338	349	13
Sodium	121	114	107	110	115	111	6	121	107	113	5
Potassium	5	6	5	4	3	3	6	6	3	4.3	1.2
Calcium	8	8	10	8	7	4	6	10	4	7.5	2.0
Magnesium	1	3	1	2	2	2	6	3	1	2.0	0.9
Sulfate	120	108	106	105	116	92	6	120	92	108	10
Chloride	7	10	4	3	5	6	6	10	3	5.8	2.5
Carbonate				0	0	12	3	12	0	4	6.9
Bicarbonate	185	195	181	190	190	176	6	195	176	186	7
Hydroxide											
Total Milliequivalent Major Cations	5.87	5.76	5.36	5.45	5.59	5.36					
Total Milliequivalent Major Anions	5.73	5.73	5.29	5.38	5.67	5.37					
Absolute Value, Charged, Balance	1.21	0.26	0.75	0.65	0.71	0.09					
Ammonia as N	ND	0.16	0.13	ND	ND	ND	6	0.16	ND	0.08	0.05
Nitrate as N (0.05)	ND	0.2	ND	ND	ND	ND	6	0.2	ND	0.075	0.061
Fluoride (0.1)	0.61	0.57	0.85	0.51	0.74	0.36	6	0.85	0.36	0.607	0.172
Total Alkalinity as $CaCO_3$	152	160	148	156	156	165	6	165	148	156	6
Total Hardness as $CaCO_3$	24	32	29	28	26	22	6	32	22	27	3.6
Boron (0.01)	0.1	ND	ND	ND	ND	ND	6	0.1	ND	0.025	0.037
Aluminum (0.05)	0.16	ND	0.29	0.08	ND	ND	6	0.29	ND	0.113	0.097
Arsenic (0.005)	0.041	0.016	0.032	.008	ND	0.012	6	0.041	ND	0.019	0.014
Barium (0.03)	ND	ND	ND	ND	ND	ND	6	-	ND	0.03	-
Cadmium (0.002)	ND	0.003	0.004	ND	ND	ND	6	0.004	ND	0.0025	0.0008
Chromium (0.01)	0.02	ND	ND	ND	ND	ND	6	0.02	ND	0.0117	0.0042
Copper (0.01)	ND	ND	ND	.01	ND	ND	6	0.01	ND	0.01	-
Iron (0.01)	0.04	0.05	0.16	.01	0.09	0.07	6	0.16	0.01	0.07	0.052
Lead (0.01)	ND	ND	ND	ND	ND	ND	6	-	ND	0.01	-
Manganese (0.01)	0.04	ND	0.04	.03	0.01	0.02	6	0.04	ND	0.025	0.014
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	6	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	6	-	ND	0.02	-
Selenium (0.005)	ND	ND	ND	ND	ND	ND	6	-	ND	0.005	-
Zinc (0.005)	0.34	0.007	0.03	.005	0.024	ND	6	0.34	ND	0.0685	0.1334
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.045	0.003	0.003	<0.001	0.004	0.001	6	0.045	< 0.001	0.0095	0.0174
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Radium 226, PiC/L (0.5)	0.5	0.8	1.3	1.3	3.0	1.3	6	3.0	0.5	1.37	0.87
Radium, Precision, PiC/L	±0.4	±0.5	±0.7	±0.6	±1.0						

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

Table D-6.9, p. 4

Baseline Water Quality Data
20-Sand Aquifer (Revised 7/6/81)

WELL	7-M-20 (New)
DATE SAMPLED	5/8/81
Temperature, °C, Field	15
pH, Units Field	8.4
pH, Units, Lab at 25°C	8.26
Conductivity, µmhos, Field-Ambient	440
Conductivity, µmhos, Lab at 25°C	550
TDS, Evaporation at 180°C	356
Sodium	106
Potassium	3
Calcium	4
Magnesium	2
Sulfate	78
Chloride	8
Carbonate	10
Bicarbonate	176
Hydroxide	
Total Milliequivalent Major Cations	5.05
Total Milliequivalent Major Anions	5.07
Absolute Value, Charged, Balance	.40
Ammonia as N	ND
Nitrate as N (0.05)	ND
Fluoride (0.1)	0.30
Total Alkalinity as $CaCO_3$	161
Total Hardness as $CaCO_3$	18
Boron (0.01)	ND
Aluminum (0.05)	ND
Arsenic (0.005)	ND
Barium (0.03)	ND
Cadmium (0.002)	ND
Chromium (0.01)	ND
Copper (0.01)	ND
Iron, Total (0.01)	.20
Lead (0.01)	ND
Manganese (0.01)	.02
Mercury (0.0005)	ND
Nickel (0.02)	ND
Selenium (0.005)	ND
Zinc (0.005)	.015
Molybdenum (0.05)	ND
Uranium, U_3O_8, (0.001)	.001
Vanadium, V_2O_5, (0.05)	ND
Radium 226, PiC/L (0.5)	7.8
Radium, Precision, PiC/L	±1.1

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

TABLE D-6. 9, p. 5.
Baseline Water Quality Data For
20-Sand Aquifer
(Revised 7/6/81)

WELL	41.										
DATE SAMPLED	6/12/80	10/8/80	10/8/80	12/16/80	1/21/81	5/14/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	12	14	14.6	12.0	11	13	6	14.6	11	12.8	1.4
pH, Units Field	8.5	8.6	8.6	8.4	8.5	8.4	6	8.6	8.4	8.5	0.1
pH, Units, Lab at 25°C	7.81	8.43	7.88	7.91	7.84	7.83	6	8.43	7.81	7.95	0.24
Conductivity, umhos, Field-Ambient	605	500	-	440	390	410	5	605	390	469	87
Conductivity, umhos, Lab at 25°C	453	524	512	529	572	535	6	572	453	521	39
TDS, Evaporation at 180°C	332	308	312	311	329	346	6	346	308	323	15
Sodium	112	102	104	107	112	112	6	112	102	108	5
Potassium	5	6	5	4	3	5	6	6	3	4.7	1.03
Calcium	8	7	6	8	8	9	6	9	6	7.67	1.03
Magnesium	2	3	2	1	1	2	6	3	1	1.83	0.75
Sulfate	110	85	75	96	105	117	6	117	75	98	16
Chloride	8	10	8	4	5	6	6	10	4	6.8	2.2
Carbonate		22		0	0	0	4	22	0	5.5	11
Bicarbonate	193	142	185	185	185	183	6	193	142	179	18
Hydroxide											
Total Milliequivalent Major Cations	5.65	5.19	5.11	5.23	5.43	5.61					
Total Milliequivalent Major Anions	5.69	5.17	5.03	5.14	5.35	5.60					
Absolute Value, Charged, Balance	0.35	0.19	0.16	0.87	0.74	0.09					
Ammonia as N	ND	0.18	ND	ND	ND	ND	6	0.18	ND	0.072	0.053
Nitrate as N (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Fluoride	0.51	0.51	0.14	0.43	0.57	0.51	6	0.57	0.14	0.445	0.156
Total Alkalinity as $CaCO_3$	159	153	152	152	151	150	6	159	150	153	3
Total Hardness as $CaCO_3$	33	30	23	24	24	30	6	33	23	27	4.2
Boron (0.01)	0.08	0.1	ND	ND	ND	ND	6	0.08	ND	0.037	0.042
Aluminum (0.05)	0.20	ND	ND	ND	ND	ND	6	0.20	ND	0.075	0.061
Arsenic (0.005)	0.014	0.014	0.012	0.001	ND	0.001	4	0.014	ND	0.011	0.004
Barium (0.03)	ND	ND	ND	ND	ND	ND	6	-	ND	0.03	-
Cadmium (0.002)	ND	ND	ND	ND	ND	0.003	6	0.003	ND	0.0022	0.0004
Chromium (0.01)	ND	ND	ND	ND	ND	ND	6	-	ND	0.01	-
Copper (0.01)	ND	ND	ND	ND	ND	ND	6	-	ND	0.01	-
Iron (0.01)	0.02	0.05	0.14	.03	0.04	ND	6	0.14	ND	0.048	0.047
Lead	0.15	ND	ND	ND	ND	ND	5	-	ND	0.01	-
Manganese (0.01)	0.01	0.01	ND	.01	0.01	0.02	6	0.02	ND	0.011	0.004
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	6	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	6	-	ND	0.02	-
Selenium (0.005)	ND	0.003	ND	ND	ND	ND	5	-	ND	0.005	-
Zinc (0.005)	0.89	ND	0.01	.009	0.037	0.006	5	0.037	ND	0.013	0.013
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.006	0.010	0.011	0.003	0.004	<0.001	6	0.011	<0.001	0.0058	0.0040
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.058	-
Radium 226, PiC/L (0.5)	175	161	127	156	143	225	6	225	127	165	34
Radium, Precision, PiC/L	±7	±7	±7	±6	±7	±6					

Analyses reported in milligr per liter except where noted

( ) detection limit.

ND - not detected.

The underlined data are considered as outliers and are not included in the calculations.

TABLE D-6.9, p. 6.
Baseline Water Quality Data For
20-Sand Aquifer
(Revised 7/6/81)

WELL	RL										
DATE SAMPLED	6/12/80	7/23/80	10/6/80	12/16/80	1/22/81	5/11/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	11.5	14	14.4	12.0	13	.12	6	14.4	11.5	12.8	1.2
pH, Units Field	8.6	8.6	8.8	8.5	8.2	9.4	6	9.4	8.2	8.7	0.4
pH, Units, Lab at 25°C	7.82	8.25	8.12	7.98	7.90	8.48	6	8.48	7.82	8.09	0.25
Conductivity, µmhos, Field-Ambient	445	500	-		400	420	4	500	400	441	43
Conductivity, µmhos, Lab at 25°C	468	523	511	523	566	534	6	566	468	521	32
TDS, Evaporation at 180°C	332	299	321	310	335	328	6	335	299	321	14
Sodium	109	99	105	106	110	109	6	110	99	106	4
Potassium	5	5	5	4	3	4	6	5	3	4.3	0.8
Calcium	6	6	10	8	6	7	6	10	6	7.2	1.6
Magnesium	2	4	1	1	3	1	6	4	1	2	1.3
Sulfate	98	75	99	99	108	84	6	108	75	94	12
Chloride	6	9	9	4	5	4	6	9	4	6.2	2.3
Carbonate		17		0	0	41	4	41	0	14.5	19.4
Bicarbonate	193	163	178	183	185	127	6	193	127	172	24
Hydroxide											
Total Milliequivalent Major Cations	5.33	5.07	5.28	5.19	5.42	5.27					
Total Milliequivalent Major Anions	5.38	5.05	5.23	5.17	5.42	5.31					
Absolute Value, Charged, Balance	0.47	0.20	0.48	0.19	0	0.38					
Ammonia as N	ND	0.28	0.21	ND	ND	ND	6	0.28	ND	0.115	0.103
Nitrate as N (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	0.039
Fluoride (0.1)	0.43	0.38	0.51	0.43	0.65	0.27	6	0.65	0.27	0.445	0.128
Total Alkalinity as $CaCO_3$	159	162	146	150	151	172	6	172	146	157	10
Total Hardness as $CaCO_3$	23	32	29	24	28	21	6	32	21	26	4.2
Boron (0.01)	0.08	ND	ND	ND	ND	ND	6	0.00	ND	0.022	0.029
Aluminum (0.05)	0.38	ND	0.23	.15	ND	0.3	6	0.38	ND	0.19	0.14
Arsenic (0.005)	0.094	0.022	0.008	.001	ND	ND	5	0.094	ND	0.027	0.038
Barium (0.03)	ND	ND	ND	ND	ND	ND	6	-	ND	0.03	-
Cadmium (0.002)	ND	0.004	0.008	ND	ND	ND	6	0.008	ND	0.0033	0.0024
Chromium (0.01)	ND	ND	ND	ND	ND	ND	6	-	ND	0.02	-
Copper (0.01)	0.02	ND	ND	ND	ND	ND	6	0.02	ND	0.0117	0.0043
Iron (0.01)	ND	<.01	0.14	.02	0.01	0.16	6	0.16	ND	0.058	0.071
Lead (0.01)	ND	ND	ND	ND	ND	ND	6	-	ND	0.01	-
Manganese (0.01)	0.02	0.03	0.02	.01	0.01	ND	6	0.03	ND	0.0167	0.0082
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	6	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	6	-	ND	0.02	-
Selenium (0.005)	ND	ND	ND	ND	ND	ND	6	-	ND	0.005	-
Zinc (0.005)	0.08	0.04	0.06	.004	.019	ND	5	0.08	ND	0.041	0.030
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.071	0.026	0.019	.019	0.003	0.008	6	0.071	0.003	0.024	0.024
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	6	-	ND	0.05	-
Radium 226, PiC/L (0.5)	120	136	74	143	83	131	6	143	74	115	29
Radium, Precision, PiC/L	±6	±7	±5	±6	±5	±4					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

The underlined data are considered as outliers and are not included in the calculations.

Table D-6.10
Baseline Water Quality Data for
Well 1-M-30 - 30-Sand
(Revised 7/6/81)

DATE SAMPLED	2/11/80	6/12/80	7/18/80	10/8/80	12/18/80	1/20/81	5/13/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation
Temperature, °C, Field	8	13.5	13	14.6		13	14	6	14.6	8	12.7	2.4
pH, Units Field	10.0	9.8	10.4	10.2	9.8	9.6	9.6	7	10.4	9.6	9.9	0.3
pH, Units Lab at 25°C	9.60	9.51	9.54	9.26	9.14	8.88	9.43	7	9.6	8.88	9.34	0.26
Conductivity, µmhos, Field-Ambient	410	605	600	-	400	480	440	6	605	400	489	92
Conductivity, µmhos, Lab at 25°C	550	555	575	535	605	658	435	7	658	435	559	69
TDS, Evaporation at 180°C	359	381	362	336	378	366	326	7	381	326	358	21
Sodium	126	135	125	115	135	130	113	7	135	113	126	9
Potassium	7	10	13	7	7	5	5	7	13	5	7.7	2.9
Calcium	2	1	4	2	2	3	2	7	4	1	2.3	1.0
Magnesium	1	1	1	4	1	2	1	7	4	1	1.57	1.13
Sulfate	85	98	70	76	105	86	88	7	105	70	87	12
Chloride	14	14	18	14	9	9	9	7	18	9	12.4	3.5
Carbonate	96	108	126	86	96	65	67	7	126	65	92	22
Bicarbonate	39	22		46	39	122	49	6	122	22	53	35
Hydroxide												
Total Milliequivalent Major Cations	5.84	6.26	6.05	5.61	6.23	6.10	5.18					
Total Milliequivalent Major Anions	6.00	6.39	6.17	5.58	6.27	6.20	5.11					
Absolute Value, Charged Balance	1.35	1.03	0.98	0.27	.32	0.81	0.66					
Ammonia as N	0.30	ND	0.20	ND	ND	ND	ND	7	0.3	ND	0.11	0.10
Nitrate as N (0.05)	0.17	ND	0.4	ND	ND	ND	ND	7	0.4	ND	0.117	0.133
Fluoride (0.1)	1.07	1.16	0.74	1.38	0.99	1.07	0.65	7	1.38	0.65	1.01	0.25
Total Alkalinity as $CaCO_3$	192	198	210	180	192	208	151	7	210	151	190	20
Total hardness as $CaCO_3$	8	7	14	22	9	16	7	7	22	7	12	5.7
Boron (0.01)	ND	0.1	ND	ND	ND	ND	ND	7	0.1	ND	0.023	0.034
Aluminum (0.05)	0.31	0.28	ND	ND	ND	ND	ND	6	0.28	ND	0.09	0.094
Arsenic (0.005)	ND	ND	0.008	ND	ND	ND	ND	7	0.008	ND	0.0054	0.0011
Barium (0.03)	0.04	ND	ND	ND	ND	ND	ND	7	0.04	ND	0.0314	0.0038
Cadmium (0.002)	ND	ND	ND	ND	.003	.003	ND	7	0.003	ND	0.0023	0.0005
Chromium (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.01	-
Copper (0.01)	ND	ND	ND	ND	.01	ND	0.02	7	0.02	ND	0.0114	0.0038
Iron, Total (0.01)	0.06	0.03	0.03	0.17	.07	0.04	0.06	7	0.17	0.03	0.066	0.049
Lead (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.01	-
Manganese (0.01)	0.02	0.02	ND	ND	ND	ND	ND	7	0.02	ND	0.013	0.005
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.02	-
Selenium (0.005)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.005	-
Zinc (0.005)	0.01	0.24	0.12	0.01	.012	.021	0.004	6	0.24	0.01	0.069	0.094
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.003	0.022	0.004	0.002	0.007	0.041	0.001	7	0.041	0.001	0.0114	0.0149
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Radium 226, PiC/L (0.5)	0.3	0.56	13	1.3	1.1	3.1	1.3	6	13	0.56	3.39	4.78
Radium, Precision, PiC/L	±0.2	±0.4	±0.7	±0.7	±0.6	±1.0	±0.5					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

Table D-6.11

Baseline Water Quality Data for

Well 1 - W - 51 - 51-Sand

(Revise 7/6/81)

DATE SAMPLED	6/12/80	7/18/80	10/2/80	1/22/81*	5/13/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	12.5	14	11.0	11	11	5	14	11	11.9	1.3
pH Units Field	8.5	8.2	8.2	8.3	8.2	5	8.5	8.2	8.28	0.13
pH Units Lab at 25°C	8.33	8.57	7.78	8.01	8.29	5	8.57	7.78	8.20	0.31
Conductivity µmhos, Field-Ambient	395	420	443	360	360	5	443	360	396	37
Conductivity µmhos, Lab at 25°C	410	467	500	513	385	5	513	385	455	56
TDS, Evaporation at 180°C	286	283	261	268	298	5	298	261	279	15
Sodium	108	110	90	96	107	5	110	90	102	9
Potassium	4	4	3	3	3	5	4	3	3.4	0.6
Calcium	6	4	7	7	4	5	7	4	5.6	1.5
Magnesium	3	1	3	3	3	5	3	1	2.6	0.9
Sulfate	15	21	46	18	17	5	46	15	23.4	12.8
Chloride	10	10	6	5	7	5	10	5	7.6	2.3
Carbonate	31	22		0	20	4	31	0	18.3	13.1
Bicarbonate	228	224	212	266	240	5	266	212	234	21
Hydroxide										
Total Milliequivalent Major Cations	5.35	5.17	4.59	4.86	5.18					
Total Milliequivalent Major Anions	5.36	5.12	4.60	4.87	5.15					
Absolute Value, Charged Balance	0.09	0.49	0.16	0.10	0.29					
Ammonia as N	ND	0.13	ND	ND	ND	5	0.13	ND	0.07	0.04
Nitrate as N (0.05)	ND	0.5	ND	ND	ND	5	0.5	ND	0.14	0.20
Flouride (0.1)	0.36	0.75	1.68	1.24	0.65	5	1.68	0.36	0.94	0.52
Total Alkalinity as $CaCO_3$	239	220	174	218	230	5	239	174	216	25
Total Hardness as $CaCO_3$	28	15	30	30	22	5	30	15	25	6.5
Boron (0.01)	ND	ND	ND	ND	ND	5	- -	ND	0.01	-
Aluminum (0.05)	0.12	ND	ND	ND	ND	5	0.12	ND	0.064	0.031
Arsenic (0.005)	ND	0.006	0.004	ND	ND	4	0.006	ND	0.0053	0.0005
Barium (0.03)	ND	ND	ND	ND	ND	5	-	ND	0.03	-
Cadmium (0.002)	ND	ND	ND	0.002	ND	5	0.002	ND	0.002	-
Chromium (0.01)	ND	ND	ND	ND	ND	6	-	ND	0.01	-
Copper (0.01)	0.01	ND	ND	ND	ND	5	0.01	ND	0.01	-
Iron, Total (0.01)	ND	0.01	0.08	0.03	0.09	5	0.09	ND	0.044	0.039
Lead (0.01)	ND	ND	ND	ND	ND	5	-	ND	0.01	-
Magnese (0.01)	0.01	ND	0.02	0.02	0.02	5	0.02	ND	0.016	0.0055
Mercury (0.0005)	ND	ND	ND	ND	ND	5	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	5	-	ND	0.02	-
Selenium (0.005)	ND	ND	ND	ND	ND	5	-	ND	0.005	-
Zinc (0.005)	0.66	0.12	0.01	.034	0.008	5	0.66	0.008	0.166	0.280
Molybdenum (0.05)	ND	ND	ND	ND	ND	5	-	ND	0.05	-
Uranium, U_3O_8 (0.001)	0	0.003	0.002	<0.001	0.002	4	0.003	<0.001	0.002	0.0008
Vanadium, V_2O_5 (0.05)	ND	ND	ND	ND	ND	5	-	ND	0.05	
Radium 226 PiC/L (0.5)	1.0	0.8	1.5	6.4	2.6	5	6.4	0.8	2.46	2.31
Radium, Precision, PiC/L	±0.6	±0.5	±0.7	±1.5	±0.6					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected

Table D-6.11, p. 2
Baseline Water Quality Data
51-Sand Aquifer (Revised 7/6/81)

WELL	1-M-51
DATE SAMPLED	5/13/81
Temperature, ^{o}C, Field	13.5
pH, Units Field	8.3
pH, Units, Lab at 25^{o}C	8.25
Conductivity, µmhos, Field-Ambient	450
Conductivity, µmhos, Lab at 25^{o}C	472
TDS, Evaporation at 180^{o}C	394
Sodium	139
Potassium	4
Calcium	7
Magnesium	2
Sulfate	56
Chloride	9
Carbonate	14
Bicarbonate	290
Hydroxide	
Total Milliequivalent Major Cations	6.66
Total Milliequivalent Major Anions	6.64
Absolute Value, Charged, Balance	0.15
Ammonia as N	ND
Nitrate as N (0.05)	ND
Fluoride (0.1)	0.65
Total Alkalinity as $CaCO_3$	261
Total Hardness as $CaCO_3$	26
Boron (0.01)	ND
Aluminum (0.05)	ND
Arsenic (0.005)	ND
Barium (0.03)	ND
Cadmium (0.002)	ND
Chromium (0.01)	ND
Copper (0.01)	ND
Iron, Total (0.01)	.05
Lead (0.01)	ND
Manganese (0.01)	.02
Mercury (0.0005)	ND
Nickel (0.02)	ND
Selenium (0.005)	ND
Zinc (0.005)	.010
Molybdenum (0.05)	ND
Uranium, U_3O_8, (0.001)	<.001
Vanadium, V_2O_5, (0.05)	ND
Radium 226, PiC/L (0.5)	3.8
Radium, Precision, PiC/L	±0.9

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

Table D-6.12
Baseline Water Quality Data for
Well 1-M-10 - 10-Sand
(Revised 7/6/81)

DATE SAMPLED	2/11/80	6/12/80	7/24/80	10/31/80	12/17/81	1/22/81	5/8/8[illegible]	No. of Samples	Maximum Observed	Minimum Observed	Mean	Stand Deviation
Temperature, °C, Field	7.5	13.0	13	13.4	12.6	10	10	7	13.4	7.5	11.4	2.2
pH, Units Field	8.10	8.6	7.6	8.8	9.0	8.6	8.7	7	9.0	7.6	8.5	0.5
pH, Units, Lab at 25°C	8.61	8.31	8.62	8.12	8.3	8.14	8.53	7	8.62	8.12	8.38	0.2
Conductivity, µmhos, Field-Ambient	330	405	400	-	390	320	400	6	405	320	374	39
Conductivity, µmhos, Lab at 25°C	415	464	457	477	465	487	509	7	509	415	468	29
TDS, Evaporation at 180°C	319	305	278	297	278	276	311	7	319	276	295	18
Sodium	117	100	102	98	104	98	117	7	117	98	105	8
Potassium	5	5	5	3	4	3	3	7	5	3	4	1
Calcium	5	2	6	6	7	6	6	7	7	2	5.4	1.6
Magnesium	2	4	1	9	1	2	2	7	9	1	3.0	2.8
Sulfate	12	27	26	30	27	32	33	7	33	12	27	7
Chloride	10	8	8	10	3	4	6	7	10	3	7	2.8
Carbonate	39	29	31		53	0	31	5	53	29	36.6	9.9
Bicarbonate	244	198	195	268	161	240	232	7	268	161	220	37
Hydroxide												
Total Milliequivalent Major Cations	5.63	4.91	4.95	5.38	5.05	4.80	5.63					
Total Milliequivalent Major Anions	5.83	5.01	5.00	5.30	5.04	4.72	5.69					
Absolute Value, Charged Balance	1.75	1.01	0.50	0.73	0.10	0.84	0.53					
Ammonia as N	0.33	0.22	0.24	ND	ND	0.12	ND	7	0.33	ND	0.151	0.113
Nitrate as N (0.05)	0.10	ND	0.3	ND	ND	ND	ND	7	0.3	ND	0.093	0.093
Fluoride (0.1)	0.79	0.45	0.65	1.07	0.61	0.99	0.45	7	1.07	0.45	0.72	0.25
Total Alkalinity as $CaCO_3$	265	211	212	220	220	197	242	7	265	197	224	23
Total Hardness as $CaCO_3$	20	22	19	52	21	23	23	7	52	19	26	12
Boron (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.01	-
Aluminum (0.05)	0.01	0.31	ND	ND	0.06	ND	0.07	6	0.31	ND	0.098	0.104
Arsenic (0.005)	ND	0.006	ND	0.004	ND	ND	ND	6	0.006	ND	0.0052	0.0004
Barium (0.[illegible])	0.04	ND	ND	ND	ND	ND	ND	7	0.04	ND	0.031	0.0038
Cadmium (0.002)	ND	0.003	ND	ND	.003	0.002	ND	7	0.003	ND	0.0023	0.0005
Chromium (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.02	-
Copper (0.01)	ND	0.02	ND	0.02	.01	ND	0.01	7	0.02	ND	0.013	0.005
Iron, Total (0.01)	0.14	0.05	0.02	0.03	.27	0.05	0.08	7	0.27	0.02	0.091	0.088
Lead (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.01	-
Manganese (0.01)	0.06	0.01	0.02	ND	.02	0.02	0.02	7	0.06	ND	0.023	0.017
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.02	-
Selenium (0.005)	ND	0.005	ND	0.004	ND	ND	ND	6	0.005	ND	0.005	-
Zinc (0.005)	0.01	0.33	0.06	0.04	.035	.035	ND	7	0.33	ND	0.074	0.115
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.007	0.008	0.003	0.003	0.005	0.002	0.001	7	0.008	0.001	0.0041	0.0026
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Radium 226, PiC/L (0.5)	0.3	0.95	3.9	1.8	3.4	1.4	3.6	6	3.9	0.95	2.51	1.27
Radium, Precision, PiC/L	±0.2	±0.6	±0.2	±0.8	±1	±0.7	±0.7					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

Table D-6.13, p. 1
Baseline Water Quality Data For
Stock Wells
(Revised 7/6/81)

WELL	Moore S.											
DATE SAMPLED	2/12/80	6/12/80	7/18/80	10/31/80	12/15/80	1/19/81	5/13/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	7	13.5	13.5	13.5	13.5	13	14	7	14	7	12.6	2.5
pH, Units Field	8.6	8.4	8.0	7.9	8.6	8.4	8.0	7	8.6	7.9	8.3	0.3
pH, Units, Lab at 25°C	8.21	7.79	8.02		7.89	7.97	8.18	6	8.21	7.79	8.01	0.16
Conductivity, μmhos, Field-Ambient	420	445	480	-		440	420	5	480	420	441	25
Conductivity, μmhos, Lab at 25°C	470	481	590	518	535	592	453	7	592	453	520	56
TDS, Evaporation at 180°C	336	335	363	299	327	359	351	7	363	299	339	22
Sodium	112	113	111	98	107	120	119	7	120	98	111	7.5
Potassium	3	4	5	3	4	3	3	7	5	3	3.6	0.8
Calcium	8	6	10	8	9	9	6	7	10	6	8.0	1.5
Magnesium	2	4	2	2	3	2	2	7	4	2	2.43	0.8
Sulfate	105	108	110	78	105	123	115	7	123	78	107	14
Chloride	10	8	10	8	5	6	1	7	10	1	6.9	3
Carbonate	5				0	0	0	4	5	0	1.25	2.5
Bicarbonate	185	190	183	185	190	193	198	7	198	183	189	5.3
Hydroxide												
Total Milliequivalent Major Cations	5.51	5.65	5.62	4.90	5.45	5.91	5.72					
Total Milliequivalent Major Anions	5.66	5.60	5.57	4.88	5.44	5.90	5.67					
Absolute Value, Charged Balance	1.34	0.44	0.45	0.22	0.09	0.08	0.44					
Ammonia as N	0.31	ND	ND	ND	ND	ND	ND	7	0.31	ND	0.087	0.098
Nitrate as N (0.05)	ND	ND	1.2	ND	ND	ND	ND	6	-	ND	0.05	-
Fluoride (0.1)	0.74	1.38	0.40	0.65	0.51	0.74	0.33	7	1.38	0.33	0.68	0.35
Total Alkalinity as $CaCO_3$	160	1	150	152	156	158	162	7	162	150	156	4
Total Hardness as $CaCO_3$	28	32	33	28	35	30	23	7	35	23	29.9	4
Boron (0.01)	0.02	0.1	ND	ND	ND	ND	ND	7	0.1	ND	0.024	0.034
Aluminum (0.05)	ND	0.22	ND	ND	ND	ND	ND	7	0.22	ND	0.074	0.064
Arsenic (0.005)	0.020	0.036	0.024	0.016	.027	0.02	0.034	7	0.036	0.016	0.025	0.0075
Barium (0.03)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.03	-
Cadmium (0.002)	ND	0.005	0.005	0.003	ND	0.005	ND	7	0.005	ND	0.0034	0.0015
Chromium (0.01)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.02	-
Copper (0.01)	ND	0.09	ND	0.02	ND	0.01	0.04	7	0.09	ND	0.027	0.030
Iron, Total (0.01)	0.14	0.11	0.11	0.13	.09	0.23	0.18	7	0.23	0.09	0.141	0.0485
Lead (0.01)	ND	0.13	ND	ND	ND	ND	ND	6	-	ND	0.01	-
Manganese (0.01)	0.06	0.02	0.03	0.02	.03	0.03	0.04	7	0.06	0.02	0.033	0.014
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.02	-
Selenium (0.005)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.005	-
Zinc (0.005)	0.07	0.43	0.09	0.06	.012	0.026	0.007	7	0.43	0.007	0.099	0.149
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.004	0.016	0.004	0.010	<0.001	<0.001	<0.001	7	0.016	<0.001	0.0053	0.0057
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	ND	7	-	ND	0.05	-
Radium 226, PiC/L (0.5)	3.2	0.84	0.5	1.0	1.2	0.8	4.0	7	4	0.5	1.66	1.37
Radium, Precision, PiC/L	±0.4	±0.5	±0.4	±0.6	±.6	±0.5	±0.9					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND = not detected.

The underlined data are considered as outliers and are not included in the calculations.

TABLE D-6.13, p.2
Baseline Water Quality Data For Stock Wells
(Revised 7/6/81)

WELL	Moore N.												
DATE SAMPLED	2/12/80	6/12/80	7/16/80	10/2/80	12/15/81	12/15/80	1/19/81	5/11/81	No. of Samples	Maximum Observed	Minimum Observed	Mean	Standard Deviation (σ)
Temperature, °C, Field	7	14	16		13	10.6	10	12	7	16	7	11.8	2.9
pH, Units Field	8.8	8.3	8.3		8.0	8.7	8.3	8.4	7	8.8	8.0	8.4	0.3
pH, Units, Lab at 25°C	8.24	7.24	7.82	7.99	7.88	7.91	7.91	8.18	8	8.24	7.24	7.90	0.30
Conductivity, umhos, Field-Ambient	380	445	500				400	410	5	500	380	427	47
Conductivity, umhos, Lab at 25°C	460	451	469	500	500	512	539	555	8	555	451	498	37
TDS, Evaporation at 180°C	320	316	310	284	287	293	320	330	8	330	284	308	17
Sodium	113	109	105	97	97	102	112	107	8	113	97	105	6
Potassium	4	4	6	3	3	4	2	3	8	6	2	3.6	1.2
Calcium	5	5	9	7	6	6	7	6	8	9	5	6.4	1.3
Magnesium	2	2	2	2	4	1	1	1	8	4	1	1.9	0.99
Sulfate	77	79	70	58	71	68	80	69	8	80	58	72	7.2
Chloride	10	10	10	8	7	6	6	7	8	10	6	8.0	1.8
Carbonate	10					0	0	0	4	10	0	2.5	5.0
Bicarbonate	195	212		207	202	203	212	215	7	215	195	207	7.0
Hydroxide													
Total Milliequivalent Major Cations	5.43	5.25	5.33	4.81	4.92	4.92	5.35	5.11					
Total Milliequivalent Major Anions	5.41	5.40	5.27	4.83	4.99	4.91	5.31	5.17					
Absolute Value, Charged, Balance	0.18	1.41	0.57	0.17	0.63	0.1	0.38	0.58					
Ammonia as N	ND	ND	0.18	ND	ND	ND	ND	ND	8	0.18	ND	0.066	0.046
Nitrate as N (0.05)	0.06	ND	ND	ND	ND	ND	ND	ND	8	0.06	ND	0.051	0.004
Fluoride (0.1)	0.65	0.51	1.38	0.85	0.74	0.61	0.85	0.45	8	1.38	0.45	0.73	0.29
Total Alkalinity as $CaCO_3$	177	174	176	170	166	166	174	180	8	180	166	173	5
Total Hardness as $CaCO_3$	20	21	31	26	31	19	21	19	8	31	19	23.5	5.1
Boron (0.01)	0.02	ND	ND	ND	ND	ND	ND	ND	8	0.02	ND	0.011	0.0035
Aluminum (0.05)	0.01	0.21	ND	ND	ND	ND	ND	ND	7	0.21	ND	0.073	0.061
Arsenic (0.005)	0.002	0.006	0.008	0.004	0.004	ND	ND	ND	5	0.008	ND	0.0058	0.0013
Barium (0.03)	ND	ND	ND	ND	ND	ND	ND	ND	8	-	ND	0.03	-
Cadmium (0.002)	ND	ND	ND	0.003	ND	.002	ND	ND	8	0.003	ND	0.0021	0.0004
Chromium (0.01)	ND	ND	ND	ND	ND	ND	ND	ND	8	-	ND	0.02	-
Copper (0.01)	ND	0.02	ND	0.01	ND	ND	ND	ND	8	0.02	ND	0.011	0.0035
Iron, Total (0.01)	0.20	0.05	0.10	0.16	0.11	.06	0.09	0.32	8	0.32	0.05	0.136	0.089
Lead (0.01)	ND	0.12	ND	ND	ND	ND	ND	ND	8	0.12	ND	0.024	0.039
Manganese (0.01)	0.17	0.02	ND	0.04	0.02	.02	0.03	0.02	8	0.17	ND	0.041	0.053
Mercury (0.0005)	ND	ND	ND	ND	ND	ND	ND	ND	8	-	ND	0.0005	-
Nickel (0.02)	ND	ND	ND	ND	ND	ND	ND	ND	8	-	ND	0.02	-
Selenium (0.005)	ND	ND	0.002	ND	ND	ND	ND	ND	7	-	ND	0.005	
Zinc (0.005)	0.05	0.06	0.05	0.02	0.06	.013	.017	0.006	8	0.06	0.006	0.0345	0.0226
Molybdenum (0.05)	ND	ND	ND	ND	ND	ND	ND	ND	8	-	ND	0.05	-
Uranium, U_3O_8, (0.001)	0.003		0.017	0.007	ND	0.058	0.004	<0.001	7	0.058	ND	0.013	0.021
Vanadium, V_2O_5, (0.05)	ND	ND	ND	ND	ND	ND	ND	ND	8	-	ND	0.05	-
Radium 226, PiC/L (0.5)	1.1	1.5	0.8	1.3	0.5	0.9	1.3	1.9	8	1.9	0.5	1.16	0.44
Radium, Precision, PiC/L	±0.3	±0.7	±0.5	±0.6	±0.4	±0.5	±0.7	±0.5					

Analyses reported in milligrams per liter except where noted.

( ) detection limit.

ND - not detected.

NRC Comment 5 (6/16/81)

E. First Part

What is your quality assurance program, including that of any outside lab used, regarding water quality sampling and analyses?

Response:

a. Quality Assurance Programs will be maintained by the Radiation Safety Officer of UUS, who is reporting directly to the Manager Solution Mining. All QA programs will be conducted according to the Regulation Guide 4.15. Standard QA procedures will be maintained through the operational plan.

Laboratory

Outside labs will be contracted based upon their response to requirements of 4.15. All labs will be required to file QA documents with UUS prior to contract finalization.

In-house labs will be placed under the same QA requirements with audits, inspections, etc. as the outside labs, again following the 4.15 requirements.

All lab work will be performed using Standard Methods as required by EPA and the Clean Water.Act. Certifications and qualifications will be on file with UUS as part of the QA program. All labs will be audited through spike samples, split samples and inspections to assure quality control of data.

NRC Comment 5 (6/16/81)

E. Second Part

We note that for all samples split on January 21, 1981, measurable amounts of zinc were reported by WAMCO and in no cases did PAL report detectable amounts. In some instances PAL reports concentrations (of other elements) below their own published detection limits.

Response:

As to the problem of the 21 January 1981 split samples, PAL laboratory were not satisfactory. They will not be used in the future.

NRC Comment 5 (6/16/81)

F. On page D-6.19 you state "baseline groundwater quality will be defined just before start-up on the basis of average concentrations, their standard deviations and maximum and minimum values". Please explain the exact procedure you propose for this determination.

Response:

UUS does not propose, at this time, a procedure for baseline determination. Results of future analysis will be added to the tables until operation start-up. Data and the calculations of average concentrations, maximum and minimum values, and standard deviations made after the inclusion of the final sample prior to start-up, will then be used as criteria for baseline definition.

(Revised 7/6/81)

NRC Comment 5 (6/16/81)

G. On page D-6.17 you state "elements that cannot be detected in four consecutive samples from the same well will be removed from the list of analyses required for that particular well unless a particular element should be mobilized in the leaching zone during the proposed test". Because we would require an analysis for the full suite of parameters only on a quarterly basis during leaching operations we would not permit elimination of such elements from the required list. Only the excursion parameters are required biweekly during leaching.

Response:

Analysis for all baseline parameters will be made and reported on a quarterly basis. The excursion parameters will be sampled, analyzed and reported biweekly.

NRC Comment 5 (6/16/81)

H. What are you proposing as the upper control limit for vanadium considering the fact it is listed as "not detected" in all baseline samples?

Response:

New Tables M-5 and M-6 are submitted giving an Upper Control Limit for vanadium.

(Revised 7/6/81)

Table M-5

Upper Control Limits
Excursion Monitoring For
Well 1-M-20 - Production Zone

	Baseline Mean	Baseline Maximum	Baseline Std Deviation (σ)	Mean Plus 2 σ
pH - Lab at 25°C	8.23	8.65	0.24	7.75-8.71
Conductivity, µmhos Lab at 25°C	505	552	30.3	565.6
Total Alkalinity as $CaCO_3$ mg/l	154	168	10	174
Uranium mg/l**	0.003	0.011	0.0037	1*
Vanadium mg/l**	ND	ND	-	0.10
Chloride	7.9	14	3.4	14.7

Upper Control Limits
Excursion Monitoring For
Well 4-M-20 - Production Zone

	Baseline Mean	Baseline Maximum	Baseline Std. Deviation (σ)	Mean Plus 2 σ
pH - Lab at 25°C	8.65	9.25	0.36	7.93-9.37
Conductivity, µmhos Lab at 25°C	519	566	44	607
Total Alkalinity as $CaCO_3$ mg/l	149	158	10.2	169.4
Uranium mg/l**	0.0113	0.028	0.0104	1*
Vanadium mg/l**	ND	ND	-	0.10
Chloride	7.5	13	3.8	15.1

Upper Control Limits
Excursion Monitoring For
Well 5-M-20 - Production Zone

	Baseline Mean	Baseline Maximum	Baseline Std. Deviation (σ)	Mean Plus 2 σ
pH - Lab at 25°C	7.98	8.32	0.18	7.62-8.34
Conductivity, µmhos Lab at 25°C	547	636	57	661
Total Alkalinity as $CaCO_3$ mg/l	156	165	[illegible]	168
Uranium mg/l**	0.0095	0.045	0.0174	1*
Vanadium gm/l**	ND	ND	-	0.10
Chloride	5.8	10	2.5	10.8

* Upper Control Limit for U_3O_8 suggested by DEQ.
**Uranium as U_3O_8
Vanadium as V_2O_5

(Revised 7/6/81)

Table M-6

Upper Control Limits
Excursion Monitoring For
Well 1-M-10 - Lower Aquifer

	Baseline Mean	Baseline Maximum	Baseline Std. Deviation (σ)	Mean Plus 2 σ
pH - Lab at 25°C	8.38	8.62	0.2	7.98-8.78
Conductivity, µmhos Lab at 25°C	468	509	29	526
Total Alkalinity as $CaCO_3$ mg/l	224	265	23	270
Uranium mg/l**	0.0041	0.008	0.0026	1*
Vanadium mg/l**	ND	ND	-	0.10
Chloride	7	10	2.8	12.6

Upper Control Limits
Excursion Monitoring For
Well 1-M-30 - Upper Aquifer

	Baseline Mean	Baseline Maximum	Baseline Std. Deviation (σ)	Mean Plus 2 σ
pH - Lab at 25°C	9.34	9.60	0.26	8.82-9.86
Conductivity, µmhos Lab at 25°	559	658	69	697
Total Alkalinity as $CaCO_3$ mg/l	190	210	20	230
Uranium mg/l**	0.0114	0.041	0.0149	1*
Vanadium mg/l**	ND	ND	-	0.10
Chloride	12.4	18	3.5	19.4

Upper Control Limits
Excursion Monitoring For
Well 1-W-51 - Domestic Water Supply

	Baseline Mean	Baseline Maximum	Baseline Std. Deviation (σ)	Mean Plus 2 σ
pH - Lab at 25°C	8.20	8.57	0.31	7.58-8.82
Conductivity, µmhos Lab at 25°	455	513	56	567
Total Alkalinity as $CaCO_3$ mg/l	216	239	25	266
Uranium mg/l**	0.002	0.003	0.0008	1*
Vanadium mg/l**	ND	ND	-	0.10
Chloride	7.6	10.0	2.3	12.2

* Upper Control Limit for U_3O_8 suggested by DEQ.
** Uranium as U_3O_8
Vanadium as V_2O_5

(Revised 7/6/81)

NRC Comment 5 (6/16/81)

I. How will use of an NH_4HCO_3 eluant instead of $NaCl/Na_2CO_3$ affect the choice of Cl as an excursion parameter?

Response:

Uranerz U.S.A., Inc. will test both $NaCl/Na_2CO_3$ and NH_4CO_3 as eluants during the pilot plant operation. $NaCl/Na_2CO_3$ will be used first. While this is used as the eluant, Cl is an appropriate excursion parameter.

NRC Comment 5 (6/16/81)

J. Referring to p. M-27, what do you propose as a course of action if the two analyses (split sample) obtained as excursion confirmation samples differ markedly?

Response:

If the two analyses of a split sample differ markedly, the following procedure would be followed.

1. Any unusual result would be compared to previous data to determine its potential as an outlier.

2. The sample would be rerun by UUS lab and the outside lab to determine if the results were caused by a procedural error.

3. Following the procedure, described on page M-27, a second control sample will be taken three days after an excursion is suspected.

NRC Comment 5 (6/16/81)

K. It is not clear what water quality parameters you propose to measure during an excursion.

Response:

The water quality parameters to be measured during an excursion are listed on Tables M-5 and M-6. Upper control limits for HCO_3 and CO_3 will be added prior to start-up. The parameters were proposed by WDEQ.

NRC Comment 5 (6/16/81)

L. Referring to pages M-28, M-29 regarding corrective action, it is not clear what the proposed sampling schedule is after the first 2 weeks of an excursion.

Response: Add the following to paragraph 1, Page M-29.

Weekly sampling of the monitor well in excursion status, and of all other monitor wells, with analysis for all UCL parameters, will be done continuously after the first two weeks. This will continue until recovery from excursion has been achieved and maintained for a continuous period of at least one month.

NRC Comment 5 (6/16/81)

M. Referring to paragraphs No. 3 and 4 on p. M-29, what is meant by a "substantial decrease" in concentration?

Response:

A 50%, or more, decrease in concentration.

(Revised 7/6/81)

NRC Comment 6 (6/16/81)

Referring to your statement on page M-26, "The leak detection system will be checked daily for leakage solution during initial filling of a pond. The time intervals will later be extended to two weeks", we require leak detection systems to be checked on a daily basis.

Response:

Paragraph 2, page M-26, first sentence is revised to read:

The leak detection system will be checked daily for leakage solutions, as part of the daily walk through by the RST.

(Revised 7/6/81)

NRC Comments 7.A through 7.I (6/16/81)

Due to the complexity of and detail required to respond to Comment 7, all parts, the responses are submitted as a supplement to follow page D-6.15.

(Revised 7/6/81)

NRC Comment 7 (6/16/81)

The following questions refer to hydrologic test No. 9.

A. What "borehole damage" exists in wells 5L and 6L as noted on the graphs? No mention of this exists in the text. Were or are repair measures necessary?

Response:

Bore hole damage is caused when drilling mud or cement invade the producing formation, thus causing reduced permeability in the immediate vicinity of the completed interval. No repair measures are necessary.

NRC Comment 7 (6/16/81)

B. The M-20 wells have different completion intervals than pumped well 4L. Were the data corrected for the effects or partial penetration? If not, provide justification. The subject is not addressed in the text.

Response:

Transmissivities appear slightly lower in the center of the proposed test area than in the outlying monitor wells. This may be due to the partial penetration of the pumped well and of those observation wells that are labeled "L". The "L" wells are located within a radius of 110 ft. of the pumped well which is twice the thickness (55 ft.) of the aquifer. Within this area vertical flow components will theoretically influence the observed drawdown readings during pump tests. The sedimentary environment in roll front aquifers is, however, so varied that differences in transmissivity have to be expected. The variations in Table D-6.5 may be an account of the varying transmissivity through the roll front. The differences, however, are small enough to be explained as well by errors that are inherent in the pumping test methods. Correcting for possible partial penetration effects would not increase the accuracy of the results. The range of transmissivity values given in Table D-6.5 describes the transmissivity at the test site in general. It is not practical to assign transmissivity values to any particular volume of the aquifer smaller than the test site.

NRC Comments 7.C, 7.E and 7.I (6/16/81)

C. There are inconsistencies in the text regarding the log-log plot for well 4L.

* p. D-6.10: The heterogeneous nature of the transmissivity can also be considered responsible for the abnormal shape of the drawdown curve of the pumped well 4L in hydro test No. 9.

* p. D-6.10: The most plausible explanation for the curves shape is a change in transmissivity at a certain distance from the pumped well.

* p. D-6.10: As there are not such deformities (re: obs. well curves) the conclusions can be made that there are no hydraulic boundaries within the area between the monitor wells.

* p. D-6.14: 4L: The early flattening out of the drawdown curve is due to a slightly falling flow rate at the time (200-930-min). The flowrate was then readjusted.

* During our site visit Mr. Froehlich stated that the declining flow rate was a deliberate measure taken to keep the water level above the level of the pump.

The following apply to part C, above.

c1: The text needs clarification on the above items.

c2: Why wasn't the test initially run at a lower Q to eliminate drawdown problems at the pump well?

c3: Was the drawdown data corrected for a variable Q? If not, this should be done.

(Revised 7/6/81)

E. On page D-6.10 and again on D-6.15 it states there were no pressure changes in the upper and lower aquifers. Data provided indicated a .5 psi reduction in the lower aquifer and a .2 psi reduction in the upper aquifer. In addition, the drawdown curve for well 4-M-20 shows a break from the Theis curve of a nature often indicative of leakage. Provide a detailed explanation of this observ tion.

I. Based on all parts of question 7, justify the validity of hydrologic test No. 9.

Response: 7.C, 7.E, and 7.I:

Long term pump tests like test No. 9 in this context are conducted to provide evidence on two possible hydraulic situations that would impair a solution mining project:

A. Hydraulic boundaries
B. Leaky aquifer conditions.

Hydraulic boundaries can be negative like tight faults or bedrock contacts. This condition would be observed as increased slopes in all drawdown curves. There is no indication of this in all the pump test data.

A positive boundary would be an area of recharge to the pumped aquifer which would be observed as a decline of the slope in all drawdown curves. Such decline has been observed in only one well (4L). Other reasons for declining slopes of drawdown curves are:

- improving hydraulics in the pumped well.
- changing transmissivity in the distance.
- declining flow rates.

These factors are extremely difficult to be quantified exactly. The need to do so would only be justified if there were doubts about the confinement of the target aquifer in an area within the monitored leaching zone. Complete confinement of the leaching zone is assured by the pumping test results as the upper and lower monitor wells did not react to the pumping of the target aquifer. The small pressure reduction in both 1-M-30 and 1-M-10 at a late point of time during test No. 9 can be explained by various other factors:

- a change in barometric pressure.
- elastic reactions to pressure changes in the 20-sand which is sandwiched between the 10- and 30- sands (Noorbergum Effect*).

Otherwise the pressure changes are small enough to be explained by reading error:

Observation Well No.	Pressure Gauge	Marked Intervals	Readings
1-M-10	0-60 psi	2 psi	25.5 - 25.0 psi
1-M-30	0-15 psi	0.5 psi	8.0 - 7.8 psi

(1 psi = 0.0703 kp/cm^2)

If in fact the observed pressure changes were caused by a hydraulic connection between the aquifers, this connection would be outside of the monitored area of the 20-sand aquifer as the pressure changes were observed at a time when the radius of influence from the pumped well had already reached far beyond the outling monitor wells (M-20 wells). The drawdown curve 4-M-20 is considered a good approximation of the Theis-Curve within the limits of accuracy of the method.

*Verruigt, A. 1969, Elastic Storage of Aquifers, in: Flow through Porous Media; R. DeWeist, Ed.: Acad. Press, NY, pp. 331-376.

(Revised 7/6/81)

During test No. 9 the pumping rate was held as constant as possible under field conditions in order to facilitate test interpretation. The average flow rate was 10.91 gpm ($0.69\ 10^{-3}\ m^3\ sec^{-1}$) over a period of 2130 minutes. During that time the extremes were +1.51 gpm ($0.063\ 10^{-3}\ m^3\ sec^{-1}$)(13.8%) and -0.24 gpm ($0.015\ 10^{-3}\ m^3\ sec^{-1}$)(2.2%). This accuracy is considered adequate for this purpose. Drawdown data from the pumped well were not included into the average calculations of transmissivity and storage coefficient for this and other reasons stated above. Drawdown observations in the other wells are not affected by the slight variations in the pumping rate.

(Revised 7/6/81)

NRC Comments 7 (6/16/81)

D. Why wasn't recovery data used in the analysis of test No. 9? This data should be analyzed.

Response:

Recovery data from test No. 9 was analyzed (see attached Graph 4L) but was not considered relevant.

NRC Comments 7 (6/16/81)

F. Why wasn't recovery data obtained for the upper and lower aquifers?

Response:

During test No.9, water pressures in the upper and lower aquifers remained at ±2% of the readings they had shown for weeks before the test and were therefore not measured during the recovery phase of the test.

NRC Comments 7 (6/16/81)

G. Why weren't water levels (or pressures) taken prior to starting of the pump test and taken into account during analysis?

Response:

The 0-minute readings of water pressures of each well were taken before start-up of the pumping tests. They are not included on the graph sheets as no attempt was made to quantify the casing capacity and skin effects which become negligible in the later parts of the curves.

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NRC Comments 7 (7/16/81)

H. Why weren't barometric data obtained prior to and during the test and taken into account during analysis?

Response:

Barometric variations may reach extremes of 25 inches (0.635 m) of water or less than 1 psi (0.0703 kp/cm^2). No extreme weather situations were observed during test No. 9. Any possible effects on the observed drawdown curves would have negligible extent.

NRC Comment 8 (6/16/81)

Referring to figure M-7A, Fluid Flow Path, why are negative values assigned to injection wells and positive values to production wells relating to relative water level differences.

Response:

Head pressures are given in feet drawdown. Injection pressures are therefore negative drawdown.

(Revised 7/6/81)

NRC Comment 9 (6/16/81)

Submit additional information regarding the nature of the fluid flow model.

Response:

The computer model that was used for Figure M-7A was developed by the U.S. Bureau of Mines for the purpose of simulating uranium solution mining. Following is an abstract of their Report of Investigation No. 8479* describing the model:

> This Bureau of Mines report describes the development and application of a computer model for simulating the hydrological activity associated with in situ leaching. The model is intended to provide uranium resource developers with a description of the flow behavior of leachants and ground water during the development, production, and restoration phases of leaching operation involving an arbitrary pattern of injection and recovery wells.
>
> Different aquifer environments are modeled, using a closed-form solution to the partial differential equation that describes three-dimensional changes in piezometric head as a result of pumping from leachant injection and recovery wells. The computer program can model a maximum of 50 arbitrarily located wells.

*Computer Modeling of Fluid Flow During Production and Environmental Restoration Phases of In Situ Uranium Leaching,
US Bureau of Mines Report of Investigations 8479,
Robert D. Schmidt, 1980

Numerical techniques involving difference quotients and Taylor expansions about time points are used to derive time, velocity, areal sweep, and fluid volume parameters associated with leaching hydraulics. These parameters are output by the program in graphic and tabular formats. Other numeric methods insure that the program running time is minimized without significantly affecting the accuracy of results.

(Revised 7/6/81)

NRC Comment 10 (6/16/81)

Regarding your statement on page R-2 (part III, reclamation), "the purified water from these processes (R.O.) may be reinjected into the 20-sand or could be discharged to the Dry Fork of the Powder River", any such proposed discharges would have to be supported by an analysis alternatives, including the alternative of discharge to a lined evaporation pond, covering the environmental and economic impacts associated with each alternative. Prior approval by the NRC through the issuance of a special license amendment would be required. Our experience with similar matters indicates an NPDES permit would also be required.

Response:

Uranerz U.S.A., Inc. acknowledges that an analysis covering the environmental and economic impacts must be made for any alternative disposal of water during restoration, and, that appropriate permits and amendments would need to be obtained.

NRC Comment 11 (6/16/81)

The NRC routinely requires all solid process residues to be disposed of in a licensed tailings impoundment. Any alternative proposals shall require an analysis of alternative methods as indicated by appropriate criteria of Appendix A of 10 CFR 40.

Response:

Uranerz U.S.A., Inc. acknowledges that all solid process residues must be disposed in a licensed tailings impoundment, and will follow the proper procedures for their disposal.

NRC Comment 12 (6/16/81)

Any proposal to dispose of contaminated material (clothing, spent filters, etc.) on-site would require approval of the NRC through issuance of a special license.

Response:

The Uranerz U.S.A., Inc. procedure for the disposal of all contaminated material, including clothing, spent filters, etc.) will be in an approved NRC disposal site.