

Semiannual Quality Assurance Report
Church Rock Site
Second Half of 1990
July and October Events

February 1991

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1.0 Requirements

The quality assurance and control procedures are contained in Section 3.0 of the Remedial Action Plan for the Churchrock site dated April 1989. The procedures address sampling, chain of custody, laboratory quality control and data validation.

These requirements became effective on July 3, 1989 when United Nuclear received the Administrative Order on the Churchrock site from the Environmental Protection Agency (EPA).

2.0 Field Sampling Procedures

Copies of the field sampling report sheets for the third and fourth quarters of 1990 are included in Appendix A. These sheets indicate the estimated volume of water purged from the well prior to sampling and the field parameters of pH, temperature and conductivity. The field blank and rinsate analysis reports are also included in Appendix A.

3.0 Chain of Custody

Copies of the Chain of Custody forms are included in Appendix B. Energy Laboratories, Inc., our contract laboratory, is located in Casper, WY. Energy Labs inspects the sample shipments upon arrival to verify the information on the Chain of Custody form and to determine if samples arrive at the appropriate temperature.

4.0 Laboratory Quality Control

Copies of the Internal Quality Control report prepared by Energy Laboratories and the associated EPA performance evaluations are included in Appendix C.

5.0 Data Validation

Analytical reports are reviewed by the Churchrock General Manager/Radiation Safety Officer after receipt from Energy Labs. The reported values are compared to previous reports for each well.

Significant increases or decreases and out of range values are identified and the laboratory is requested to recheck the suspect values. The laboratory responds by checking the transcription for these items and, where necessary, repeats the analysis. A revised report is then issued for that sample if an error is discovered.

As a result of this screening process, 29 errors out of 3,456 laboratory determinations were discovered and corrected in the second half of 1990.

Appendix A

Field Data Sheets

GROUND WATER MONITORING FIELD DATA SHEET

WATER DEPTH AND PURGING

3rd QUARTER 19 90

Well No.	Month /Day	Time	Water Depth	Purging Method	Est. Vol. Purged
FW-1	7-1-90	11:34	48.7	AIR LIFT	5
1- * GW-2	7-1-90	10:15	44.0	" "	3
GW-3	7-1-90	09:27	40.8	" "	
1- * GW-4	7-1-90	09:41	46.5	" "	2
1- * EPA-1	7-11-90	13:16	232.4	Pumped-DRY	12.6
EPA-2	7-16-90	12:53	174.6	" "	18.3
1- * EPA-3	7-16-90	12:38	128.6	" "	15.6
EPA-4	7-16-90	09:58	200.7	" "	50.4
1- * EPA-5	7-16-90	10:09	116.3	" "	60.1
EPA-7	7-16-90	10:20	104.6	" "	135.6
EPA-8	7-16-90	09:35	217.7	" "	65.3
EPA-9	7-16-90	09:47	165.8	" "	14.9
1- * EPA-11	7-11-90	13:37	151.1	" "	0 *
1- * EPA-12	7-11-90	14:13	166.4	" "	21.3
1- * EPA-13	7-16-90	09:18	153.7	" "	33.0 - (muddy)
2- * EPA-14	7-12-90	14:29	79.0	Conductivity-Settled	277.1
1- * EPA-15	7-9-90	12:47	123.8	Pumped-DRY	200.0
- EPA-17	7-9-90	11:03	186.5	Hand-Bailed	2.0
EPA-18	7-16-90	08:59	164.0	Pumped-DRY	33.2
1- * EPA-22A	7-16-90	11:33	42.7	" "	30.9 - (muddy)
1- * EPA-23	7-13-90	09:36	31.6	Conductivity-Settled	300
EPA-25	7-13-90	08:47	42.8	" "	115 - (sandy)
EPA-27	7-12-90	10:43	46.8	Pumped DRY	7.4
EPA-28	7-13-90	10:15	51.7	Conductivity-Settled	171.1
411	7-1-90	08:42	119.2	AIR-LIFT	4
1- * 420	7-1-90	08:31	106.8	" "	5 - G.P.
1- * 126	7-6-90	10:00	81.4		

*EPA #11 Pump is too high - Not enough Water
To fill Drop line.

GROUND WATER MONITORING FIELD DATA SHEET

WATER DEPTH AND PURGING

2nd. QUARTER 19 90

Well No.	Month /Day	Time	Water Depth	Purging Method	Est. Vol. Purged
2 - * 501-B	7-9-90	10:38	165.1	Hand-Bail	2.5
2 - * 502-B	7-1-90	07:57	143.0	Air-LIFT	3
1 - * 504-B	7-1-90	07:45	138.2	" "	2 - G.P.
1 - * 509-D	7-1-90	10:03	36.0	" "	15
1 - * 515-A	7-1-90	11:58	90.6	" "	2.5
1 - * 516-A	7-1-90	12:13	86.0	" "	3
1 - * * 517	7-1-90	08:22	78.7	" "	5
* 518	7-1-90	08:01	?	" "	0
1 - * 604	7-1-90	12:04	89.4	" "	15
1 - * 614	7-1-90	11:51	85.3	" "	12
1 - * 510	7-1-90	12:25	126.0	" "	13
624	7-1-90	11:12	38.9	" "	25
1 - * 627	7-1-90	09:02	46.0	" "	18
1 - * * 632	7-9-90	08:54	32.4	Hand-Bail	3.0
1 - * 639	7-9-90	09:34	35.2	Bailed - S.T.	6.0
1 - * 642	7-9-90	09:50	47.0	" "	12.0
1 - * 644	7-9-90	10:07	44.2	" "	6.0
645	7-9-90	10:19	43.6	" "	4.0 Bailed dr.
6 - * TWQ-9D	7-9-90	08:23	65.2	Hand-Bailed	1.0 Bailed dry.
TWQ-29A	7-1-90	09:21	54.7	Air-LIFT	1.5
1 - * TWQ-106D	7-9-90	08:34	55.3	Hand-Bailed	.3 Bailed dry.
TWQ-141	7-1-90	06:25	213.6	Air-LIFT	10
TWQ-142	7-1-90	06:47	223.9	" "	10
TWQ-143	7-1-90	07:32	280.3	" "	12
1 - * * 804	7-6-90	14:02	35.8		
805	7-6-90	14:05	38.6		
806	7-6-90	14:09	38.4		
807	7-6-90	14:12	40.7		
FIELD BLANK					
RINSATE					
518 - 7-9-90	13:20	122.9	Air Lifted	1.5	- G.P.
* Well is plugged at 101.0 (518)					
7-5-90 → Dropped Bailer down well + unplugged.					
Bailed about 17 gal.					

GROUND WATER MONITORING FIELD DATA SHEET

SAMPLING

3rd. QUARTER 19 90

Well No.	Month /Day	Time	Sampling Method	pH	Cond.	Temp.	Comments
GW-1	7-3-90	10:30	Hand-Bail	6.4	4,900	12.5	
GW-2	7-3-90	10:10	" "	6.3	4,500	9.8	
✓ GW-3	7-2-90	14:24	" "	6.4	4,100	13.1	
✓ GW-4	7-2-90	14:44	" "	6.8	3,600	13.2	Failed dry to sample.
EPA-1	7-12-90	12:53	Pumped	6.4	3,400	12.8	
EPA-2	7-17-90	13:03	"	6.6	3,000	12.2	
EPA-3	7-17-90	12:51	"	6.7	3,700	13.1	
EPA-4	7-17-90	10:23	"	6.4	3,400	12.9	
EPA-5	7-17-90	11:06	"	6.0	4,200	13.2	
EPA-7	7-17-90	10:47	"	4.4	7,200	12.6	
EPA-8	7-17-90	09:51	"	6.5	3,500	13.1	
EPA-9	7-17-90	10:09	"	4.6	4,100	13.3	
EPA-11			"				
EPA-12	7-12-90	14:12	"	6.0	3,600	14.5	
EPA-13	7-17-90	09:33	"	5.3	3,600	12.8	
EPA-14	7-12-90	14:47	"	5.8	2,800	12.8	
EPA-15	7-10-90	14:15	"	6.2	2,200	12.0	
EPA-17	7-10-90	13:53	Hand-Bail	6.1	4,600	12.9	
EPA-18	7-17-90	09:15	Pumped	5.4	4,000	12.8	Pumped until no more water.
EPA-22A	7-17-90	11:37	"	6.9	1,500	11.9	
EPA-23	7-13-90	09:51	"	6.6	3,800	12.5	
EPA-25	7-13-90	09:04	"	6.7	2,700	12.9	Sandy water
EPA-27	7-13-90	10:48	"	8.9	3,600	12.8	
EPA-28	7-13-90	10:30	"	6.7	3,800	12.4	Pump Sarged 8 Min
411	7-2-90	13:12	Hand-Bail	5.8	2,300	13.8	
420	7-2-90	12:53	" "	6.0	2,300	13.2	

GROUND WATER MONITORING FIELD DATA SHEET

SAMPLING

3rd QUARTER 19 90

Well No.	Month /Day	Time	Sampling Method	pH	Cond.	Temp. °C	Comments
501-B	7-10-90	13:21	Hand-Bail	4.5	4,000	14.5	
502-B	7-2-90	11:05	" "	4.4	3,800	13.1	
504-B	7-2-90	10:40	" "	5.6	3,300	12.1	
509-D	7-3-90	09:49	" "	6.3	4,100	11.8	
515-A	7-3-90	13:11	" "	4.0	7,200	12.8	
516-A	7-3-90	13:42	" "	4.2	8,800	12.8	
517	7-2-90	11:27	" "	5.6	3,200	12.2	
518	7-10-90	14:28	" "	3.3	6,900	12.8	
604	7-3-90	13:26	" "	4.0	4,500	12.7	
614	7-3-90	12:55	" "	6.3	7,000	13.1	
619	7-3-90	13:59	" "	6.5	3,600	13.2	
624	7-3-90	10:53	" "	7.1	3,700	12.0	
627	7-2-90	13:40	" "	6.7	3,700	13.1	
632	7-10-90	09:21	" "	6.3	5,700	12.5	
639	7-10-90	12:10	" "	6.7	3,800	12.8	
642	7-10-90	12:26	" "	6.9	3,300	13.7	
644	7-10-90	12:42	" "	6.8	4,400	12.3	
* 645	7-10-90	12:57	" "	7.0	8,500	13.9	Bailed dry
* TWQ-9D	7-10-90	08:39	" "	4.4	6,000	12.9	" "
✓ TWQ-29A	7-2-90	14:08	" "	7.0	4,000	13.8	Bailed dry to camp
* TWQ-106D	7-10-90	09:03	" "	4.6	3,100	12.8	Bailed dry
TWQ-141	7-2-90	09:28	" "	7.6	1,300	13.3	
TWQ-142	7-2-90	09:50	" "	7.6	1,400	13.6	
TWQ-143	7-2-90	10:15	" "	7.4	1,300	13.7	
801	7-9-90	14:35	Pumped	6.5	8,100	14.5	
802	7-9-90	14:47	"	6.6	6,800	12.8	
803	7-9-90	14:58	"	6.6	5,600	14.2	
FIELD BLANK	7-9-90	15:18		7.1	35	20.7	
RINSE	7-10-90	08:51		4.7	240	20.0	
* 9-D	7-11-90	08:25					Bailed dry
* 106-D	7-11-90	08:44					" "
* 645	7-11-90	09:13					" "
* 106-D	7-11-90	11:12					No water
* 106-D	7-12-90	09:04					Bailed Dry

GROUND WATER MONITORING FIELD DATA SHEET

WATER DEPTH AND PURGING

4th QUARTER 19 90

Well No.	Month / Day	Time	Water Depth	Purging Method	Est. Vol. Purged
GW-1	10-1-90	14:10	48.9	air Lift	6.0 gal
GW-2	10-1-90	14:02	44.2	" "	7.0 "
GW-3	10-1-90	13:19	40.9	" "	4.0 "
GW-4	10-1-90	13:32	46.8	" "	2.5 "
EPA-1	10-15-90	09:20	232.6	Pumped DRY	10.3 "
EPA-2	10-15-90	13:32	174.4	" "	17.1 "
* EPA-3	10-15-90	13:10	129.6	" "	10.4 "
EPA-4	10-15-90	11:45	200.7	" "	53.1 "
EPA-5	10-15-90	11:23	116.4	" "	60.1 "
EPA-7	Pumping		104-		
EPA-8	10-15-90	10:51	217.2	Pumped DRY	68.6 "
EPA-9	10-15-90	11:05	165.7	" "	15.0 "
EPA-11	Well is	Non productive			
* EPA-12	10-15-90	09:59	167.0	Pumped DRY	21.8 "
* EPA-13	10-15-90	10:15	154.4	" "	21.6 "
** EPA-14	10-10-90	12:59	78.8	Pumped until Good Settled	205.7
EPA-15	10-8-90	14:55	123.1	Pumped - DRY	200.0 "
EPA-17	10-8-90	11:14	186.6	Hand Bailed	2.0 "
* EPA-18	10-15-90	10:30	165.4	Pumped DRY	31.1 "
EPA-22A	10-15-90	13:58	44.5	" "	30.0 "
EPA-23	10-11-90	09:06	21.8	Pumped until Good Settled	300.0 "
EPA-25	10-10-90	14:22	42.7	Pumped until Good Settled	130.0 "
EPA-27	10-15-90	14:22	46.7	Pumped DRY	7.1 "
EPA-28	10-15-90	14:35	51.2	" "	85.2 "
* 411	10-1-90	11:48	120.1	air Lift	4.0 "
* 420	10-1-90	11:40	107.9	" "	3.0 "
126	10-1-90	11:34	81.1		
NR-1	10-1-90 - 08:16		40.3	Not enough water to purge.	
NR-2	10-1-90 - 08:36		Dry	Dry	

Sample on EPA #28

OAT 518

10-5-90 -> Canceled -> 17th - 516-A

EPA #7

EPA #3

632

GROUND WATER MONITORING FIELD DATA SHEET

WATER DEPTH AND PURGING

4th QUARTER 19 90

Well No.	Month /Day	Time	Water Depth	Purging Method	Est. Vol. Purged
*- 501-B	10-8-90	10:36	166.1	Hand Bail	2.5 gal
*- 502-B	10-1-90	10:52	144.3	Air Lift	2.5 " G.P.
*- 504-B	10-1-90	10:30	139.0	" "	3.0 "
509-D	10-1-90	13:44	31.8	" "	1.50 "
515-A	10-1-90	14:49	90.9	" "	2.5 "
516-A	10-8-90	12:42	86.8	" "	3.0 "
*- 517	10-1-90	11:12	79.0	" "	5.0 "
2-* - 518	10-8-90	13:03	124.1	" "	1.5 " G.P.
*- 604	10-1-90	14:56	90.0	" "	15.0 "
614	10-1-90	14:41	85.6	" "	13.0 "
*- 619	10-1-90	15:17	126.1	" "	15.0 "
624	10-1-90	14:18	38.8	" "	20.0 "
627	10-1-90	12:48	46.0	" "	18.0 "
*- 632	10-8-90	10:03	33.1	Hand Bailed	3.0 "
639	10-8-90	13:36	35.4	Bail (S.T.)	7.0 "
642	10-8-90	13:50	47.7	" "	12.0 "
*- 644	10-8-90	14:01	45.0	" "	7.0 "
645	10-8-90	14:16	43.6	" " - Dry	- 3.5 "
TWQ-9D	10-8-90	09:30	65.6	Hand Bailed - Dry	.75 "
*- TWQ-29A	10-1-90	13:11	55.0	Air Lift	2.0 "
*- TWQ-106D	10-8-90	09:46	56.2	Hand Bailed - Dry	.25 "
TWQ-141	10-1-90	08:45	213.6	Air Lift	9.0 "
TWQ-142	10-1-90	09:08	223.7	" "	8.0 "
TWQ-143	10-1-90	10:06	230.3	" "	9.0 "
804	10-3-90	13:08	36.1		
805	10-3-90	13:03	39.1		
806	10-3-90	13:00	39.0		
807	10-3-90	12:57	41.3		
FIELD BLANK					
RINSATE					

GROUND WATER MONITORING FIELD DATA SHEET

SAMPLING

4th QUARTER 19 90

Well No.	Month /Day	Time	Sampling Method	pH	Cond.	Temp. °C	Comments
GW-1	10-3-90	10:36	Hand Bail	6.3	14,700	11.6	
GW-2	10-3-90	10:20	" "	6.5	14,400	10.1	
GW-3	10-2-90	15:20	" "	6.6	4,000	11.9	
GW-4	10-3-90	08:46	" "	6.9	3,300	10.9	
EPA-1	10-16-90	09:23	Pumped	6.3	3,400	12.1	
EPA-2	10-16-90	13:50	"	6.4	3,100	12.1	
EPA-3	10-16-90	13:39	"	6.5	3,500	12.9	
EPA-4	10-16-90	11:48	"	6.4	3,200	12.2	
EPA-5	10-16-90	11:29	"	6.0	4,200	12.1	
EPA-7	10-9-90	13:13	Pumping	4.4	6,500	14.1	
EPA-8	10-16-90	10:59	Pumped	6.5	3,400	12.2	
EPA-9	10-16-90	11:12	"	4.7	3,900	12.6	
EPA-11			Nonproductive				
EPA-12	10-16-90	10:02	Pumped	6.0	3,500	12.5	
EPA-13	10-16-90	10:22	"	5.7	3,500	12.2	
EPA-14	10-10-90	14:25	"	5.7	2,800	12.2	
EPA-15	10-10-90	12:36	"	6.4	2,100	11.6	
EPA-17	10-9-90	11:25	Hand Bail	6.3	4,500	12.0	
EPA-18	10-16-90	10:38	Pumped	5.4	4,000	12.8	
EPA-22A	10-16-90	14:13	"	6.8	1,500	11.4	
EPA-23	10-11-90	09:30	"	6.5	3,800	12.0	
EPA-25	10-10-90	14:35	"	6.8	2,800	13.0	Sandy Water
EPA-27	10-16-90	14:38	"	8.2	3,500	11.0	
EPA-28	10-16-90	14:52	"	6.5	3,800	11.4	
411	10-2-90	13:56	Hand Bail	6.2	2,100	12.2	
420	10-2-90	13:35	" "	6.1	2,200	12.0	

GROUND WATER MONITORING FIELD DATA SHEET

SAMPLING

4th QUARTER 19 90

Well No.	Month / Day	Time	Sampling Method	pH	Cond.	Temp. °C	Comments
501-B	10-9-90	11:00	Hand Bail	4.2	3,700	11.3	
502-B	10-2-90	11:24	Hand Bail	4.7	3,500	12.0	
504-B	10-2-90	10:56	" "	5.8	3,300	12.4	
509-D	10-3-90	09:12	" "	6.2	4,100	10.7	
515-A	10-3-90	14:11	" "	4.4	6,900	12.7	
516-A	10-9-90	12:57	" "	4.6	8,200	11.7	
517	10-2-90	11:46	" "	5.5	3,000	12.1	
518	10-9-90	13:40	" "	3.1	2,000	11.8	
604	10-3-90	14:30	" "	4.1	4,500	12.1	
614	10-3-90	13:53	" "	6.3	6,800	12.5	
619	10-3-90	14:55	" "	6.7	3,300	12.5	
624	10-3-90	10:54	" "	7.0	3,700	11.0	
627	10-2-90	14:36	" "	6.8	3,600	12.0	
632	10-9-90	10:34	" "	6.2	6,300	11.2	
639	10-9-90	14:22	" "	6.7	2,900	11.5	
642	10-9-90	14:39	" "	6.7	3,200	12.1	
644	10-9-90	14:55	" "	6.7	4,300	11.7	
645	10-10-90	11:03	" "	6.9	7,300	11.1	*1.7 Gal - Bailed D.
TWQ-9D	10-9-90	09:32	" "	4.3	6,200	10.9	*.75 Gal - Bailed
TWQ-29A	10-2-90	15:06	" "	7.1	3,900	11.8	
TWQ-106D	10-9-90	10:14	" "	4.5	3,000	11.0	*.25 Gal - Bailed
TWQ-141	10-2-90	09:11	" "	7.6	1,300	11.7	
TWQ-142	10-2-90	09:45	" "	7.7	1,400	12.2	
TWQ-143	10-2-90	10:13	" "	7.5	1,300	12.7	
801	10-3-90	10:03	Pumping -	6.3	8,500	16.9	
802	10-3-90	09:49	"	6.6	6,100	12.2	
803	10-3-90	09:30	"	6.5	4,600	15.9	
FIELD BLANK	10-3-90	13:00	—	7.6	160	15.8	
RINSATE	10-9-90	09:48	—	6.4	220	15.6	
9D	10-9-90	15:17	Bailed Day	.4 gal.			
106D	10-9-90	15:30	" "	.2 gal			
106D	10-10-90	08:11	" "	.2 gal			
9D	10-10-90	08:20	" "	.6 gal			Completed
106D	10-10-90	15:25	" "	.2 gal			
106D	10-11-90	08:30	" "	.25 gal			Completed.

UNC MINING AND MILLING: CHURCHROCK OPERATIONS
GROUNDWATER MONITORING PROGRAM: SOUTHWEST ALLUVIUM MONITOR WELLS

NUMBER: Field Blank
I.D.: 90-18094
SAMPLE DATE: 07-09-90
REPORT DATE: 08-15-90
QUARTER REPRESENTED: Third
UNC SUBMITTAL #: TE-15-7-90

MAJOR IONS:		ANALYTICAL RESULT	L.L.D.	UNITS	GROUNDWATER PROTECTION STANDARDS	
					NRC	ARAR
Calcium	(Ca)	1.32	0.05	mg/l		
Magnesium	(Mg)	0.46	0.01	mg/l		
Sodium	(Na)	3.4	0.05	mg/l		
Potassium	(K)	1.6	0.10	mg/l		
Carbonate	(CO ₃)		0.10	mg/l		
Bicarbonate	(HCO ₃)	7.8	0.10	mg/l		
Sulfate	(SO ₄)	0.8	1.0	mg/l		2160
Chloride	(Cl)	0.3	0.10	mg/l		250
Ammonium	(NH ₄)	<0.05	0.05	mg/l		
Nitrate	(NO ₃)	0.03	0.01	mg/l		30.0
Dissolved Solids @ 180 C	(TDS)	14.5	1	mg/l		3170
pH	(units)	6.70	1-14	s.u.		
Cyanide	(CN)	<0.005	0.005	mg/l	0.005	
TRACE METALS:						
Aluminum	(Al)	<0.10	0.10	mg/l		5.0
Arsenic	(As)	<0.001	0.001	mg/l	0.05	0.05
Beryllium	(Be)	<0.05	0.05	mg/l	0.05	0.017
Cadmium	(Cd)	<0.01	0.01	mg/l	0.01	0.01
Cobalt	(Co)	<0.01	0.01	mg/l		0.05
Lead	(Pb)	<0.05	0.05	mg/l	0.05	0.05
Manganese	(Mn)	<0.01	0.01	mg/l		2.6
Molybdenum	(Mo)	<0.10	0.10	mg/l		1.0
Nickel	(Ni)	<0.05	0.05	mg/l	0.05	0.2
Selenium	(Se)	<0.001	0.001	mg/l	0.01	0.01
Vanadium	(V)	<0.10	0.10	mg/l	0.10	0.70
RADIOMETRIC:						
Uranium	(U)	<0.0003	0.0003	mg/l	0.30	5.0
Radium-226	(Ra226)	<0.2	0.2	pCi/l	5.0*	5.0*
Ra-226 precision +/-				pCi/l		
Radium-228	(Ra228)	<1.0	1.0	pCi/l	5.0*	5.0*
Ra-228 precision				pCi/l		
Thorium-230	(Th230)	<0.2	0.2	pCi/l	5.0	15.0
Th-230 precision +/-				pCi/l		
Lead-210	(Pb210)	<1.0	1.0	pCi/l	1.0	
Pb-210 precision +/-				pCi/l		
Gross Alpha - U-nat and Rn-222		<1.0	1.0	pCi/l	15.0	
Gross Alpha precision +/-				pCi/l		

* Radium protection standards refer to combined Ra-226 and Ra-228

TRACE ORGANIC:

Chloroform	2.42	1.0	ug/l	1.0
Napthalene	<1.0	1.0	ug/l	1.0

Q.A. MANAGER: *P.A. Leasing*
Energy Laboratories, Inc.
P.O. Box 3258
Casper, Wyoming 82602

UNC MINING AND MILLING: CHURCHROCK OPERATIONS
GROUNDWATER MONITORING PROGRAM: SOUTHWEST ALLUVIUM MONITOR WELLS

WELL NUMBER: Field Blank
LAB I.D.: 90-25634
SAMPLE DATE: 10-03-90
REPORT DATE: 11-20-90
QUARTER REPRESENTED: Fourth
UNC SUBMITTAL #: TE-20-10-90

MAJOR IONS:		ANALYTICAL RESULT	L.L.D.	UNITS	GROUNDWATER PROTECTION STANDARDS	
					NRC	ARAR
Calcium	(Ca)	0.43	0.05	mg/l		
Magnesium	(Mg)	0.15	0.01	mg/l		
Sodium	(Na)	33.1	0.05	mg/l		
Potassium	(K)	0.6	0.10	mg/l		
Carbonate	(CO ₃)		0.10	mg/l		
Bicarbonate	(HCO ₃)	46.0	0.10	mg/l		
Sulfate	(SO ₄)	21.9	1.0	mg/l		2160
Chloride	(Cl)	8.6	0.10	mg/l		250
Ammonium	(NH ₄)	<0.05	0.05	mg/l		
Nitrate	(NO ₃)	<0.01	0.01	mg/l		30.0
Dissolved Solids @ 180 C	(TDS)	99	1	mg/l		3170
pH	(units)	7.15	1-14	s.u.		
Cyanide	(CN)	<0.005	0.005	mg/l	0.005	
TRACE METALS:						
Aluminum	(Al)	<0.10	0.10	mg/l		5.0
Arsenic	(As)	0.003	0.001	mg/l	0.05	0.05
Beryllium	(Be)	<0.05	0.05	mg/l	0.05	0.017
Cadmium	(Cd)	<0.01	0.01	mg/l	0.01	0.01
Cobalt	(Co)	0.01	0.01	mg/l		0.05
Lead	(Pb)	<0.05	0.05	mg/l	0.05	0.05
Manganese	(Mn)	<0.01	0.01	mg/l		2.6
Molybdenum	(Mo)	<0.10	0.10	mg/l		1.0
Nickel	(Ni)	<0.05	0.05	mg/l	0.05	0.2
Selenium	(Se)	0.002	0.001	mg/l	0.01	0.01
Vanadium	(V)	<0.10	0.10	mg/l	0.10	0.70
RADIOMETRIC:						
Uranium	(U)	0.0010	0.0003	mg/l	0.30	5.0
Radium-226	(Ra226)	<0.2	0.2	pCi/l	5.0*	5.0*
Ra-226 precision +/-				pCi/l		
Radium-228	(Ra228)	<1.0	1.0	pCi/l	5.0*	5.0*
Ra-228 precision				pCi/l		
Thorium-230	(Th230)	<0.2	0.2	pCi/l	5.0	15.0
Th-230 precision +/-				pCi/l		
Lead-210	(Pb210)	<1.0	1.0	pCi/l	1.0	
Pb-210 precision +/-				pCi/l		
Gross Alpha - U-nat and Rn-222		<1.0	1.0	pCi/l	15.0	
Gross Alpha precision +/-				pCi/l		

* Radium protection standards refer to combined Ra-226 and Ra-228

TRACE ORGANIC:

Chloroform	<1.0	1.0	ug/l	1.0
Napthalene	<1.0	1.0	ug/l	1.0

Q.A. MANAGER: *P.A. Leach*
Energy Laboratories, Inc.
P.O. Box 3258
Casper, Wyoming 82602

UNC MINING AND MILLING; CHURCHROCK OPERATIONS
GROUNDWATER MONITORING PROGRAM

WELL NUMBER: Rinsate
1.D.: 90-18096
SAMPLE DATE: 07-10-90
REPORT DATE: 08-14-90
QUARTER REPRESENTED: Third
UNC SUBMITTAL #: TE-16-7-90

MAJOR IONS:		ANALYTICAL RESULT	L.L.D.	UNITS	GROUNDWATER PROTECTION STANDARDS NRC ARAR
Calcium	(Ca)	16.2	0.05	mg/l	
Magnesium	(Mg)	11.8	0.01	mg/l	
Sodium	(Na)	4.6	0.05	mg/l	
Potassium	(K)	1.3	0.10	mg/l	
Carbonate	(CO ₃)		0.10	mg/l	
Bicarbonate	(HCO ₃)	1.5	0.10	mg/l	
Sulfate	(SO ₄)	85.1	1.0	mg/l	2160
Chloride	(Cl)	2.0	0.10	mg/l	250
Ammonium	(NH ₄)	0.05	0.05	mg/l	
Nitrate	(NO ₃)	0.05	0.01	mg/l	30.0
Dissolved Solids @ 180 C	(TDS)	144	1	mg/l	3170
pH	(units)	5.08	1-14	s.u.	
Cyanide	(CN)	<0.005	0.005	mg/l	0.005
TRACE METALS:					
Aluminum	(Al)	0.30	0.10	mg/l	5.0
Arsenic	(As)	<0.001	0.001	mg/l	0.05
Beryllium	(Be)	<0.05	0.05	mg/l	0.05
Cadmium	(Cd)	<0.01	0.01	mg/l	0.01
Cobalt	(Co)	<0.01	0.01	mg/l	0.05
Lead	(Pb)	<0.05	0.05	mg/l	0.05
Manganese	(Mn)	0.20	0.01	mg/l	2.6
Molybdenum	(Mo)	<0.10	0.10	mg/l	1.0
Nickel	(Ni)	<0.05	0.05	mg/l	0.05
Selenium	(Se)	<0.001	0.001	mg/l	0.01
Vanadium	(V)	<0.10	0.10	mg/l	0.10
RADIOMETRIC:					
Uranium	(U)	<0.001	0.0003	mg/l	0.30
Radium-226	(Ra226)	<0.2	0.2	pCi/l	5.0*
Ra-226 precision +/-				pCi/l	5.0*
Radium-228	(Ra228)	<1.0	1.0	pCi/l	5.0*
Ra-228 precision				pCi/l	5.0*
Thorium-230	(Th230)	<0.2	0.2	pCi/l	5.0
Th-230 precision +/-				pCi/l	15.0
Lead-210	(Pb210)	<1.0	1.0	pCi/l	1.0
Pb-210 precision +/-				pCi/l	1.0
Gross Alpha - U-nat and Pn-222		<1.0	1.0	pCi/l	15.0
Gross Alpha precision +/-				pCi/l	

* Radium protection standards refer to combined Ra-226 and Ra-228

TRACE ORGANIC:

Chloroform	2.1	1.0	mg/l	1.0
Napthalene	<1.0	1.0	ug/l	1.0

Q.A. MANAGER: *A.A. Harding*
Energy Laboratories, Inc.
P.O. Box 3258
Casper, Wyoming 82602

UNC MINING AND MILLING: CHURCHROCK OPERATIONS
GROUNDWATER MONITORING PROGRAM: ZONE 3 MONITOR WELLS

WELL NUMBER: Rinsate
LAB I.D.: 90-25872
SAMPLE DATE: 10-09-90
REPORT DATE: 11-20-90
QUARTER REPRESENTED: Fourth
UNC SUBMITTAL #: TE-21-10-90

MAJOR IONS:		ANALYTICAL RESULT	L.L.D.	UNITS	GROUNDWATER PROTECTION STANDARDS NRC ARAR
Calcium	(Ca)	4.57	0.05	mg/l	
Magnesium	(Mg)	5.50	0.01	mg/l	
Sodium	(Na)	35.0	0.05	mg/l	
Potassium	(K)	1.0	0.10	mg/l	
Carbonate	(CO ₃)		0.10	mg/l	
Bicarbonate	(HCO ₃)	33.0	0.10	mg/l	
Sulfate	(SO ₄)	71.4	1.0	mg/l	2160
Chloride	(Cl)	8.7	0.10	mg/l	250
Ammonium	(NH ₄)	<0.05	0.05	mg/l	
Nitrate	(NO ₃)	<0.01	0.01	mg/l	30.0
Dissolved Solids @ 180 C	(TD)	153	1	mg/l	3170
pH	(unit)	7.27	1-14	s.u.	
Cyanide	(CN)	<0.005	0.005	mg/l	0.005
TRACE METALS:					
Aluminum	(Al)	<0.10	0.10	mg/l	5.0
Arsenic	(As)	<0.001	0.001	mg/l	0.05
Beryllium	(Be)	<0.05	0.05	mg/l	0.017
Cadmium	(Cd)	<0.01	0.01	mg/l	0.01
Cobalt	(Co)	0.01	0.01	mg/l	0.05
Lead	(Pb)	<0.05	0.05	mg/l	0.05
Manganese	(Mn)	0.12	0.01	mg/l	0.05
Molybdenum	(Mo)	<0.10	0.10	mg/l	2.6
Nickel	(Ni)	<0.05	0.05	mg/l	1.0
Selenium	(Se)	<0.001	0.001	mg/l	0.2
Vanadium	(V)	<0.10	0.10	mg/l	0.01
RADIOMETRIC:					
Uranium	(U)	<0.0003	0.0003	mg/l	0.30
Radium-226	(Ra226)	<0.2	0.2	pCi/l	5.0*
Ra-226 precision +/-				pCi/l	
Radium-228	(Ra228)	<1.0	1.0	pCi/l	5.0*
Ra-228 precision +/-				pCi/l	
Thorium-230	(Th230)	<0.2	0.2	pCi/l	5.0
Th-230 precision +/-				pCi/l	15.0
Lead-210	(Pb210)	<1.0	1.0	pCi/l	1.0
Pb-210 precision +/-				pCi/l	
Gross Alpha - U-nat and Rn-222		<1.0	1.0	pCi/l	15.0
Gross Alpha precision +/-				pCi/l	

* Radium protection standards refer to combined Ra-226 and Ra-228

TRACE ORGANIC:

Chloroform	<1.0	1.0	ug/l	1.0
Napthalene	<1.0	1.0	ug/l	1.0

Q.A. MANAGER: *R.A. Leavitt*
Energy Laboratories, Inc.
P.O. Box 3258
Casper, Wyoming 82602

Appendix B

Chain of Custody Forms

JNO MILL & MILLING
(St. Rd. 566 - 2 Miles NE of Gallup)
P. O. Drawer QQ
Gallup, NM 87301
(505) 722-6651

CHAIN OF CUSTODY

Energy Laboratories, Inc.
Laboratory
254 N. Center St.
Address
Casper WY 82601
City State Zip
(307) 235-0515
Phone No.

All analysis will be performed in accordance with
EPA approved procedures and/or 15th Edition of
Standard Methods

UNC Submittal No. TE-13-790

Sample Description	Date	Time	Filter 0.45u	PRESERVATION plain	HNO ₃	H ₂ SO ₄	Na ₂ S ₂ O ₃	NaOH	Preserved By	Analysis Required (For all samples listed)
✓ 141	7-2-90	09:28	✓	H.A.V	✓	✓	✓ RA	✓	T.H.	As, Be, Ca, Cd, Cl, HC
✓ 142	"	09:50	✓	✓	✓	✓	✓	✓		K, Mg, Mn, Na, NH ₃ , Ni
✓ 143	"	10:15	✓	✓	✓	✓	✓	✓		NO ₃ , Pb, Pb-210, pH, S
✓ 504-B	"	10:40	✓	✓	✓	✓	✓	✓		SO ₄ , TDS, Th-230, U, V
✓ 502-B	"	11:05	✓	✓	✓	✓	✓	✓		Chloroform, Cyanide,
✓ 517	"	11:27	✓	✓	✓	✓	✓	✓		Gross Alpha (-) U & Rn
✓ 420 -	"	12:53	✓	✓	✓	✓	✓	✓		Naphthalene, Combined
✓ 411	"	13:12	✓	✓	✓	✓	✓	✓		Ra-226 & Ra-228, Al, C
✓ 627 -	"	13:40	✓	✓	✓	✓	✓	✓		Mo
✓ 29-A	"	14:08	✓	✓	✓	✓	✓	✓		
✓ GW-3	"	14:24	✓	✓	✓	✓	✓	✓		
✓ GW-4 -	"	14:44	✓	✓	✓	✓	✓	✓	T.D.	

Sampled By: Ham Hall
Dispatched By: Keith Sple
Carrier: Kevin Mauer

Received By: Harry Hall
Date: 7-3-90 Time: 1:25

Date: 7-3-90 Time: 09:30
S. Hunter
Lab Receipt Signature
Date: 7/6/90 Time: 2:00 pm

The above analysis to be performed authorized by:
Marshall Fletcher
Signature
Date: 7-3-90

Method of Shipment

CHAIN OF CUSTODY

Energy Laboratories, Inc.

254 N. Center St.

Casper WY 82601

(307) 235-0515

UNC Submittal No.

TE-14-7-90

All analysis will be performed in accordance with EPA approved procedures and/or 15th Edition of Standard Methods

[illegible]

The above analysis to be performed
authorized by:

Date	Time
7-5-90	12:20

Sampled By: John F. Hall Received By:

Field Signature

Dispatched By: Edith L. L. Date _____ Time _____

Lab. Help Signature

	Date	Time
1105. F	7/2/96	1:25
1105. F	7/2/96	1:25

7/9/90

Carrier: W.D. Fur Young 7/5/90 1:25

Date _____ Time _____

Method of Shipment

CHAIN OF CUSTODY

UNC Submittal No. TE-15-7-90

Date 7-10-90

Mode of Shipment

CHAIN OF CUSTODY

UNC Submittal No.

Phone No.

Sampled By: Ann J. Hall

Dispatched By: K. Borgelt

Carrier: UPS

Method of Shipment Cooler

Received By:

7-10-90
Date

Harry S. Hall

1:24 pm
Time

77C-90

J. Hunter
Lab Receipt Signature

7/13/90

10:45
Time

2:00
Time

The above analysis to be performed
authorized by:

Signature

Date 7-10-90

UNC HILL 6-MILLING
(St. Rd. 566 - 1 Miles NE of Gallup)
P. O. Drawer QQ
Gallup, NM 87301
(505) 722-6651

CHAIN OF CUSTODY

Energy Laboratories, Inc.
Laboratory
254 N. Center St.
Address
Casper WY 82601 Zip
City State
(307) 235-0515
Phone No.

All analysis will be performed in accordance with
EPA approved procedures and/or 15th Edition of
Standard Methods

UNC Submittal No. TE-16-7-90

Sample Description	Date	Time	Filter 0.45u	PRESERVATION plain	HNO ₃	H ₂ SO ₄	H ₂ SO ₄	Na ₂ O ₃	NaOH	Preserved By	Analysis Required (For all samples list)
✓ 9-D	7-10-90	08:39	✓	✓	✓	✓	✓	✓	✓	T.D.	As, Be, Ca, Cd, Cl, H
✓ RINSATE	"	08:51	✓	✓	✓	✓	✓	✓	✓	T.D.	K, Mg, Mn, Na, NH ₃ , N
✓ 106-D	"	09:23	✓	✓	✓	✓	✓	✓	✓	T.D.	NO ₃ , Pb, Pb-210, pH,
✓ 632	"	09:21	✓	✓	✓	✓	✓	✓	✓	T.D.	SO ₄ , TDS, Th-230, U,
✓ 639	"	12:10	✓	✓	✓	✓	✓	✓	✓	T.D.	Chloroform, Cyanide,
✓ 642	"	12:26	✓	✓	✓	✓	✓	✓	✓	T.D.	Gross Alpha (-) U & R
✓ 644	"	12:42	✓	✓	✓	✓	✓	✓	✓	T.D.	Naphthalene, Combined
✓ 645	"	12:57	✓	✓	✓	✓	✓	✓	✓	T.D.	Ra-226 & Ra-228, Al,
✓ 501-B	"	13:21	✓	✓	✓	✓	✓	✓	✓	T.D.	Mo
✓ EPA #17	"	13:53	✓	✓	✓	✓	✓	✓	✓	T.D.	
✓ EPA #15	"	14:15	✓	✓	✓	✓	✓	✓	✓	T.D.	
✓ 518	"	14:28	✓	✓	✓	✓	✓	✓	✓	T.D.	

The above analysis to be performed
authorized by:

7-11-90 11:40
Date Time

Received By: Harry S. Hall
7-11-90 1:00 pm
Date Time

Sampled By: Harry S. Hall

Signature Ed Mark

Lab Receipt Signature Susan Hunter

7-11-90 1:00 pm
Date Time

Dispatched By: R. Barget

Signature Ed Mark

7-11-90 02:00
Date Time

Carrier: UPS

Method of Shipment Coolers

CHAIN OF CUSTODY

Phone No. _____

All analysis will be performed in accordance with VFA approved procedures and/or 15th Edition of Standard Methods

UNC Submittal No. **TE-17-7-90**

[illegible]

The above analysis to be performed
authorized by:

7-13-90 11:00 AM

Lab Recipient Signature Jessie Hunter

Date	Time
7/17/90	2:00

Sampled By:	Received By:
<i>Harold</i>	

Dispatched By: R. Bergit Date 7-13-90

Carrier: UPS

Paulo

Method of Shipment

UNC MINN. & HILLING
(St. Rd. 566 - 1 Miles NE of Gallup)
P. O. Drawer QQ
Gallup, NM 87301
(505) 722-6651

CHAIN OF CUSTODY

Energy Laboratories, Inc.
Laboratory
254 N. Center St.
Address
Casper WY 82601
City State Zip
(307) 235-0515
Phone No.

All analysis will be performed in accordance with
EPA approved procedures and/or 15th Edition of
Standard Methods

UNC Submittal No. TE-19-10-90

Sample Description	Date	Time	Filter 0.45u	PRESERVATION plain	H ₂ SO ₄	NO ₃	Na ₂ S ₂ O ₃	NaOH	Preserved By	Analysis Required (For all samples list)
1141	10-2-90	09:11	T.B.	✓	T.B.	T.B.	✓	T.B.	H.H.	As, Be, Ca, Cd, Cl, U
1142	"	09:45	T.B.	✓			✓		H.H.	K, Mg, Mn, Na, NH ₃ , N
1143	"	10:13	"	✓			✓		H.H.	NO ₃ , Pb, Pb-210, PU,
3504-B	"	10:56	"	✓			✓		H.H.	SO ₄ , TDS, Th-230, U,
3502-B	"	11:24	T.B.	✓	T.B.	T.B.	✓	T.B.	H.H.	Chloroform, Cyanide,
3517	"	11:46		✓			✓		H.H.	Gross Alpha (-) U & R
3420	"	13:35		✓			✓		H.H.	Naphthalene, Combined
3411	"	13:56		✓			✓		H.H.	Ra-226 & Ra-228, Al,
A1627	"	14:36		✓			✓		H.H.	Mo
A129-A	"	15:06		✓			✓		H.H.	
A1GW-3	"	15:20	T.B.	✓	T.B.	T.B.	✓	T.B.	H.H.	

The above analysis to be performed
authorized by: M. J. H. H. H.
Signature 10-3-90
Date

Sampled By: Harry J. Hall Received By: Harry J. Hall 10-3-90 11:50
Date Time
Dispatched By: Ronnie Brought 10-3-90 1:20pm
Date Time
Carrier: UPS Lab Receipt Signature Susan Hunter 10/5/90 2:00pm
Date Time

Method of Shipment

UNC 1100: & MILLING
(St. Rd. 566 - 1/2 Miles NE of Gallup)
P. O. Drawer QQ
Gallup, NM 87301
(505) 7. 6651

CHAIN OF CUSTODY

Energy Laboratories, Inc.
Laboratory
254 N. Center St.
Address
Casper WY 82601
City State Zip
(307) 235-0515
Phone No.

All analysis will be performed in accordance with
EPA approved procedures and/or 15th Edition of
Standard Methods

UNC Submittal No. TE-20-10-70

Sample Description	Date	Time	Filter 0.45u	PRESERVATION plain	HNO ₃	H ₂ SO ₄	Na ₂ S ₂ O ₃	NaOH	Preserved By	Analysis Required (For all samples list)
✓ Gw-4	10-3-95	08:46	TH	✓	TH	TH	✓	TH	TH	Ag, Be, Ca, Cd, Cl, H
✓ 509-D	"	09:12		✓			✓			K, Mg, Mn, Na, Ni ₃ , N
✓ 803	"	09:30		✓			✓			NC ₃ , Pt, Pb-210, pH,
✓ 802	"	09:49		✓			✓			SO ₄ , TDS, Th-230, U,
✓ 801	"	10:03		✓			✓			Chloroform, Cyanide,
✓ Gw-2	"	10:20		✓			✓			Gross Alpha (-) U & R
✓ Gw-1	"	10:36		✓			✓			Naphthalene, Combined
✓ 624	"	10:54		✓			✓			Ra-226 & Ra-228, Al,
Field Blank	"	13:00		✓			✓			Mo
✓ 614	"	13:53	✓	✓	✓	✓	✓	✓	TH	
✓ 515-A	"	14:11	✓	✓	✓	✓	✓	✓	TH	
✓ 604	"	14:30	✓	✓	✓	✓	✓	✓	TH	
✓ 619	"	14:55	✓	✓	✓	✓	✓	✓	TH	

Sampled By: Harry S. Hall Received By: Harry S. Hall Date: 10-4-90 Time: 11:10
 Dispatched By: Ronnie Bright Date: 10-4-90 Time: 3:00
 Carrier: UPS Signature: Marked Bright Date: 10-4-90
 Method of Shipment: 5 Coolers

UNC HILL & MILLING
(St. Rd. 566 - 1/2 Miles NE of Gallop)
P. O. Drawer QJ
Gallop, NH 87361
(505) 722-6651

CHAIN OF CUSTODY

Energy Laboratories, Inc.
Laboratory
254 N. Center St.
Address
Casper WY 82601
City State Zip
(307) 235-0515
Phone No.

All analysis will be performed in accordance with
EPA approved procedures and/or 15th Edition of
Standard Methods

UNC Submittal No. TE-21-10-90

Sample Description	Date	Time	Filter 0.45u	PRESERVATION plain HNO ₃ H ₂ SO ₄ H ₂ S ₂ O ₃ NaOH	Preserved By	Analyte Required (For all samples list As, Be, Ca, Cd, Cl, H K, Mg, Mn, Na, Ni, N NO ₃ , Pb, Pb-210, PU, SO ₄ , TDS, Th-230, U, Chloroform, Cyanide, Gross Alpha (-) U & R Naphthalene, Combined Ra-226 & Ra-228, Al, Mo
*9-D	10-9-90	09:32	✓	✓	T-D	
*RINSAIR	"	09:48	✓	✓		
*632	"	10:34	✓	✓		
*516-A	"	12:57	✓	✓		
*EPA-#7	"	13:13	✓	✓		
*EPA #17	"	11:25	✓	✓	T-D	
*501-B	"	11:00	✓	✓	H-A	
*1518	"	13:40	✓	✓		
*639	"	14:22	✓	✓		
*642	"	14:39	✓	✓		
*644	"	14:55	✓	✓		

Sampled By: Haley Hall Received By: Haley Hall Date: 10-11 Time: 1:00
Dispatched By: R. Bergait Date: 10-10-90 Time: 10:00
Carrier: UPS Signature: S. Hunter Date: 10-10-90 Time: 12:45
Method of Shipment: H. Carlin

UNC MFG & MILLING
(St. Rd. 566 - 1/2 Miles NE of Gallop)
P. O. Drawer QQ
Gallop, NH 87301
(505) 722-4651

CHAIN OF CUSTODY

Energy Laboratories, Inc.
Laboratory
254 N. Center St.
Address
Casper WY 82601
City State Zip
(307) 235-0515
Phone No.

All analysis will be performed in accordance with
EPA approved procedures and/or 15th Edition of
Standard Methods

UNC Submittnl No. TE-22-10-90

Sample Description	Date	Time	Filter 0.45u	PRESERVATION plain	HNO ₃	H ₂ SO ₄	Na ₂ S ₂ O ₃	H ₂ O ₂	Preserved By	Analysis Required (For all samples list)
*706-D	10-9-90	10:14	✓	✓	✓	✓	✓	✓	H.H.	As, Be, Ca, Cd, Cl, I, K, Mg, Mn, Na, Ni, Pb, Se, Si, Th, Tl, U, V, Zn, Zr
*706-45	10-10-90	11:03	✓	✓	✓	✓	✓	✓	M.C.	As, Be, Ca, Cd, Cl, I, K, Mg, Mn, Na, Ni, Pb, Se, Si, Th, Tl, U, V, Zn, Zr
*EPA #15	"	12:36	✓	✓	✓	✓	✓	✓	M.C.	As, Be, Ca, Cd, Cl, I, K, Mg, Mn, Na, Ni, Pb, Se, Si, Th, Tl, U, V, Zn, Zr
*EPA #14	"	14:25	✓	✓	✓	✓	✓	✓	M.C.	As, Be, Ca, Cd, Cl, I, K, Mg, Mn, Na, Ni, Pb, Se, Si, Th, Tl, U, V, Zn, Zr
*EPA #25	"	14:35	✓	✓	✓	✓	✓	✓	M.C.	As, Be, Ca, Cd, Cl, I, K, Mg, Mn, Na, Ni, Pb, Se, Si, Th, Tl, U, V, Zn, Zr
*EPA #23	10-11-90	09:30	✓	✓	✓	✓	✓	✓	H.H.	As, Be, Ca, Cd, Cl, I, K, Mg, Mn, Na, Ni, Pb, Se, Si, Th, Tl, U, V, Zn, Zr
										Chloroform, Cyanide, Gross Alpha (-) U & F, Naphthalene, Combined Ra-226 & Ra-228, Al, Mo

Sampled By: Harry Hall Received By: Harry Hall 10-11-90
Dispatched By: R. Borziti 1:43 PM
Carrier: UPS 1:45 PM
Method of Shipment: 3-Order
The above analysis to be performed authorized by: Markel Fletcher Signature
Date: 10-11-90

UNC HILL & MILLING
(St. Rd. 566 - 11 Miles NE of Gallup)
P. O. Drawer QQ
Gallup, NM 87301
(505) 722-6651

CHAIN OF CUSTODY

Energy Laboratories, Inc.
Laboratory
254 N. Center St.
Address
Casper WY 82601
City State Zip
(307) 235-0515
Phone No.

All analysis will be performed in accordance with
EPA approved procedures and/or 15th Edition of
Standard Methods

UNC Submittal No. TE-23-10-90

Sample Description	Date	Time	Filter 0.45u	PRESERVATION plain	HNO ₃	H ₂ SO ₄	Na ₂ S ₂ O ₃	NaOH	Preserved By	Analysis Required (For all samples list)
*EPA #1	10-16-90	09:23	T.B.	✓	T.B.	T.B.	✓	T.B.	H.H.	As, Be, Cu, Cd, Cl, H
*EPA #12	"	10:02		✓			✓			K, Mg, Mn, Na, NH ₃ , N
*EPA #13	"	10:22		✓			✓			NO ₃ , Pb, Pb-210, pH,
*EPA #18	"	10:38		✓			✓			SO ₄ , TDS, Th-230, U,
*EPA #8	"	10:59		✓			✓			Chloroform, Cyanide,
*EPA #9	"	11:12		✓			✓			Gross Alpha (-) U & R
*EPA #5	"	11:29		✓			✓			Naphthalene, Combined
*EPA #4	"	11:48		✓			✓			Ra-226 & Ra-228, Al,
*EPA #3	"	13:39	✓	✓	✓	✓	✓	✓		Mo
*EPA #2	"	13:50	✓	✓	✓	✓	✓	✓		
*EPA #22A	"	14:13	✓	✓	✓	✓	✓	✓		
*EPA #27	"	14:38	✓	✓	✓	✓	✓	✓		
*EPA #28	"	14:52	✓	✓	✓	✓	✓	✓		
									H.H.	

Sampled By: Harry J. Hall Received By: Harry J. Hall 10-17-90 10:30
Date Time
Dispatched By: R. Bergert 10-17-90 2:35pm
Date Time
Carrier: UPS
Cooler
Method of Shipment

S. Hunter
Lab Receipt Signature
10/19/90 1:45 pm
Date Time

The above analysis to be performed
authorized by:
Marshall Fletcher
Signature
10-17-90
Date

Appendix C

Laboratory Quality Control
and
Performance Reports

Energy Laboratories, Inc.
Internal Quality Control Audit
Final Report for 1990

Introduction:

This report is the 1990 summary internal quality control audit. As always, the purpose of this report is to document the continuing precision and accuracy of the data reported by Energy Laboratories', Casper Wyoming Branch.

The following four objectives are shown to be achieved in this report. One, that the data reported in 1990 did lie within the specified confidence ranges. Two, that any updates and modifications that the quality assurance guidelines may have required were in fact necessary and beneficial to the assurance of quality data. Three, a continuing demonstration that the staff is following the guidelines of the program. And fourth, through this report, to show that the system is being checked periodically to assess the effectiveness of the program.

Performance (Certification) Status:

The Radiochemistry Department continued to report acceptable data in EPA Performance Studies for 1990. The Trace Organics Department during 1990 successfully completed it's first Performance Study, the second step towards independent certification by the agency. The Inorganics Department noted acceptable reports for 1990 on it's Performance Studies. Those few parameters which triggered warning limits resulted in minor modifications in sample data reduction/reporting and SOP requirements.

Instrumentation:

Several new instruments and pieces of support hardware were acquired by ELI-Casper during 1990. First was a Perkin-Elmer P-40 ICAP spectrometer with a AS-5i autosampler; second was a Tekmar ALS-2016 autosampler for GC work; third was a Technicon Autoanalyzer 2 for NO_2^- , NO_3^- , and NH_4^+ automated colorimetry measurements; fourth was the addition of computerized data acquisition for the Perkin-Elmer 703 GP/AAS instrument; fifth was the expansion of the hazardous waste department through the addition of Associated Design's 3745-ZHE Zero Headspace Extraction (ZHE) equipment for the newly effective final rule (September 25, 1990) of the Toxicity Characteristic Leaching Procedure (TCLP); and lastly the upgrading and purchasing of four new PC-AT Compatible computer systems. The new equipment increased the laboratory's capabilities in inorganic analysis, trace organic analysis, and data handling. The resulting decrease in turnaround time for routine samples was proven time and again to be an asset to our client base.

QC/QA 1990 Report

Page 2

Quality Control Practices:

The quality control practices employed by the laboratory continued to be effective during 1990. Few parameters were determined to be out of control, with those data resulting in corrections to the system affected. The methods accepted for analytical use by the certifying agencies are continuing to be followed with no method changes made by any member of the staff. The internal audit shows that the standard operating procedures have been followed effectively and that the general data quality from the laboratory has been acceptable. For 1990, duplication of samples occurred at 10.8 % and spiking occurred at 8.3 % for the entire sample load (approximately 30,000 tests). Control charts for duplicate and spike samples have been used routinely and instrument performance tracking has been documented and filed.

Personnel and Training:

Early in 1990 David Blaida was sent to the Canberra class in Radiochemical Techniques and Alpha Spectroscopy allowing his department to remain current in new techniques in the ever growing Radioanalysis area. Steve Dobos and Roger Garling attended the 40 hour OSHA class for hazardous waste identification, safety, sampling, and testing. Steve Dobos also attended the class for P-40 measurements at Perkin-Elmer. Steve Carlston attended the environmental seminar in trace organic analysis hosted by the Finnigan-MAT company.

Several memberships and associations were initiated this year. Roger Garling and Steve Carlston became members of the API in Wyoming. Steve Dobos has become a member of the WWA. Steve Carlston has become a member of the Wyoming State Committee on Pesticides in Groundwater.

ELI-Casper feels very fortunate to have made the following additions to it's staff during 1990: Connie Tucker (Radiochemistry), Dan Rea (Calibrations/Electronics/Instrument Repair), Rick Landeis (Wet Bench/AAS), and Marty Glenn (Soils/Wet Bench). Also during 1990 ELI-Casper saw Kurt Slentz promoted to Branch Manager of the Rapid City, South Dakota Division and the return of Shirley Morava to the Ferret-Nebraska operations at the Crow Butte Mine.

PERFORMANCE EVALUATION REPORT
WATER POLLUTION STUDY NUMBER WFO24

TE: 6/18/90

LABORATORY:

ANALYTES	SAMPLE NUMBER	PERCENT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN PICOGRAMS PER LITER:						
ALUMINUM	1	1160	1200	989- 1440	1010- 1390	ACCEPTABLE
	2	732	750	537- 910	628- 867	ACCEPTABLE
ARSENIC	1	27.1	30.0	20.6- 37.6	22.7- 35.5	ACCEPTABLE
	2	184	180	137- 215	149- 205	ACCEPTABLE
CADMIUM	1	294	300	219- 393	257- 331	ACCEPTABLE
	2	110	110	72.7- 124	96.7- 129	ACCEPTABLE
CHROMIUM	1	50.3	50.0	37.2- 61.0	40.2- 57.0	ACCEPTABLE
	2	700	700	562- 819	595- 787	ACCEPTABLE
COPPER	1	82.5	95.0	72.7- 94.5	75.6- 91.8	ACCEPTABLE
	2	480	500	444- 547	457- 538	ACCEPTABLE
IRON	1	630	550	557- 737	531- 715	ACCEPTABLE
	2	1600	1650	1420- 1860	1480- 1810	ACCEPTABLE
MERCURY	1	8.62	7.00	5.19- 8.74	5.64- 8.30	CHECK FOR ERROR
	2	0.77	1.25	0.729- 1.48	0.873- 1.74	CHECK FOR ERROR
MANGANESE	1	192	200	179- 217	193- 212	ACCEPTABLE
	2	635	650	595- 707	601- 692	ACCEPTABLE
NICKEL	1	196	200	172- 227	179- 220	ACCEPTABLE
	2	784	800	675- 879	721- 974	ACCEPTABLE
LEAD	1	108	100	76.0- 121	81.0- 115	ACCEPTABLE
	2	260	275	239- 309	243- 299	ACCEPTABLE
SELENIUM	1	55.9	70.0	47.5- 81.1	52.0- 77.0	ACCEPTABLE
	2	13.5	16.0	9.71- 19.7	11.0- 13.5	ACCEPTABLE
VANADIUM	1	1140	1150	995- 1300	1040- 1260	ACCEPTABLE
	2	1460	1700	1650- 2150	1710- 2790	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

WATER QUALITY STUDY NUMBER WPC

LABORATORY:

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
TRACE METALS IN MICROGRAMS PER LITER:						
ZINC	1	844	900	743- 1000	810- 976	ACCEPTABLE
	2	530	550	477- 614	494- 597	ACCEPTABLE
SILVER	3	5.40	4.43	3.27- 5.58	3.57- 5.28	CHECK FOR ERROR
	4	2.24	1.58	1.14- 2.24	1.28- 2.11	CHECK FOR ERROR
MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)						
PH-UNITS	3	5.98	5.90	5.85- 6.12	5.89- 6.09	ACCEPTABLE
	4	8.55	8.50	8.19- 8.84	8.27- 8.76	ACCEPTABLE
SPEC. COND. (UMHOS/CM AT 25 C)	1	723	728	645- 789	663- 771	ACCEPTABLE
	2	721	715	629- 788	649- 769	ACCEPTABLE
TDS AT 180 C	1	350	441	216- 628	267- 577	ACCEPTABLE
	2	387	395	297- 515	316- 486	ACCEPTABLE
TOTAL HARDNESS (AS CaCO ₃)	1	271	267	242- 283	247- 278	ACCEPTABLE
	2	56.0	56.1	47.3- 61.4	49.5- 59.7	ACCEPTABLE
CALCIUM	1	39.4	41.0	34.0- 42.2	35.0- 41.2	ACCEPTABLE
	2	13.1	12.9	10.9- 14.0	11.2- 13.6	ACCEPTABLE
MAGNESIUM	1	41.4	40.0	34.0- 45.8	35.5- 44.3	ACCEPTABLE
	2	6.05	5.90	4.91- 6.66	5.13- 6.44	ACCEPTABLE
SODIUM	1	6.3	6.72	5.73- 7.94	6.01- 7.66	ACCEPTABLE
	2	127	123	109- 135	112- 132	ACCEPTABLE
POTASSIUM	1	23.9	24.0	20.0- 27.2	20.9- 26.3	ACCEPTABLE
	2	7.2	7.00	5.73- 8.46	6.07- 8.12	ACCEPTABLE
TOTAL ALKALINITY (AS CaCO ₃)	1	9.6	9.10	6.69- 13.9	7.58- 13.0	ACCEPTABLE
	2	89.7	87.5	81.6- 93.7	83.1- 92.2	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

WATER POLLUTION STUDY NUMBER WPC24

LABORATORY:

ANALYTES	SAMPLE NUMBER	REPORT VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	WARNING LIMITS	PERFORMANCE EVALUATION
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MINERALS IN MILLIGRAMS PER LITER: (EXCEPT AS NOTED)

CHLORIDE	1	151	198	177- 205	180- 201	ACCEPTABLE
	2	93.5	95.0	95.4- 101	84.2- 99.2	ACCEPTABLE
FLUORIDE	1	0.56	0.59	0.472-0.602	0.499-0.656	ACCEPTABLE
	2	2.22	2.30	2.03- 2.52	2.09- 2.46	ACCEPTABLE
SULFATE	1	23.8	25.0	19.0- 29.3	20.7- 29.0	ACCEPTABLE
	2	98.3	100	83.4- 113	87.2- 110	ACCEPTABLE

NUTRIENTS IN MILLIGRAMS PER LITER:

AMMONIA-NITROGEN	1	3.4	3.60	2.10- 4.30	2.99- 4.16	ACCEPTABLE
	2	10.7	11.0	9.76- 13.0	9.27- 12.5	ACCEPTABLE
NITRATE-NITROGEN	1	2.03	2.20	1.73- 2.67	1.85- 2.55	ACCEPTABLE
	2	6.28	6.50	5.30- 7.67	5.62- 7.39	ACCEPTABLE

MISCELLANEOUS PARAMETERS:

NON-FILTERABLE RESIDUE (IN MG/L)	1	70.8	73.0	61.3- 78.0	63.3- 75.9	ACCEPTABLE
	2	55.9	60.0	49.5- 52.0	50.2- 60.3	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY.

PERFORMANCE EVALUATION REPORT

DATE: 8/10/

WATER SUPPLY STUDY NUMBER WS026

LABORATORY

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
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TRACE METALS IN MICROGRAMS PER LITER:

ARSENIC	1	168	150	126- 168	ACCEPTABLE
	2	53.0	54.3	43.5- 62.2	ACCEPTABLE
BARIUM	1	730	743	669- 800	ACCEPTABLE
	2	625	633	558- 683	ACCEPTABLE
BERYLLIUM	3	26.2 **	23.1	18.7- 25.5	NOT ACCEPTABLE
	4	0.9	0.530	0.384-0.703	NOT ACCEPTABLE
CADMIUM	1	11.1	9.20	7.80- 10.8	NOT ACCEPTABLE
	2	58.0	53.9	44.9- 60.2	ACCEPTABLE
CHROMIUM	1	93.4	94.6	82.7- 107	ACCEPTABLE
	2	49.1	50.2	43.5- 57.0	ACCEPTABLE
COPPER	1	91.2	93.1	84.1- 104	ACCEPTABLE
	2	485	483	445- 523	ACCEPTABLE
LEAD	1	3.4	2.45	1.78- 4.65	ACCEPTABLE
	2	53.2	49.2	42.3- 56.4	ACCEPTABLE
MERCURY	1	4.94	4.56	3.45- 5.50	ACCEPTABLE
	2	2.67	2.47	1.76- 3.01	ACCEPTABLE
NICKEL	3	152	151	128- 167	ACCEPTABLE
	4	337	331	292- 366	ACCEPTABLE
SELENIUM	1	9.2	9.99	7.46- 11.6	ACCEPTABLE
	2	34.2 **	41.1	31.5- 46.5	ACCEPTABLE
SILVER	1	96.1	97.0	83.9- 110	ACCEPTABLE
	2	22.9	22.4	19.0- 26.9	ACCEPTABLE

NITRATE/NITRITE/FLUORIDE IN MILLIGRAMS PER LITER:

NITRATE AS N	1	0.83	0.850	0.650- 1.10	ACCEPTABLE
	2	8.60	9.00	7.63- 10.6	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY
 ** SIGNIFICANT GENERAL METHOD BIAS IS ANTICIPATED FOR THIS RESULT.

WATER SUPPLY STUDY NUMBER WS026

LABORATORY

A	LYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
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NITRATE/NITRITE/FLUORIDE IN MILLIGRAMS PER LITER:

NITRITE AS N	1	0.134	0.125	0.107-0.152	ACCEPTABLE
	2	0.851	** 0.850	0.772- 1.01	ACCEPTABLE
FLUORIDE	1	3.22	3.41	3.07- 3.75	ACCEPTABLE
	2	1.23	1.25	1.12- 1.38	ACCEPTABLE

TRICHALOMETHANES IN MICROGRAMS PER LITER:

BROMODICHLOROMETHANE	1	22.7	25.8	20.6- 31.0	ACCEPTABLE
	2	56.3	60.5	48.4- 72.6	ACCEPTABLE
BROMOFORM	1	14.2	15.4	12.3- 18.5	ACCEPTABLE
	2	71.4	77.4	61.9- 92.9	ACCEPTABLE
CHLORODIBROMOMETHANE	1	20.1	22.1	17.7- 26.5	ACCEPTABLE
	2	66.6	72.7	58.3- 87.5	ACCEPTABLE
CHLOROFORM	1	8.36	7.53	6.02- 9.04	ACCEPTABLE
	2	65.7	59.1	47.3- 70.9	ACCEPTABLE
TOTAL TRICHALOMETHANE	1	65.36	70.8	56.6- 85.0	ACCEPTABLE
	2	260.0	270	216- 324	ACCEPTABLE

VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:

BENZENE	1	10.1	10.3	8.24- 12.4	ACCEPTABLE
CARBON TETRACHLORIDE	1	16.4	16.7	13.4- 20.0	ACCEPTABLE
1,4-DICHLOROBENZENE	1	14.0	14.6	11.7- 17.5	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY
 ** SIGNIFICANT GENERAL METHOD BIAS IS ANTICIPATED FOR THIS RESULT.

PERFORMANCE EVALUATION REPORT
WATER SUPPLY STUDY NUMBER WSO26

DATE: 8/10/

LABORATORY 222

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:					
1,2-DICHLOROETHANE	1	11.2	10.8	8.64- 13.0	ACCEPTABLE
1,1-DICHLOROETHYLENE	1	7.40	6.64	3.93- 9.30	ACCEPTABLE
1,1,1-TRICHLOROETHANE	1	12.6	13.6	10.9- 16.3	ACCEPTABLE
TRICHLOROETHYLENE	1	8.11	6.63	3.93- 9.23	ACCEPTABLE
VINYL CHLORIDE	1	10.7	3.77	5.22- 12.2	ACCEPTABLE
SEC-BUTYL BENZENE	2	11.8	12.2	9.76- 14.6	ACCEPTABLE
CHLOROBENZENE	2	18.4	19.3	14.6- 22.0	ACCEPTABLE
2-CHLOROTOLUENE	2	20.1	22.0	17.6- 26.4	ACCEPTABLE
DIBROMOMETHANE	2	33.7	28.2	22.6- 33.8	ACCEPTABLE
1,2 DICHLOROBENZENE	2	24.6	24.3	19.4- 29.2	ACCEPTABLE
DICHLOROMETHANE	2	14.1	15.2	12.2- 18.2	ACCEPTABLE
1,2 DICHLOROPROPANE	2	14.4	18.1	14.5- 21.7	NOT ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY

PERFORMED BY RESEARCH REPORT
WATER SUPPLY STUDY NUMBER WS026

LABORATORY

ANALYTES	SAMPLE NUMBER	REPORTED VALUE	TRUE VALUE*	ACCEPTANCE LIMITS	PERFORMANCE EVALUATIONS
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VOLATILE ORGANIC COMPOUNDS IN MICROGRAMS PER LITER:

1,3-DICHLOROPROPANE	2	22.0	23.4	18.7- 28.1	ACCEPTABLE
1,1,2-TRICHLOROETHANE	2	24.3	26.9	21.5- 32.3	ACCEPTABLE

MISCELLANEOUS ANALYTES:

TOTAL FILTERABLE RESIDUE (MILLIGRAMS PER LITER)	1	303	** 254	188- 376	ACCEPTABLE
CALCIUM (MG. CaCO ₃ /L)	1	133	125	112- 135	ACCEPTABLE
PH-UNITS	1	9.08	9.12	8.35- 9.33	ACCEPTABLE
ALKALINITY (MG. CaCO ₃ /L)	1	42.3	** 39.2	37.0- 45.1	ACCEPTABLE
CORROSIVITY (LANGELIER IND. AT 20C)	1	0.49	** 1.00	0.634- 1.00	NOT ACCEPTABLE
SODIUM (MILLIGRAMS PER LITER)	1	18.5	18.7	16.4- 20.3	ACCEPTABLE
SULFATE (MILLIGRAMS PER LITER)	1	22.8	24.0	21.0- 26.8	ACCEPTABLE
	2	7.30	7.50	5.17- 9.71	ACCEPTABLE

* BASED UPON THEORETICAL CALCULATIONS, OR A REFERENCE VALUE WHEN NECESSARY
** SIGNIFICANT GENERAL METHOD BIAS IS ANTICIPATED FOR THIS RESULT.

EMSL-LV Radiochemistry Results
 10-21-87 thru 9-21-90
 Chronological Listing by Parameter

Update 11-28-90

Parameter	Date	Known Value	Reported Value	Std	Diff
Alpha	10-21-87	28.00	24.33	-0.91	-3.67
Alpha	01-22-88	4.00	3.33	-0.23	-0.67
Alpha	03-18-88	6.00	5.00	-0.35	-1.00
Alpha	04-24-88	46.00	46.00	0.00	0.00
Alpha	01-20-89	8.00	10.00	0.69	2.00
Alpha	03-31-89	21.00	20.33	-0.23	-0.67
Alpha	04-18-89	29.00	22.67	-1.57	-6.33
Alpha	05-12-89	30.00	28.00	-0.43	-2.00
Alpha	09-22-89	4.00	10.33	2.19	6.33
Alpha	10-31-89	49.00	41.00	-1.15	-8.00
Alpha	01-26-90	12.00	19.00	2.60	7.00
Alpha	03-30-90	5.00	5.00	0.00	0.00
Alpha	04-17-90	90.00	61.00	-1.52	-29.00
Alpha	05-11-90	22.00	15.00	-0.57	-7.00
Alpha	08-31-90	10.00	9.00	-1.11	-1.00
Alpha	09-21-90	10.00	7.67	-0.81	-2.33
Beta	10-21-87	72.00	80.00	2.77	8.00
Beta	01-22-88	8.00	37.00	10.05	29.00
Beta	03-18-88	13.00	13.33	0.12	0.33
Beta	04-24-88	57.00	62.67	1.96	5.67
Beta	01-20-89	4.00	9.00	1.73	5.00
Beta	03-31-89	62.00	57.00	-1.73	-5.00
Beta	05-12-89	30.00	38.00	-4.16	-12.00
Beta	09-22-89	6.00	9.33	1.15	3.33
Beta	10-31-89	32.00	25.00	-2.42	-7.00
Beta	01-26-90	12.00	14.67	0.61	2.67
Beta	03-30-90	31.00	40.00	2.70	9.00
Beta	04-17-90	52.00	36.00	-4.52	-16.00
Beta	05-11-90	15.00	17.00	0.29	2.00
Beta	08-31-90	62.00	64.00	-0.23	2.00
Beta	09-21-90	10.00	10.67	-0.08	0.67
Ra226	10-21-87	4.80	2.83	-4.73	-1.97
Ra226	12-11-87	4.80	2.40	-5.77	-2.40
Ra226	03-11-88	7.60	7.60	0.00	0.00
Ra226	10-18-88	5.00	5.57	1.23	0.57
Ra226	12-16-88	3.50	3.23	-0.92	-0.27
Ra226	03-10-89	4.90	3.70	-2.97	-1.20
Ra226	04-18-89	3.50	3.17	-1.15	-0.33
Ra226	07-14-89	17.70	13.83	-2.48	-3.87
Ra226	10-10-89	8.70	6.00	-3.60	-2.70
Ra226	10-31-89	8.40	8.73	0.44	0.33
Ra226	03-09-90	4.00	5.10	-0.25	0.20
Ra226	04-17-90	5.00	5.13	0.36	0.13
Ra226	07-13-90	12.10	11.50	0.06	-0.60

EMSL-LV Radiochemistry Results
 10-21-87 thru 9-21-90
 Chronological Listing by Parameter

Update 11-28-90

Parameter	Date	Known Value	Reported Value	Std	Diff
Ra228	10-21-87	3.60	7.70	13.15	4.10
Ra228	12-11-87	5.30	4.47	-1.80	-0.83
Ra228	03-11-88	7.70	9.57	2.79	1.87
Ra228	10-18-88	5.20	5.93	1.59	0.73
Ra228	12-16-88	10.30	11.27	1.12	0.97
Ra228	03-10-89	1.70	1.20	-2.89	-0.50
Ra228	04-18-89	3.60	4.47	3.00	0.87
Ra228	07-14-89	18.30	10.83	-4.79	-7.47
Ra228	10-10-89	9.30	1.27	-9.94	-8.03
Ra228	10-31-89	4.10	3.53	-1.64	-0.57
Ra228	03-09-90	12.70	3.20	-8.25	-9.50
Ra228	04-17-90	10.20	11.83	1.62	1.63
Ra228	07-13-90	5.10	8.50	3.99	3.40
Unat	02-19-88	3.00	2.67	0.10	-0.33
Unat	04-24-88	6.00	6.00	0.00	0.00
Unat	10-18-88	5.00	5.00	0.00	0.00
Unat	03-17-89	5.00	4.30	-0.19	-0.70
Unat	04-18-89	3.00	3.00	0.00	0.00
Unat	07-21-89	41.00	40.00	-0.29	-1.00
Unat	10-31-89	12.00	13.00	0.29	1.00
Unat	11-17-89	15.00	14.00	-0.29	-1.00
Unat	03-16-90	4.00	3.33	-0.24	-0.67
Unat	04-17-90	20.00	18.33	-0.26	-1.67
Unat	07-20-90	20.80	15.00	-2.40	-5.80