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by

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ABSTRACT

Two environmental simulation chambers were used to study the behavior of a $^{238}\text{PuO}_2$ heat source deposited in an arid, temperate environment. Large fragments from an impact-tested source were deposited in the first chamber, and fines from the source were placed in the second. Plutonium released into the soil, the soil drainages, and the condensates from the dehumidifiers were monitored throughout the experiment. The bulk of the released plutonium, up to 0.04% of the source, was retained in the soil. Of the remainder, larger amounts of plutonium were released to the condensates (to the air) than to the soil percolates. Release rates to the condensates and percolates increased with time for both chambers. Condensate release rates averaged 23 nCi/day for the fines chamber and 90 nCi/day for the chamber with the large fragments. Percolate release rates averaged 224 nCi/rain for the fines chamber and 170 nCi/rain for the other chamber. Spalling of particles from the surface of the plutonium oxide to the air, caused by the action of rain on the hot source fragments, seemed to be a significant release mechanism for the large source fragments but not for the fines. A simulated cleanup operation, involving removal of the source and a small amount of soil, had little effect on the continuing release of plutonium to the soil percolates and to the dehumidifier condensates, except that the condensate release rates from the chamber that had contained the large source fragments dropped to a value equal to that of the other chamber. The large source fragments remained virtually unchanged after 8.5 yr of exposure, in contrast to one previous experiment in which fragments of similar size disintegrated into fines.

I. INTRODUCTION

Radioisotope thermoelectric generators (RTGs), which are essentially thermopiles with radioisotope heat sources at their hot junctions, are used extensively to provide power for instruments and data transmission on space missions. Plutonium-238 is the isotope used almost exclusively to provide the heat in these systems. In all recent uses the isotope

has been present in the form of hot-pressed plutonium dioxide (PuO_2). The heat source container is designed to withstand reentry from orbit and impact with earth so the source will be safely contained until recovery. Although existing designs have proven to be adequately safe, the Department of Energy seeks to improve the safety of the heat sources, as well as to provide data for risk assessment studies, by continued investigation of PuO_2 release and its possible

effects. As part of this program the Los Alamos National Laboratory is studying the interactions of $^{238}\text{PuO}_2$ fuel materials with various environments. Studies of the release of plutonium to several aquatic systems were reported previously.¹⁻⁵ Also reported were the results of experiments with iridium-clad fuel,⁶ a complete fueled sphere assembly with iridium cladding and graphite impact shell,⁷ and unclad fragments of pressed plutonium oxide (PPO),^{8,9} all in humid terrestrial environments. This paper describes an experiment in which bare PPO fragments were exposed to an arid terrestrial climate in a simulated worst-case accident in which the containment failed completely.

II. OBJECTIVE

The purpose of this experiment was to study plutonium release from bare PPO under simulated arid, temperate conditions. We wished to know whether the lower humidity and less frequent rains would affect the release to soil, ground water, and air under summer and winter temperature ranges. For this reason the source material was of the same type as in the two previous terrestrial experiments with bare PPO,^{8,9} but the soil, temperature ranges, humidity ranges, and rainfall cycles were different. Also, we wished to obtain more information on the mechanism of the apparent thermal spalling observed in a previous experiment,⁸ when rain first hit the hot PPO pieces.

III. EXPERIMENTAL WORK

A. Equipment

This experiment was conducted in two environmental test chambers manufactured by Standard Environmental Systems, Inc., of Totowa, New Jersey, model SLHH/64 (Fig. 1). In this system the temperature and humidity of the air in the chamber are cycled diurnally by a bridge-type controller. This controller balances the signals from wet and dry bulb resistance thermometers against cams by energizing an electric heater, a water boiler, and a refrigeration unit that supplies cooling and dehumidification as needed. A manually operated spray head was included in each chamber to provide simulated rainfall. Each chamber contained a tray 0.9 m square by 0.3 m deep that was filled with a sand soil (Table I) to about 2 cm from the top.

B. Chamber Operation

The daily ranges of temperature and humidity for the 6-month winter were 3 to 18°C and 21 to 87% RH, which were alternated with 6 months of summer with ranges of 26 to 53°C and 7 to 33% RH. With the exception of the first summer, each month there was one rain of 6 to 8 cm in each chamber. (If the rainfall was less than this, no water percolated through the soil.) The operation of these chambers was relatively trouble free until the last year when the dehumidifier in chamber 10 did not work efficiently.

C. PuO_2 Sources

The impact-tested postimpact shell assembly (PISA) MHFT-27, which consisted of an iridium-clad 253-g sphere of PuO_2 80% enriched in the 238 isotope, was used for an earlier terrestrial experiment requiring an iridium-clad source.⁶ After this experiment was completed, the fragmented PPO was removed from the cladding and the fragments were sorted by size. The "chunks" larger than 6 mm in diameter, weighing 221 g, were placed on top of the soil in the center of the tray in chamber 10 (Fig. 2); the "fines" with diameters between 10 μm and 6 mm, weighing 32 g, were placed in the equivalent position in chamber 7 (Fig. 3). The specific activity of the plutonium in the source material was 13.649 Ci/g. These sources were removed from the chambers after 2612 days. The pieces were picked up individually in chamber 10, along with a small amount of soil that was attached to the pieces. One of these pieces was examined microscopically. Because in chamber 7 the source was no longer visible, about 500 cm^3 of soil was removed from the source location. Chamber operation was continued for an additional 419 days to investigate the continued release of plutonium to the air and ground water after removal of the source without extensive cleanup of the soil in the area.

D. Samples

1. Aqueous Effluents. The water that percolated through the soil after each rain was collected and analyzed for plutonium by liquid scintillation counting. Condensates from the dehumidifier of the chamber climate control system also were collected and sampled for liquid scintillation plutonium analysis. The analyses of the percolated rainwater indicated the ground water plutonium content, and the

Fig. 1. An environmental simulation chamber.

TABLE I. Sand Soil Composition.

Clay (%)	1.7
Silt (%)	2.6
Sand (%)	95.7
Carbon, organic (%)	0.10
Carbonate, as CaCO_3 (%)	1
H_2O at 15 bars (%)	1.7
pH	8.4
Mg (meq/100 g)	0.6
Na (meq/100 g)	---
K (meq/100 g)	0.1
Cation exchange capacity (meq/100 g)	3.5
Clay minerals (relative amounts)	
Montmorillonite	Moderate
Chlorite	Small
Calcite	Small
Kaolinite	Trace

Fig. 2. Chunks of PuO_2 on sand soil in chamber 10.

Fig. 3. Fines of PuO_2 on sand soil in chamber 7 before the first rain.

condensate data showed trends in the airborne plutonium concentrations but did not quantitatively measure them.

2. Soil Cores. Near the end of each winter and summer season for the first six seasons we took two soil cores in each chamber. We obtained the cores from positions equidistant in opposite directions from the source by pushing sections of 1/2-in. copper tubing into the soil to the full depth of the tray. We filled the resulting holes in the soil with melted paraffin wax to prevent channeling of the rainwater. Each core was divided into from 5 to 14 sections that were individually analyzed to determine the plutonium concentration as a function of depth. Analyses were performed by dissolving the individual sections with nitric and hydrofluoric acids and counting them in a mixture with scintillation cocktail.

After the experiment was terminated, 25 core samples were taken in each chamber by the above method in a square grid pattern, with the cores 18 cm apart. Each of the nine cores on the grid diagonals was divided into five roughly equal sections and analyzed. Of the nine cores analyzed, one was taken at the center of the tray, approximately the position from which the source had been removed, and four each were 25 and 50 cm from this position.

3. Airborne Particles. To study the mechanism of spalling from large pieces of PPO, a box was placed over the chunks in chamber 10 during the rainless first summer (Fig. 4). The bottom of the box surrounding the opening for the PPO source was filled with sand. Removable surfaces of glass, Teflon, Lucite, and stainless steel were fastened to the inside top of the box. In the top of the box were an inlet for liquid nitrogen and a tube for sampling air. This tube led through a 0.45- μm Millipore filter to a pump with a measured air flow rate.

Liquid nitrogen was dropped onto the source for 5 min. The filters were changed before the rain, immediately after the rain, and then at regular intervals. One set of surfaces was exposed at the top of the box for 48 h for a prerin background. Another set was exposed during the rain, and a third set was exposed a

Fig. 4. Apparatus used for liquid nitrogen rain in chamber 10.

day after the rain. The filters were counted immediately after they were removed and again a few days later.

IV. RESULTS AND DISCUSSION

A. Appearance of Sources

The fine PPO in chamber 7 quickly mixed with the soil after a few rains and no longer was visible. This also happened to fine material in two previous terrestrial experiments.^{8,9} The chunks, in contrast, remained on the surface and appeared to change little after an 8.5-yr exposure to soil and weather. Our experience in the first terrestrial experiment with bare PPO was similar;⁸ however, in the second one the chunks seemed to crumble to fine material in a short time.⁹ These chunks looked fractured and friable when they were first received, quite different from the two longer lasting sources that had sharp outlines throughout the experiment. Similarly, Clinard and Rohr¹⁰ found that some impacted PPO samples were more resistant than others to spontaneous degradation. For this reason, differences were seen in the behavior of the two chambers

throughout the experiment, in contrast to the experience in Ref. 9, where in a short time both chambers essentially contained fines. Microscopic examination of the piece of plutonium dioxide from chamber 10 showed no evidence of corrosion.

B. Aqueous Effluents

Tables II through V summarize the results of the plutonium analysis of the aqueous effluents by seasons. These are reported in terms of total activity, concentration, and rate for each season. Complete listings of the data are found in Appendices A and B.

In agreement with previous experiments,^{8,9} the plutonium release rate for condensates from chamber 10, which contained the larger pieces of PPO, was greater by a factor of 4 than that for the chamber containing the fines. This result was not unexpected in light of the previously observed thermal spalling, evidenced by the high air concentration of plutonium at the beginning of a rain on the chunks, a phenomenon not observed during rains on fines.⁸ However, the release rates for plutonium in condensates were comparable for the two chambers during the rainless first summer since no spalling occurred in either

TABLE II. Chamber 7 Condensate Data Summarized by Season.

Season	Elapsed Time (days)	Volume (L)	Activity Concentration (nCi/L)	Activity (μ Ci)	Release Rate (nCi/day)
Winter I	122.0	186	11.2	2.08	17.0
Summer I	195.8	162	9.3	1.50	7.7
Winter II	167.0	374	6.8	2.55	15.3
Summer II	210.2	538	7.5	4.06	19.3
Winter III	188.0	315	11.4	3.59	19.1
Summer III	180.8	437	12.4	5.40	29.9
Winter IV	155.0	258	13.0	3.36	21.7
Summer IV	169.0	450	14.7	6.62	39.2
Winter V	183.0	382	12.4	4.74	25.9
Summer V	181.0	482	10.8	5.20	28.7
Winter VI	181.2	323	7.0	2.26	12.5
Summer VI	182.0	464	6.0	2.77	15.2
Winter VII	189.8	360	17.4	6.25	32.9
Summer VII	182.9	483	13.0	6.28	34.3
Winter VIII	124.3	193	12.0	2.32	18.7
Σ Winter	1310.3	2391	11.4	27.15	20.7
Σ Summer	1301.7	3016	10.6	31.83	24.5
Total	2612.0	5407	10.9	58.98	22.6

TABLE III. Chamber 7 Percolate Data Summarized by Season.

Season	Number of Rains	Rainfall (mm)	Volume (L)	Activity		
				Concentration (nCi/L)	Activity (μCi)	μCi/Rain
Winter I	4	241	19.0	3.00	0.057	0.0142
Summer I	0	0	0	---	0	---
Winter II	6	474	59.0	2.14	0.126	0.0210
Summer II	7	581	46.2	3.33	0.154	0.0220
Winter III	6	456	69.4	4	0.3	0.05
Summer III	6	511	42.0	12.1	0.51	0.085
Winter IV	5	375	33.0	2.4	0.078	0.0156
Summer IV	5	407	24.6	28.5	0.70	0.140
Winter V	6	464	59	5	0.3	0.05
Summer V	6	493	27.5	160	4.4	0.73
Winter VI	6	462	52.2	63.6	3.32	0.553
Summer VI	6	478	25.8	137	3.54	0.590
Winter VII	6	436	32.6	28.5	0.93	0.155
Summer VII	6	486	51.2	24.2	1.24	0.207
Winter VIII	4	264	48.2	41.5	2.00	0.500
Σ Winter	43	3172	372	19.1	7.1	0.165
Σ Summer	36	2956	217.3	48.3	10.5	0.292
Total	79	6128	590	30.0	17.7	0.224

TABLE IV. Chamber 10 Condensate Data Summarized by Season.

Season	Elapsed Time (days)	Volume (L)	Activity		Release Rate (nCi/day)
			Concentration (nCi/L)	Activity (μCi)	
Winter I	122.1	200	11.7	2.33	19.1
Summer I	195.7	252	6.51	1.64	8.38
Winter II	167.0	421	21.4	9.03	54.1
Summer II	210.2	563	64.7	36.44	173
Winter III	188.0	332	23.7	7.86	41.8
Summer III	180.8	482.8	45.3	21.89	121
Winter IV	155.0	279.8	35.0	9.79	63.2
Summer IV	169.0	484	32.1	15.53	91.9
Winter V	183.0	319.7	23.7	7.57	41.4
Summer V	181.1	452	17.5	7.93	43.8
Winter VI	181.2	290.8	47.9	13.93	76.9
Summer VI	182.0	466	45.1	21.0	115
Winter VII	190.7	306.0	99.0	30.29	159
Summer VII	181.9	393	66.8	26.25	144
Winter VIII	124.3	185	122	22.6	182
Σ Winter	1311.3	2334	44.3	103.4	78.9
Σ Summer	1300.7	3093	42.3	130.7	100
Total	2612.0	5427	43.1	234.1	89.6

TABLE V. Chamber 10 Percolate Data Summarized by Season.

Season	Number of Rains	Rainfall (mm)	Volume (L)	Activity Concentration (nCi/L)	Activity (μ Ci)	μ Ci/Rain
Winter I	4	196	26.8	41.0	1.10	0.275
Summer I	0	0	0	---	0	---
Winter II	6	700	96	9.8	0.94	0.157
Summer II	7	599	29.4	3.98	0.117	0.0167
Winter III	6	465	64.8	17.7	1.15	0.192
Summer III	6	528	25.8	7.09	0.183	0.0305
Winter IV	5	381	39.5	12.7	0.501	0.100
Summer IV	6	447	30.8	7.8	0.24	0.040
Winter V	6	474	53.2	14.8	0.79	0.132
Summer V	6	507	23.1	13.9	0.32	0.053
Winter VI	6	462	65.1	29.2	1.90	0.317
Summer VI	6	515	20.8	16.7	0.348	0.0580
Winter VII	6	429	47.8	41.0	1.96	0.327
Summer VII	6	486	25.9	27.3	0.706	0.118
Winter VIII	4	324	44	75	3.3	0.82
Σ Winter	43	3431	437	26.5	11.6	0.270
Σ Summer	37	3082	155.8	12.3	1.91	0.0516
Total	80	6513	593	22.9	13.6	0.170

chamber during this season. In both chambers more plutonium was found in the condensates than in the percolates, indicating that even in the absence of spalling more plutonium was airborne than was transported through the soil by water, since the plutonium in the condensate had come from the air. See Ref. 9 for similar results.

There was no apparent seasonal effect on the average release rates for the condensates from either chamber. However, in the percolates there seemed to be an effect of seasons, especially in chamber 10. Interestingly, the effect was opposite in the two chambers—the average winter rate per rain was 5 times that for summer in chamber 10 and about 0.5 for chamber 7. This difference is not easily explained, but it may be related to the much higher winter-to-summer effluent volume ratio for the percolates for chamber 10 compared with that for chamber 7.

The release rates for the condensates and percolates for both chambers increased with time (Figures 5 through 8); however, the increase was very slight for the condensates. It was most marked in the percolates for chamber 7, where the first six seasons averaged 40 nCi/rain, compared with 442 for the last six seasons. The plutonium in the percolate for the first rain for chamber 10 was very high (700 nCi), but by the

fourth rain it decreased by 2 orders of magnitude. The initial value was not reached again for nearly 2400 days. The high initial value of the percolate may result from the accumulation of very fine material from the disruption of the crystal structure by recoil nuclei on the surface of the pieces.¹¹ The slow increase in the release rate may indicate increased surface area of the particles from the gradual breakup of the PPO.¹⁰

Tables VI through IX show the seasonal summaries of the plutonium in the aqueous effluents after removal of the sources on day 2612. Because of the plutonium remaining in the soil, the release rates did not drop to background at this time but continued high. In fact, the condensate collection for the period in which the source was removed in chamber 7 contained more plutonium than did any other condensate in this chamber, probably because of airborne dust from the disturbed soil. The only marked decrease in release rates was in the chamber 10 condensates, with an average decrease of about a factor of 5; therefore, it became comparable with the release rate for the chamber 7 condensates. This is consistent with the absence of spalling after source removal in chamber 10.

Fig. 5. Cumulative releases of chamber 7 condensates.

Fig. 6. Cumulative releases of chamber 7 percolates.

Fig. 7. Cumulative releases of chamber 10 condensates.

Fig. 8. Cumulative releases of chamber 10 percolates.

TABLE X. Plutonium Content of Soil Cores from Chamber 7 Taken During the First Three Years.^a

Core No.	1	2	3	4	5	6	7	8	9	10	11	12				
Days exposed	119	119	317	317	414	414	695	695	842	842	1053	1053				
Season ^b	W I	W I	S I	S I	W II	W II	S II	S II	W III	W III	S III	S III				
Position ^c	25L	25K	25B	25F	25LF	25RB	25RF	25LB	30L	30R	30F	30B				
	Depth (cm)													Winter	Summer	Total
Top section	0	129	5.63 μ	0	9.45	3.3	1.18 μ	78.2 μ	22.1 μ	3.3	9.85 μ	5.9 μ	7.4	16.80 μ	106.2 μ	123.0 μ
Lower sections	2	2.6	2.2	—	—	0.5	1.4	880	1.9	1.3	2.4	—	7.8 μ			
	5	—	0.4	—	—	0	—	6.2	1.4	0	3.7	4.5	6.92 μ			
	8	0	0	0	0	0	0.4	2.5	—	420	0.5	0.8	316			
	11	0.4	0	0	0	0	0	491	0.8	0	2.4	0	1.0			
	13	0	0.9	0	0	0	0	2.4	0.9	0	0	2.0	0.9			
	16	0	0	0	0	0	0	0.8	0.5	0	0	0	0.8			
	18	0	0	0	0	0	0	0.9	0.4	0	0	0.4	0.6			
	20	0	0	0	0	0	0	0.4	—	0	0	29.7	0			
	22	—	0.5	0	0	0	0	0.8	3.4	0	0	—	0.5			
	24	0	0	0.7	0	0	0	1.0	2.44 μ	0	—	0	0			
	26	0	1.6	0	0	0	0	1.23 μ	296	0	0	0	0			
Subsurface totals		3.0	5.6	0.7	0	0.5	1.8	2.62 μ	2.75 μ	421	9.0	37.4	15.0 μ	441	20.4 μ	20.8 μ
Core totals		132	5.64 μ	0.7	9.45	3.8	1.18 μ	80.8 μ	24.8 μ	425	9.86 μ	5.9 μ	15.0 μ	17.24 μ	126.5 μ	143.8 μ

^a Data are in nanocuries, except where marked μ for microcuries.^b W = winter, S = summer.^c Number = distance from source (in cm), L = left, R = right, B = back, F = front.TABLE XI. Plutonium Content of Soil Cores from Chamber 10 Taken During the First Three Years.^a

Core No.	1	2	3	4	5	6	7	8	9	10	11	12				
Days exposed	119	119	317	317	414	414	695	695	842	842	1053	1053				
Season ^b	W I	W I	S I	S I	W II	W II	S II	S II	W III	W III	S III	S III				
Position ^c	25L	25R	25F	25B	25LF	25RB	25RF	25LB	10L	10R	13F	13B				
	Depth (cm)												Winter	Summer	Total	
Top section	0	45.1	54.3	212	11.2 μ	55.7	37.8 μ	0.97 μ	17.0 μ	5.4 μ	672	1.70 μ	87 μ	44.0 μ	118 μ	162 μ
Lower sections	2	---	14.9 μ	---	---	0.6	6.3	12.3	---	5	6	---	974			
	4	---	---	---	13.8 μ	0.5	1.5	---	---	0.3	14	---	---			
	6	0	---	5.2	---	0.6	---	---	---	0.5	2.4	3.63 μ	31.3 μ			
	8	---	---	1.47 μ	---	---	0.6	---	24.1	0	1.1	---	---			
	10	---	2.5	---	32.5	0	0.4	0.8	---	0	0.5	---	---			
	12	263	---	1.2	---	---	0.4	1.7	---	0	0.8	---	---			
	14	---	---	---	---	0	0.6	---	13.2	4.7	1.7	8.6	3.38 μ			
	16	---	0.7	0	18.8	---	0.4	---	---	0	0.5	---	---			
	18	---	---	0	---	0	0	0.9	---	0	0.6	0.4	---			
	20	---	0	0	15.6	0	0.4	0.7	2.3	0	0	0	1.36 μ			
	22	0	---	0	---	---	0.7	0.8	---	0	0.5	0	---			
24	---	0	0	---	0	1.1	0	3.9	0	1.0	---	7.72				
26	0	0	0	---	216 μ	0.8	4.8	---	0	0.4	0.7	---				
Subsurface totals	263	14.9 μ	1.48 μ	65.1 μ	216 μ	13.2	22.0	43.5	10	30	3.64 μ	37.0 μ	231 μ	107.3 μ	339 μ	
Core totals	308	15.0 μ	1.69 μ	76.3 μ	216 μ	37.8 μ	0.99 μ	17.0 μ	5.4 μ	702	μ	124 μ	275 μ	225 μ	501 μ	

^a Data are in nanocuries, except where marked μ for microcuries.^b W = winter, S = summer.^c Number = distance from source (in cm), L = left, R = right, B = back, F = front.

TABLE XII. Plutonium Content in Soil Cores in Chamber 7 at End of Experiment.^a

Core No. Position ^b		1	5	7	9	13	17	19	21	25					
		50LF	50RF	25LF	25RF	0	25LB	25RB	50LB	50RB					
	Depth (cm)											Pu/core at			Total Pu
												50 cm	25 cm	0	
Top section	0	30.6	313	28 μ	3.83 μ	26.6 μ	61.4 μ	8.32 μ	5.66 μ	45 μ	12.8 μ	25.4 μ	26.6 μ	179 μ	
Lower sections	6	3.0	7.1	19.7	4.0	15.5 μ	30	336	5.8	5.3	5.30	97.4	15.5 μ	15.9 μ	
	12	0.5	6.4	16.0	172	5.62 μ	4.5	262	0.5	1.8	2.30	114	5.62 μ	6.08 μ	
	18	1.3	4.6	2.5	1.3	2.41 μ	33	211	1.5	5.0	3.10	62.0	2.41 μ	2.67 μ	
	24	2.0	18.7	17.3	60	3.76 μ	1.7	1.8	3.7	8.6	8.25	20.2	3.76 μ	3.87 μ	
Subsurface totals		6.8	36.8	55.5	237	27.29 μ	69	811	11.5	20.7	19.0	293	27.29 μ	28.5 μ	
Core totals		37.4	550	28 μ	4.07 μ	53.9 μ	61.5 μ	9.13 μ	5.67 μ	45 μ	12.8 μ	25.7 μ	53.9 μ	208 μ	

^a Data are in nanocuries except where marked μ for microcuries.

^b Number = distance in cm. L = left, R = right, F = front, B = back.

TABLE XIII. Plutonium Content in Soil Cores in Chamber 10 at End of Experiment.^a

Core No. Position ^b		1	5	7	9	13	17	19	21	25				
		50LF	50RF	25LF	25RF	0	25LB	25RB	50LB	50RB				
	Depth (cm)											Pu/core at		Total Pu
												50 cm	25 cm	0
Top section	0	271	1.66 μ	1.83 μ	1.45 μ	2.60 μ	58.2 μ	6.16 μ	1.14 μ	573	0.91 μ	16.9 μ	2.60 μ	73.9 μ
Lower sections	6	0.7	3.3	1.5	3.3	0.6 μ	56.8	0.6	3.30 μ	60.0	841	15.6	0.6 μ	4.0 μ
	12	0.7	0.2	1.2	2.8	7	17.3	0.5	1.0	0.2	0.53	5.45	7	31
	18	2.4	4.1	0.9	0.3	25.6	1.83 μ	0.3	1.3	59.9	16.9	458	25.6	1.92 μ
	24	0.9	0.8	2.9	0.8	22.7	48.2 μ	2.2	2.3	0	1.55	12.1 μ	22.7	48.2 μ
Subsurface totals		4.7	8.4	6.5	7.2	0.7 μ	50.1 μ	3.6	3.30 μ	120.1	0.86 μ	12.5 μ	0.7 μ	54.2 μ
Core totals		276	1.67 μ	1.84 μ	1.46 μ	3.3 μ	108.3 μ	6.16 μ	4.44 μ	693	1.77 μ	29.5 μ	3.3 μ	128.1 μ

^a Data are in nanocuries except where marked μ for microcuries.

^b Number = distance in cm. L = left, R = right, F = front, B = back.

cores on the diagonals of a 25-core grid were divided into 5 roughly equal sections and analyzed separately. On the first line are listed the core numbers with regard to the grid, which was numbered left to right in rows beginning at the front. The distances (50, 25, and 0 cm) and positions of the cores with regard to the center of the tray, where the source had been located, are on the second line (LF = left front, RF = right front, LB = left back, RB = right back). The approximate depths in centimeters from the top of each section are listed in the first column. The results shown are in nanocuries, unless followed by a μ for microcuries.

The average plutonium content of the cores in chamber 7 was about twice that for the earlier cores; this ratio is about 1:3 in chamber 10. The remaining plutonium inventories, by extrapolation from these cores, were 0.15 and 0.09 Ci for chambers 7 and 10, respectively. Most of the plutonium released still remains in the soil 433 days and 13 rains after the source removal. This is corroborated by the fact that the plutonium content of the aqueous effluents during this post-removal period is a very small fraction of the total in the soil.

In chamber 7 the plutonium content per core decreased with distance from the previous location of the source, as expected, even with the plutonium-rich top layer removed from the center core. However, in chamber 10 the core at the center (0 cm) contained less plutonium than the average amount at 25 cm. This may indicate that the source in chamber 10 had been away from the center, as no effort had been made to center it. Another possible explanation for the lower plutonium content in the center core from chamber 10 may be that the plutonium released to the soil under the source was nearly all from surface recoil damage and was therefore so finely divided that nearly all of it was washed through the soil. In contrast, the plutonium released away from the source may have been largely from spalling, which produced larger particles that were trapped by the soil.

In chamber 7 the fraction of the total plutonium on the surface of the final cores was identical to that for the earlier cores; in chamber 10 these fractions were within a factor of 2. The distance effect in the vertical distribution of plutonium may also show the influence of spalling. With one exception, every core in chamber 7 had at least 80% of the plutonium on the surface, suggesting that the plutonium transported along the surface, either by air or water, was attached to larger particles of soil, which were more readily transported than plutonium dioxide particles be-

cause of their lower density and were too large to penetrate the soil. The exception mentioned above was the center core, in which about half the plutonium was below the surface. In this case the top layer, which contained most of the plutonium, was removed along with the source, with the remaining plutonium more evenly distributed down the core. The plutonium in the cores from chamber 10 showed greater penetration, up to 74% below the surface; the fraction below the surface for the center core was about half the average for the more distant cores. A large fraction of the surface transport was probably by spalling, which would have produced particles finer than the soil particles that may have been the main means of transport for chamber 7. In the 0-cm core where there was no transport by spalling, the vertical distribution was closer to that for chamber 7 cores.

D. Liquid Nitrogen Rain

In a previous experiment very large increases in the airborne plutonium were observed at the beginning of a rain on large PPO pieces; these increases were not observed in rains on fines.⁸ This was attributed to spalling of particles from the hot chunks because of thermal shock when they first were contacted by the cold rainwater. In this experiment liquid nitrogen was used for a rain in chamber 10 to determine if water itself played a role in this spalling process. This test was carried out during the rainless first summer.

During the 5-min nitrogen rain, the airborne concentration of plutonium increased by a factor of 10 000 over the prerin concentration, which was reached again about 1 h after the rain. These results were identical with those obtained in four water rains in the previous experiment, indicating that the spalling was solely a thermal shock effect, with no contribution from hydration or other reaction with water.

After the rain plutonium was found on the surface of soil that had been placed around the source before the rain; none was found below the surface. This differs significantly from the experience with water rain, in which rain carried plutonium through 30 cm of soil. Since the liquid nitrogen evaporated on contact with the soil, the absence of subsurface plutonium indicates that plutonium is transported through soil hydrodynamically and not by dry mechanical processes.

On the small plates of four materials attached to the top of the box over the source during the liquid nitrogen rain, glass collected the most plutonium, Teflon and Lucite collected 3 orders of magnitude less, and stainless steel collected almost none. These results are consistent with an electrostatic mechanism for collecting dust that carried the plutonium oxide. A set of these plates exposed 1 day after the rain showed far lower adsorption rates than a similar set exposed for 48 h before the rain. This is in agreement with the relative levels of airborne plutonium found before and after rains in previous experiments⁸ and again is consistent with the transport of plutonium by dust, since the airborne dust level in the chamber undoubtedly was lower after a rain because the soil was wet.

V. SUMMARY

The chunks in chamber 10 appeared to change very little during 8.5 yr under simulated arid weather conditions. For this reason the plutonium releases in this chamber agreed more closely with those of Ref. 8, where the chunks also remained intact, than with those of Ref. 9, where the chunks disintegrated to fines within 1 yr.

The plutonium release rate in the condensates from the air dehumidifier for chamber 10 was 4 times that for chamber 7, which contained the fines (90 compared with 23 nCi/day). This increased release rate was caused by the spalling into the air of fine particles of plutonium oxide at the beginning of a rain on the thermally hot chunks, a phenomenon first observed in the experiment in Ref. 8. This conclusion was reinforced by the comparable condensate release rates seen in the two chambers during the periods of no spalling, i.e., during the rainless first summer (8.4 vs 7.6 nCi/day) and after the sources had been removed (35 vs 39 nCi/day). In agreement with previous experiments, more plutonium was found in the condensates than in the rainwater percolates in both chambers (249 vs 22 μ Ci for chamber 10, 75 vs 22 μ Ci for chamber 7), which indicates that even in the absence of spalling more of the released plutonium was airborne than was carried by water through the soil.

There was no apparent seasonal effect on plutonium in the condensates from either chamber. The opposite seasonal effects on plutonium in the percolates for the two chambers (winter/summer = 5 for chamber 10 and 0.5 for chamber 7) may be related to the higher seasonal variation in percolate volumes

in chamber 10 (winter/summer = 2.8 for chamber 10 and 1.7 for chamber 7).

In general, the release rates for both the condensates and percolates increased with time in both chambers, although the rates of increase for condensates were small. The percolates for chamber 10 began with a value of 700 nCi of plutonium, dropped 2 orders of magnitude, then increased slowly, reaching the original amount after 2400 days. The high initial value probably resulted from the removal of fine particles previously loosened from the surface of the chunks by recoil nuclei. The increase of the released plutonium with time in the aqueous effluents probably reflects the gradual increase in surface area of the source material.

The release rates remained high after the removal of the sources except for the chamber 10 condensates, which decreased, as mentioned earlier, because there was no more spalling. The chamber 7 condensate reached the maximum value for the experiment at this time, probably because of airborne material from the disturbance of the soil.

In agreement with previous experiments, the fraction of the released plutonium remaining in the soil was orders of magnitude greater than that found in the aqueous effluents. Extrapolation of the plutonium contents of the 12 cores taken in each of the chambers during the first six seasons indicates releases of 0.02 and 0.009% of the sources in chambers 7 and 10, respectively. Most of the plutonium was found in the surface sections of these cores in chamber 7, but approximately one-half of that in chamber 10 cores was below the surface. It would seem that spalled particles, which were too large to penetrate the fine loam used in the previous two experiments, were able to penetrate the sand in this experiment.

The plutonium inventory extrapolated from the amounts found in nine cores from each chamber taken at the end of the experiment was similar to that found in the earlier cores, indicating that no large fraction of plutonium was washed out by the rains after source removal. The distribution between the surface and the subsurface sections was also in agreement for the two sets of cores. The final set of cores for chamber 7 showed a decrease of plutonium content with distance, but this effect was not evident for chamber 10, possibly a result of spalling.

The liquid nitrogen rain carried out in chamber 10 produced changes in the airborne plutonium concentration that agreed closely in duration and intensity with those for water rain in a previous experiment, indicating that spalling is purely an effect of thermal

shock with no contribution from reactions with water. On the other hand, the fact that all the plutonium was on the surface of the sand after this rain indicated that the transport of plutonium through the soil was purely hydrodynamic, with no dry mechanical effect. The pattern of collection of plutonium by glass, stainless steel, and two types of plastic surfaces before, during, and after this rain suggests that particles airborne between rains are carried by dust particles.

Comparing this experiment with the previous experiments conducted under humid conditions does not reveal any marked effects of the differences in temperatures, humidities, and frequencies of rainfall. The results of the three experiments agree very well. The differences generally are related to differences in source and soil characteristics.

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APPENDIX A. PERCOLATE DATA

TABLE A-I. Percolate Data for Chamber 7.

sample		date modyyr	time hrmn	season	rainfall (mm)	percolate volume (l)	percolate activity (ci/l)	activity error (ci/l)
07001	ar	031075	1010	1.0	.5700e+02	.3100e+01	.1111e-07	.7261e-09
07002	br	042375	1630	1.0	.6000e+02	.5700e+01	.1331e-08	.5582e-09
07003	ar	051975	1415	1.0	.5600e+02	.3750e+01	.2252e-08	.7957e-09
07004	ar	062575	1057	1.0	.6800e+02	.6500e+01	.1013e-08	.4545e-09
07005	br	011276	1425	3.0	.1000e+03	.6400e+01	.6627e-08	.4149e-09
07006	ar	021876	1214	3.0	.8100e+02	.1050e+02	.1433e-08	.2730e-09
07007	br	031776	1530	3.0	.7500e+02	.1020e+02	.9513e-09	.1911e-09
07008	ar	041376	1513	3.0	.7500e+02	.1020e+02	.8694e-09	.1911e-09
07009	br	051276	1000	3.0	.7500e+02	.1110e+02	.7275e-09	.1761e-09
07010	ar	061676	1125	3.0	.6800e+02	.1065e+02	.3931e-08	.1965e-09
07011	br	071476	0930	4.0	.8100e+02	.5000e+01	.1104e-08	.3180e-09
07012	ar	081776	1410	4.0	.8800e+02	.6400e+01	.4504e-08	.1392e-09
07013	br	091676	1022	4.0	.8800e+02	.1110e+02	.3517e-08	.1379e-09
07014	ar	101976	1420	4.0	.8100e+02	.5500e+01	.1843e-08	.5787e-09
07015	br	111576	0900	4.0	.8100e+02	.6200e+01	.2593e-08	.5132e-09
07016	ar	121376	1100	4.0	.8100e+02	.4200e+01	.1570e-08	.1515e-09
07017	br	011777	1105	4.0	.8100e+02	.7750e+01	.6244e-08	.1829e-09
07018	ar	021377	1125	5.0	.8100e+02	.1320e+02	.2157e-08	.1160e-09
07019	br	031477	1055	5.0	.7500e+02	.1125e+02	.1825e-08	.9145e-10
07020	ar	041277	0955	5.0	.7500e+02	.9600e+01	.4132e-08	.2121e-08
07021	br	051777	1120	5.0	.7500e+02	.1120e+02	.1560e-07	.9748e-08
07022	ar	061477	1130	5.0	.7500e+02	.1160e+02	.2099e-08	.4613e-09
07023	br	071277	1120	5.0	.7500e+02	.1250e+02	.2382e-08	.7425e-09
07024	ar	081777	0955	6.0	.9200e+02	.1150e+02	.1213e-07	.6688e-10
07025	br	091377	1050	6.0	.8100e+02	.6000e+01	.1604e-07	.5664e-09
07026	ar	101377	1055	6.0	.8100e+02	.5800e+01	.4968e-08	.4723e-09
07027	br	111577	1057	6.0	.8100e+02	.5200e+01	.7630e-08	.1370e-08
07028	ar	121277	0900	6.0	.8100e+02	.9400e+01	.1879e-07	.3617e-08
07029	br	011778	1415	6.0	.9500e+02	.4800e+01	.5774e-08	.1114e-08
07030	ar	021478	1500	7.0	.7500e+02	.4800e+01	.1317e-08	.2607e-09
07031	br	031478	1421	7.0	.7500e+02	.1110e+02	.3371e-08	.2375e-09
07032	ar	041278	1120	7.0	.7500e+02	.9200e+01	.1713e-08	.5282e-09
07033	br	051678	1415	7.0	.7500e+02	.1300e+01	.5869e-09	.1733e-09
07034	ar	061478	1415	7.0	.7500e+02	.6600e+01	.2798e-08	.1733e-09
07035	br	071178	1115	8.0	.8100e+02	.1500e+02	.4444e-07	.9240e-09
07036	ar	081578	1620	8.0	.7500e+02	.1300e+01	.9418e-09	.1720e-09
07037	br	091478	1440	8.0	.8100e+02	.2650e+01	.1269e-08	.1706e-09
07038	ar	101678	0915	8.0	.7500e+02	.2100e+01	.3180e-08	.2143e-09
07039	br	111478	1100	8.0	.9500e+02	.3600e+01	.6197e-08	.2020e-09
07041	br	011679	1110	9.0	.7400e+02	.7500e+01	.7330e-09	.5187e-10
07042	ar	021379	1146	9.0	.7900e+02	.1020e+02	.7220e-08	.7643e-10
07043	br	031379	1105	9.0	.7500e+02	.6500e+01	.3672e-08	.1201e-09
07044	ar	041879	1350	9.0	.7400e+02	.1065e+02	.4900e-08	.7370e-10
07045	br	051579	1130	9.0	.8100e+02	.1300e+02	.2962e-08	.7916e-10
07046	ar	061279	0831	9.0	.8100e+02	.1160e+02	.1287e-07	.1789e-07
07047	br	071079	1420	10.0	.8100e+02	.8250e+01	.3143e-06	.3435e-08
07048	ar	081479	1058	10.0	.8800e+02	.8400e+01	.2102e-06	.5831e-07
07049	br	091179	1420	10.0	.8100e+02	.2800e+01	.3071e-08	.2279e-09
07050	ar	101579	1626	10.0	.8100e+02	.1950e+01	.4313e-08	.3221e-09
07051	br	110879	0930	10.0	.8100e+02	.3500e+01	.3330e-08	.2511e-09
07052	ar	121079	1430	10.0	.8100e+02	.2600e+01	.2935e-08	.9554e-10
07053	br	011580	1050	11.0	.8100e+02	.6400e+01	.2894e-07	.4218e-09
07054	ar	021180	1425	11.0	.8100e+02	.1200e+02	.8101e-07	.2462e-08
07055	br	031180	1100	11.0	.7500e+02	.1050e+02	.3603e-07	.2739e-08
07056	ar	041580	1102	11.0	.7500e+02	.7800e+01	.7534e-07	.1638e-08

TABLE A-I. Cont.

sample		date modyr	time hrmn	season	rainfall (mm)	percolate volume (l)	percolate activity (ci/l)	activity error (ci/l)
07057	br	051280	0839	11.0	.7500e+02	.9750e+01	.1018e-06	.2223e-08
07058	ar	061080	1415	11.0	.7500e+02	.5700e+01	.3695e-07	.1925e-09
07059	br	071580	1525	12.0	.8400e+02	.3500e+01	.2252e-08	.1815e-09
07060	ar	081280	1420	12.0	.8900e+02	.9000e+01	.3853e-06	.7518e-08
07061	br	090980	1130	12.0	.8100e+02	.3000e+01	.2539e-08	.1501e-09
07062	ar	101680	0833	12.0	.8800e+02	.4400e+01	.7896e-08	.8203e-09
07063	br	111780	1620	12.0	.6800e+02	.2150e+01	.2498e-08	.2102e-09
07064	ar	120980	1525	12.0	.6900e+02	.3800e+01	.4327e-08	.1679e-09
07065	br	011481	0920	13.0	.7500e+02	.5800e+01	.2450e-07	.2894e-09
07066	ar	021181	1525	13.0	.7500e+02	.7200e+01	.3972e-07	.3667e-08
07067	br	031081	1410	13.0	.6800e+02	.5500e+01	.2348e-07	.3667e-08
07068	ar	041581	1015	13.0	.6800e+02	.2250e+01	.2006e-08	.2006e-09
07069	br	051181	1420	13.0	.7500e+02	.8000e+01	.4081e-07	.7725e-09
07070	ar	061581	1425	13.0	.7500e+02	.4000e+01	.1242e-07	.3590e-09
07071	br	071481	1137	14.0	.8100e+02	.7200e+01	.1261e-07	.7725e-09
07072	ar	081781	1106	14.0	.8100e+02	.6000e+01	.1638e-07	.3385e-09
07073	br	091481	1430	14.0	.8100e+02	.1000e+02	.8565e-07	.1254e-08
07074	ar	101381	0930	14.0	.8100e+02	.1000e+02	.9220e-08	.2152e-08
07075	br	111681	0924	14.0	.8100e+02	.8000e+01	.4545e-08	.2430e-09
07076	ar	121481	0949	14.0	.8100e+02	.1000e+02	.6456e-08	.1854e-08
07077	br	011182	1059	15.0	.8100e+02	.1900e+02	.5712e-07	.3571e-08
07078	ar	021682	0925	15.0	.6100e+02	.8000e+01	.1679e-07	.1738e-08
07079	br	030882	0925	15.0	.6100e+02	.2000e+02	.3747e-07	.5637e-09
07080	ar	041282	1111	15.0	.6100e+02	.1250e+01	.3713e-08	.3562e-09
07081	br	051082	0846	15.0	.6900e+02	.2000e+01	.7234e-08	.3794e-09
07082	ar	061482	0846	15.0	.6800e+02	.4600e+01	.6224e-08	.3262e-09
07083	br	071282	1400	16.0	.8100e+02	.7000e+01	.1578e-07	.5097e-08
07084	ar	081682	0855	16.0	.8100e+02	.3500e+01	.7821e-08	.4095e-09
07085	br	091382	1601	16.0	.8100e+02	.5000e+01	.7794e-08	.4081e-09
07086	ar	101382	1324	16.0	.8900e+02	.1000e+02	.4074e-07	.1834e-08
07087	br	111582	1408	16.0	.8100e+02	.5000e+01	.5541e-08	.2907e-09
07088	ar	121382	1320	16.0	.8100e+02	.8000e+01	.1829e-07	.9582e-09
07089	br	011783	1248	17.0	.8100e+02	.1050e+02	.5965e-08	.3126e-09
07090	ar	021483	1309	17.0	.8100e+02	.1400e+02	.7507e-08	.4545e-09
07091	br	031483	1454	17.0	.8100e+02	.1700e+02	.1802e-06	.9434e-08
07092	ar	041183	1319	17.0	.5800e+02	.1250e+01	.1014e-07	.8408e-09
07093	br	051683	0835	17.0	.8100e+02	.6200e+01	.2689e-08	.1406e-09

TABLE A-II. Percolate Data for Chamber 10.

sample		date modyr	time hrmn	season	rainfall (mm)	percolate volume (l)	percolate activity (ci/l)	activity error (ci/l)
10001	ar	031075	0950	1.0	.5400e+02	.9200e+01	.7916e-07	.5450e-07
10002	br	042375	1625	1.0	.4800e+02	.1140e+02	.2488e-07	.4256e-08
10003	ar	051975	1413	1.0	.4800e+02	.3600e+01	.2170e-07	.3860e-08
10004	ar	062575	1104	1.0	.4600e+02	.2600e+01	.4504e-08	.8885e-09
10005	br	011276	1440	3.0	.3070e+03	.4050e+02	.3412e-08	.1095e-08
10006	ar	021876	1217	3.0	.8100e+02	.1050e+02	.9859e-08	.1451e-08
10007	br	031776	1530	3.0	.8100e+02	.1360e+02	.1881e-07	.4142e-08
10008	ar	041376	1513	3.0	.7500e+02	.8400e+01	.9118e-08	.5719e-09
10009	br	051276	1000	3.0	.7500e+02	.1200e+02	.1802e-07	.1295e-08
10010	ar	061676	1125	3.0	.8100e+02	.1050e+02	.1381e-07	.4545e-09
10011	br	071476	1050	4.0	.8100e+02	.2050e+01	.5965e-08	.3562e-09
10012	ar	081776	1410	4.0	.8800e+02	.3600e+01	.4163e-08	.6183e-09
10013	br	091676	1018	4.0	.8800e+02	.4500e+01	.3208e-09	.2798e-09
10014	ar	101976	1420	4.0	.8800e+02	.4500e+01	.4982e-08	.1448e-08
10015	br	111576	0900	4.0	.8600e+02	.4400e+01	.4231e-08	.7234e-09
10016	ar	121376	0905	4.0	.8700e+02	.5300e+01	.3822e-08	.6019e-09
10017	br	011777	1105	4.0	.8100e+02	.5000e+01	.5405e-08	.1273e-08
10018	ar	021477	1125	5.0	.8100e+02	.1320e+02	.2327e-07	.3571e-08
10019	br	031477	1025	5.0	.7500e+02	.9750e+01	.7989e-08	.1860e-08
10020	ar	041277	0925	5.0	.7500e+02	.9900e+01	.1467e-07	.9677e-09
10021	br	051777	1120	5.0	.8400e+02	.1440e+02	.2550e-07	.5505e-08
10022	ar	061477	1130	5.0	.7500e+02	.9600e+01	.1025e-07	.2457e-09
10023	br	071277	1120	5.0	.7500e+02	.8000e+01	.1671e-07	.4748e-08
10024	ar	081777	1000	6.0	.8800e+02	.3200e+01	.7002e-08	.2277e-08
10025	br	091377	1050	6.0	.8800e+02	.3600e+01	.8312e-08	.2703e-08
10026	ar	101377	0955	6.0	.8800e+02	.5000e+01	.6865e-08	.2914e-08
10027	br	111577	1057	6.0	.8800e+02	.5000e+01	.6285e-08	.1226e-08
10028	ar	121277	1013	6.0	.8800e+02	.4800e+01	.6756e-08	.2162e-08
10029	br	011778	1415	6.0	.8800e+02	.4200e+01	.5146e-08	.7207e-09
10030	ar	021478	1500	7.0	.8100e+02	.9000e+01	.1615e-07	.1043e-08
10031	br	031478	1421	7.0	.7500e+02	.8000e+01	.1301e-07	.3863e-09
10032	ar	041278	1120	7.0	.7500e+02	.9500e+01	.1457e-07	.3999e-08
10033	br	051678	1415	7.0	.7500e+02	.5500e+01	.6736e-08	.7821e-09
10034	ar	061478	1415	7.0	.7500e+02	.7500e+01	.9800e-08	.4245e-09
10035	br	071178	1115	8.0	.8300e+02	.4400e+01	.7493e-08	.1447e-09
10036	ar	081578	1535	8.0	.8100e+02	.4000e+01	.5234e-08	.1597e-09
10038	ar	091478	0902	8.0	.2400e+02	.1035e+02	.4258e-08	.1395e-08
10039	br	101678	0915	8.0	.9000e+02	.4300e+01	.9882e-08	.2511e-09
10040	ar	111478	1100	8.0	.8800e+02	.5000e+01	.1104e-07	.1269e-09
10041	br	121278	0912	8.0	.8100e+02	.2750e+01	.1829e-07	.4190e-09
10042	ar	011679	1110	9.0	.8100e+02	.8250e+01	.1306e-07	.4258e-09
10043	br	021379	1146	9.0	.7500e+02	.8250e+01	.1496e-07	.1388e-08
10044	ar	031379	1105	9.0	.7500e+02	.7200e+01	.1495e-07	.1254e-08
10045	ar	041879	1005	9.0	.8100e+02	.9600e+01	.1765e-07	.5173e-09
10046	ar	051579	1130	9.0	.8100e+02	.9900e+01	.1675e-07	.4381e-09
10047	br	061279	1424	9.0	.8100e+02	.1000e+02	.1212e-07	.3085e-09
10048	ar	071079	1420	10.0	.8800e+02	.4900e+01	.1976e-07	.1045e-07
10049	br	081479	1100	10.0	.8800e+02	.6500e+01	.7091e-08	.1013e-08
10050	ar	091179	1420	10.0	.8100e+02	.2000e+01	.2389e-07	.2352e-08
10051	br	101579	1626	10.0	.8800e+02	.2700e+01	.1086e-07	.1070e-08
10052	ar	110879	0920	10.0	.8100e+02	.4200e+01	.1437e-07	.1100e-08
10053	br	121079	1430	10.0	.8100e+02	.2800e+01	.1353e-07	.9459e-09
10054	ar	011580	1050	11.0	.8100e+02	.1120e+02	.3221e-07	.5787e-09
10055	br	021180	0915	11.0	.8100e+02	.1400e+02	.4040e-07	.4013e-09
10056	ar	031180	1100	11.0	.7500e+02	.1050e+02	.2939e-07	.5514e-09

TABLE A-II. Cont.

sample		date modyr	time hrmn	season	rainfall (mm)	percolate volume (l)	percolate activity (ci/l)	activity error (ci/l)
10057	br	041580	1103	11.0	.7500e+02	.1100e+02	.2978e-07	.1197e-08
10058	ar	051280	0842	11.0	.7500e+02	.1060e+02	.1952e-07	.4815e-08
10059	br	061080	1415	11.0	.7500e+02	.7800e+01	.1628e-07	.6156e-09
10060	ar	071580	1525	12.0	.8400e+02	.2350e+01	.2225e-07	.8776e-09
10061	br	081280	1420	12.0	.8800e+02	.5000e+01	.1754e-07	.2894e-09
10062	ar	090380	1130	12.0	.8400e+02	.3600e+01	.1542e-07	.6087e-09
10063	br	101680	1415	12.0	.8800e+02	.2800e+01	.1284e-07	.5064e-09
10064	ar	111780	1620	12.0	.1020e+03	.2850e+01	.2375e-07	.9363e-09
10065	br	120880	1525	12.0	.6900e+02	.4200e+01	.1136e-07	.8776e-09
10066	ar	011481	0920	13.0	.7500e+02	.8000e+01	.2088e-07	.1925e-09
10067	br	021181	1525	13.0	.7500e+02	.1200e+02	.4914e-07	.9650e-09
10068	ar	031081	1410	13.0	.6800e+02	.8000e+01	.1392e-07	.1925e-09
10069	br	041581	1015	13.0	.6800e+02	.8000e+01	.2266e-07	.5787e-09
10070	ar	051181	1420	13.0	.6800e+02	.5800e+01	.2546e-07	.4151e-08
10071	br	061581	1425	13.0	.7500e+02	.6000e+01	.1263e-06	.9236e-08
10072	ar	071421	1426	14.0	.8100e+02	.5800e+01	.4579e-07	.1062e-08
10073	br	081781	1059	14.0	.8100e+02	.4000e+01	.1706e-07	.4927e-09
10074	ar	091481	1430	14.0	.8100e+02	.5000e+01	.2095e-07	.8681e-09
10075	br	101381	0930	14.0	.8100e+02	.4000e+01	.1843e-07	.1252e-08
10076	ar	111681	0924	14.0	.8100e+02	.3600e+01	.1447e-07	.9827e-09
10077	br	121681	0820	14.0	.8100e+02	.3500e+01	.4026e-07	.2737e-08
10078	ar	011282	1058	15.0	.8100e+02	.1000e+02	.1296e-06	.9362e-08
10079	br	021682	0925	15.0	.8100e+02	.1300e+02	.7712e-07	.1197e-07
10080	ar	030382	0925	15.0	.8100e+02	.2000e+02	.4688e-07	.2219e-08
10081	br	041282	1110	15.0	.8100e+02	.1250e+01	.2211e-07	.1069e-08
10082	ar	051082	1100	15.0	.8100e+02	.1800e+02	.2900e-07	.1448e-08
10083	ar	061482	0848	15.0	.8100e+02	.1920e+02	.7193e-07	.4440e-08
10084	br	071282	1405	16.0	.8100e+02	.9000e+01	.2505e-06	.3186e-07
10085	ar	081682	0855	16.0	.8100e+02	.6000e+01	.1720e-06	.1972e-07
10086	br	091382	1602	16.0	.8100e+02	.9000e+01	.8408e-07	.9644e-08
10087	ar	101382	1324	16.0	.8100e+02	.6200e+01	.3399e-07	.7725e-09
10088	br	111582	1508	16.0	.8100e+02	.5000e+01	.3153e-07	.3063e-08
10089	ar	121382	1330	16.0	.8100e+02	.8000e+01	.7657e-07	.7437e-08
10090	br	011783	1348	17.0	.8100e+02	.1150e+02	.2006e-07	.2266e-08
10091	ar	021483	1409	17.0	.8100e+02	.2000e+02	.2470e-07	.2399e-08
10092	br	031483	1554	17.0	.8100e+02	.2000e+02	.2034e-07	.1975e-08
10093	ar	041183	1401	17.0	.5700e+02	.5000e+01	.8804e-08	.8558e-09
10094	br	051683	0920	17.0	.6100e+02	.3800e+01	.1063e-07	.1033e-08
10095	ar	061583	0815	17.0	.6100e+02	.6000e+01	.9172e-08	.8913e-09

APPENDIX B. CONDENSATE DATA

TABLE B-I. Condensate Data for Chamber 7.

sample		date modyyr	time hrmn	season	condensate volume (l)	condensate activity (ci/l)	activity error (ci/l)
07001	avc	031075	1530	1.0	.1900e+02	.5255e-07	.1092e-08
07002	bvc	031275	1320	1.0	.1850e+02	.8435e-08	.6429e-09
07003	avc	031975	1428	1.0	.1800e+02	.1194e-07	.6429e-09
07004	bvc	040475	1415	1.0	.1500e+02	.3276e-08	.6429e-09
07005	avc	042475	0703	1.0	.1800e+02	.6415e-08	.6429e-09
07006	bvc	042975	0835	1.0	.1900e+02	.2457e-08	.6429e-09
07007	avc	050975	0920	1.0	.1800e+02	.1256e-08	.6429e-09
07008	bvc	052075	0824	1.0	.2500e+02	.7648e-08	.6429e-09
07009	avc	061875	1410	1.0	.1800e+02	.7753e-08	.6429e-09
07010	bvc	062575	1630	1.0	.1700e+02	.8203e-08	.6429e-09
07011	avc	063075	1010	2.0	.2400e+02	.3112e-07	.6429e-09
07012	bvc	070275	0900	2.0	.1800e+02	.2143e-07	.3221e-09
07013	avc	071875	1530	2.0	.1800e+02	.1638e-08	.3221e-09
07014	bvc	080175	1430	2.0	.1500e+02	.1911e-08	.3221e-09
07015	avc	082275	1515	2.0	.1430e+02	.2184e-08	.3221e-09
07016	bvc	091975	1600	2.0	.1700e+02	.2866e-08	.3221e-09
07017	avc	100275	1019	2.0	.1720e+02	.4409e-08	.3221e-09
07018	bvc	121075	1400	2.0	.1800e+02	.2866e-08	.4327e-09
07019	avc	123075	1600	2.0	.2000e+02	.4982e-08	.3221e-09
07020	bvc	011676	1545	3.0	.2000e+02	.3344e-08	.3221e-09
07021	avc	012376	1320	3.0	.1600e+02	.4832e-08	.3221e-09
07022	bvc	020676	1550	3.0	.1600e+02	.3767e-08	.3221e-09
07023	avc	021176	1630	3.0	.1790e+02	.3139e-08	.3221e-09
07024	bvc	021876	1545	3.0	.2400e+02	.1952e-07	.3221e-09
07025	avc	022376	1610	3.0	.1940e+02	.2866e-08	.3221e-09
07026	bvc	022776	1000	3.0	.1700e+02	.3303e-08	.3412e-09
07027	avc	030976	0850	3.0	.2000e+02	.3808e-08	.3221e-09
07028	bvc	031876	0830	3.0	.1900e+02	.9827e-08	.3221e-09
07029	avc	032576	1020	3.0	.1800e+02	.6429e-08	.3221e-09
07030	bvc	040276	0830	3.0	.2000e+02	.6743e-08	.3221e-09
07031	avc	040776	0826	3.0	.2000e+02	.8394e-08	.3221e-09
07032	bvc	041976	0845	3.0	.2000e+02	.6060e-08	.3221e-09
07033	avc	042376	1601	3.0	.1350e+02	.6210e-08	.3221e-09
07034	bvc	050676	0830	3.0	.2000e+02	.5023e-08	.3221e-09
07035	bvc	051476	1440	3.0	.1900e+02	.1216e-07	.3221e-09
07036	avc	052076	1620	3.0	.1800e+02	.6579e-08	.3221e-09
07037	bvc	052676	1400	3.0	.1800e+02	.7330e-08	.3221e-09
07038	avc	060776	0840	3.0	.2000e+02	.6565e-08	.3221e-09
07039	bvc	062276	0850	3.0	.1850e+02	.5883e-08	.3221e-09
07040	avc	062576	1100	4.0	.1850e+02	.5364e-08	.3221e-09
07041	bvc	062876	1545	4.0	.1800e+02	.4613e-08	.3221e-09
07042	avc	070976	1025	4.0	.1800e+02	.2457e-08	.3221e-09
07043	bvc	071576	0905	4.0	.1900e+02	.6306e-08	.5282e-09
07044	avc	071976	0900	4.0	.1800e+02	.6060e-08	.4736e-09
07045	bvc	072376	1035	4.0	.2000e+02	.3863e-08	.1286e-09
07046	avc	080676	1545	4.0	.1700e+02	.2088e-08	.1286e-09
07047	bvc	081776	1630	4.0	.3000e+02	.2170e-07	.1815e-09
07048	avc	081876	1010	4.0	.2050e+02	.7207e-08	.1287e-09
07049	bvc	090876	1015	4.0	.1840e+02	.3453e-08	.1287e-09
07050	bvc	091776	1621	4.0	.2080e+02	.6047e-08	.1287e-09
07051	avc	092076	1105	4.0	.2000e+02	.9609e-08	.1287e-09
07052	bvc	092976	0840	4.0	.1820e+02	.3890e-08	.1287e-09
07053	avc	101576	0850	4.0	.1840e+02	.2276e-08	.6429e-09
07054	bvc	102176	0840	4.0	.2550e+02	.1692e-07	.6429e-09
07055	avc	102276	1520	4.0	.1600e+02	.1447e-07	.6429e-09

TABLE B-I. Cont.

sample	date modyyr	time hrmn	season	condensate volume (l)	condensate activity (ci/l)	activity error (ci/l)
07056	cvc	102676 1100	4.0	.2000e+02	.5869e-08	.6429e-09
07057	bvc	110376 0845	4.0	.1800e+02	.5869e-08	.6429e-09
07058	avc	111676 1045	4.0	.1850e+02	.4231e-08	.6429e-09
07059	bvc	111876 1045	4.0	.1800e+02	.8476e-08	.6429e-09
07060	avc	112476 1435	4.0	.1700e+02	.5050e-08	.6429e-09
07061	bvc	121076 1629	4.0	.1730e+02	.6442e-08	.1815e-09
07062	avc	121476 1340	4.0	.2000e+02	.8490e-08	.3003e-09
07063	bvc	121676 1555	4.0	.1900e+02	.7043e-08	.1287e-09
07064	avc	122376 1320	4.0	.1650e+02	.6156e-08	.1365e-09
07065	bvc	010477 0818	4.0	.1820e+02	.5719e-08	.1287e-09
07066	avc	011377 1110	4.0	.1900e+02	.1163e-07	.1287e-09
07067	bvc	011977 1355	4.0	.2000e+02	.7289e-08	.1287e-09
07068	avc	012477 0900	5.0	.1800e+02	.8804e-08	.2825e-09
07069	bvc	021777 0900	5.0	.1800e+02	.1501e-07	.1287e-09
07070	avc	022577 1335	5.0	.1800e+02	.5269e-08	.1287e-09
07071	bvc	031477 1055	5.0	.2000e+02	.5937e-08	.1287e-09
07072	avc	032177 0910	5.0	.2050e+02	.1570e-07	.1287e-09
07073	bvc	032977 1545	5.0	.1900e+02	.9104e-08	.1287e-09
07074	avc	041277 1611	5.0	.1810e+02	.2157e-07	.2907e-09
07075	bvc	042177 0900	5.0	.1900e+02	.1174e-07	.2361e-09
07076	avc	042977 1520	5.0	.1750e+02	.9541e-08	.1287e-09
07077	bvc	051777 1400	5.0	.1900e+02	.1325e-07	.1287e-09
07078	avc	052577 0850	5.0	.1800e+02	.1111e-07	.8640e-10
07079	bvc	060377 0840	5.0	.1800e+02	.8026e-08	.1815e-09
07080	avc	061477 1430	5.0	.1900e+02	.1556e-07	.1365e-09
07081	bvc	062377 0900	5.0	.1800e+02	.7289e-08	.9104e-10
07082	avc	070177 1020	5.0	.1600e+02	.5869e-08	.6429e-10
07083	bvc	071277 1600	5.0	.1850e+02	.1815e-07	.7275e-10
07084	avc	072177 1540	5.0	.2050e+02	.1084e-07	.8189e-10
07085	bvc	072877 1005	6.0	.1850e+02	.5746e-08	.6429e-10
07086	avc	080877 1055	6.0	.1800e+02	.1365e-07	.2006e-09
07087	bvc	081877 0900	6.0	.1800e+02	.1419e-07	.6429e-10
07088	avc	081977 1535	6.0	.1800e+02	.1335e-07	.1287e-09
07089	bvc	082477 1345	6.0	.1800e+02	.7493e-08	.2825e-09
07090	avc	090877 0859	6.0	.1800e+02	.5064e-08	.7275e-09
07091	bvc	091477 1146	6.0	.2000e+02	.1515e-07	.9104e-09
07092	avc	091677 1345	6.0	.2000e+02	.1433e-07	.6429e-09
07093	bvc	092377 1325	6.0	.1800e+02	.6988e-08	.6429e-09
07094	avc	100377 1020	6.0	.2400e+02	.4982e-07	.1273e-09
07095	bvc	101477 1637	6.0	.1390e+02	.9663e-08	.6429e-10
07096	avc	101777 1104	6.0	.1800e+02	.1037e-07	.3453e-09
07097	bvc	102577 1545	6.0	.1800e+02	.8558e-08	.6429e-10
07098	avc	110377 1602	6.0	.2410e+02	.1433e-07	.6825e-10
07099	bvc	111777 1330	6.0	.2200e+02	.1015e-07	.1137e-09
07100	avc	112177 1456	6.0	.1920e+02	.7575e-08	.6429e-10
07101	bvc	120677 0900	6.0	.1800e+02	.7957e-08	.6429e-10
07102	avc	121377 1042	6.0	.1800e+02	.7248e-08	.9104e-10
07103	bvc	121577 1107	6.0	.1810e+02	.8749e-08	.1638e-09
07104	avc	122177 0900	6.0	.1800e+02	.6947e-08	.6429e-10
07105	bvc	010678 1320	6.0	.1800e+02	.6101e-08	.6429e-10
07106	avc	011878 0915	6.0	.2200e+02	.1022e-07	.1542e-09
07107	bvc	012078 1050	6.0	.1900e+02	.1774e-07	.6429e-10
07108	avc	021478 1335	7.0	.1800e+02	.9268e-08	.1815e-09
07109	bvc	022178 1015	7.0	.1800e+02	.1611e-07	.6429e-10
07110	avc	030178 1445	7.0	.2000e+02	.1185e-07	.7275e-10
07111	bvc	031478 1431	7.0	.1800e+02	.1379e-07	.1501e-09
07112	avc	032378 0850	7.0	.1900e+02	.1134e-07	.6429e-10
07113	bvc	033078 1355	7.0	.1800e+02	.2921e-08	.6429e-10
07114	avc	041278 1335	7.0	.1800e+02	.2307e-07	.6429e-10
07115	bvc	041978 0845	7.0	.1850e+02	.1774e-07	.1365e-09

TABLE B-I. Cont.

sample		date modyyr	time hrmn	season	condensate volume (l)	condensate activity (ci/l)	activity error (ci/l)
07116	avc	042678	1530	7.0	.1800e+02	.9773e-08	.6429e-10
07117	bvc	051678	1350	7.0	.1800e+02	.1088e-07	.6429e-10
07118	avc	052378	0900	7.0	.1800e+02	.1897e-07	.7739e-10
07119	bvc	053178	0845	7.0	.1800e+02	.9268e-08	.8640e-10
07120	avc	061478	1450	7.0	.2000e+02	.1212e-07	.6429e-10
07121	bvc	062178	0905	7.0	.1800e+02	.1583e-07	.2593e-09
07122	avc	062878	1040	8.0	.1900e+02	.1323e-07	.6429e-10
07123	bvc	070578	0821	8.0	.2000e+02	.1925e-07	.6429e-10
07124	avc	071178	1407	8.0	.1800e+02	.2143e-07	.9554e-10
07125	bvc	071378	1521	8.0	.1950e+02	.1563e-07	.6429e-10
07126	avc	071778	1530	8.0	.1700e+02	.1043e-07	.6429e-10
07127	bvc	072878	1045	8.0	.1600e+02	.8299e-08	.1597e-09
07128	avc	081578	1600	8.0	.2000e+02	.7575e-08	.1365e-09
07129	bvc	081778	1150	8.0	.1810e+02	.1339e-07	.6429e-10
07130	avc	082178	0905	8.0	.2100e+02	.1043e-07	.6429e-10
07131	bvc	082978	1330	8.0	.1550e+02	.9527e-08	.6429e-10
07132	avc	091278	1440	8.0	.2000e+02	.7616e-08	.8640e-10
07133	avc	091478	0817	8.0	.1800e+02	.1570e-07	.1320e-09
07134	avc	091878	0825	8.0	.2200e+02	.2225e-07	.6429e-10
07135	bvc	092578	0815	8.0	.1900e+02	.1884e-07	.1047e-09
07136	avc	101678	1037	8.0	.1900e+02	.8585e-08	.9554e-10
07137	avc	101878	1110	8.0	.1900e+02	.1419e-07	.9104e-10
07138	avc	102378	0811	8.0	.1800e+02	.9623e-08	.1137e-09
07139	bvc	103078	0815	8.0	.2200e+02	.2566e-07	.6429e-10
07140	avc	110678	1011	8.0	.1900e+02	.2116e-07	.6429e-10
07141	bvc	111678	0900	8.0	.2200e+02	.3371e-07	.6429e-10
07142	avc	112078	0810	8.0	.1800e+02	.1542e-07	.1137e-09
07143	bvc	112978	1325	8.0	.1900e+02	.6988e-08	.6429e-10
07144	avc	121378	1000	8.0	.2400e+02	.8804e-08	.1273e-09
07145	bvc	121878	0810	8.0	.2300e+02	.4845e-07	.6429e-10
07146	avc	122878	0840	9.0	.1800e+02	.7643e-08	.7275e-10
07147	bvc	011679	1340	9.0	.1800e+02	.5269e-08	.6429e-10
07148	avc	011979	1320	9.0	.1800e+02	.8558e-08	.6429e-10
07149	bvc	012579	0840	9.0	.1800e+02	.6620e-08	.7739e-10
07150	avc	020579	0820	9.0	.1900e+02	.5269e-08	.6429e-10
07151	bvc	021479	0915	9.0	.2200e+02	.1815e-07	.1047e-09
07152	avc	022079	0905	9.0	.1950e+02	.1030e-07	.6429e-10
07153	bvc	022779	1105	9.0	.1800e+02	.6142e-08	.6429e-10
07154	avc	031379	1320	9.0	.2000e+02	.9118e-08	.8640e-10
07155	bvc	031979	0840	9.0	.1900e+02	.7739e-08	.9554e-10
07156	avc	032679	1137	9.0	.1900e+02	.4122e-07	.6429e-10
07157	bvc	041379	1030	9.0	.1600e+02	.4040e-08	.6429e-10
07158	avc	041979	1550	9.0	.1800e+02	.1136e-07	.6429e-10
07159	bvc	042579	1024	9.0	.1900e+02	.8258e-08	.1501e-09
07160	avc	050279	0910	9.0	.1800e+02	.6388e-08	.1638e-09
07161	avc	051679	0835	9.0	.2000e+02	.7753e-08	.8189e-10
07162	avc	052279	1546	9.0	.2000e+02	.7452e-08	.6429e-10
07163	bvc	053079	0831	9.0	.1800e+02	.5419e-08	.7736e-10
07164	avc	061379	0842	9.0	.2200e+02	.1168e-07	.7739e-10
07165	bvc	061879	0821	10.0	.3900e+02	.3617e-07	.1047e-09
07166	avc	062779	0825	10.0	.1800e+02	.1070e-07	.6436e-10
07167	bvc	071179	0955	10.0	.2400e+02	.7712e-08	.6436e-10
07168	avc	071879	1630	10.0	.1800e+02	.5419e-08	.9101e-10
07169	bvc	080279	1420	10.0	.1800e+02	.3289e-08	.6436e-10
07170	avc	081679	1408	10.0	.1970e+02	.3808e-08	.6436e-10
07171	bvc	081779	1430	10.0	.1850e+02	.9363e-08	.6436e-10
07172	avc	082079	0833	10.0	.2200e+02	.6388e-08	.6436e-10
07173	bvc	083179	1003	10.0	.1700e+02	.4941e-08	.1138e-09
07174	avc	091179	1545	10.0	.1800e+02	.3590e-08	.6436e-10
07175	bvc	091479	1025	10.0	.1900e+02	.7043e-08	.6436e-10

TABLE B-I. Cont.

sample		date mo/yr	time hr/mn	season	condensate volume (l)	condensate activity (ci/l)	activity error (ci/l)
07176	avc	091779	0830	10.0	.2550e+02	.8858e-08	.1456e-09
07177	bvc	092879	0900	10.0	.1700e+02	.5719e-08	.1183e-09
07178	avc	101679	0845	10.0	.2560e+02	.4081e-07	.7736e-10
07179	bvc	101779	1543	10.0	.1800e+02	.1013e-07	.7280e-10
07180	avc	101979	1310	10.0	.1600e+02	.6333e-08	.6436e-10
07181	bvc	102979	0831	10.0	.1900e+02	.5637e-08	.6436e-10
07182	avc	110979	0845	10.0	.2400e+02	.4531e-08	.6436e-10
07183	bvc	111379	0912	10.0	.3000e+02	.1046e-07	.6436e-10
07184	avc	112179	0850	10.0	.1500e+02	.8490e-08	.6436e-10
07185	bvc	120779	1040	10.0	.1600e+02	.4108e-08	.1229e-09
07186	avc	121179	0900	10.0	.2200e+02	.4067e-08	.1183e-09
07187	bvc	121379	0900	10.0	.2300e+02	.4996e-08	.9554e-10
07188	avc	121179	0855	11.0	.1400e+02	.6470e-08	.3945e-08
07189	avc	011580	1050	11.0	.1800e+02	.4613e-08	.6436e-10
07190	avc	012180	0856	11.0	.1800e+02	.1542e-07	.3549e-09
07191	bvc	012880	1022	11.0	.2300e+02	.7944e-08	.9554e-10
07192	avc	021180	1525	11.0	.2000e+02	.6360e-08	.6436e-10
07193	bvc	021580	1305	11.0	.1400e+02	.5582e-08	.6436e-10
07194	avc	022180	1512	11.0	.1890e+02	.6292e-08	.1092e-09
07195	bvc	022980	1325	11.0	.1600e+02	.4231e-08	.7280e-10
07196	avc	031380	0805	11.0	.1900e+02	.5869e-08	.7736e-10
07197	bvc	031980	1330	11.0	.1850e+02	.6633e-08	.1047e-09
07198	avc	032780	0833	11.0	.1860e+02	.6115e-08	.3217e-10
07199	bvc	041580	1102	11.0	.1800e+02	.5869e-08	.3217e-10
07200	avc	041180	0836	11.0	.1940e+02	.6879e-08	.3276e-10
07201	bvc	042880	0822	11.0	.1990e+02	.7384e-08	.3217e-10
07202	avc	051380	0759	11.0	.1940e+02	.7384e-08	.3217e-10
07203	bvc	051980	0845	11.0	.2010e+02	.7684e-08	.3143e-10
07204	avc	052380	1010	11.0	.1200e+02	.8708e-08	.3868e-10
07205	bvc	060680	0900	11.0	.1650e+02	.6197e-08	.3217e-10
07206	avc	061280	0900	12.0	.1800e+02	.6429e-08	.3217e-10
07207	bvc	061380	0830	12.0	.1250e+02	.5391e-08	.3217e-10
07208	avc	061680	1055	12.0	.1800e+02	.1007e-07	.3217e-10
07209	bvc	062680	1505	12.0	.1800e+02	.3958e-08	.4779e-10
07210	avc	071680	0835	12.0	.2500e+02	.6797e-08	.5461e-10
07211	bvc	071880	0825	12.0	.1930e+02	.1071e-07	.3217e-10
07212	avc	072180	1342	12.0	.1800e+02	.6865e-08	.1183e-09
07213	bvc	080180	0834	12.0	.1700e+02	.4340e-08	.3217e-10
07214	avc	081280	1645	12.0	.1800e+02	.4013e-08	.4323e-10
07215	bvc	081480	1102	12.0	.1870e+02	.4368e-08	.3217e-10
07216	avc	081880	1005	12.0	.2400e+02	.7439e-08	.4095e-10
07217	bvc	082980	0842	12.0	.1650e+02	.5064e-08	.3217e-10
07218	avc	091080	0845	12.0	.2200e+02	.4422e-08	.3640e-10
07219	bvc	091280	0855	12.0	.2100e+02	.5637e-08	.6825e-10
07220	avc	091780	0807	12.0	.1860e+02	.5514e-08	.3217e-10
07221	bvc	100380	1013	12.0	.1800e+02	.4463e-08	.3217e-10
07222	avc	101780	0833	12.0	.2000e+02	.3958e-08	.3217e-10
07223	bvc	102380	0850	12.0	.2800e+02	.8299e-08	.3217e-10
07224	avc	102780	1320	12.0	.1800e+02	.1032e-07	.6370e-10
07225	bvc	111480	0855	12.0	.1800e+02	.4818e-08	.3217e-10
07226	avc	111980	0850	12.0	.2440e+02	.3794e-08	.3217e-10
07227	bvc	112180	0820	12.0	.1720e+02	.5364e-08	.3412e-10
07228	avc	112680	1533	12.0	.1400e+02	.5446e-08	.6143e-10
07229	bvc	120980	0855	12.0	.2200e+02	.4736e-08	.3217e-10
07230	avc	121180	1530	13.0	.1800e+02	.5146e-08	.3217e-10
07231	bvc	121580	0820	13.0	.1900e+02	.3863e-07	.1183e-09
07232	avc	122480	0850	13.0	.1400e+02	.1328e-07	.6598e-10
07233	bvc	011581	0912	13.0	.1800e+02	.9896e-08	.3217e-10
07234	avc	012681	0822	13.0	.2250e+02	.1720e-07	.3217e-10
07235	bvc	021181	1525	13.0	.2000e+02	.1911e-07	.1183e-09

TABLE B-I. Cont.

sample		date mo/yr	time hr/min	season	condensate volume (l)	condensate activity (ci/l)	activity error (ci/l)
07236	avc	021781	0902	13.0	.2400e+02	.1638e-07	.3868e-10
07237	bvc	022381	0847	13.0	.1900e+02	.2962e-07	.6826e-10
07238	avc	030481	1030	13.0	.2700e+02	.2157e-07	.1661e-09
07239	bvc	031381	1410	13.0	.1650e+02	.1275e-07	.3217e-10
07240	avc	031981	1520	13.0	.1900e+02	.1097e-07	.4095e-10
07241	bvc	032781	0855	13.0	.1650e+02	.9445e-08	.7736e-10
07242	avc	042081	0850	13.0	.1850e+02	.1253e-07	.3217e-10
07243	bvc	042481	0915	13.0	.1400e+02	.1925e-07	.3726e-08
07244	avc	050181	0855	13.0	.1700e+02	.2034e-07	.1753e-09
07245	bvc	051181	1540	13.0	.1800e+02	.1488e-07	.1114e-09
07246	avc	051981	0845	13.0	.1900e+02	.2061e-07	.6436e-10
07247	bvc	052981	0855	13.0	.1800e+02	.1802e-07	.6436e-10
07248	avc	061681	0835	13.0	.2200e+02	.1570e-07	.1684e-09
07249	bvc	061981	0900	14.0	.2800e+02	.6238e-07	.8419e-10
07250	avc	062281	0935	14.0	.1800e+02	.1733e-07	.5915e-10
07251	bvc	062581	1430	14.0	.1760e+02	.9254e-08	.3217e-10
07252	avc	070981	1345	14.0	.1400e+02	.9718e-08	.6436e-10
07253	bvc	071581	1337	14.0	.1800e+02	.7138e-08	.3217e-10
07254	avc	071781	0813	14.0	.1500e+02	.1263e-07	.2931e-07
07255	bvc	072081	0914	14.0	.1750e+02	.6312e-08	.1160e-09
07256	avc	072781	1327	14.0	.1700e+02	.7384e-08	.9556e-10
07257	bvc	081381	1307	14.0	.1700e+02	.6756e-08	.6436e-10
07258	avc	081881	0807	14.0	.1900e+02	.6934e-08	.3549e-08
07259	bvc	082181	1405	14.0	.1500e+02	.9595e-08	.6436e-10
07260	avc	082581	1350	14.0	.1700e+02	.7862e-08	.9101e-10
07261	bvc	090381	1323	14.0	.1800e+02	.7452e-08	.2375e-08
07262	avc	091581	0849	14.0	.2500e+02	.8067e-08	.3221e-10
07263	bvc	092181	0820	14.0	.2800e+02	.7930e-08	.6429e-10
07264	avc	092581	1415	14.0	.1500e+02	.6183e-08	.1406e-09
07265	bvc	100981	0903	14.0	.1720e+02	.7575e-08	.6429e-10
07266	avc	101481	0810	14.0	.2000e+02	.7875e-08	.6429e-10
07267	bvc	101981	1430	14.0	.2400e+02	.7643e-08	.6429e-10
07268	avc	102381	1345	14.0	.1500e+02	.7848e-08	.1587e-09
07269	bvc	110681	0830	14.0	.1800e+02	.8162e-08	.1137e-09
07270	avc	111781	0750	14.0	.2400e+02	.8299e-08	.3917e-09
07271	bvc	112081	0815	14.0	.1400e+02	.6592e-08	.6429e-10
07272	avc	112481	1545	14.0	.1300e+02	.5323e-07	.2825e-09
07273	bvc	120381	1325	14.0	.1700e+02	.4149e-08	.2143e-09
07274	avc	121581	0810	14.0	.1700e+02	.5582e-08	.1092e-09
07275	bvc	122181	0830	15.0	.1800e+02	.6838e-08	.3917e-09
07276	avc	010482	0900	15.0	.1880e+02	.7302e-08	.8640e-10
07277	bvc	012082	1530	15.0	.1800e+02	.9868e-08	.6429e-10
07278	avc	020582	0800	15.0	.1700e+02	.1171e-07	.6429e-10
07279	bvc	021982	0800	15.0	.1800e+02	.9118e-08	.9554e-10
07280	avc	030382	1030	15.0	.1800e+02	.1248e-07	.4327e-09
07281	bvc	031182	0810	15.0	.1700e+02	.1116e-07	.9104e-10
07282	avc	031982	1045	15.0	.1700e+02	.2170e-07	.1952e-09
07283	bvc	032682	0830	15.0	.1600e+02	.1542e-07	.2361e-09
07284	avc	041682	1330	15.0	.1600e+02	.1624e-07	.8640e-10
07285	bvc	041982	0845	15.0	.2000e+02	.1167e-07	.1320e-09
07286	avc	042982	0830	15.0	.1850e+02	.1047e-06	.8189e-10
07287	bvc	051282	0815	15.0	.1800e+02	.1720e-07	.7275e-10
07288	avc	051782	0910	15.0	.1700e+02	.1178e-07	.6429e-10
07289	bvc	052482	0830	15.0	.1800e+02	.1733e-07	.1338e-09
07290	avc	061182	0845	15.0	.1400e+02	.1316e-07	.7739e-10
07291	bvc	061782	1610	16.0	.1730e+02	.2662e-07	.1597e-09
07292	avc	062182	1610	16.0	.1790e+02	.1938e-07	.1092e-09
07293	bvc	070682	0900	16.0	.1800e+02	.1392e-07	.2416e-09
07294	avc	071382	1630	16.0	.1900e+02	.1460e-07	.6825e-10
07295	bvc	071682	0815	16.0	.1800e+02	.1170e-07	.1638e-09

TABLE B-I. Cont.

sample	date modyyr	time hrmn	season	condensate volume (l)	condensate activity (ci/l)	activity error (ci/l)
07296	avc	071982 1045	16.0	.1400e+02	.1140e-07	.6429e-10
07297	bvc	073082 1015	16.0	.1600e+02	.1006e-07	.8640e-10
07298	avc	081682 1310	16.0	.1900e+02	.1099e-07	.1365e-09
07299	bvc	081882 1600	16.0	.1900e+02	.8626e-08	.6429e-10
07300	avc	082382 0855	16.0	.2000e+02	.9309e-08	.1460e-09
07301	bvc	090382 1300	16.0	.1600e+02	.1198e-07	.6429e-10
07302	avc	091382 1315	16.0	.2100e+02	.1774e-07	.1365e-09
07303	bvc	091682 1600	16.0	.2000e+02	.2334e-07	.7275e-10
07304	avc	092082 1430	16.0	.1700e+02	.9418e-08	.2498e-08
07305	bvc	092182 1340	16.0	.1600e+02	.2798e-07	.4955e-09
07306	avc	101282 1530	16.0	.2050e+02	.1007e-07	.6429e-10
07307	bvc	101582 1500	16.0	.1400e+02	.1002e-07	.3644e-09
07308	avc	101982 1325	16.0	.2000e+02	.1365e-07	.1952e-09
07309	bvc	110182 1353	16.0	.1950e+02	.1230e-07	.4777e-09
07310	avc	111582 1407	16.0	.1650e+02	.5350e-08	.6429e-10
07311	bvc	111682 1345	16.0	.1900e+02	.1036e-07	.8967e-09
07312	avc	111982 1630	16.0	.1800e+02	.1331e-07	.2730e-09
07313	bvc	112282 1630	16.0	.2000e+02	.1488e-07	.1501e-08
07314	avc	120682 1400	16.0	.1900e+02	.1039e-07	.2416e-09
07315	bvc	121482 1400	16.0	.2900e+02	.8613e-08	.1320e-09
07316	avc	122082 1830	16.0	.2900e+02	.1556e-07	.1228e-09
07317	avc	011783 1550	17.0	.2800e+02	.3030e-07	.8831e-10
07318	avc	012483 1600	17.0	.1850e+02	.1474e-07	.1433e-08
07319	cvc	020183 1400	17.0	.1800e+02	.9295e-08	.1014e-09
07320	avc	021483 1550	17.0	.3000e+02	.1597e-07	.1101e-08
07321	cvc	022283 1530	17.0	.1800e+02	.101e-07	.1256e-08
07322	avc	030483 1540	17.0	.1800e+02	.1002e-07	.2552e-09
07323	cvc	031583 1330	17.0	.5200e+02	.2088e-07	.2593e-09
07324	avc	031883 1600	17.0	.1800e+02	.1884e-07	.3057e-08
07325	bvc	032583 1357	17.0	.1610e+02	.1774e-07	.1183e-08
07326	avc	040483 1405	17.0	.1900e+02	.1392e-07	.8189e-10
07327	bvc	041583 1535	17.0	.1800e+02	.1733e-07	.8230e-09
07328	avc	042283 1420	17.0	.1700e+02	.1235e-07	.3590e-09
07329	bvc	050683 1530	17.0	.1650e+02	.1299e-07	.3317e-09
07330	avc	051983 1330	17.0	.1900e+02	.1286e-07	.8967e-09
07331	bvc	052383 1600	17.0	.1800e+02	.1855e-07	.8503e-09
07332	avc	060183 0800	17.0	.3300e+02	.3344e-07	.9145e-09
07333	bvc	061583 1320	17.0	.1700e+02	.1035e-07	.2143e-09

TABLE B-II. Condensate Data for Chamber 10.

sample		date modyr	time hrmn	season	condensate volume (l)	condensate activity (ci/l)	activity error (ci/l)
10001	avc	030775	0820	1.0	.1400e+02	.4095e-09	.6429e-09
10002	bvc	031375	1330	1.0	.1800e+02	.5391e-07	.6429e-09
10003	avc	031775	1600	1.0	.1500e+02	.2320e-08	.6429e-09
10004	bvc	032875	1534	1.0	.1600e+02	.7097e-09	.6429e-09
10005	avc	041775	1005	1.0	.1850e+02	.1911e-08	.6429e-09
10006	bvc	042375	0830	1.0	.2000e+02	.4777e-08	.6429e-09
10007	avc	042875	0925	1.0	.2500e+02	.1488e-07	.6429e-09
10008	bvc	050275	1450	1.0	.1700e+02	.5323e-08	.6429e-09
10009	avc	052075	0845	1.0	.1800e+02	.1638e-08	.6429e-09
10010	avc	061875	1410	1.0	.1800e+02	.2061e-07	.3044e-08
10011	bvc	062775	0832	1.0	.2000e+02	.1570e-07	.1000e-08
10012	avc	070175	1000	2.0	.1850e+02	.7466e-08	.3221e-09
10013	bvc	071075	0912	2.0	.2000e+02	.9281e-08	.3221e-09
10014	avc	071875	1514	2.0	.1700e+02	.6019e-08	.3221e-09
10015	bvc	072575	1320	2.0	.1900e+02	.3139e-08	.3221e-09
10016	bvc	073075	1345	2.0	.2000e+02	.3139e-08	.3221e-09
10017	bvc	080475	1000	2.0	.2100e+02	.1141e-07	.3221e-09
10018	avc	080775	1015	2.0	.2000e+02	.4450e-08	.3221e-09
10019	bvc	081175	0850	2.0	.2300e+02	.1979e-07	.3412e-09
10020	avc	082275	1522	2.0	.1530e+02	.4354e-08	.3221e-09
10021	bvc	091175	0837	2.0	.1900e+02	.3726e-08	.3221e-09
10022	avc	101075	1515	2.0	.1240e+02	.1911e-08	.3221e-09
10023	bvc	102475	1315	2.0	.1800e+02	.3426e-08	.3221e-09
10024	avc	111475	1030	2.0	.1300e+02	.4968e-08	.3221e-09
10025	bvc	122475	1345	2.0	.1600e+02	.1911e-08	.3221e-09
10026	avc	011276	0845	3.0	.2000e+02	.8490e-08	.5910e-09
10027	bvc	011476	0825	3.0	.2000e+02	.3822e-07	.1000e-08
10028	avc	012776	1620	3.0	.1800e+02	.6128e-08	.3221e-09
10029	bvc	013076	1425	3.0	.1800e+02	.2457e-08	.3221e-09
10030	avc	020376	0830	3.0	.1900e+02	.1774e-08	.3221e-09
10031	bvc	020676	1530	3.0	.1400e+02	.1106e-08	.3221e-09
10032	avc	021176	0818	3.0	.1880e+02	.1078e-08	.3221e-09
10033	bvc	021776	1025	3.0	.2100e+02	.2866e-08	.3221e-09
10034	avc	021976	1600	3.0	.1800e+02	.2880e-07	.9554e-09
10035	bvc	022376	1012	3.0	.1930e+02	.3139e-08	.3221e-09
10036	avc	030576	1400	3.0	.1800e+02	.1187e-08	.3221e-09
10037	bvc	031876	1330	3.0	.1800e+02	.2184e-07	.3221e-09
10038	avc	032276	1015	3.0	.2000e+02	.2061e-07	.5228e-09
10039	bvc	040176	0828	3.0	.1800e+02	.1788e-08	.3221e-09
10040	avc	041576	0845	3.0	.2000e+02	.1843e-07	.3221e-09
10041	bvc	041976	0845	3.0	.1800e+02	.2252e-08	.3221e-09
10042	avc	042376	1609	3.0	.1280e+02	.1515e-08	.3221e-09
10043	bvc	051276	1345	3.0	.1800e+02	.3194e-07	.3221e-09
10044	avc	051776	0845	3.0	.2500e+02	.7616e-07	.5228e-09
10045	bvc	052576	1615	3.0	.1780e+02	.1052e-07	.3221e-09
10046	avc	061776	0810	3.0	.2300e+02	.2948e-07	.3221e-09
10047	bvc	062276	0845	3.0	.2600e+02	.9950e-07	.3221e-09
10048	avc	062976	1452	4.0	.1820e+02	.4149e-07	.3221e-09
10049	bvc	071376	0900	4.0	.1850e+02	.3276e-08	.3221e-09
10050	avc	071576	1105	4.0	.1820e+02	.1679e-07	.1287e-09
10051	bvc	071676	1645	4.0	.1550e+02	.6811e-08	.1287e-09
10052	avc	071976	0900	4.0	.1850e+02	.5501e-08	.1287e-09
10053	bvc	073076	1320	4.0	.1800e+02	.3016e-08	.1287e-09
10054	avc	081776	1345	4.0	.2000e+02	.2225e-07	.1287e-09
10055	bvc	081976	0920	4.0	.2000e+02	.8204e-09	.1638e-09
10056	avc	082076	0845	4.0	.2000e+02	.3276e-08	.1287e-09
10057	bvc	082776	1330	4.0	.1750e+02	.8203e-08	.1365e-09
10058	avc	091376	0908	4.0	.1990e+02	.2825e-08	.2006e-09
10059	bvc	091776	0918	4.0	.1800e+02	.9472e-08	.4095e-09
10060	avc	092076	1020	4.0	.2400e+02	.2157e-06	.2511e-08

TABLE B-II. Cont.

sample		date modyyr	time hrmn	season	condensate volume (l)	condensate activity (ci/l)	activity error (ci/l)
10061	bvc	092476	1618	4.0	.1690e+02	.1501e-06	.7097e-09
10062	avc	100876	0920	4.0	.1850e+02	.1870e-06	.2784e-08
10063	bvc	102076	0835	4.0	.2600e+02	.1065e-06	.2552e-08
10064	avc	102276	1525	4.0	.2400e+02	.3494e-06	.1733e-08
10065	cvc	110276	1415	4.0	.1850e+02	.7330e-07	.6429e-09
10066	bvc	111576	0905	4.0	.2000e+02	.1788e-07	.6429e-09
10067	avc	111776	0835	4.0	.2020e+02	.5432e-07	.8285e-09
10068	cvc	111976	1135	4.0	.1300e+02	.2334e-07	.1287e-09
10069	bvc	120376	1400	4.0	.1850e+02	.1190e-07	.6429e-09
10070	avc	121376	1054	4.0	.1820e+02	.2184e-07	.6429e-09
10071	bvc	121476	1630	4.0	.1900e+02	.1265e-07	.2730e-09
10072	avc	121676	0850	4.0	.2500e+02	.2252e-06	.5733e-09
10073	cvc	122376	1320	4.0	.1450e+02	.1474e-07	.1287e-09
10074	avc	011077	1015	4.0	.1810e+02	.3999e-08	.1287e-09
10075	bvc	011877	0910	4.0	.2600e+02	.6183e-07	.4368e-09
10076	avc	012077	0840	4.0	.2050e+02	.7370e-08	.1287e-09
10077	cvc	021477	1325	5.0	.2000e+02	.1058e-06	.3180e-09
10078	bvc	021877	0915	5.0	.1850e+02	.3521e-07	.2825e-09
10079	avc	022377	1535	5.0	.1800e+02	.3603e-07	.1287e-09
10080	bvc	031477	0555	5.0	.1850e+02	.2730e-07	.2279e-09
10081	avc	031877	0905	5.0	.1800e+02	.1597e-07	.1287e-09
10082	bvc	032377	1400	5.0	.1800e+02	.3221e-08	.1287e-09
10083	avc	041277	1130	5.0	.1750e+02	.2307e-07	.3180e-09
10084	bvc	041877	0827	5.0	.2000e+02	.2484e-07	.5555e-09
10085	avc	042177	1530	5.0	.1800e+02	.2771e-08	.1287e-09
10086	bvc	051777	1400	5.0	.1850e+02	.1318e-07	.1287e-09
10087	avc	052077	1430	5.0	.1900e+02	.3999e-07	.1460e-09
10088	bvc	052577	0850	5.0	.1900e+02	.3221e-08	.6429e-10
10089	avc	061477	1325	5.0	.1900e+02	.1733e-07	.8189e-10
10090	bvc	061777	1613	5.0	.1820e+02	.2116e-07	.7739e-10
10091	avc	062277	1535	5.0	.1800e+02	.6183e-08	.6429e-10
10092	bvc	071277	1325	5.0	.1900e+02	.2225e-07	.1460e-09
10093	avc	071577	1417	5.0	.1600e+02	.2034e-07	.1952e-09
10094	bvc	072077	1112	5.0	.1850e+02	.4600e-08	.2184e-09
10095	avc	080177	1100	6.0	.1800e+02	.1447e-08	.6429e-10
10096	bvc	081577	1330	6.0	.1800e+02	.2580e-08	.6429e-10
10097	avc	081877	0900	6.0	.2350e+02	.2621e-07	.6429e-10
10098	bvc	081977	1535	6.0	.1700e+02	.1733e-07	.1365e-09
10099	avc	082677	0840	6.0	.1850e+02	.2088e-08	.1287e-09
10100	bvc	090977	0850	6.0	.1800e+02	.1155e-08	.6429e-10
10101	avc	091477	0920	6.0	.2400e+02	.4996e-07	.9786e-09
10102	bvc	091677	1345	6.0	.2100e+02	.4873e-07	.1183e-09
10103	avc	092377	1325	6.0	.1700e+02	.2143e-07	.2552e-09
10104	bvc	101177	1030	6.0	.2000e+02	.4996e-08	.6429e-10
10105	avc	101477	0850	6.0	.2170e+02	.1256e-06	.1273e-09
10106	bvc	101777	0835	6.0	.2390e+02	.9759e-07	.2361e-09
10107	avc	102777	0915	6.0	.1900e+02	.2211e-06	.6429e-10
10108	bvc	111577	1010	6.0	.1800e+02	.1303e-08	.6429e-10
10109	avc	111677	0810	6.0	.1990e+02	.2703e-07	.4777e-09
10110	bvc	111877	0900	6.0	.2200e+02	.5760e-08	.7275e-10
10111	avc	112877	1330	6.0	.2300e+02	.1082e-07	.2006e-09
10112	bvc	121277	1000	6.0	.1890e+02	.2580e-08	.6825e-10
10113	avc	121377	1002	6.0	.1800e+02	.2457e-07	.1137e-09
10114	bvc	121577	0850	6.0	.2080e+02	.3385e-08	.6429e-10
10115	avc	122377	0859	6.0	.1810e+02	.2170e-08	.6429e-10
10116	bvc	010678	1400	6.0	.1750e+02	.7275e-09	.6429e-10
10117	avc	011878	0906	6.0	.2500e+02	.1474e-06	.9691e-09
10118	bvc	012078	1100	6.0	.2200e+02	.1652e-06	.7138e-09
10119	avc	020378	1350	7.0	.1750e+02	.6101e-07	.7739e-10
10120	bvc	021778	0840	7.0	.2000e+02	.4149e-07	.1542e-09

TABLE B-II. Cont.

sample	date modyyr	time hrmn	season	condensate volume (l)	condensate activity (ci/l)	activity error (ci/l)
10121	avc	022278 0855	7.0	.2000e+02	.1052e-07	.7739e-10
10122	bvc	031078 0900	7.0	.1800e+02	.4531e-08	.7275e-10
10123	avc	031778 0825	7.0	.2000e+02	.4026e-07	.1228e-09
10124	bvc	032278 0845	7.0	.1950e+02	.4654e-08	.6429e-10
10125	avc	032878 1130	7.0	.9750e+01	.2457e-08	.6934e-10
10127	bvc	041378 0905	7.0	.1850e+02	.7534e-07	.4136e-09
10128	avc	041778 1130	7.0	.1800e+02	.9868e-08	.1047e-09
10129	bvc	042478 0912	7.0	.1800e+02	.5965e-08	.6429e-10
10130	avc	051778 0845	7.0	.1800e+02	.2184e-07	.9104e-10
10131	bvc	052278 1005	7.0	.2600e+02	.1474e-06	.1638e-09
10132	avc	060278 0830	7.0	.1750e+02	.8026e-08	.1406e-09
10133	bvc	061678 1100	7.0	.2000e+02	.2716e-07	.3999e-09
10134	avc	062078 1325	7.0	.1900e+02	.4709e-08	.6429e-10
10135	bvc	063078 0817	8.0	.1900e+02	.2170e-08	.6429e-10
10136	avc	071178 0820	8.0	.1700e+02	.1624e-07	.6429e-10
10137	bvc	071778 0837	8.0	.2400e+02	.2866e-07	.3958e-09
10138	avc	071978 0820	8.0	.1850e+02	.3385e-06	.1774e-09
10139	bvc	072578 1527	8.0	.1600e+02	.1011e-07	.1000e-09
10140	avc	081178 1030	8.0	.1750e+02	.2320e-08	.6429e-10
10141	bvc	081678 0845	8.0	.2000e+02	.1433e-07	.6429e-10
10142	avc	081878 0915	8.0	.1800e+02	.4723e-08	.6429e-10
10143	bvc	082578 1100	8.0	.1700e+02	.1870e-07	.6429e-10
10144	avc	090178 0915	8.0	.1500e+02	.3945e-08	.6429e-10
10145	bvc	091378 0820	8.0	.2500e+02	.2525e-07	.6825e-10
10146	avc	091478 0801	8.0	.1640e+02	.1347e-07	.6429e-10
10147	bvc	091578 0815	8.0	.1700e+02	.6429e-08	.6429e-10
10148	avc	091878 0817	8.0	.3300e+02	.5282e-07	.1183e-09
10149	bvc	092678 1320	8.0	.1750e+02	.3631e-08	.6429e-10
10150	avc	101378 0835	8.0	.1700e+02	.2894e-09	.6429e-10
10151	bvc	101778 0830	8.0	.1900e+02	.7480e-07	.2088e-09
10152	avc	101978 0910	8.0	.2100e+02	.3576e-08	.1000e-09
10153	bvc	102578 1545	8.0	.1800e+02	.1761e-08	.6429e-10
10154	avc	110678 1530	8.0	.1700e+02	.3672e-09	.6429e-10
10155	bvc	111578 0900	8.0	.2200e+02	.2689e-07	.1320e-09
10156	avc	111778 0853	8.0	.2000e+02	.2211e-07	.6470e-10
10157	bvc	112278 0905	8.0	.1600e+02	.4832e-08	.8640e-10
10158	avc	120478 0815	8.0	.1780e+02	.1025e-07	.6429e-10
10159	bvc	121278 1010	8.0	.2500e+02	.6865e-07	.2320e-09
10160	avc	121878 0840	9.0	.2000e+02	.2825e-07	.1000e-09
10161	bvc	011679 1100	9.0	.1900e+02	.1720e-08	.7275e-10
10162	avc	012279 0850	9.0	.2200e+02	.5937e-07	.9554e-10
10163	bvc	012979 0844	9.0	.1800e+02	.1043e-07	.6429e-10
10164	avc	021379 1545	9.0	.1700e+02	.4627e-07	.3549e-09
10165	bvc	022079 1030	9.0	.2500e+02	.2812e-07	.7739e-10
10166	avc	030279 0850	9.0	.1700e+02	.8258e-08	.1501e-09
10167	bvc	031579 0855	9.0	.1800e+02	.4245e-07	.6429e-10
10168	avc	032079 1607	9.0	.1800e+02	.5828e-08	.6429e-10
10169	bvc	040279 1330	9.0	.1850e+02	.2020e-08	.6429e-10
10170	avc	041979 1555	9.0	.1800e+02	.7316e-07	.2225e-09
10171	bvc	042579 1025	9.0	.1900e+02	.1134e-07	.1774e-09
10172	avc	050479 0855	9.0	.1800e+02	.6115e-08	.6429e-10
10173	bvc	051779 1315	9.0	.1820e+02	.3521e-07	.2047e-09
10174	avc	052379 0826	9.0	.1900e+02	.4299e-08	.6429e-10
10175	bvc	060179 0910	9.0	.1700e+02	.2457e-08	.6825e-10
10176	avc	061479 0900	9.0	.1800e+02	.2962e-07	.1092e-09
10177	bvc	061879 0830	10.0	.3200e+02	.4354e-07	.8645e-10
10178	avc	062779 1305	10.0	.1800e+02	.1652e-07	.6436e-10
10179	bvc	071079 1420	10.0	.1800e+02	.3426e-08	.6436e-10
10180	avc	071279 0850	10.0	.2000e+02	.2102e-07	.9101e-10
10181	bvc	071679 1001	10.0	.2000e+02	.6019e-08	.6436e-10

TABLE B-II. Cont.

sample	date mdayyr	time hrmn	season	condensate volume (l)	condensate activity (ci/l)	activity error (ci/l)
10182	avc	072579 0950	10.0	.1800e+02	.1419e-08	.6436e-10
10183	bvc	081479 1014	10.0	.1800e+02	.6142e-09	.6436e-10
10184	avc	081679 0845	10.0	.2200e+02	.3453e-07	.7280e-09
10185	bvc	082079 0908	10.0	.2700e+02	.7671e-07	.3913e-09
10186	avc	082979 0840	10.0	.1800e+02	.1406e-07	.6825e-10
10187	bvc	091179 1540	10.0	.1800e+02	.5719e-08	.6436e-10
10188	avc	091479 1310	10.0	.1850e+02	.1305e-07	.9645e-10
10189	bvc	091779 0830	10.0	.2050e+02	.1216e-07	.1228e-09
10190	avc	092879 0930	10.0	.1700e+02	.3549e-08	.7275e-10
10191	bvc	101579 1612	10.0	.1800e+02	.3399e-08	.6436e-10
10192	avc	101879 1245	10.0	.1900e+02	.1474e-07	.6436e-10
10193	bvc	102279 1022	10.0	.2400e+02	.1183e-07	.6436e-10
10194	bvc	110279 0830	10.0	.1600e+02	.5159e-08	.6436e-10
10195	avc	110979 0850	10.0	.1800e+02	.2184e-07	.6826e-10
10196	avc	111379 0906	10.0	.2100e+02	.9063e-08	.6436e-10
10197	bvc	111679 1400	10.0	.1600e+02	.1178e-07	.1001e-09
10198	avc	112979 1000	10.0	.1700e+02	.5228e-08	.7736e-10
10199	bvc	121179 1500	10.0	.1850e+02	.1624e-07	.7736e-10
10200	avc	121879 0915	11.0	.1800e+02	.1278e-07	.2457e-09
10201	bvc	122879 1030	11.0	.1300e+02	.1433e-07	.6825e-10
10202	avc	012180 0930	11.0	.2800e+02	.6483e-08	.6436e-10
10203	bvc	020780 1540	11.0	.2000e+02	.1624e-07	.3094e-09
10204	avc	021980 1530	11.0	.1900e+02	.2143e-07	.1821e-09
10205	bvc	022880 1355	11.0	.1800e+02	.1993e-07	.1411e-09
10206	avc	031380 1015	11.0	.1800e+02	.3631e-07	.4824e-09
10207	bvc	032180 0826	11.0	.1700e+02	.3917e-07	.6436e-10
10208	avc	033180 0835	11.0	.1800e+02	.2184e-07	.3217e-10
10209	bvc	041180 1315	11.0	.1750e+02	.5623e-07	.3208e-09
10210	avc	041580 1530	11.0	.1950e+02	.3317e-06	.3276e-09
10211	bvc	042580 0745	11.0	.1920e+02	.3863e-07	.3640e-10
10212	avc	050280 0832	11.0	.1820e+02	.2484e-07	.1433e-09
10213	bvc	051680 1535	11.0	.1730e+02	.5255e-07	.2412e-09
10214	avc	052380 0910	11.0	.1500e+02	.3726e-07	.8645e-10
10215	bvc	060680 1015	11.0	.1500e+02	.2839e-07	.1866e-09
10216	avc	061280 0855	12.0	.1800e+02	.1073e-06	.2503e-09
10217	bvc	061380 1120	12.0	.1200e+02	.4299e-07	.1974e-07
10218	avc	061680 1055	12.0	.2400e+02	.1032e-06	.5461e-10
10219	bvc	062080 0845	12.0	.1400e+02	.4695e-07	.9556e-10
10220	avc	070380 0900	12.0	.1700e+02	.1870e-07	.3217e-10
10221	bvc	071680 0850	12.0	.1800e+02	.2320e-07	.3217e-10
10222	avc	071880 0845	12.0	.1600e+02	.2989e-07	.4323e-10
10223	bvc	072180 1056	12.0	.2200e+02	.2812e-07	.5688e-10
10224	avc	073080 1534	12.0	.1750e+02	.1925e-07	.3217e-10
10225	bvc	081280 1515	12.0	.1900e+02	.1965e-07	.1570e-09
10226	avc	081580 1140	12.0	.1900e+02	.3317e-07	.1411e-09
10227	bvc	082080 1435	12.0	.1800e+02	.2566e-07	.4258e-08
10228	avc	090380 1525	12.0	.1800e+02	.2907e-07	.7493e-08
10229	bvc	090980 1120	12.0	.1900e+02	.2484e-07	.6826e-10
10230	avc	091180 1550	12.0	.1800e+02	.3631e-07	.2320e-09
10231	bvc	091580 0957	12.0	.2600e+02	.4654e-07	.1024e-09
10232	avc	092480 0845	12.0	.1800e+02	.3399e-07	.3217e-10
10233	bvc	101080 0900	12.0	.1600e+02	.1334e-07	.3217e-10
10234	avc	101780 1315	12.0	.1700e+02	.3194e-07	.2480e-09
10235	bvc	102080 0855	12.0	.2100e+02	.2539e-07	.9328e-10
10236	avc	102480 0910	12.0	.1800e+02	.3440e-07	.1047e-09
10237	bvc	111880 1400	12.0	.1800e+02	.1965e-07	.4551e-10
10238	avc	112080 1630	12.0	.2200e+02	.1336e-06	.6092e-06
10239	bvc	112680 0835	12.0	.1600e+02	.1250e-06	.2244e-08
10240	avc	120880 1536	12.0	.2400e+02	.4313e-07	.3217e-10
10241	bvc	121180 1500	13.0	.1700e+02	.3631e-07	.2753e-09

TABLE B-II. Cont.

sample		date modyyr	time hrmn	season	condensate volume (l)	condensate activity (ci/l)	activity error (ci/l)
10242	avc	122480	0850	13.0	.1500e+02	.4996e-07	.1884e-09
10243	bvc	011481	1600	13.0	.1830e+02	.1993e-06	.8981e-09
10244	avc	012381	0900	13.0	.1600e+02	.6715e-07	.2457e-09
10245	bvc	020281	1025	13.0	.1800e+02	.4996e-07	.7616e-09
10246	avc	021381	0902	13.0	.1700e+02	.1347e-06	.5187e-09
10247	bvc	022381	0845	13.0	.2050e+02	.8544e-07	.2320e-09
10248	avc	030681	0845	13.0	.1700e+02	.9609e-07	.4613e-09
10249	bvc	031381	1110	13.0	.1550e+02	.1474e-06	.6865e-09
10250	avc	032081	1555	13.0	.1620e+02	.8421e-07	.8667e-09
10251	bvc	040181	0845	13.0	.1800e+02	.7084e-07	.3221e-10
10252	avc	041681	1620	13.0	.1800e+02	.1965e-06	.2116e-09
10253	bvc	042481	0916	13.0	.1550e+02	.8121e-07	.6661e-09
10254	avc	050181	1110	13.0	.1400e+02	.6442e-07	.1460e-09
10255	bvc	051181	1120	13.0	.1800e+02	.1138e-06	.9008e-09
10256	avc	052181	1002	13.0	.1800e+02	.9309e-07	.3508e-09
10257	bvc	052981	1535	13.0	.1600e+02	.7111e-07	.1006e-08
10258	avc	061681	0835	13.0	.1800e+02	.1189e-06	.2020e-09
10259	bvc	062281	0955	14.0	.2800e+02	.1294e-06	.3016e-09
10260	avc	062681	0921	14.0	.1600e+02	.1198e-06	.6988e-09
10261	avc	071081	1342	14.0	.1600e+02	.5036e-07	.3781e-09
10262	avc	071581	1340	14.0	.1600e+02	.7695e-07	.3276e-09
10263	bvc	072081	0906	14.0	.2100e+02	.9677e-07	.5910e-08
10264	avc	073181	1339	14.0	.1700e+02	.7985e-07	.3235e-09
10265	bvc	081781	1128	14.0	.1800e+02	.7944e-07	.4777e-09
10266	avc	082081	1430	14.0	.1850e+02	.3726e-07	.2088e-09
10267	bvc	082481	1542	14.0	.1800e+02	.3399e-07	.2279e-09
10268	avc	091081	1444	14.0	.1800e+02	.4313e-07	.6429e-10
10269	bvc	091681	1330	14.0	.2100e+02	.1036e-06	.6920e-09
10270	avc	092181	0820	14.0	.2000e+02	.3440e-07	.1228e-09
10271	bvc	100281	0827	14.0	.1580e+02	.6388e-07	.6429e-10
10272	avc	101481	1430	14.0	.2000e+02	.6702e-07	.7739e-09
10273	bvc	102081	0845	14.0	.2400e+02	.7957e-07	.1747e-08
10274	avc	110281	1330	14.0	.1800e+02	.7466e-07	.8599e-09
10275	bvc	111681	1545	14.0	.1700e+02	.6265e-07	.6429e-10
10276	avc	112081	0815	14.0	.2000e+02	.3371e-07	.1406e-09
10277	bvc	112581	1320	14.0	.1800e+02	.3289e-07	.6429e-10
10278	avc	121181	0830	14.0	.1500e+02	.3167e-07	.6374e-09
10279	bvc	121681	0830	14.0	.1800e+02	.2907e-07	.1183e-09
10280	avc	122481	0830	15.0	.1500e+02	.3440e-07	.5637e-09
10281	bvc	011282	0810	15.0	.1800e+02	.1332e-06	.1000e-08
10282	avc	012282	1030	15.0	.1600e+02	.7193e-08	.3235e-09
10283	bvc	020582	0800	15.0	.1900e+02	.4545e-07	.7916e-09
10284	avc	021782	0830	15.0	.1700e+02	.1406e-06	.4586e-08
10285	bvc	030182	1315	15.0	.2000e+02	.7398e-07	.6429e-10
10286	avc	030982	0845	15.0	.1700e+02	.1156e-06	.2525e-08
10287	bvc	031982	1115	15.0	.1600e+02	.7234e-07	.9049e-09
10288	avc	032282	0815	15.0	.2100e+02	.1774e-06	.2061e-08
10289	cvc	041282	1330	15.0	.2600e+02	.3044e-06	.3617e-08
10290	avc	042282	1530	15.0	.2200e+02	.3781e-07	.6429e-10
10291	cvc	051082	0830	15.0	.1600e+02	.1294e-07	.2006e-09
10292	avc	052082	1600	15.0	.1900e+02	.3576e-07	.5323e-09
10293	bvc	060482	1030	15.0	.1800e+02	.1706e-07	.3276e-09
10294	avc	061582	1618	16.0	.2150e+02	.4436e-07	.2047e-09
10295	cvc	061882	0844	16.0	.1480e+02	.2580e-07	.1047e-09
10296	bvc	062182	1119	16.0	.1840e+02	.1433e-07	.4054e-09
10297	cvc	063082	1414	16.0	.1850e+02	.8271e-08	.1137e-09
10298	avc	071382	0820	16.0	.1800e+02	.1815e-07	.7411e-09
10299	bvc	071682	0815	16.0	.1800e+02	.1033e-07	.2143e-09
10300	avc	072082	0830	16.0	.1900e+02	.1336e-07	.3317e-09
10301	bvc	073082	1015	16.0	.1400e+02	.1097e-07	.1365e-09

TABLE B-II. Cont.

sample		date mo dy yr	time hr mn	season	condensate volume (l)	condensate activity (ci/l)	activity error (ci/l)
10302	avc	081682	1050	16.0	.1800e+02	.1597e-07	.3003e-09
10303	cvc	082082	0830	16.0	.2000e+02	.1290e-07	.7193e-09
10304	avc	082382	1600	16.0	.1800e+02	.9827e-08	.2006e-09
10305	bvc	090382	1300	16.0	.1400e+02	.8230e-08	.1320e-09
10306	avc	091482	0730	16.0	.1600e+02	.1379e-07	.2552e-09
10307	bvc	091782	1400	16.0	.2000e+02	.1070e-07	.3685e-09
10308	avc	092082	1430	16.0	.1450e+02	.1123e-07	.6429e-10
10309	bvc	100782	1325	16.0	.2000e+02	.7466e-08	.7739e-10
10310	avc	101582	1500	16.0	.2000e+02	.1338e-07	.1000e-09
10311	bvc	101982	1325	16.0	.2050e+02	.1323e-07	.9104e-10
10312	avc	102882	1400	16.0	.1800e+02	.1144e-07	.6429e-10
10313	bvc	110882	1440	16.0	.2200e+02	.1515e-07	.1870e-09
10314	avc	111982	1630	16.0	.2100e+02	.1043e-07	.4231e-09
10315	bvc	112482	1335	16.0	.1600e+02	.1088e-07	.6429e-10
10316	avc	121482	1400	16.0	.2000e+02	.1303e-07	.1110e-08
10317	bvc	122082	0830	16.0	.2500e+02	.1101e-07	.1047e-09
10318	avc	011983	1530	17.0	.1700e+02	.1856e-07	.3317e-08
10319	bvc	020283	1600	17.0	.1700e+02	.1392e-07	.1774e-09
10320	avc	021483	1410	17.0	.1800e+02	.1788e-07	.6101e-09
10321	bvc	022882	1430	17.0	.1950e+02	.1460e-07	.9008e-09
10322	avc	031183	1454	17.0	.1700e+02	.1302e-07	.1082e-08
10323	bvc	032583	1407	17.0	.1980e+02	.2047e-07	.3453e-09
10324	avc	040883	1530	17.0	.1800e+02	.3044e-07	.2143e-08
10325	cvc	041883	1350	17.0	.1750e+02	.5432e-07	.1287e-09
10326	avc	050283	1245	17.0	.1800e+02	.9759e-08	.3098e-10
10327	cvc	051783	0715	17.0	.2000e+02	.2266e-07	.4545e-09
10328	avc	052783	1310	17.0	.1400e+02	.3480e-07	.1788e-08
10329	cvc	061083	1400	17.0	.1800e+02	.9363e-08	.6429e-10
10330	avc	061683	0735	17.0	.1800e+02	.9063e-07	.3999e-08
10331	cvc	062883	0900	17.0	.1150e+02	.5419e-07	.4327e-09