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MOLECULAR AND ISOTOPIC ANALYSES OF THE HYDROCARBON GASES WITHIN GAS HYDRATE-BEARING ROCK UNITS OF THE PRUDHOE BAY-KUPARUK RIVER AREA IN NORTHERN ALASKA

by

Zenon C. Valin[1] and Timothy S. Collett[2]

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[1] U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

[2] U.S. Geological Survey
Federal Center, Box 25046
Denver, Colorado 80225

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ABSTRACT

Gas hydrates, which are crystalline substances of water molecules that encase gas molecules, have the potential for being a significant source of natural gas. World-wide estimates for the amount of gas contained in hydrates range from 1.1×10^5 to 2.7×10^8 trillion cubic feet. Gas hydrates exist in many Arctic regions, including the North Slope of Alaska.

The two primary objectives of the U.S. Geological Survey Gas Hydrate Research Project are (1) to map the distribution of in-situ gas hydrates on the North Slope of Alaska, and (2) to evaluate the geologic parameters that control the distribution of these gas hydrates. To aid in this study, British Petroleum Exploration, ARCO Alaska, Exxon Company USA, and the Continental Oil Company allowed the U.S. Geological Survey to collect geochemical samples from drilling North Slope production wells.

Molecular analysis of gaseous drill cutting and free-flowing gas samples from 10 production wells drilled in the Prudhoe Bay, Kuparuk River, and Milne Point oil fields indicates that methane is the primary hydrocarbon gas in the gas hydrate-bearing stratigraphic units. Isotopic data for several of these rock units indicate that the methane within the inferred gas hydrate occurences originated from both microbial and thermogenic processes.

INTRODUCTION

Gas hydrates are naturally occurring solids composed of rigid cages of water molecules that entrap gas molecules. While methane, propane, and other gases can be included in the clathrate structure, methane hydrates appear to be the most common in nature (Kvenvolden, 1988). At standard conditions (STP), one volume of saturated methane hydrate will contain as much as 164 volumes of methane gas (Davidson and others, 1978). Because of this large gas storage capacity, gas hydrates may represent an important commercial source of natural gas. Significant quantities of naturally occurring gas hydrates have been detected in many regions of the Arctic including Siberia (Makogon and others, 1972), the Mackenzie River Delta (Bily and Dick, 1974), and the North Slope of Alaska (Collett, 1983; Collett and others, 1988). Estimates of the amount of gas within the hydrates of the world are highly speculative and range over about three orders of magnitude, from 1.1×10^5 to 2.7×10^8 trillion cubic feet (adapted from the Potential Gas Committee, 1981). The amount of gas in the hydrate reservoirs of the world greatly exceeds the volume of known conventional gas reserves. The production history of the

Russian Messoyakha gas hydrate field demonstrates that gas hydrates are an immediate source of natural gas that can be produced by conventional methods (Makogon, 1981). Gas hydrates also represent a significant drilling and production hazard. Soviet, Canadian, and American researchers have described numerous problems associated with gas hydrates, including blowouts and casing failures (Bily and Dick, 1974; Franklin, 1980; Makogon, 1981). Recent studies have indicated that atmospheric methane, a potential greenhouse gas, is increasing at such a rate that the current concentrations (≈1.7 ppm) could double in the next 50 years (Rasmussen and Khalil, 1981). It has been suggested that destabilized gas hydrates may be contributing to this build-up in atmospheric methane. Because gas hydrates occur close to the earth's surface, they are easily affected by near-surface changes in pressure and temperature; thus, destabilized gas hydrates may be an important source of atmospheric methane (Kvenvolden, 1988).

Gas hydrates exist under a limited range of temperature and pressure conditions. The depth and thickness of the zone of potential gas hydrate stability in permafrost regions can be calculated, if the geothermal gradient and gas chemistry are known (Bily and Dick, 1974). In figure 1, the methane hydrate stability curve and the depth to the base of the ice-bearing permafrost were used to determine the depth and thickness of the potential methane hydrate zone at the Northwest Eileen State-2 well on the North Slope of Alaska. In this example, the depth to the base of the ice-bearing permafrost, as determined from well logs, is ≈530 m (Collett and others, 1988). Temperature surveys from surrounding wells (Lachenbruch and others, 1982) suggest that the mean-annual surface temperature at the Eileen well is -11°C, and that the base of ice-bearing permafrost is at -1.0°C. These temperature data have been used to project a geothermal gradient that intersects the methane hydrate stability curve at 210 m and 950 m, delineating a 740-m zone in which methane hydrate would be stable. Results reported in Collett and others (1988) indicate that methane hydrates would be stable beneath most of the coastal plain province on northern Alaska, with thicknesses being greater than 1,000 m in the Prudhoe Bay area. Thermal conditions, however, preclude the occurrence of gas hydrates in the north-central part of the National Petroleum Reserve in Alaska, located ≈300 km west of Prudhoe Bay, and in the foothills east of the Umiat oil field, which is located ≈150 km southwest of Prudhoe Bay.

Within the methane hydrate stability field on the North Slope, evidence for gas hydrates has been found in 50 wells by means of well log responses calibrated to the logs within the confirmed gas hydrate occurrences in the Northwest Eileen State-2 well (Collett, 1983; Collett and others, 1988). Most of the gas hydrates identified by well logs are

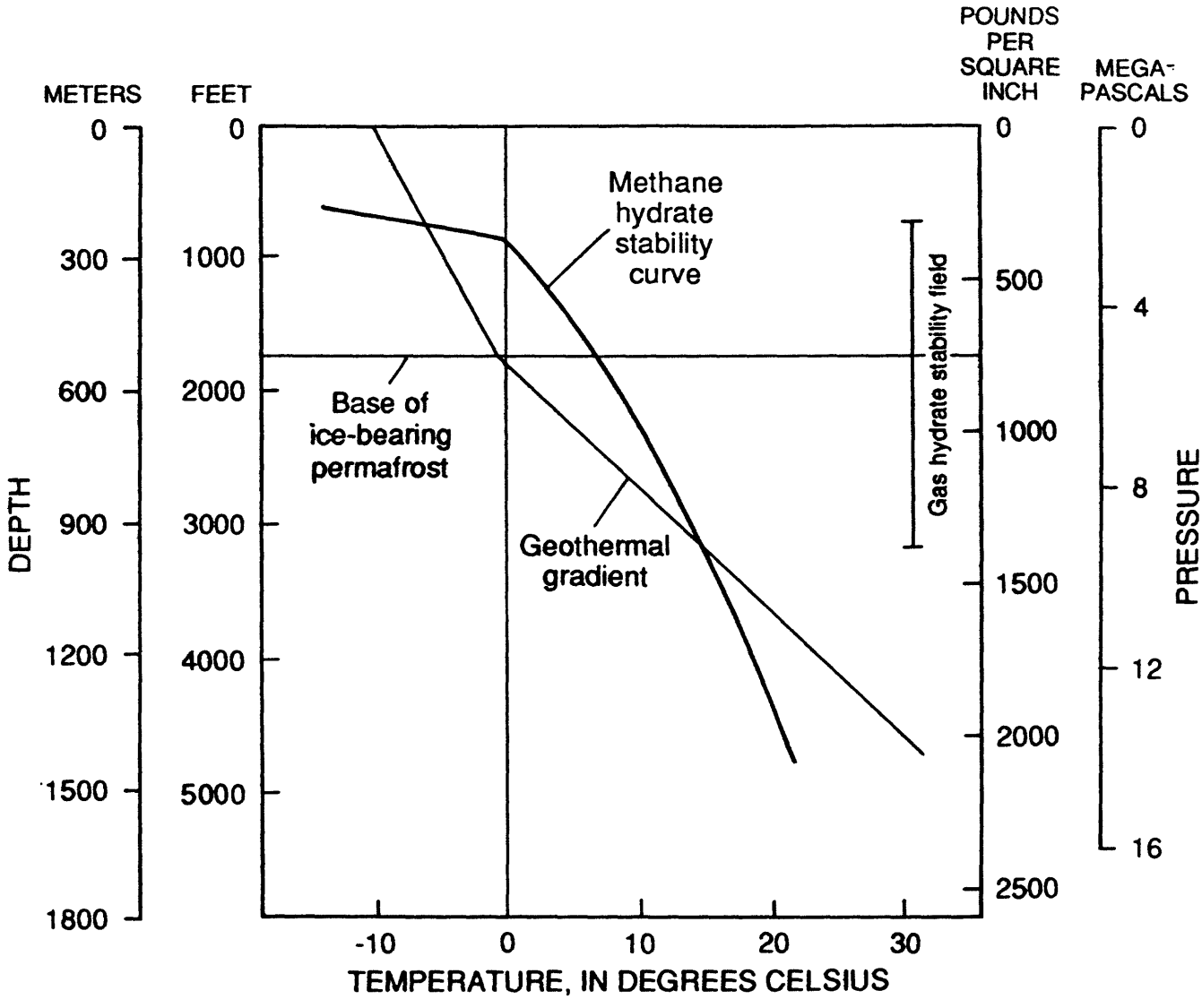

Figure 1. Example of the depth-temperature zone in which methane hydrates are stable in a permafrost region. Geothermal gradients are those predicted for the Northwest Eileen State-2 well in the Prudhoe Bay oil field. See figure 2 for well location (adapted from Collett, 1983).

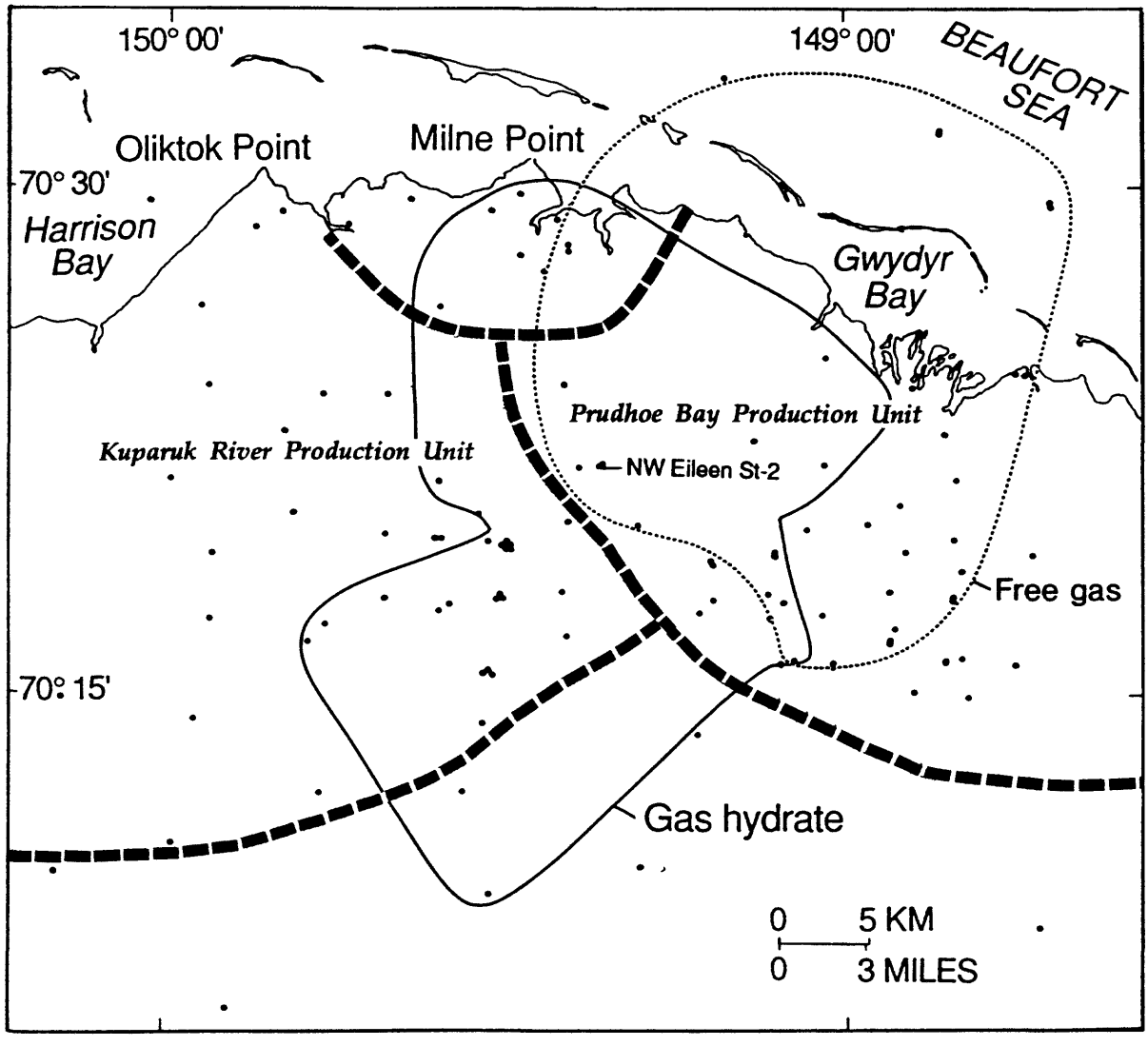

Figure 2. Composite map of the distribution of gas hydrate/free gas units in the Prudhoe Bay-Kuparuk River area (adapted from Collett and others, 1988). Dots show well locations.

geographically restricted to the eastern part of the Kuparuk River Production Unit and the western part of the Prudhoe Bay Production Unit (figure 2).

Stratigraphically below the mapped gas hydrate occurrences are several super-giant oil fields that contain enormous quantities of gas in solution or as a gas cap. These accumulations include the Prudhoe Bay and Kuparuk River oil fields, and the heavy-oil and tar deposits within the West Sak and Ugnu sands (Werner, 1987). West Sak and Ugnu are informal terms used by ARCO to identify a series of shallow oil-bearing sandstone reservoirs in the Kuparuk River area. Oil-source-rock correlations indicate that the oil in the entire Prudhoe Bay area came from a common source (Seifert and others, 1979); however, little is known about the history of oil or gas migration.

The objective of this study was to document the molecular and isotopic composition of the gas trapped within the gas hydrate-bearing stratigraphic intervals overlying the Prudhoe Bay and Kuparuk River oil fields. To reach this objective, we have analyzed cuttings gas and free gas samples collected from 10 drilling-production wells in the Prudhoe Bay and Kuparuk River fields. A description of the sampling procedures and analytical results follow.

SAMPLING PROCEDURE

For this study, drill cuttings and free gas samples were obtained from 10 wells drilled in the Prudhoe Bay, Kuparuk River, and Milne Point oil fields (table 1, figure 3). The drill cuttings were collected from the shaker table (figure 4) and placed in either quart or pint size metal cans. Water was added to submerge the cuttings, leaving a $\approx$1.5 cm air-space or headspace at the top of the can. In most cases a bactericide (Zephiran Chloride or Sodium Azide) was added to the water to prevent biological activity in the sample. The can was sealed with a metal lid. The free gas samples were collected from the mud logger's gas trap, which is positioned within the mud pit (figure 4) at the back of the shaker table. The gas trap consists of a pipe (15 cm in diameter) which is sealed at one end and inverted in the opossum belly. At the top of the trap is an agitator which separates the formation gas from the drilling muds. Both the shaker table and gas trap are open to the atmosphere. Most of the free gas samples were collected in 400 ml glass bottles by a simple displacement method, which consisted of using a small vacuum pump to withdraw the gas sample from the mud logger's gas trap and inject the sample into a glass bottle that was filled with water and inverted in a water bath.

Table 1. Prudhoe Bay Unit, Kuparuk River Unit, and Milne Point Unit production wells sampled for this study

Well name and number	API number	Company	Location		
			Sec.	T.	R.
Kuparuk River Unit 2B-10	5002921084	ARCO Alaska Inc.	19	11N	9E
Kuparuk River Unit 2D-15	5002921184	ARCO Alaska Inc.	26	11N	9E
Kuparuk River Unit 3A-9	5002920699	ARCO Alaska Inc.	7	12N	9E
Kuparuk River Unit 3H-9	5010320086	ARCO Alaska Inc.	12	12N	8E
Kuparuk River Unit 3K-9	5002921656	ARCO Alaska Inc.	35	13N	9E
Milne Point Unit E-4	5002921997	Conoco Inc.	25	13N	10E
Prudhoe Bay Unit R-1	5002920353	Sohio Alaska Inc.	32	12N	13E
Prudhoe Bay Unit S-26	5002922047	BP Exploration Inc.	35	12N	12E
Prudhoe Bay Unit Z-7	5002922046	BP Exploration Inc.	19	11N	12E
Prudhoe Bay Unit Z-8	5002921787	Standard Production	19	11N	12E

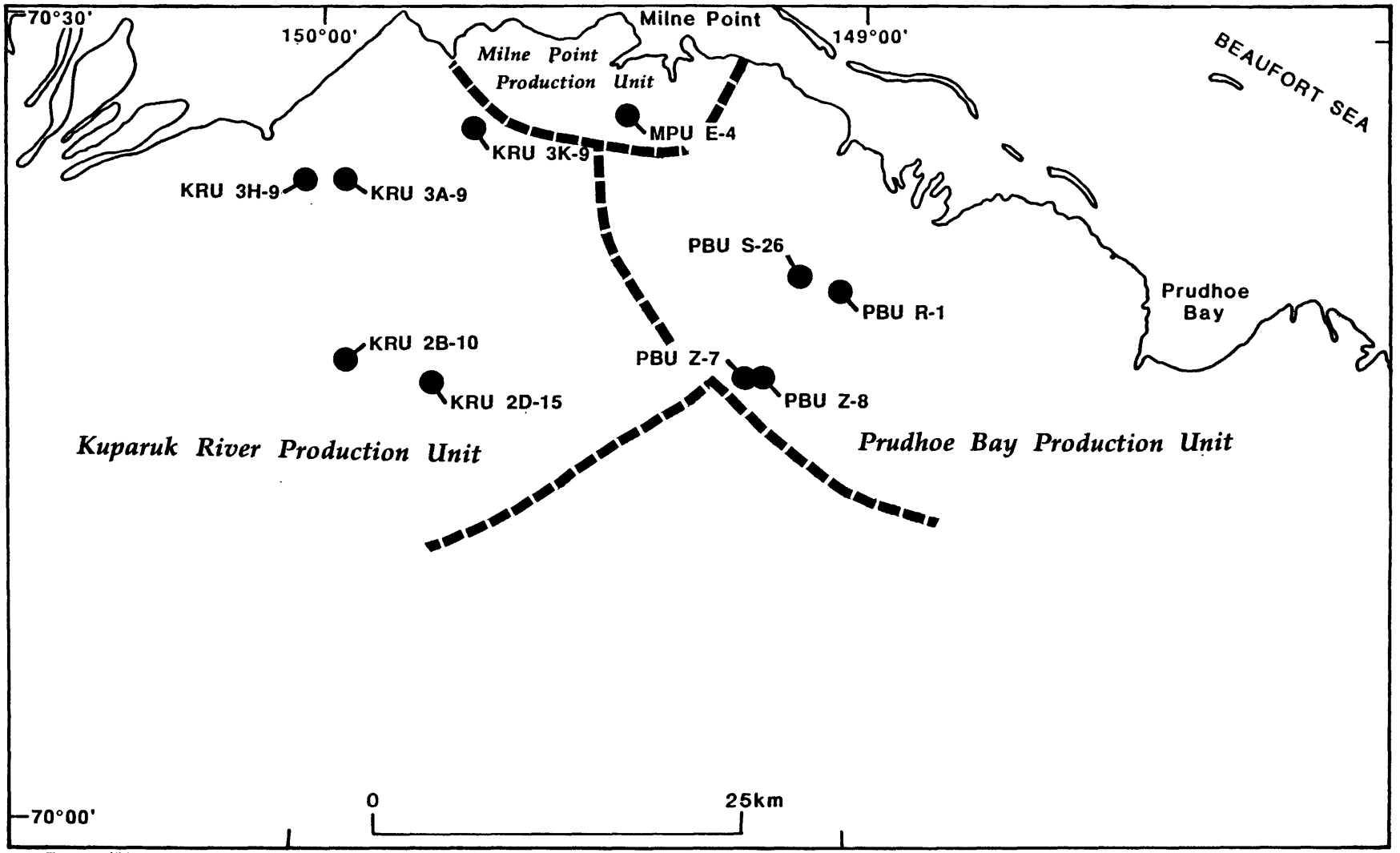

Figure 3. Map of Prudhoe Bay Unit, Kuparuk River Unit, and Milne Point Unit production wells sampled for this study.

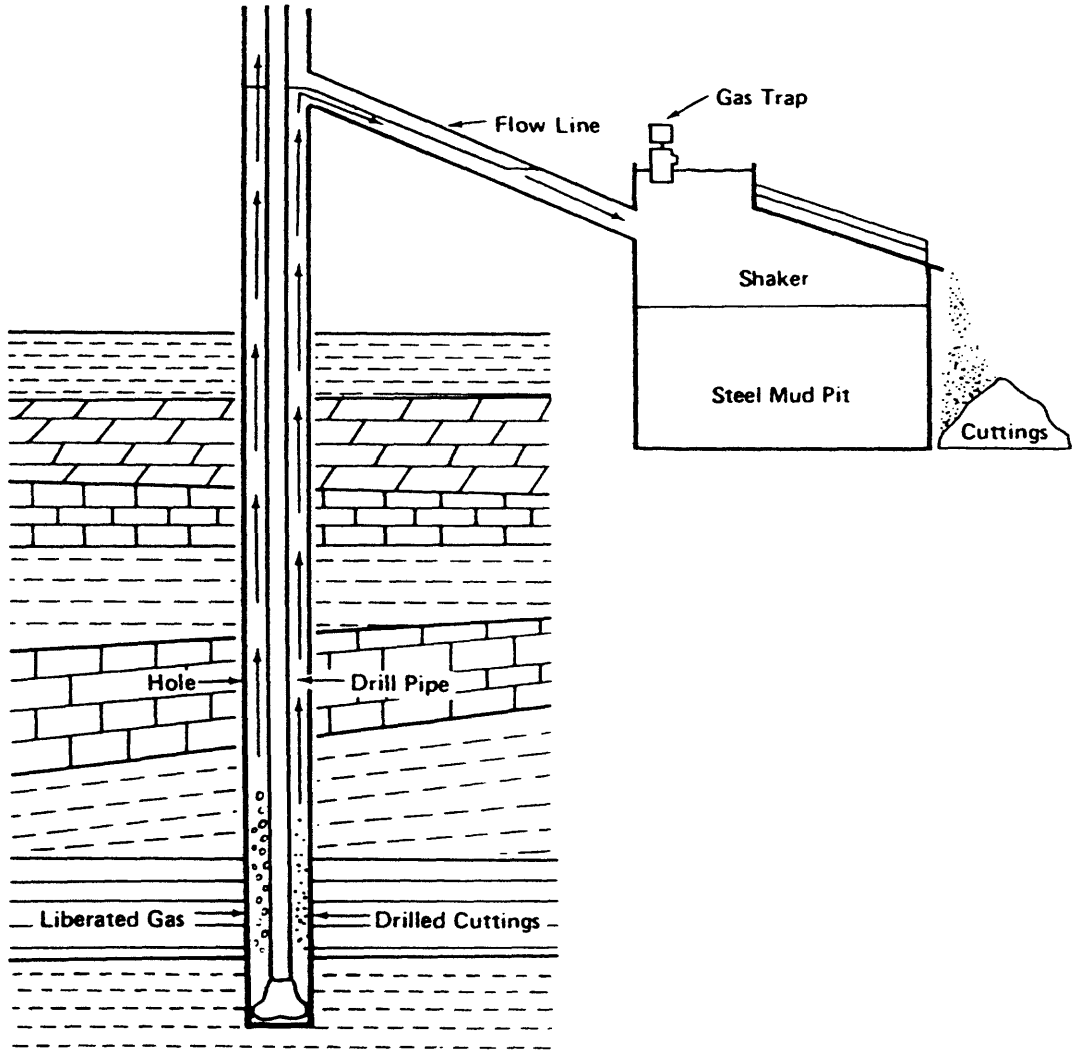

Figure 4. Simplified diagram of a standard drilling rig mud return and separation system.

ANALYTICAL METHODS

Two U.S. Geological Survey laboratories (Branch of Petroleum Geology laboratories, Denver, Colorado and Branch of Pacific Marine Geology laboratories, Palo Alto, California) and two contract laboratories (Geochem Research Incorporated, Houston, Texas and Global Geochemistry Corporation, Canoga Park, California) have been used to analyze the samples collected from the 10 wells in this study. Cooperative research efforts also permitted the West German Federal Institute for Geosciences and Natural Resources (BGR) to analyze samples from the Kuparuk River Unit 2B-10 and Kuparuk River Unit 2D-15 wells. A description of the analytical methods used in each of these laboratories follows.

USGS Branch of Petroleum Geology

The canned drill cuttings were permitted to outgas for several weeks prior to analyzing the headspace gas. The cans were punctured, internal pressures were measured, and a sample of gas was acquired. The headspace gas sample was injected into a gas chromatograph and the components air, carbon dioxide (CO_2), methane (C_1), ethane (C_2), and propane (C_3) through normal-pentane (NC_5) were separated and identified with a thermal conductivity detector. During the chromatographic separation, the methane peak was diverted into a syringe for injection and subsequent oxidation to CO_2 in a Leco induction furnace. The oxidized methane was dehydrated and the stable C isotopic composition of methane was measured on a Nier-McKinney mass spectrometer, and reported in the delta notation relative to the Peedee belemnite (PDB) marine carbonate standard (written communication, 1987, C. N. Threlkeld, U.S. Geological Survey, Denver, Colorado). The bottled free gas samples were analyzed in the same manner as the canned headspace samples.

USGS Branch of Pacific Marine Geology

The canned drill cuttings analyzed in this laboratory were equipped with septa covered ports. Prior to analysis, the can was shaken for ten minutes. A 8-ml aliquot of helium was injected into the can and an equal amount of headspace gas was withdrawn and analyzed. The gas analysis was performed on a Karl model 311 gas chromatograph equipped with flame ionization and thermal conductivity detectors. The gas chromatograph was calibrated with standard mixtures of hydrocarbon gases, CO_2, and air. Calculations of gas concentrations were made by integrating the areas of the chromatograph peaks and comparing the values with the standards. The bottled free gas samples and a limited

number of vacuum tube-stored samples were analyzed in a manner similar to the analyses of the canned headspace samples.

Geochem Research Incorporated

At the laboratory, a silicone rubber septum was attached to the lid of the canned sample in preparation for the C_1-C_7 headspace gas analysis. Prior to analysis, the can was shaken by hand for 1 minute. A small hole was pierced through the septum, and a sample of gas was withdrawn with a 2-ml syringe after a positive pressure (one atmosphere) was created in the can by the injection of 2 ml of degassed water. The 2-ml headspace gas sample was injected into a standard 1-ml gas sample loop attached to a Varian Aerograph 1400 isothermal gas chromatograph, equipped with a 3.18 mm by 2.44 m alumina-packed column and a flame ionization detector. This column resolves C_1, C_2, C_3, iso- and normal butane, and if present, the C_2, C_3, and C_4 olefinic hydrocarbons. After the normal butane peak eluted, the flow of carrier gas through the system was reversed with a back-flush valve, and the C_5-C_7 hydrocarbons were eluted as a single composite chromatographic peak. The concentration of each hydrocarbon was computed from the peak area by means of an electronic integrator with baseline correction. Before a suite of samples were analyzed, a light gas standard containing 100 ppm each of methane, ethane, propane, iso-butane, and normal butane were analyzed in triplicate. Analytical reproducibility is consistently within 2-3% of the observed value.

After the can was opened, an aliquot of 10-ml of wet cuttings was placed in a specially designed, sealed blender for the C_1-C_7 cuttings gas analysis. The sample was disaggregated for 2-3 minutes. A 2-ml sample of degassed water was injected into the 10-ml air space at the top of the blender and an equal amount of headspace gas was withdrawn. This 2-ml gas sample was analyzed in the same manner as the canned headspace gas.

Global Geochemistry Corporation

The C_1-C_5 hydrocarbon composition of the canned headspace gases and free gas samples were measured on a Hach 400 gas chromatograph equipped with a sample/back-flush valve, two 3.18 mm by 2.44 m stainless steel columns in a series/bypass configuration, and a flame ionizer detector. Analyses were completed in 15 minutes employing an He carrier gas (30 ml/min) and an oven temperature of 60°C. As the individual hydrocarbon components eluted they were channeled to a vacuum line for isotopic analyses. The hydrocarbons were combusted to CO_2 and H_2O in a cupric furnace (held at 800°C). The CO_2 was collected at the sample tube, and the H_2O was collected in a

separate sample tube containing precombusted zinc reagent. The zinc tube was heated at 500°C for one hour to convert the H_2O to H_2 gas. Carbon (δ13C) and deuterium (δD) isotopic measurements were made on a Nuclide (7.62 cm, 60°C) dual-collecting stable isotopic ratio mass spectrometer and were reported relative to the Peedee belemnite (PDB) marine carbonate standard and the Standard Mean Oceanic Water (SMOW) international standard, respectively. Analytical reproducibility is typically +-0.2 ppt for carbon and +-3 ppt for hydrogen. The gas chromatograph was calibrated with in-house gas standards.

West German Federal Institute for Geosciences and Natural Resources (BGR)

See Faber and Stahl (1983) for an analytical description of the laboratory methods methods employed.

ANALYTICAL RESULTS

To characterize the gas within the interval of gas hydrate stability on the North Slope, 10 drilling-production wells have been sampled and analyzed (table 1, figure 3). Results of these analyses have been included in the appendices of this report. An important assumption in our work is that the gas compositions of drill cuttings and free gas samples reflect the in-situ gas composition of the stratigraphic interval that was sampled. These analyses suggest that methane is the principal hydrocarbon gas in the near-surface (0-1500 m) strata of the North Slope. Stable methane carbon isotopic analyses of gaseous drill cuttings from several gas hydrate-bearing rock units yielded carbon isotopic values averaging approximately -49 ppt, thus suggesting that the methane within the inferred gas hydrate occurrences is from mixed sources, microbial and thermogenic (Collett and others, 1990). Gas with stable carbon isotopic compositions of -50 ppt and heavier is considered to be thermally generated; conversely, an isotopic composition of -60 ppt or lighter indicates that the gas was formed by microbial processes (Schoell, 1983). However, due to the arbitrary nature of these analytical boundaries, we have defined an isotopic transitional or mixing zone (values ranging from -65 to -45 ppt) between the thermogenic and microbial end members. Vitrinite reflectance (R_0) measurements of about 0.4 percent show that the gas hydrate-bearing rocks have never been subjected to temperatures within the thermogenic window (Collett and others, 1990). Thus, the thermogenic gas must have migrated from greater depths.

The gas cap of the Prudhoe Bay field is composed primarily of methane (83 to 88 %) along with small quantities of ethane (5 to 7 %) and propane (1 to 2 %) (written

communication, 1989, M.C. Davidson, BP Exploration, Anchorage, Alaska). If the gas within the near-surface sediments migrated from deeper structures, these shallow gases should have geochemical constituents similar to those of the deeper gases. However, no significant amounts of ethane or propane were detected within the interval of gas hydrate stability. The depletion of heavier hydrocarbons such as ethane and propane from gas mixtures by stripping during migration has been suggested by Schoell (1983) and Jenden and Kaplan (1986) to explain natural gases containing thermogenic methane but only minor amounts of heavier hydrocarbons. The thermogenic component of the gas within the interval of gas hydrate stability on the North Slope may have been stripped of most of its heavier hydrocarbons. Such a process could account for the molecular and isotopic compositions observed.

By comparing the methane carbon isotopic composition of this apparent gas mixture to the isotopic composition of the Prudhoe Bay gas cap it is possible to calculate the relative volume of thermogenically versus microbially sourced gas within the hydrate stability field. The methane carbon isotopic analyses of the Prudhoe Bay gas cap yield an average value of approximately -39 ppt (written communication, M.C. Davidson, BP Exploration, Anchorage, Alaska). The microbially-sourced methane component likely had an original methane isotopic composition ranging from -60 to -70 ppt (Collett and others, 1990). Because the mixing of two gases results in a linear and proportional change in isotopic composition (Schoell, 1983), it is estimated that about 50 to 70 percent of the methane within the hydrate stability field is thermogenic and has migrated from the Prudhoe Bay gas cap.

SUMMARY

Methane is the most abundant hydrocarbon gas within the gas hydrate-bearing rock units of the Prudhoe Bay-Kuparuk River area in the North Slope of Alaska. Isotopic analysis indicates that both microbial and thermogenic processes have contributed to the formation of this methane. The thermogenic component probably migrated into the rock units from greater depths, since vitrinite reflectance measurements show that the units never endured temperatures within the thermogenic range. Approximately 50 to 70 percent of the methane within the gas hydrate units is thermogenic in origin.

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APPENDICES EXPLANATION

The following appendices give the results of the headspace, free gas, and blended headspace analyses performed on the drill cutting and free gas samples from the wells listed in table 1. Each appendix includes an identification table which gives information for each sample analyzed. The numbers in the first column specify a sample number for which information about that sample is indicated in the boxes across from the number; the corresponding number can be found on the headspace, headspace/free gas, and blended headspace tables. A blank box indicates that the test was not performed; a dashed box indicates that the element was not detected. All data are expressed in parts per million.

Free gas samples for the KRU3A9 and PBUR1 wells were not analyzed. Blended headspace analyses were not performed for the KRU3H9, MPUE4, PBUS26, and PBUZ7 wells.

The following abbreviations are used for the sample ID table:

Sample Type
CT - Cuttings
GS - Free Gas

Container
CP - Pint Can
CQ - Quart Can
GB - Glass Bottle
VT - Vacuum Tube

Bactericide
A - Sodium Azide
Z - Zephiran Chloride
N - None

Laboratory
BG - Federal Institute for Geosciences and Natural Resources
GC - Geochem Research Incorporated
GG - Global Geochemistry Corporation
GM - USGS Branch of Pacific Marine Geology
GP - USGS Branch of Petroleum Geology

The following abbreviations are used for the headspace, headspace/free gas, and blended headspace analyses tables:

N2 - Nitrogen
CO2 - Carbon Dioxide
C1 - Methane
C2 - Ethane
C2:1 - Ethene
C3 - Propane
C3:1 - Propene
IC4 - Isobutane
NC4 - n-Butane
IC5 - Isopentane
NC5 - n-Pentane
C5-C7 - sum of the C5(Pentane), C6(Hexane), and C7(Heptane) fractions
d13C1 - stable carbon isotope ratio (C13/C12) of the methane fraction
dDC1 - deuterium isotope ratio (H2/H1) of the methane fraction
d13C2 - stable carbon isotope ratio (C13/C12) of the ethane fraction
d13CO2 - stable carbon isotope ratio (C13/C12) of the carbon dioxide fraction

APPENDIX I KRU2B10 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
1	5002921084	300	CT	CQ	March 1984	Z	GP	July 1984
2	5002921084	300	CT	CQ	March 1984	Z	GC	May 1984
3	5002921084	345	CT	CP	March 1984	A	BG	August 1986
4	5002921084	390	CT	CQ	March 1984	Z	GC	May 1984
5	5002921084	480	CT	CQ	March 1984	Z	GC	May 1984
6	5002921084	570	CT	CQ	March 1984	Z	GC	May 1984
7	5002921084	660	CT	CQ	March 1984	Z	GC	May 1984
8	5002921084	675	CT	CP	March 1984	A	BG	August 1986
9	5002921084	690	CT	CQ	March 1984	Z	GP	July 1984
10	5002921084	750	CT	CQ	March 1984	Z	GC	May 1984
11	5002921084	840	CT	CQ	March 1984	Z	GC	May 1984
12	5002921084	930	CT	CQ	March 1984	Z	GC	May 1984
13	5002921084	1020	CT	CQ	March 1984	Z	GP	July 1984
14	5002921084	1020	CT	CQ	March 1984	Z	GC	May 1984
15	5002921084	1065	CT	CP	March 1984	A	BG	August 1986
16	5002921084	1087	GS	GB	March 1984	N	BG	August 1986
17	5002921084	1110	CT	CQ	March 1984	Z	GC	May 1984
18	5002921084	1140	CT	CQ	March 1984	Z	GP	July 1984
19	5002921084	1200	CT	CQ	March 1984	Z	GC	May 1984
20	5002921084	1215	CT	CP	March 1984	A	BG	August 1986
21	5002921084	1217	GS	GB	March 1984	N	BG	August 1986
22	5002921084	1290	CT	CQ	March 1984	Z	GC	May 1984
23	5002921084	1305	CT	CP	March 1984	A	BG	August 1986
24	5002921084	1340	GS	GB	March 1984	N	BG	August 1986
25	5002921084	1350	CT	CQ	March 1984	Z	GC	May 1984
26	5002921084	1380	CT	CQ	March 1984	Z	GP	July 1984
27	5002921084	1380	CT	CQ	March 1984	Z	GC	May 1984
28	5002921084	1470	CT	CQ	March 1984	Z	GC	May 1984
29	5002921084	1560	CT	CQ	March 1984	Z	GC	May 1984
30	5002921084	1650	CT	CQ	March 1984	Z	GC	May 1984
31	5002921084	1695	CT	CP	March 1984	A	BG	August 1986

KRU2B10 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
32	5002921084	1740	CT	CQ	March 1984	Z	GC	May 1984
33	5002921084	1755	CT	CP	March 1984	A	BG	August 1986
34	5002921084	1770	CT	CQ	March 1984	Z	GP	July 1984
35	5002921084	1830	CT	CQ	March 1984	Z	GC	May 1984
36	5002921084	1920	CT	CQ	March 1984	Z	GC	May 1984
37	5002921084	1935	CT	CP	March 1984	A	BG	August 1986
38	5002921084	2010	CT	CQ	March 1984	Z	GC	May 1984
39	5002921084	2100	CT	CQ	March 1984	Z	GC	May 1984
40	5002921084	2160	CT	CQ	March 1984	Z	GC	May 1984
41	5002921084	2175	CT	CP	March 1984	A	BG	August 1986
42	5002921084	2180	GS	GB	March 1984	N	BG	August 1986
43	5002921084	2250	CT	CQ	March 1984	Z	GC	May 1984
44	5002921084	2340	CT	CQ	March 1984	Z	GP	July 1984
45	5002921084	2340	CT	CQ	March 1984	Z	GC	May 1984
46	5002921084	2375	GS	GB	March 1984	N	GP	July 1984
47	5002921084	2430	CT	CQ	March 1984	Z	GC	May 1984
48	5002921084	2505	CT	CP	March 1984	A	BG	August 1986
49	5002921084	2520	GS	GB	March 1984	N	BG	August 1986
50	5002921084	2550	CT	CQ	March 1984	Z	GC	May 1984
51	5002921084	2610	CT	CQ	March 1984	Z	GP	July 1984
52	5002921084	2610	CT	CQ	March 1984	Z	GC	May 1984
53	5002921084	2670	GS	GB	March 1984	N	GP	July 1984
54	5002921084	2670	CT	CQ	March 1984	Z	GC	May 1984
55	5002921084	2820	CT	CQ	March 1984	Z	GC	May 1984
56	5002921084	2835	CT	CP	March 1984	A	BG	August 1986
57	5002921084	2970	CT	CQ	March 1984	Z	GC	May 1984
58	5002921084	3060	CT	CQ	March 1984	Z	GC	May 1984
59	5002921084	3180	CT	CQ	March 1984	Z	GC	May 1984
60	5002921084	3270	CT	CQ	March 1984	Z	GC	May 1984
61	5002921084	3360	CT	CQ	March 1984	Z	GC	May 1984

KRU2B10 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	300	980900	15600	3500	-		-		-	-	-	-		-	-		
2	300			352	0		0		0	0			0				
3	345	998400	1000	600										-62.7			-16.7
4	390			197	7		14		10	19			334				
5	480			126	1		14		3	7			263				
6	570			389	5		29		10	14			434				
7	660			192	2		23		5	9			316				
8	675	991700	8000	300										-65.1			-15.2
9	690	985800	10200	3900	-		-		-	-	-	-		-	-		
10	750			3874	26		26		25	52			2509				
11	840			113952	96		24		12	24			1752				
12	930			2753	32		16		30	30			2190				
13	1020	974200	25100	600	-		-		-	-	-	-		-	-		
14	1020			1099	11		12		0	0			91				
15	1065	984900	15000	100										-56.3			-13.3
16	1087	999900															
17	1110			12357	15		10		5	10			495				
18	1140	998600	100	-	-		-		-	-	-	-		-	-		
19	1200			2890	14		14		10	14			662				
20	1215	985900	13000	1100										-64.6			-14.5
21	1217	999900															
22	1290			45878	35		8		8	12			607				
23	1305	979700	18000	2300										-56.4			-15.6
24	1340	998500	1000	500										-53.6			-20.4
25	1350			6619	11		6		0	0			67				
26	1380	957400	36300	6300	-		-		-	-	-	-		-	-		
27	1380			50999	24		0		0	0			0				
28	1470			638	12		7		3	3			53				
29	1560			384	1		0		0	0			0				
30	1650			372375	4		0		0	0			0				
31	1695	977600	14000	8400										-49.0	-242		-16.2

KRU2B10 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
32	1740			411385	6		1		0	0			0				
33	1755	975300	16000	8700										-50.9	-248		-16.2
34	1770	989100	4600	6300	-		-		-	-	-	-		-	-		
35	1830			476126	59		4		1	11			0				
36	1920			229536	18		3		0	1			12				
37	1935	745100	2000	252900										-51.6	-317		-14.7
38	2010			1129324	84		5		1	2			17				
39	2100			605565	38		2		1	2			6				
40	2160			731714	49		5		0	5			18				
41	2175	925000	4000	71000										-50.2	-316		-12.8
42	2180	996100	1500	2400										-51.1	-273		-21.2
43	2250			382476	25		2		0	2			5				
44	2340	916000	1900	82000	-		-		-	-	-	-		-43.74	-208		
45	2340			1004450	57		3		0	0			20	-43.74			
46	2375	915500	2400	82100	-		-		-	-	-	-		-48.01	-256		
47	2430			226142	29		2		1	1			12				
48	2505	995400	2000	2600										-25.6	-145		-7.1
49	2520	994000	2000	4000										-49.0	-272		-20.7
50	2550			5206	5		4		2	4			18				
51	2610	928400	2000	68100	300		500		400	300				-46.56	-187		
52	2610			806368	1148		675		1901	233			5427				
53	2670	980600	2400	17000	-		-		-	-	-	-		-	-		
54	2670			826841	974		899		3510	488			11126	-46.56			
55	2820			953781	35492		25335		32653	17138			87012				
56	2835	946800	1000	45200										-45.9	-302	-25.4	-11.6
57	2970			48944	2977		2842		1996	2281			6210				
58	3060			3495	413		356		283	602			7763				
59	3180			1204	385		116		39	83			1311				
60	3270			3520	827		685		271	476			6331				
61	3360			20328	3224		1647		752	1038			8353				

KRU2B10 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	300																
2	300			21446	216		183		14	27			114				
3	345																
4	390			30557	288		114		16	32			142				
5	480			20811	180		70		10	23			101				
6	570			26259	158		63		10	22			92				
7	660			7513	72		26		6	10			19				
8	675																
9	690																
10	750			31531	299		260		16	37			114				
11	840			6054	58		26		5	10			158				
12	930			18010	174		64		9	19			112				
13	1020																
14	1020			19459	244		84		12	20			58				
15	1065																
16	1087																
17	1110			9214	164		55		10	16			77				
18	1140																
19	1200			30049	351		125		17	31			137				
20	1215																
21	1217																
22	1290			8906	140		47		7	14			114				
23	1305																
24	1340																
25	1350			11590	168		57		8	15			118				
26	1380																
27	1380			9364	221		85		8	18			108				
28	1470			11142	155		56		9	19			48				
29	1560			11190	158		48		7	14			66				
30	1650			20905	491		151		17	27			57				
31	1695																

KRU2B10 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
32	1740			11598	156		55		6	14			39				
33	1755																
34	1770																
35	1830			15628	182		76		16	21			55				
36	1920			14481	180		62		10	18			39				
37	1935																
38	2010			16319	95		29		4	7			15				
39	2100			18666	272		91		10	18			31				
40	2160			18378	408		118		15	25			59				
41	2175																
42	2180																
43	2250			16429	378		132		15	33			67				
44	2340																
45	2340			15694	224		78		14	26			91				
46	2375																
47	2430			21699	439		193		31	54			196				
48	2505																
49	2520																
50	2550			50843	327		99		16	29			108				
51	2610																
52	2610			14747	223		111		57	40			1479				
53	2670																
54	2670			30327	479		275		257	135			1393				
55	2820			12136	382		453		1052	1116			37023				
56	2835																
57	2970			17787	290		141		35	82			3121				
58	3060			12339	202		105		28	89			14392				
59	3180			4916	99		54		8	24			2455				
60	3270			4090	79		46		18	48			6973				
61	3360			5606	271		181		85	235			14838				

APPENDIX II KRU2D15 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
1	5002921184	270	CT	CQ	October 1984	A	GC	June 1985
2	5002921184	360	CT	CQ	October 1984	A	GC	June 1985
3	5002921184	450	CT	CQ	October 1984	A	GC	June 1985
4	5002921184	465	CT	CP	October 1984	A	BG	August 1986
5	5002921184	540	CT	CQ	October 1984	A	GC	June 1985
6	5002921184	630	CT	CQ	October 1984	A	GC	June 1985
7	5002921184	720	CT	CQ	October 1984	A	GC	June 1985
8	5002921184	810	CT	CQ	October 1984	A	GC	June 1985
9	5002921184	855	CT	CP	October 1984	A	BG	August 1986
10	5002921184	900	CT	CQ	October 1984	A	GC	June 1985
11	5002921184	990	CT	CQ	October 1984	A	GC	June 1985
12	5002921184	1050	CT	CQ	October 1984	A	GC	June 1985
13	5002921184	1065	CT	CP	October 1984	A	BG	August 1986
14	5002921184	1110	CT	CP	October 1984	A	GP	August 1985
15	5002921184	1110	CT	CQ	October 1984	A	GC	June 1985
16	5002921184	1150	GS	GB	October 1984	N	GP	August 1985
17	5002921184	1170	CT	CQ	October 1984	A	GC	June 1985
18	5002921184	1200	GS	GB	October 1984	N	BG	August 1986
19	5002921184	1230	CT	CP	October 1984	A	GP	August 1985
20	5002921184	1230	CT	CQ	October 1984	A	GC	June 1985
21	5002921184	1290	GS	GB	October 1984	N	GP	August 1985
22	5002921184	1290	CT	CQ	October 1984	A	GC	June 1985
23	5002921184	1300	GS	GB	October 1984	N	BG	August 1986
24	5002921184	1305	CT	CP	October 1984	A	BG	August 1986
25	5002921184	1350	GS	GB	October 1984	N	GP	August 1985
26	5002921184	1350	CT	CP	October 1984	A	GP	August 1985
27	5002921184	1350	CT	CQ	October 1984	A	GC	June 1985
28	5002921184	1400	GS	GB	October 1984	N	BG	August 1986
29	5002921184	1425	CT	CP	October 1984	A	BG	August 1986
30	5002921184	1470	CT	CP	October 1984	A	GP	August 1985
31	5002921184	1470	CT	CQ	October 1984	A	GC	June 1985

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
32	5002921184	1530	CT	CQ	October 1984	A	GC	June 1985
33	5002921184	1545	CT	CP	October 1984	A	BG	August 1986
34	5002921184	1590	CT	CQ	October 1984	A	GC	June 1985
35	5002921184	1650	CT	CQ	October 1984	A	GC	June 1985
36	5002921184	1680	CT	CP	October 1984	A	GP	August 1985
37	5002921184	1770	CT	CQ	October 1984	A	GC	June 1985
38	5002921184	1785	CT	CP	October 1984	A	BG	August 1986
39	5002921184	1830	CT	CQ	October 1984	A	GC	June 1985
40	5002921184	1890	CT	CP	October 1984	A	GP	August 1985
41	5002921184	1890	CT	CQ	October 1984	A	GC	June 1985
42	5002921184	1950	CT	CQ	October 1984	A	GC	June 1985
43	5002921184	2100	GS	GB	October 1984	N	GP	August 1985
44	5002921184	2100	CT	CP	October 1984	A	GP	August 1985
45	5002921184	2100	CT	CQ	October 1984	A	GC	June 1985
46	5002921184	2150	GS	GB	October 1984	N	BG	August 1986
47	5002921184	2160	CT	CQ	October 1984	A	GC	June 1985
48	5002921184	2220	CT	CQ	October 1984	A	GC	June 1985
49	5002921184	2235	CT	CP	October 1984	A	BG	August 1986
50	5002921184	2280	CT	CQ	October 1984	A	GC	June 1985
51	5002921184	2340	CT	CQ	October 1984	A	GC	June 1985
52	5002921184	2400	CT	CQ	October 1984	A	GC	June 1985
53	5002921184	2500	CT	CP	October 1984	A	GP	August 1985
54	5002921184	2500	CT	CQ	October 1984	A	GC	June 1985
55	5002921184	2560	CT	CQ	October 1984	A	GC	June 1985
56	5002921184	2620	CT	CQ	October 1984	A	GC	June 1985
57	5002921184	2650	GS	GB	October 1984	N	GP	August 1985
58	5002921184	2680	CT	CQ	October 1984	A	GC	June 1985
59	5002921184	2725	GS	GB	October 1984	N	BG	August 1986
60	5002921184	2740	CT	CQ	October 1984	A	GC	June 1985
61	5002921184	2800	CT	CP	October 1984	A	GP	August 1985
62	5002921184	2815	CT	CP	October 1984	A	BG	August 1986

KRU2D15 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
63	5002921184	2860	CT	CQ	October 1984	A	GC	June 1985
64	5002921184	2920	CT	CQ	October 1984	A	GC	June 1985
65	5002921184	2980	CT	CQ	October 1984	A	GC	June 1985
66	5002921184	3040	CT	CP	October 1984	A	GP	August 1985
67	5002921184	3040	CT	CQ	October 1984	A	GC	June 1985
68	5002921184	3055	CT	CP	October 1984	A	BG	August 1986
69	5002921184	3100	GS	GB	October 1984	N	GP	August 1985
70	5002921184	3100	CT	CQ	October 1984	A	GC	June 1985
71	5002921184	3150	GS	GB	October 1984	N	BG	August 1986
72	5002921184	3160	CT	CQ	October 1984	A	GC	June 1985

KRU2D15 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	270			423	8		7		0	2			118				
2	360			2595	15		17		6	6			142				
3	450			49	1		1		0	1			115				
4	465	996900	3000	100										-70.3	-409		-15.7
5	540			6757	21		7		3	5			359				
6	630			28030	38		8		3	3			61				
7	720			28362	44		30		11	14			98				
8	810			12031	20		5		3	2			66				
9	855	925700	2000	72300										-62.5	-294		-20.9
10	900			11487	13		4		2	2			32				
11	990			13032	15		1		1	1			47				
12	1050			7720	5		1		1	1			8				
13	1065	775500	15000	209500										-49.8			-21.8
14	1110	825400	6000	167700	-		900		-	-	-	-		-39.27			
15	1110			17356	5		1		1	0			44				
16	1150	723600	1700	274700	-		-		-	-	-	-		-49.63			
17	1170			47188	10		3		1	1			140	-39.27			
18	1200	666300	2100	331600										-50.1	-261		-26.0
19	1230	751700	9400	238900	-		-		-	-	-	-		-48.89			
20	1230			71768	13		4		2	1			70	-49.63			
21	1290	605500	3600	390900	-		-		-	-	-	-		-49.95			
22	1290			71223	10		2		1	1			11	-48.89			
23	1300	559400	2100	438500										-50.6	-271		-24.5
24	1305	726900	16000	257100										-47.1	-276		-15.6
25	1350	929800	2200	68000	-		-		-	-	-	-		-49.13			
26	1350	971300	15900	12800	-		-		-	-	-	-					
27	1350			58856	9		1		0	1			21	-49.95			
28	1400	990400	300	9200										-49.7	-275		-25.0
29	1425	929300	13000	57700										-40.1	-217		-18.2
30	1470	875700	7900	116500	-		-		-	-	-	-		-46.62			
31	1470			14579	1		0		0	0			25	-49.13			

KRU2D15 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
32	1530			12733	1		0		0	0			8	-46.16			
33	1545	868800	7000	124200										-45.5	-258		-16.0
34	1590			163	0		0		0	0			8				
35	1650			14119	2		0		0	0			12				
36	1680	922700	5200	72100	-		-		-	-	-	-		-41.16			
37	1770			22279	4		1		0	0			36				
38	1785	932600	2000	65400										-48.9	-278		
39	1830			2816	2		2		0	0			30				
40	1890	996000	4000	-	-		-		-	-	-	-					
41	1890			4926	1		0		0	0			10				
42	1950			10764	2		1		0	1			20				
43	2100	982200	2900	14700	100		-		-	-	-	-					
44	2100	995700	3000	1200	-		-		-	-	-	-					
45	2100			11	0		0		0	0			11				
46	2150	961100	2100	36700										-50.0	-264		-27.2
47	2160			47	1		1		0	0			37				
48	2220			122	1		1		1	1			49				
49	2235	999800	-	200										-63.9			
50	2280			8492	4		2		1	2			30				
51	2340			114	0		0		0	0			18				
52	2400			25	1		1		1	0			11				
53	2500	808500	700	190800	-		-		-	-	-	-		-38.64			
54	2500			30431	8		1		1	0			11	-38.64			
55	2560			322	1		0		0	0			7				
56	2620			4	0		0		0	0			0				
57	2650	984800	2000	13100	-		-		-	-	-	-					
58	2680			838	1		0		0	0			14				
59	2725	990500	2400	7100										-49.9	-280		-26.7
60	2740			6760	4		1		0	0			18				
61	2800	988900	1400	8400	-		-		-	-	-	-					
62	2815	990400	6000	3600													

KRU2D15 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
63	2860			4958	4		2		1	1			22				
64	2920			37	1		1		1	0			24				
65	2980			134	8		9		6	2			35				
66	3040	976900	100	16100	-		-		-	-	-	-					
67	3040			10	1		1		9	3			52				
68	3055	977900	22000	100										-51.3			-10.7
69	3100	977600	5700	14900	600		900		100	100	100	-					
70	3100			27	2		3		9	8			37				
71	3150	960900	4000	32600	900		400		400	400	400	100		-47.7	-286		-26.6
72	3160			8511	214		150		177	143			356				

KRU2D15 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	270			3835	99		45		10	19			222				
2	360			8185	252		123		25	48			328				
3	450			8310	241		145		27	69			427				
4	465																
5	540			10164	225		102		22	41			786				
6	630			19984	396		185		38	71			227				
7	720			22167	459		228		44	88			247				
8	810			14742	363		165		34	64			328				
9	855																
10	900			17008	361		158		35	61			209				
11	990			12673	333		174		36	75			287				
12	1050			11117	274		141		27	62			576				
13	1065																
14	1110																
15	1110			6683	148		66		13	26			693				
16	1150																
17	1170			8283	126		54		13	20			744				
18	1200																
19	1230																
20	1230			9563	195		79		14	22			108				
21	1290																
22	1290			14204	303		127		19	35			132				
23	1300																
24	1305																
25	1350																
26	1350																
27	1350			4706	192		92		10	29			420				
28	1400																
29	1425																
30	1470																
31	1470			13069	438		214		46	82			297				

KRU2D15 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
32	1530			10424	367		179		38	70			274				
33	1545																
34	1590			8542	369		181		35	70			278				
35	1650			9351	311		153		32	60			252				
36	1680																
37	1770			11846	496		233		55	90			396				
38	1785																
39	1830			4162	168		78		15	30			113				
40	1890																
41	1890			5936	229		107		19	43			129				
42	1950			9136	472		233		58	92			309				
43	2100																
44	2100																
45	2100			7464	246		126		25	53			150				
46	2150																
47	2160			8571	314		150		33	60			209				
48	2220			6227	246		110		26	53			216				
49	2235																
50	2280			6303	265		113		27	49			319				
51	2340			9170	209		86		16	31			251				
52	2400			4330	262		118		19	36			116				
53	2500																
54	2500			12013	353		156		34	55			174				
55	2560			8654	309		133		26	42			176				
56	2620			10974	334		151		32	53			187				
57	2650																
58	2680			12141	298		133		28	46			216				
59	2725																
60	2740			11907	253		101		24	33			177				
61	2800																
62	2815																

KRU2D15 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
63	2860			6851	208		95		21	33			155				
64	2920			7600	297		141		33	48			120				
65	2980			9965	445		67		49	62			151				
66	3040																
67	3040			13085	418		213		65	97			400				
68	3055																
69	3100																
70	3100			11072	335		159		85	112			750				
71	3150																
72	3160			12754	432		211		117	156			894				

APPENDIX III KRU3A9 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
1	5002920699	100	CT	CQ	February 1982	Z	GC	April 1982
2	5002920699	200	CT	CQ	February 1982	Z	GC	April 1982
3	5002920699	300	CT	CQ	February 1982	Z	GC	April 1982
4	5002920699	400	CT	CQ	February 1982	Z	GC	April 1982
5	5002920699	500	CT	CQ	February 1982	Z	GC	April 1982
6	5002920699	600	CT	CQ	February 1982	Z	GC	April 1982
7	5002920699	700	CT	CQ	February 1982	Z	GC	April 1982
8	5002920699	800	CT	CQ	February 1982	Z	GC	April 1982
9	5002920699	900	CT	CQ	February 1982	Z	GC	April 1982
10	5002920699	1000	CT	CQ	February 1982	Z	GC	April 1982
11	5002920699	1100	CT	CQ	February 1982	Z	GC	April 1982
12	5002920699	1200	CT	CQ	February 1982	Z	GC	April 1982
13	5002920699	1300	CT	CQ	February 1982	Z	GC	April 1982
14	5002920699	1400	CT	CQ	February 1982	Z	GC	April 1982
15	5002920699	1500	CT	CQ	February 1982	Z	GC	April 1982
16	5002920699	1600	CT	CQ	February 1982	Z	GC	April 1982
17	5002920699	1700	CT	CQ	February 1982	Z	GC	April 1982
18	5002920699	1800	CT	CQ	February 1982	Z	GC	April 1982
19	5002920699	1900	CT	CQ	February 1982	Z	GC	April 1982
20	5002920699	2000	CT	CQ	February 1982	Z	GC	April 1982
21	5002920699	2100	CT	CQ	February 1982	Z	GC	April 1982
22	5002920699	2160	CT	CQ	February 1982	Z	GC	April 1982
23	5002920699	2190	CT	CQ	February 1982	Z	GC	April 1982
24	5002920699	2250	CT	CQ	February 1982	Z	GC	April 1982
25	5002920699	2310	CT	CQ	February 1982	Z	GC	April 1982
26	5002920699	2370	CT	CQ	February 1982	Z	GC	April 1982
27	5002920699	2430	CT	CQ	February 1982	Z	GC	April 1982
28	5002920699	2490	CT	CQ	February 1982	Z	GC	April 1982
29	5002920699	2550	CT	CQ	February 1982	Z	GC	April 1982
30	5002920699	2610	CT	CQ	February 1982	Z	GC	April 1982
31	5002920699	2670	CT	CQ	February 1982	Z	GC	April 1982

KRU3A9 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
32	5002920699	2730	CT	CQ	February 1982	Z	GC	April 1982
33	5002920699	2790	CT	CQ	February 1982	Z	GC	April 1982
34	5002920699	2850	CT	CQ	February 1982	Z	GC	April 1982
35	5002920699	2910	CT	CQ	February 1982	Z	GC	April 1982
36	5002920699	2970	CT	CQ	February 1982	Z	GC	April 1982
37	5002920699	3030	CT	CQ	February 1982	Z	GC	April 1982
38	5002920699	3090	CT	CQ	February 1982	Z	GC	April 1982
39	5002920699	3150	CT	CQ	February 1982	Z	GC	April 1982
40	5002920699	3210	CT	CQ	February 1982	Z	GC	April 1982
41	5002920699	3270	CT	CQ	February 1982	Z	GC	April 1982
42	5002920699	3330	CT	CQ	February 1982	Z	GC	April 1982
43	5002920699	3390	CT	CQ	February 1982	Z	GC	April 1982
44	5002920699	3450	CT	CQ	February 1982	Z	GC	April 1982
45	5002920699	3510	CT	CQ	February 1982	Z	GC	April 1982
46	5002920699	3570	CT	CQ	February 1982	Z	GC	April 1982
47	5002920699	3630	CT	CQ	February 1982	Z	GC	April 1982
48	5002920699	3690	CT	CQ	February 1982	Z	GC	April 1982
49	5002920699	3750	CT	CQ	February 1982	Z	GC	April 1982
50	5002920699	3810	CT	CQ	February 1982	Z	GC	April 1982
51	5002920699	3870	CT	CQ	February 1982	Z	GC	April 1982
52	5002920699	3930	CT	CQ	February 1982	Z	GC	April 1982
53	5002920699	3990	CT	CQ	February 1982	Z	GC	April 1982
54	5002920699	4050	CT	CQ	February 1982	Z	GC	April 1982
55	5002920699	4110	CT	CQ	February 1982	Z	GC	April 1982
56	5002920699	4170	CT	CQ	February 1982	Z	GC	April 1982
57	5002920699	4230	CT	CQ	February 1982	Z	GC	April 1982
58	5002920699	4290	CT	CQ	February 1982	Z	GC	April 1982
59	5002920699	4350	CT	CQ	February 1982	Z	GC	April 1982
60	5002920699	4410	CT	CQ	February 1982	Z	GC	April 1982
61	5002920699	4470	CT	CQ	February 1982	Z	GC	April 1982
62	5002920699	4530	CT	CQ	February 1982	Z	GC	April 1982

KRU3A9 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
63	5002920699	4590	CT	CQ	February 1982	Z	GC	April 1982
64	5002920699	4650	CT	CQ	February 1982	Z	GC	April 1982
65	5002920699	4710	CT	CQ	February 1982	Z	GC	April 1982
66	5002920699	4770	CT	CQ	February 1982	Z	GC	April 1982
67	5002920699	4830	CT	CQ	February 1982	Z	GC	April 1982
68	5002920699	4890	CT	CQ	February 1982	Z	GC	April 1982
69	5002920699	4950	CT	CQ	February 1982	Z	GC	April 1982
70	5002920699	5010	CT	CQ	February 1982	Z	GC	April 1982
71	5002920699	5070	CT	CQ	February 1982	Z	GC	April 1982
72	5002920699	5130	CT	CQ	February 1982	Z	GC	April 1982
73	5002920699	5190	CT	CQ	February 1982	Z	GC	April 1982
74	5002920699	5250	CT	CQ	February 1982	Z	GC	April 1982
75	5002920699	5310	CT	CQ	February 1982	Z	GC	April 1982
76	5002920699	5370	CT	CQ	February 1982	Z	GC	April 1982
77	5002920699	5430	CT	CQ	February 1982	Z	GC	April 1982
78	5002920699	5490	CT	CQ	February 1982	Z	GC	April 1982
79	5002920699	5570	CT	CQ	February 1982	Z	GC	April 1982
80	5002920699	5610	CT	CQ	February 1982	Z	GC	April 1982
81	5002920699	5670	CT	CQ	February 1982	Z	GC	April 1982
82	5002920699	5730	CT	CQ	February 1982	Z	GC	April 1982
83	5002920699	5790	CT	CQ	February 1982	Z	GC	April 1982
84	5002920699	5850	CT	CQ	February 1982	Z	GC	April 1982
85	5002920699	5910	CT	CQ	February 1982	Z	GC	April 1982
86	5002920699	5970	CT	CQ	February 1982	Z	GC	April 1982
87	5002920699	6030	CT	CQ	February 1982	Z	GC	April 1982
88	5002920699	6090	CT	CQ	February 1982	Z	GC	April 1982
89	5002920699	6150	CT	CQ	February 1982	Z	GC	April 1982
90	5002920699	6210	CT	CQ	February 1982	Z	GC	April 1982
91	5002920699	6270	CT	CQ	February 1982	Z	GC	April 1982
92	5002920699	6330	CT	CQ	February 1982	Z	GC	April 1982
93	5002920699	6390	CT	CQ	February 1982	Z	GC	April 1982

KRU3A9 Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	100			9850	3		1		1	2			4858				
2	200			18636	22		2		0	1			1176				
3	300			12414	9		1		0	0			2703				
4	400			14855	11		1		0	0			2049				
5	500			510	0		0		0	0			174				
6	600			22904	5		1		0	0			2765				
7	700			26797	10		6		1	1			2305				
8	800			36486	10		1		0	1			1847				
9	900			42565	17		1		0	0			1492				
10	1000			29414	11		1		0	0			1975				
11	1100			12546	9		1		0	0			1419				
12	1200			8533	3		0		0	0			1140				
13	1300			51620	7		0		0	0			1251				
14	1400			52047	6		0		0	5			1034				
15	1500			144351	11		0		0	0			1296				
16	1600			153723	20		0		0	0			1209				
17	1700			22528	5		0		0	0			1166				
18	1800			20872	3		0		0	0			892				
19	1900			22040	4		0		0	0			1067				
20	2000			19139	4		0		0	0			1363				
21	2100			14464	2		0		0	0			366				
22	2160			2956	2		0		0	0			456				
23	2190			7737	15		1		0	0			2065				
24	2250			21257	11		1		0	0			4110	-39.64			
25	2310			117643	41		2		0	1			310				
26	2370			4556	2		9		12	2			525				
27	2430			30682	10		7		0	0			9822				
28	2490			4998	3		1		0	0			294				
29	2550			17310	4		2		0	0			607	-52.48			
30	2610			7164	6		0		0	0			25				
31	2670			2214	2		1		0	0			96				

KRU3A9 Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
32	2730			4818	1		0		0	0			86				
33	2790			8686	2		0		0	0			210				
34	2850			4113	3		1		0	0			57				
35	2910			3380	10		1		2	0			12				
36	2970			6461	268		5		4	1			96				
37	3030			5938	665		50		122	19			782				
38	3090			6055	640		66		191	26			1159				
39	3150			7472	1220		81		120	24			1007				
40	3210			8285	1415		73		60	15			407				
41	3270			13056	1143		108		85	27			323				
42	3330			6411	1038		116		88	44			360				
43	3390			2971	302		114		148	121			865				
44	3450			5210	997		204		224	184			2046				
45	3510			3666	832		154		133	90			778				
46	3570			5724	1351		135		84	42			395				
47	3630			6600	1942		90		61	34			378				
48	3690			10008	2164		88		28	15			126				
49	3750			9355	867		86		18	13			101				
50	3810			8739	1084		26		9	4			114				
51	3870			12341	1337		49		16	5			139				
52	3930			7730	1281		30		15	6			190				
53	3990			8506	1026		59		25	11			143				
54	4050			8614	986		44		5	4			119	-68.45			
55	4110			8859	1100		78		18	16			164				
56	4170			5879	866		50		37	21			205				
57	4230			6877	1097		36		16	8			105				
58	4290			6919	1317		31		9	4			159				
59	4350			18570	1684		118		36	22			133	-67.89			
60	4410			22079	2189		132		40	23			126				
61	4470			44692	4854		210		41	27			117				
62	4530			68190	6751		248		101	73			55				

KRU3A9 Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
63	4590			23125	3451		191		65	45			45				
64	4650			154818	22048		908		89	64			125	-37.02			
65	4710			82460	12488		581		68	48			82				
66	4770			36988	6245		333		14	19			51				
67	4830			52574	9045		638		60	34			61				
68	4890			118008	41455		4199		40	34			163				
69	4950			85000	23758		3621		146	111			100	-40.88			
70	5010			43285	16854		3063		136	102			63				
71	5070			80466	14748		2074		118	91			58				
72	5130			61545	19438		4562		272	350			202				
73	5190			37394	12876		5990		659	1501			1757				
74	5250			66312	19170		5002		409	607			484	-42.55			
75	5310			31718	9592		4328		498	1213			1336				
76	5370			41480	14748		9338		1266	3135			3004				
77	5430			49741	13099		7092		982	2353			2118				
78	5490			15738	10345		10965		1289	3951			2683				
79	5570			16448	9138		9707		1446	3834			3228	-47.60			
80	5610			22128	11451		12655		1859	4733			3132				
81	5670			33942	37230		48873		5237	15023			7655				
82	5730			93639	76792		56913		4626	12531			4513				
83	5790			102947	63658		47142		4336	9962			4225				
84	5850			38908	49298		44046		3741	10030			4485	-40.37			
85	5910			45888	39693		27410		2372	5464			1980				
86	5970			67414	30178		14018		1013	2046			770				
87	6030			16253	6704		6719		1488	4719			14047				
88	6090			6595	6541		7708		1342	3858			11436				
89	6150			7268	10181		17317		4305	13123			26692	-36.74			
90	6210			12999	14371		19346		3630	10539			19898				
91	6270			8303	6135		8815		2073	5053			8185				
92	6330			4246	4822		9388		2892	7123			23171				
93	6390			4231	5988		11812		3162	7404			15880				

KRU3A9 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	100			3421	79		54		20	34			7130				
2	200			34037	596		184		47	88			10082				
3	300			4820	49		17		5	10			8840				
4	400			4271	32		10		3	6			10236				
5	500			3189	19		10		10	22			6475				
6	600			13497	152		60		12	31			9567				
7	700			1839	15		44		1	21			6240				
8	800			90339	310		93		17	37			11154				
9	900			16523	29		10		3	6			5061				
10	1000			55316	165		43		9	19			7141				
11	1100			7626	108		68		22	36			2968				
12	1200			7423	44		12		3	6			10120				
13	1300			4297	44		38		2	6			7148				
14	1400			11225	83		23		4	10			7206				
15	1500			52906	154		42		9	17			7758				
16	1600			40776	137		28		6	11			10110				
17	1700			16973	94		30		8	14			6493				
18	1800			21259	109		34		8	15			9340				
19	1900			6972	105		30		7	14			4338				
20	2000			6098	55		16		4	8			7667				
21	2100			15330	55		15		4	9			6804				
22	2160			1549	47		29		2	5			5619				
23	2190			509	42		36		1	1			3794				
24	2250			2970	56		18		7	11			9247				
25	2310			17980	33		4		1	2			468				
26	2370			50084	708		204		33	74			439				
27	2430			28741	306		82		15	33			603				
28	2490			6578	74		23		6	13			476				
29	2550			30154	358		103		20	44			1393				
30	2610			2497	30		9		3	6			326				
31	2670			2785	24		8		2	5			237				

KRU3A9 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
32	2730			4237	44		14		3	7			278				
33	2790			2283	26		8		2	5			563				
34	2850			1637	44		36		16	23			510				
35	2910			1143	35		24		2	4			414				
36	2970			1869	61		28		3	5			589				
37	3030			1976	110		50		35	44			2846				
38	3090			2337	91		63		51	46			4148				
39	3150			2190	122		30		30	18			2293				
40	3210			1072	97		35		7	8			472				
41	3270			1207	135		59		31	35			497				
42	3330			790	114		41		47	39			395				
43	3390			334	44		33		32	73			1839				
44	3450			2060	118		88		75	110			3962				
45	3510			1912	137		100		81	66			1517				
46	3570			1735	220		85		32	28			558				
47	3630			3162	233		101		32	47			296				
48	3690			2884	788		121		67	36			244				
49	3750			1438	132		81		53	29			179				
50	3810			2083	595		53		18	13			293				
51	3870			1903	193		48		7	6			113				
52	3930			2914	290		40		16	14			232				
53	3990			2729	222		102		40	25			157				
54	4050			3126	168		90		46	31			185				
55	4110			3674	214		43		22	18			246				
56	4170			2590	116		59		27	27			298				
57	4230			1773	250		47		10	8			99				
58	4290			1132	258		48		11	9			116				
59	4350			988	301		82		48	29			146				
60	4410			1097	786		215		85	56			263				
61	4470			912	1888		414		140	92			363				
62	4530			1218	3130		650		178	100			262				

KRU3A9 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
63	4590			972	3560		1208		462	284			436				
64	4650			2442	10379		3227		986	490			431				
65	4710			2709	10514		3224		1081	527			494				
66	4770			2328	6280		2149		657	345			452				
67	4830			4393	15467		5864		1221	547			581				
68	4890			5798	40796		20160		1308	784			403				
69	4950			4636	26203		19660		1418	1315			479				
70	5010			2345	15308		14931		1247	1161			389				
71	5070			3361	11303		9691		1060	1059			635				
72	5130			1959	9945		14605		1636	2268			1036				
73	5190			1425	3932		10437		1717	4765			6191				
74	5250			1308	6339		9900		1163	2117			1226				
75	5310			3799	8301		15290		2204	5708			6049				
76	5370			4122	7113		15541		2516	8728			14948				
77	5430			4736	9504		14557		2425	7853			14789				
78	5490			967	2206		11906		2434	10075			12742				
79	5570			2601	5317		21850		5052	19018			47755				
80	5610			4878	9006		44132		6732	25481			44370				
81	5670			1980	3933		34377		5529	21969			20761				
82	5730			5044	40991		140081		16124	51480			25416				
83	5790			5869	40448		127650		15594	45237			26534				
84	5850			3703	19315		111860		16242	47066			28421				
85	5910			3538	24934		83120		10288	26043			11216				
86	5970			2929	12252		36072		4097	11040			4227				
87	6030			4626	9126		34257		9131	30590			107016				
88	6090			2299	4142		19446		4399	14480			29228				
89	6150			2446	9851		56296		17722	51933			95888				
90	6210			1565	2534		23562		7162	22292			46214				
91	6270			1444	2292		17918		6662	19754			49423				
92	6330			2484	1871		18338		9148	24480			74388				
93	6390			3381	721		11668		6065	17158			45758				

APPENDIX IV KRU3H9 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
1	5010320086	760	GS	VT	November 1987	N	GM	February 1988
2	5010320086	910	CT	CP	November 1987	A	GM	February 1988
3	5010320086	910	CT	CP	November 1987	A	GP	April 1988
4	5010320086	1010	GS	VT	November 1987	N	GM	February 1988
5	5010320086	1030	CT	CP	November 1987	A	GM	February 1988
6	5010320086	1030	CT	CP	November 1987	A	GP	April 1988
7	5010320086	1035	GS	VT	November 1987	N	GM	February 1988
8	5010320086	1220	GS	VT	November 1987	N	GM	February 1988
9	5010320086	1330	GS	VT	November 1987	N	GM	February 1988
10	5010320086	1340	CT	CP	November 1987	A	GM	February 1988
11	5010320086	1340	CT	CP	November 1987	A	GP	April 1988
12	5010320086	1420	GS	VT	November 1987	N	GM	February 1988
13	5010320086	1565	GS	VT	November 1987	N	GM	February 1988
14	5010320086	1600	CT	CP	November 1987	A	GM	February 1988
15	5010320086	2260	CT	CP	November 1987	A	GM	February 1988
16	5010320086	2260	CT	CP	November 1987	A	GP	April 1988
17	5010320086	2390	GS	VT	November 1987	N	GM	February 1988
18	5010320086	2440	CT	CP	November 1987	A	GM	February 1988
19	5010320086	2440	CT	CP	November 1987	A	GP	April 1988
20	5010320086	2470	CT	CP	November 1987	A	GM	February 1988
21	5010320086	2470	CT	CP	November 1987	A	GP	April 1988
22	5010320086	2535	GS	VT	November 1987	N	GM	February 1988
23	5010320086	2575	GS	VT	November 1987	N	GM	February 1988
24	5010320086	2650	GS	VT	November 1987	N	GM	February 1988
25	5010320086	2770	CT	CP	November 1987	A	GM	February 1988
26	5010320086	2770	CT	CP	November 1987	A	GP	April 1988
27	5010320086	2870	GS	VT	November 1987	N	GM	February 1988

KRU3H9 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	760			710	280	0.5	430	1	530	600			2				
2	910			25000	18	0.2	12	0.1	2.2	4.0			430				
3	910	982400	-	17600	-									-51.54			
4	1010			280	11	0.6	32	1	50	76			24				
5	1030			10000	29	0.5	6	0.3	1.0	2.0			2500				
6	1030	993300	2800	3300	500									-50.18			
7	1035			310	24	0.5	-	3	6	7			19				
8	1220			1400	5	0.7	1	2	7	1			22				
9	1330			7200	7	0.7	8	2	9	13			75				
10	1340			51000	17	0.4	4	1.0	0.4	0.6			290				
11	1340	931900	1200	66800	-									-48.72			
12	1420			2900	4	0.8	1	2	1	1			79				
13	1565			1300	6	0.8	7	2	10	14			73				
14	1600			22000	8	0.2	1	0.3	0.2	0.3			880				
15	2260			15000	1	11.0	2	0.5	0.6	1.0			4400				
16	2260	989300	300	10400	-									-48.54			
17	2390			600	220	0.3	280	1	210	220			62				
18	2440			15000	13	1.0	2	0.2	0.7	1.0			200				
19	2440	982700	700	16600	-									-47.05			
20	2470			25000	32	1.0	8	0.8	1.0	3.0			600				
21	2470	967400	500	31900	-									-47.57			
22	2535			3800	5	0.8	2	2	2	3			75				
23	2575			180	4	0.8	2	10	1	1			72				
24	2650			500	4	0.8	2	2	2	2			73				
25	2770			12000	19	0.4	4	0.5	.8	2.0			200				
26	2770	988200	4300	7500	-									-47.41			
27	2870			1500	4	0.5	2	2	1	1			63				

APPENDIX V KRU3K9 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
1	5002921656	226	CT	CQ	October 1986	A	GC	February 1987
2	5002921656	270	CT	CQ	October 1986	A	GC	February 1987
3	5002921656	330	CT	CQ	October 1986	A	GC	February 1987
4	5002921656	390	CT	CQ	October 1986	A	GC	February 1987
5	5002921656	450	CT	CQ	October 1986	A	GC	February 1987
6	5002921656	510	CT	CQ	October 1986	A	GC	February 1987
7	5002921656	570	CT	CQ	October 1986	A	GC	February 1987
8	5002921656	630	CT	CQ	October 1986	A	GC	February 1987
9	5002921656	690	CT	CQ	October 1986	A	GC	February 1987
10	5002921656	750	CT	CQ	October 1986	A	GC	February 1987
11	5002921656	810	CT	CQ	October 1986	A	GC	February 1987
12	5002921656	870	CT	CQ	October 1986	A	GC	February 1987
13	5002921656	930	CT	CQ	October 1986	A	GC	February 1987
14	5002921656	990	CT	CQ	October 1986	A	GC	February 1987
15	5002921656	1050	CT	CQ	October 1986	A	GC	February 1987
16	5002921656	1110	CT	CQ	October 1986	A	GC	February 1987
17	5002921656	1115	GS	GB	October 1986	N	GM	December 1986
18	5002921656	1140	CT	CP	October 1986	A	GP	February 1987
19	5002921656	1140	GS	GB	October 1986	N	GM	December 1986
20	5002921656	1170	CT	CQ	October 1986	A	GC	February 1987
21	5002921656	1230	CT	CQ	October 1986	A	GC	February 1987
22	5002921656	1270	CT	CP	October 1986	A	GP	February 1987
23	5002921656	1270	GS	GB	October 1986	N	GM	December 1986
24	5002921656	1290	CT	CQ	October 1986	A	GC	February 1987
25	5002921656	1330	GS	GB	October 1986	N	GM	December 1986
26	5002921656	1350	CT	CQ	October 1986	A	GC	February 1987
27	5002921656	1360	CT	CP	October 1986	A	GP	February 1987
28	5002921656	1360	CT	CP	October 1986	A	GM	December 1986
29	5002921656	1410	GS	GB	October 1986	N	GM	December 1986
30	5002921656	1410	CT	CQ	October 1986	A	GC	February 1987
31	5002921656	1440	CT	CP	October 1986	A	GP	February 1987

KRU3K9 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
32	5002921656	1440	GS	GB	October 1986	N	GM	December 1986
33	5002921656	1440	CT	CP	October 1986	A	GM	December 1986
34	5002921656	1470	GS	GB	October 1986	N	GM	December 1986
35	5002921656	1470	CT	CQ	October 1986	A	GC	February 1987
36	5002921656	1500	GS	GB	October 1986	N	GM	December 1986
37	5002921656	1530	CT	CQ	October 1986	A	GC	February 1987
38	5002921656	1540	GS	GB	October 1986	N	GM	December 1986
39	5002921656	1560	CT	CP	October 1986	A	GP	February 1987
40	5002921656	1590	CT	CQ	October 1986	A	GC	February 1987
41	5002921656	1650	CT	CQ	October 1986	A	GC	February 1987
42	5002921656	1675	GS	GB	October 1986	N	GM	December 1986
43	5002921656	1680	CT	CP	October 1986	A	GP	February 1987
44	5002921656	1680	CT	CP	October 1986	A	GM	December 1986
45	5002921656	1700	GS	GB	October 1986	N	GM	December 1986
46	5002921656	1710	CT	CQ	October 1986	A	GC	February 1987
47	5002921656	1770	CT	CQ	October 1986	A	GC	February 1987
48	5002921656	1830	CT	CQ	October 1986	A	GC	February 1987
49	5002921656	1890	CT	CQ	October 1986	A	GC	February 1987
50	5002921656	1950	CT	CQ	October 1986	A	GC	February 1987
51	5002921656	2040	CT	CQ	October 1986	A	GC	February 1987
52	5002921656	2070	CT	CQ	October 1986	A	GC	February 1987
53	5002921656	2130	CT	CQ	October 1986	A	GC	February 1987
54	5002921656	2190	CT	CQ	October 1986	A	GC	February 1987
55	5002921656	2280	CT	CQ	October 1986	A	GC	February 1987
56	5002921656	2310	CT	CQ	October 1986	A	GC	February 1987
57	5002921656	2370	CT	CQ	October 1986	A	GC	February 1987
58	5002921656	2430	CT	CQ	October 1986	A	GC	February 1987
59	5002921656	2490	CT	CQ	October 1986	A	GC	February 1987
60	5002921656	2550	GS	GB	October 1986	N	GM	December 1986
61	5002921656	2550	CT	CQ	October 1986	A	GC	February 1987
62	5002921656	2610	CT	CQ	October 1986	A	GC	February 1987

KRU3K9 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
63	5002921656	2670	CT	CQ	October 1986	A	GC	February 1987
64	5002921656	2730	CT	CQ	October 1986	A	GC	February 1987
65	5002921656	2790	CT	CQ	October 1986	A	GC	February 1987
66	5002921656	2850	CT	CQ	October 1986	A	GC	February 1987
67	5002921656	2910	CT	CQ	October 1986	A	GC	February 1987
68	5002921656	2970	CT	CQ	October 1986	A	GC	February 1987
69	5002921656	2985	CT	CP	October 1986	A	GP	February 1987
70	5002921656	2985	GS	GB	October 1986	N	GM	December 1986
71	5002921656	2985	CT	CP	October 1986	A	GM	December 1986
72	5002921656	2990	GS	GB	October 1986	N	GP	February 1987
73	5002921656	2990	GS	GB	October 1986	N	GM	December 1986
74	5002921656	3015	GS	GB	October 1986	N	GP	February 1987
75	5002921656	3015	GS	GB	October 1986	N	GM	December 1986
76	5002921656	3020	GS	GB	October 1986	N	GM	December 1986
77	5002921656	3030	CT	CP	October 1986	A	GP	February 1987
78	5002921656	3030	CT	CQ	October 1986	A	GC	February 1987
79	5002921656	3090	CT	CQ	October 1986	A	GC	February 1987
80	5002921656	3150	CT	CQ	October 1986	A	GC	February 1987

KRU3K9 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	226			9261	0		0		0	0			3362				
2	270			9619	0		2		0	1			2247				
3	330			5687	0		5		2	2			2500				
4	390			11382	0		2		0	1			2733				
5	450			6687	0		2		0	0			2820				
6	510			18860	0		2		0	0			3593				
7	570			29954	0		0		0	0			3236				
8	630			131981	0		0		0	0			6220				
9	690			132848	0		0		0	0			6355				
10	750			145859	0		0		0	0			4003				
11	810			134426	0		0		0	0			3889				
12	870			135502	0		0		0	0			3546				
13	930			185280	0		0		0	0			7297				
14	990			179358	0		0		0	0			9572				
15	1050			267209	0		20		0	0			32798				
16	1110			243422	0		0		0	0			19643				
17	1115			690	0.44	0.03	0.03	0.01	0.12	-							
18	1140	970000	-	29900										-50.18			
19	1140			380	0.30	0.03	0.03	0.01	0.14	0.02							
20	1170			115487	0		0		0	0			7650				
21	1230			61595	0		0		0	0			3349				
22	1270	980300	1700	18000										-50.74			
23	1270			450	0.45	0.02	0.08	-	0.13	0.04							
24	1290			173111	0		0		0	0			4504				
25	1330			430	0.41	0.06	0.11	0.01	0.09	0.04							
26	1350			112721	0		7		0	6			6541				
27	1360	971500	1000	27500										-53.79			
28	1360			41000	55	0.37	2.3	0.19	0.41	0.39							
29	1410			1200	0.86	0.05	0.07	-	0.08	0.04							
30	1410			151051	0		0		0	0			4231				
31	1440	970900	-	29200										-50.67			

KRU3K9 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
32	1440			1200	0.99	0.02	0.04	-	0.04	0.04							
33	1440			26000	36	0.37	1.7	0.22	0.30	0.26							
34	1470			700	0.59	0.04	0.03	-	0.06	0.02							
35	1470			202320	0		0		0	0			4260				
36	1500			1200	0.85	0.02	0.02	-	0.03	0.03							
37	1530			182340	0		0		0	0			4929				
38	1540			940	0.60	0.02	0.06	-	0.05	0.03							
39	1560	981700	-	18300										-48.02			
40	1590			186612	0		0		0	0			5620				
41	1650			359206	0		0		0	0			7290				
42	1675			21	0.03	0.04	-	0.02	0.03	0.01							
43	1680	964300	-	35700										-48.79			
44	1680			40000	22	0.27	2.7	0.15	0.90	0.88							
45	1700			1400	0.56	0.02	0.19	-	0.10	0.14							
46	1710			288789	0		0		0	0			12494				
47	1770			212321	0		0		0	0			6753				
48	1830			280220	0		0		0	0			7581				
49	1890			159952	0		0		0	0			879				
50	1950			102210	0		0		0	0			394				
51	2040			162997	0		0		0	0			2359				
52	2070			136737	0		0		0	0			2121				
53	2130			122813	0		0		0	0			1690				
54	2190			135346	0		0		0	0			3416				
55	2280			43879	0		0		0	0			1402				
56	2310			83169	0		0		0	0			2484				
57	2370			163295	0		0		0	0			4776				
58	2430			84006	0		0		0	0			208				
59	2490			104830	0		0		0	0			1410				
60	2550			1200	0.40	0.05	0.05	0.02	0.30	0.03							
61	2550			21501	0		0		0	0			643				
62	2610			139232	0		0		0	0			1274				

KRU3K9 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
63	2670			77672	0		0		0	0			870				
64	2730			86697	0		0		0	0			3278				
65	2790			172070	0		24		17	0			7295				
66	2850			151740	0		22		15	0			5906				
67	2910			165347	0		0		0	0			874				
68	2970			15870	0		0		0	0			1447				
69	2985	966300	-	33700										-46.52			
70	2985			20000	4.7	0.02	0.55	0.02	0.11	0.06							
71	2985			36000	32	0.34	9.3	0.57	2.1	3.0							
72	2990	987000	2500	10500										-48.18			
73	2990			18000	5.5	0.05	0.60	0.02	0.19	0.04							
74	3015	961500	-	38500										-49.78			
75	3015			38000	12	0.12	1.0	0.05	0.23	0.10							
76	3020			9	0.03	0.03	-	0.01	0.01	-							
77	3030	926400	-	73500										-48.00			
78	3030			880750	0		55		0	8			104				
79	3090			177456	0		0		0	0			582				
80	3150			115486	0		7		0	0			337				

KRU3K9 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	226			2808	44		13		2	3			157				
2	270			405	11		3		0	0			16				
3	330			4093	76		25		4	6			147				
4	390			3700	95		39		1	7			164				
5	450			3444	62		23		4	5			95				
6	510			3701	88		32		6	9			265				
7	570			2332	34		14		2	3			72				
8	630			4598	123		46		9	13			616				
9	690			4425	90		34		6	9			320				
10	750			3681	90		32		5	9			178				
11	810			465	0		0		0	0			17				
12	870			5005	74		27		5	6			128				
13	930			6187	101		40		7	10			115				
14	990			5465	85		31		5	7			270				
15	1050			6159	94		35		6	8			374				
16	1110			3817	65		25		4	6			244				
17	1115																
18	1140																
19	1140																
20	1170			5776	83		32		5	8			73				
21	1230			5360	103		37		6	9			118				
22	1270																
23	1270																
24	1290			5954	101		37		6	9			185				
25	1330																
26	1350			5621	98		36		6	9			709				
27	1360																
28	1360																
29	1410																
30	1410			7175	159		52		9	12			353				
31	1440																

KRU3K9 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
32	1440																
33	1440																
34	1470																
35	1470			5167	103		32		5	7			318				
36	1500																
37	1530			5711	111		44		8	12			227				
38	1540																
39	1560																
40	1590			5759	115		40		7	9			207				
41	1650			5714	118		43		8	11			305				
42	1675																
43	1680																
44	1680																
45	1700																
46	1710			5841	126		47		9	12			156				
47	1770			4239	82		33		6	8			155				
48	1830			5663	114		42		8	11			397				
49	1890			4432	67		22		3	5			458				
50	1950			2721	33		10		1	2			167				
51	2040			5135	79		23		5	5			522				
52	2070			6207	99		33		6	7			319				
53	2130			5802	96		34		6	7			389				
54	2190			5205	90		31		6	7			379				
55	2280			2572	39		16		5	4			233				
56	2310			299	10		6		2	2			110				
57	2370			3185	51		18		3	4			258				
58	2430			4040	61		21		3	4			401				
59	2490			3971	63		23		4	5			232				
60	2550																
61	2550			4481	77		27		5	6			245				
62	2610			3456	68		29		4	8			8				

KRU3K9 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
63	2670			4288	78		29		6	7			219				
64	2730			4437	75		25		4	5			230				
65	2790			4897	179		54		12	11			203				
66	2850			4115	66		24		4	5			94				
67	2910			4309	50		16		2	2			49				
68	2970			3354	68		25		5	6			54				
69	2985																
70	2985																
71	2985																
72	2990																
73	2990																
74	3015																
75	3015																
76	3020																
77	3030																
78	3030			4450	89		32		2	5			43				
79	3090			4461	88		33		6	8			49				
80	3150			5248	119		42		8	10			59				

APPENDIX VI MPUE4 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
1	5002921997	340	CT	CQ	January 1990	Z	GG	March 1990
2	5002921997	430	CT	CQ	January 1990	Z	GG	March 1990
3	5002921997	490	CT	CQ	January 1990	Z	GG	March 1990
4	5002921997	610	CT	CQ	January 1990	Z	GG	March 1990
5	5002921997	700	CT	CQ	January 1990	Z	GG	March 1990
6	5002921997	790	CT	CP	January 1990	A	GM	January 1990
7	5002921997	790	GS	GB	January 1990	Z	GM	January 1990
8	5002921997	820	CT	CQ	January 1990	Z	GG	March 1990
9	5002921997	910	CT	CQ	January 1990	Z	GG	March 1990
10	5002921997	1000	CT	CP	January 1990	A	GM	January 1990
11	5002921997	1000	GS	GB	January 1990	Z	GM	January 1990
12	5002921997	1030	CT	CQ	January 1990	Z	GG	March 1990
13	5002921997	1150	CT	CQ	January 1990	Z	GG	March 1990
14	5002921997	1240	CT	CQ	January 1990	Z	GG	March 1990
15	5002921997	1330	CT	CQ	January 1990	Z	GG	March 1990
16	5002921997	1420	CT	CP	January 1990	A	GM	January 1990
17	5002921997	1420	GS	GB	January 1990	Z	GM	January 1990
18	5002921997	1420	CT	CQ	January 1990	Z	GG	March 1990
19	5002921997	1510	CT	CQ	January 1990	Z	GG	March 1990
20	5002921997	1600	CT	CQ	January 1990	Z	GG	March 1990
21	5002921997	1690	CT	CQ	January 1990	Z	GG	March 1990
22	5002921997	1720	CT	CP	January 1990	A	GM	January 1990
23	5002921997	1720	GS	GB	January 1990	Z	GM	January 1990
24	5002921997	1780	CT	CQ	January 1990	Z	GG	March 1990
25	5002921997	1810	CT	CP	January 1990	A	GM	January 1990
26	5002921997	1900	CT	CP	January 1990	A	GM	January 1990
27	5002921997	1900	CT	CQ	January 1990	Z	GG	March 1990
28	5002921997	1960	CT	CP	January 1990	A	GM	January 1990
29	5002921997	1990	CT	CQ	January 1990	Z	GG	March 1990
30	5002921997	2080	CT	CQ	January 1990	Z	GG	March 1990
31	5002921997	2170	CT	CQ	January 1990	Z	GG	March 1990

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
32	5002921997	2260	CT	CP	January 1990	A	GM	January 1990
33	5002921997	2260	CT	CQ	January 1990	Z	GG	March 1990
34	5002921997	2350	CT	CP	January 1990	A	GM	January 1990
35	5002921997	2410	CT	CP	January 1990	A	GM	January 1990
36	5002921997	2410	CT	CQ	January 1990	Z	GG	March 1990
37	5002921997	2500	CT	CQ	January 1990	Z	GG	March 1990
38	5002921997	2560	CT	CP	January 1990	Z	GP	February 1990
39	5002921997	2560	CT	CP	January 1990	A	GM	January 1990
40	5002921997	2560	GS	GB	January 1990	Z	GM	January 1990
41	5002921997	2590	CT	CQ	January 1990	Z	GG	March 1990
42	5002921997	2620	CT	CP	January 1990	Z	GP	February 1990
43	5002921997	2620	CT	CP	January 1990	A	GM	January 1990
44	5002921997	2620	CT	CQ	January 1990	Z	GG	March 1990
45	5002921997	2710	CT	CQ	January 1990	Z	GG	March 1990
46	5002921997	2770	CT	CP	January 1990	Z	GP	February 1990
47	5002921997	2770	CT	CP	January 1990	A	GM	January 1990
48	5002921997	2800	CT	CQ	January 1990	Z	GG	March 1990
49	5002921997	2860	CT	CQ	January 1990	Z	GG	March 1990
50	5002921997	2950	GS	GB	January 1990	Z	GM	January 1990
51	5002921997	2950	CT	CQ	January 1990	Z	GG	March 1990
52	5002921997	3010	CT	CQ	January 1990	Z	GG	March 1990
53	5002921997	3070	CT	CP	January 1990	A	GM	January 1990
54	5002921997	3070	CT	CQ	January 1990	Z	GG	March 1990
55	5002921997	3130	CT	CP	January 1990	Z	GP	February 1990
56	5002921997	3130	CT	CP	January 1990	Z	GM	January 1990
57	5002921997	4000	CT	CQ	January 1990	Z	GG	March 1990

MPUE4 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	340			5741	2		1										
2	430			3539	2		-										
3	490			3557	2		-										
4	610			1278	3		-										
5	700			1845	8		2										
6	790		0	3020.00	12.30	0.35	1.47	0.31	0.20	0.30	-						
7	790		10900	29.9	0.05	0	0	0	0	0	0						
8	820			1870	9		2										
9	910			1911	9		2										
10	1000		0	4070.00	7.19	0.24	0.98	0.21	0.98	0.16	0.72						
11	1000		13400	8.64	0	0	0	0	0	0	0						
12	1030			8096	15		2										
13	1150			2365	10		1										
14	1240			1875	8		1										
15	1330			5772	9		1										
16	1420		0	6930.00	13.20	0.31	1.40	0.37	0.59	0.64	0.94						
17	1420		6900	11.2	0	0	0	0	0	0	0						
18	1420			5040	6		-							-47.45	-169		
19	1510			9151	13		2										
20	1600			4122	7		2										
21	1690			13695	8		2							-54.13	-226		
22	1720		1100	5920.00	5.94	0.48	0.75	0.32	0.04	0.18	-						
23	1720		6600	24.3	0	0	0	0	0	0	0						
24	1780			3130	2		-										
25	1810		2000	6130.00	7.89	0.33	0.82	0.31	0.11	0.35	-						
26	1900		1600	7240.00	9.58	0.32	1.00	0.55	0.04	0.14	-						
27	1900			8040	6		-										
28	1960		0	7420.00	12.30	0.28	0.65	0.26	0.29	0.23	-						
29	1990			6186	7		-							-53.10	-202		
30	2080			4085	1		-										
31	2170			13071	3		-										

MPUE4 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
32	2260		1200	13000.00	9.15	0.35	1.06	0.27	0.25	0.24	-						
33	2260			19665	7		-							-50.42	-233		
34	2350		0	9190.00	6.50	0.33	0.84	0.27	0.21	0.13	-						
35	2410		1600	25700.00	12.10	0.45	1.35	0.30	0.44	0.15	-						
36	2410			24116	5		-							-49.20	-219		
37	2500			18911	3		-										
38	2560	973600	2900	23500	-									-47.51			
39	2560		900	114500.00	39.50	-	4.00	0.28	0.44	0.52	-						
40	2560		5000	306	0.55	0	0	0	0	0	0						
41	2590			194180	21		-							-48.25	-237		
42	2620	920500	4400	73600	1500									-46.64			
43	2620		1100	95000.00	37.50	-	3.62	0.38	0.66	0.46	-						
44	2620			103890	15		-							-48.18	-241		
45	2710			46535	5		-										
46	2770	925000	2900	72100	-									-46.80			
47	2770		1700	73200.00	31.20	0.63	2.72	0.48	0.40	0.36	1.11						
48	2800			44393	7		-							-48.04	-239		
49	2860			64232	9		-										
50	2950		7000	261	0	0	0	0	0	0	0						
51	2950			39792	24		-							-46.78	-204		
52	3010			39755	7		-										
53	3070		0	48100.00	15.70	0.57	1.95	0.42	0.27	0.17	-						
54	3070			48337	7		-							-45.85	-221		
55	3130	965600	-	34300	-									-46.45			
56	3130		3100	45400.00	14.20	0.57	1.80	0.38	0.22	0.16	-						
57	4000			9139	2		-							-48.06	-224		

APPENDIX VII PBUR1 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
1	5002920353	180	CT	CQ	May 1979	Z	GC	January 1981
2	5002920353	240	CT	CQ	May 1979	Z	GC	January 1981
3	5002920353	300	CT	CQ	May 1979	Z	GC	January 1981
4	5002920353	360	CT	CQ	May 1979	Z	GC	January 1981
5	5002920353	420	CT	CQ	May 1979	Z	GC	January 1981
6	5002920353	480	CT	CQ	May 1979	Z	GC	January 1981
7	5002920353	540	CT	CQ	May 1979	Z	GC	January 1981
8	5002920353	600	CT	CQ	May 1979	Z	GC	January 1981
9	5002920353	660	CT	CQ	May 1979	Z	GC	January 1981
10	5002920353	720	CT	CQ	May 1979	Z	GC	January 1981
11	5002920353	780	CT	CQ	May 1979	Z	GC	January 1981
12	5002920353	840	CT	CQ	May 1979	Z	GC	January 1981
13	5002920353	900	CT	CQ	May 1979	Z	GC	January 1981
14	5002920353	960	CT	CQ	May 1979	Z	GC	January 1981
15	5002920353	1020	CT	CQ	May 1979	Z	GC	January 1981
16	5002920353	1080	CT	CQ	May 1979	Z	GC	January 1981
17	5002920353	1140	CT	CQ	May 1979	Z	GC	January 1981
18	5002920353	1200	CT	CQ	May 1979	Z	GC	January 1981
19	5002920353	1260	CT	CQ	May 1979	Z	GC	January 1981
20	5002920353	1320	CT	CQ	May 1979	Z	GC	January 1981
21	5002920353	1380	CT	CQ	May 1979	Z	GC	January 1981
22	5002920353	1440	CT	CQ	May 1979	Z	GC	January 1981
23	5002920353	1500	CT	CQ	May 1979	Z	GC	January 1981
24	5002920353	1560	CT	CQ	May 1979	Z	GC	January 1981
25	5002920353	1620	CT	CQ	May 1979	Z	GC	January 1981
26	5002920353	1680	CT	CQ	May 1979	Z	GC	January 1981
27	5002920353	1740	CT	CQ	May 1979	Z	GC	January 1981
28	5002920353	1800	CT	CQ	May 1979	Z	GC	January 1981
29	5002920353	1860	CT	CQ	May 1979	Z	GC	January 1981
30	5002920353	1920	CT	CQ	May 1979	Z	GC	January 1981
31	5002920353	1980	CT	CQ	May 1979	Z	GC	January 1981

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
32	5002920353	2040	CT	CQ	May 1979	Z	GC	January 1981
33	5002920353	2100	CT	CQ	May 1979	Z	GC	January 1981
34	5002920353	2160	CT	CQ	May 1979	Z	GC	January 1981
35	5002920353	2220	CT	CQ	May 1979	Z	GC	January 1981
36	5002920353	2280	CT	CQ	May 1979	Z	GC	January 1981
37	5002920353	2340	CT	CQ	May 1979	Z	GC	January 1981
38	5002920353	2400	CT	CQ	May 1979	Z	GC	January 1981
39	5002920353	2460	CT	CQ	May 1979	Z	GC	January 1981
40	5002920353	2520	CT	CQ	May 1979	Z	GC	January 1981
41	5002920353	2580	CT	CQ	May 1979	Z	GC	January 1981
42	5002920353	2640	CT	CQ	May 1979	Z	GC	January 1981
43	5002920353	2700	CT	CQ	May 1979	Z	GC	January 1981
44	5002920353	2760	CT	CQ	May 1979	Z	GC	January 1981
45	5002920353	2820	CT	CQ	May 1979	Z	GC	January 1981
46	5002920353	2880	CT	CQ	May 1979	Z	GC	January 1981
47	5002920353	2940	CT	CQ	May 1979	Z	GC	January 1981
48	5002920353	3000	CT	CQ	May 1979	Z	GC	January 1981
49	5002920353	3060	CT	CQ	May 1979	Z	GC	January 1981
50	5002920353	3120	CT	CQ	May 1979	Z	GC	January 1981
51	5002920353	3180	CT	CQ	May 1979	Z	GC	January 1981
52	5002920353	3240	CT	CQ	May 1979	Z	GC	January 1981
53	5002920353	3300	CT	CQ	May 1979	Z	GC	January 1981
54	5002920353	3360	CT	CQ	May 1979	Z	GC	January 1981
55	5002920353	3420	CT	CQ	May 1979	Z	GC	January 1981
56	5002920353	3480	CT	CQ	May 1979	Z	GC	January 1981
57	5002920353	3540	CT	CQ	May 1979	Z	GC	January 1981
58	5002920353	3600	CT	CQ	May 1979	Z	GC	January 1981
59	5002920353	3660	CT	CQ	May 1979	Z	GC	January 1981
60	5002920353	3720	CT	CQ	May 1979	Z	GC	January 1981
61	5002920353	3780	CT	CQ	May 1979	Z	GC	January 1981
62	5002920353	3840	CT	CQ	May 1979	Z	GC	January 1981

PBUR1 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
63	5002920353	3900	CT	CQ	May 1979	Z	GC	January 1981
64	5002920353	3960	CT	CQ	May 1979	Z	GC	January 1981
65	5002920353	4020	CT	CQ	May 1979	Z	GC	January 1981
66	5002920353	4080	CT	CQ	May 1979	Z	GC	January 1981
67	5002920353	4140	CT	CQ	May 1979	Z	GC	January 1981
68	5002920353	4200	CT	CQ	May 1979	Z	GC	January 1981
69	5002920353	4260	CT	CQ	May 1979	Z	GC	January 1981
70	5002920353	4320	CT	CQ	May 1979	Z	GC	January 1981
71	5002920353	4380	CT	CQ	May 1979	Z	GC	January 1981
72	5002920353	4440	CT	CQ	May 1979	Z	GC	January 1981
73	5002920353	4500	CT	CQ	May 1979	Z	GC	January 1981
74	5002920353	4560	CT	CQ	May 1979	Z	GC	January 1981
75	5002920353	4620	CT	CQ	May 1979	Z	GC	January 1981
76	5002920353	4680	CT	CQ	May 1979	Z	GC	January 1981
77	5002920353	4740	CT	CQ	May 1979	Z	GC	January 1981
78	5002920353	4800	CT	CQ	May 1979	Z	GC	January 1981
79	5002920353	5010	CT	CQ	May 1979	Z	GC	January 1981
80	5002920353	5070	CT	CQ	May 1979	Z	GC	January 1981
81	5002920353	5130	CT	CQ	May 1979	Z	GC	January 1981
82	5002920353	5190	CT	CQ	May 1979	Z	GC	January 1981
83	5002920353	5250	CT	CQ	May 1979	Z	GC	January 1981
84	5002920353	5310	CT	CQ	May 1979	Z	GC	January 1981
85	5002920353	5370	CT	CQ	May 1979	Z	GC	January 1981
86	5002920353	5430	CT	CQ	May 1979	Z	GC	January 1981
87	5002920353	5490	CT	CQ	May 1979	Z	GC	January 1981
88	5002920353	5550	CT	CQ	May 1979	Z	GC	January 1981
89	5002920353	5610	CT	CQ	May 1979	Z	GC	January 1981
90	5002920353	5670	CT	CQ	May 1979	Z	GC	January 1981
91	5002920353	5730	CT	CQ	May 1979	Z	GC	January 1981
92	5002920353	5790	CT	CQ	May 1979	Z	GC	January 1981
93	5002920353	5850	CT	CQ	May 1979	Z	GC	January 1981

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
94	5002920353	5910	CT	CQ	May 1979	Z	GC	January 1981
95	5002920353	5970	CT	CQ	May 1979	Z	GC	January 1981
96	5002920353	6030	CT	CQ	May 1979	Z	GC	January 1981
97	5002920353	6090	CT	CQ	May 1979	Z	GC	January 1981
98	5002920353	6150	CT	CQ	May 1979	Z	GC	January 1981
99	5002920353	6210	CT	CQ	May 1979	Z	GC	January 1981
100	5002920353	6270	CT	CQ	May 1979	Z	GC	January 1981
101	5002920353	6330	CT	CQ	May 1979	Z	GC	January 1981
102	5002920353	6390	CT	CQ	May 1979	Z	GC	January 1981
103	5002920353	6450	CT	CQ	May 1979	Z	GC	January 1981
104	5002920353	6510	CT	CQ	May 1979	Z	GC	January 1981
105	5002920353	6570	CT	CQ	May 1979	Z	GC	January 1981
106	5002920353	6630	CT	CQ	May 1979	Z	GC	January 1981
107	5002920353	6690	CT	CQ	May 1979	Z	GC	January 1981
108	5002920353	6750	CT	CQ	May 1979	Z	GC	January 1981
109	5002920353	6810	CT	CQ	May 1979	Z	GC	January 1981
110	5002920353	6870	CT	CQ	May 1979	Z	GC	January 1981
111	5002920353	6930	CT	CQ	May 1979	Z	GC	January 1981
112	5002920353	6990	CT	CQ	May 1979	Z	GC	January 1981
113	5002920353	7050	CT	CQ	May 1979	Z	GC	January 1981
114	5002920353	7110	CT	CQ	May 1979	Z	GC	January 1981
115	5002920353	7170	CT	CQ	May 1979	Z	GC	January 1981
116	5002920353	7230	CT	CQ	May 1979	Z	GC	January 1981
117	5002920353	7290	CT	CQ	May 1979	Z	GC	January 1981
118	5002920353	7350	CT	CQ	May 1979	Z	GC	January 1981
119	5002920353	7410	CT	CQ	May 1979	Z	GC	January 1981
120	5002920353	7470	CT	CQ	May 1979	Z	GC	January 1981
121	5002920353	7530	CT	CQ	May 1979	Z	GC	January 1981
122	5002920353	7590	CT	CQ	May 1979	Z	GC	January 1981
123	5002920353	7650	CT	CQ	May 1979	Z	GC	January 1981
124	5002920353	7710	CT	CQ	May 1979	Z	GC	January 1981

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
125	5002920353	7770	CT	CQ	May 1979	Z	GC	January 1981
126	5002920353	7830	CT	CQ	May 1979	Z	GC	January 1981
127	5002920353	7890	CT	CQ	May 1979	Z	GC	January 1981
128	5002920353	7950	CT	CQ	May 1979	Z	GC	January 1981
129	5002920353	8010	CT	CQ	May 1979	Z	GC	January 1981
130	5002920353	8070	CT	CQ	May 1979	Z	GC	January 1981
131	5002920353	8130	CT	CQ	May 1979	Z	GC	January 1981
132	5002920353	8190	CT	CQ	May 1979	Z	GC	January 1981
133	5002920353	8250	CT	CQ	May 1979	Z	GC	January 1981
134	5002920353	8310	CT	CQ	May 1979	Z	GC	January 1981
135	5002920353	8370	CT	CQ	May 1979	Z	GC	January 1981
136	5002920353	8430	CT	CQ	May 1979	Z	GC	January 1981
137	5002920353	8490	CT	CQ	May 1979	Z	GC	January 1981
138	5002920353	8550	CT	CQ	May 1979	Z	GC	January 1981
139	5002920353	8610	CT	CQ	May 1979	Z	GC	January 1981
140	5002920353	8670	CT	CQ	May 1979	Z	GC	January 1981
141	5002920353	8730	CT	CQ	May 1979	Z	GC	January 1981
142	5002920353	8790	CT	CQ	May 1979	Z	GC	January 1981
143	5002920353	8850	CT	CQ	May 1979	Z	GC	January 1981
144	5002920353	8900	CT	CQ	May 1979	Z	GC	January 1981
145	5002920353	8910	CT	CQ	May 1979	Z	GC	January 1981
146	5002920353	8931	CT	CQ	May 1979	Z	GC	January 1981
147	5002920353	8959	CT	CQ	May 1979	Z	GC	January 1981
148	5002920353	8970	CT	CQ	May 1979	Z	GC	January 1981
149	5002920353	8989	CT	CQ	May 1979	Z	GC	January 1981
150	5002920353	9019	CT	CQ	May 1979	Z	GC	January 1981
151	5002920353	9049	CT	CQ	May 1979	Z	GC	January 1981
152	5002920353	9079	CT	CQ	May 1979	Z	GC	January 1981
153	5002920353	9109	CT	CQ	May 1979	Z	GC	January 1981
154	5002920353	9139	CT	CQ	May 1979	Z	GC	January 1981
155	5002920353	9169	CT	CQ	May 1979	Z	GC	January 1981

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
156	5002920353	9199	CT	CQ	May 1979	Z	GC	January 1981
157	5002920353	9229	CT	CQ	May 1979	Z	GC	January 1981
158	5002920353	9259	CT	CQ	May 1979	Z	GC	January 1981
159	5002920353	9332	CT	CQ	May 1979	Z	GC	January 1981
160	5002920353	9362	CT	CQ	May 1979	Z	GC	January 1981
161	5002920353	9392	CT	CQ	May 1979	Z	GC	January 1981
162	5002920353	9422	CT	CQ	May 1979	Z	GC	January 1981
163	5002920353	9452	CT	CQ	May 1979	Z	GC	January 1981
164	5002920353	9482	CT	CQ	May 1979	Z	GC	January 1981
165	5002920353	9512	CT	CQ	May 1979	Z	GC	January 1981
166	5002920353	9542	CT	CQ	May 1979	Z	GC	January 1981
167	5002920353	9570	CT	CQ	May 1979	Z	GC	January 1981
168	5002920353	9600	CT	CQ	May 1979	Z	GC	January 1981
169	5002920353	9625	CT	CQ	May 1979	Z	GC	January 1981
170	5002920353	9670	CT	CQ	May 1979	Z	GC	January 1981
171	5002920353	9700	CT	CQ	May 1979	Z	GC	January 1981
172	5002920353	9730	CT	CQ	May 1979	Z	GC	January 1981

PBUR1 Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	180			881	4		2		0	1			31				
2	240			2662	5		2		0	2			29				
3	300			4522	0		2		0	0			36				
4	360			8428	0		2		0	1			43				
5	420			4684	0		1		0	0			16				
6	480			4821	0		1		0	0			21				
7	540			4811	0		1		0	0			12				
8	600			3843	0		1		0	0			13				
9	660			4686	0		1		0	0			8				
10	720			3915	0		1		0	0			16				
11	780			4136	5		1		0	0			2				
12	840			2852	9		1		0	0			2				
13	900			3826	10		1		0	0			0				
14	960			3361	19		1		0	0			4				
15	1020			2457	9		0		0	0			3				
16	1080			2918	10		0		0	0			3				
17	1140			4435	15		1		0	0			2				
18	1200			2322	11		1		0	0			0				
19	1260			1496	9		1		0	0			1				
20	1320			1968	5		0		0	0			0				
21	1380			2056	16		1		0	0			0				
22	1440			2220	5		1		0	0			3				
23	1500			4021	14		1		0	0			0				
24	1560			5579	12		1		0	0			6				
25	1620			5504	20		2		0	0			5				
26	1680			3530	21		2		0	0			1				
27	1740			4271	27		2		0	0			1				
28	1800			6007	12		1		0	0			4				
29	1860			5825	90		2		0	0			9				
30	1920			7243	36		3		0	0			5				
31	1980			4797	16		1		0	0			17				

PBUR1 Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
32	2040			5830	38		3		0	0			38				
33	2100			4967	25		2		0	0			12				
34	2160			4351	27		2		0	0			12				
35	2220			3835	16		2		0	1			6				
36	2280			4083	10		1		0				797				
37	2340			4802	9		1		0	0			3				
38	2400			4080	10		1		0	0			4				
39	2460			3143	5		0		0	0			3				
40	2520			3138	7		1		0	0			2				
41	2580			2687	8		1		0	0			0				
42	2640			1280	0		0		0	0			0				
43	2700			1287	3		1		2	0			16				
44	2760			1372	0		1		2	0			19				
45	2820			1120	11		3		3	1			11				
46	2880			1502	5		1		2	0			15				
47	2940			1106	4		1		1	0			6				
48	3000			2417	4		1		1	0			8				
49	3060			2906	8		1		0	0			8				
50	3120			2924	7		1		1	0			6				
51	3180			3900	6		1		0	0			7				
52	3240			3792	0		1		0	0			4				
53	3300			3705	6		1		0	0			5				
54	3360			2411	0		0		0	0			2				
55	3420			1678	4		0		0	0			3				
56	3480			59	1		0		0	0			2				
57	3540			2402	0		0		0	0			1				
58	3600			3980	0		1		0	0			6				
59	3660			1326	6		0		0	0			2				
60	3720			7984	47		5		1	1			19				
61	3780			3833	7		1		0	0			5				
62	3840			4585	0		0		0	0			3				

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
63	3900			6310	42		3		0	0			3				
64	3960			67218	0		13		0	0			0				
65	4020			21609	55		4		0	0			0				
66	4080			26205	102		6		0	0			0				
67	4140			12789	41		3		0	0			0				
68	4200			26241	0		4		0	0			0				
69	4260			22423	150		7		0	0			0				
70	4320			34664	164		10		0	0			0				
71	4380			28022	105		6		0	0			0				
72	4440			36981	203		14		0	0			0				
73	4500			21125	174		10		0	0			7				
74	4560			20448	202		0		0	0			0				
75	4620			20625	173		8		0	0			0				
76	4680			18371	258		12		0	0			0				
77	4740			29704	375		0		0	0			0				
78	4800			17532	116		6		0	0			5				
79	5010			17770	94		4		0	0			6				
80	5070			16934	70		4		0	0			0				
81	5130			29599	39		0		0	0			0				
82	5190			26189	66		4		0	0			0				
83	5250			38113	100		7		0	0			29				
84	5310			27309	168		8		0	0			0				
85	5370			12742	40		2		0	0			3				
86	5430			14514	60		4		0	0			5				
87	5490			22779	46		3		0	0			71				
88	5550			18070	52		2		0	0			188				
89	5610			9366	22		1		0	0			44				
90	5670			6099	15		1		0	0			75				
91	5730			6985	30		2		1	0			64				
92	5790			12858	200		45		65	28			863				
93	5850			15789	745		408		303	412			2639				

PBUR1 Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
94	5910			10680	1524		1587		605	1393			3701				
95	5970			15749	2420		2939		1011	2294			5221				
96	6030			16050	2898		4308		1645	4111			8307				
97	6090			12642	1759		2439		985	2496			6574				
98	6150			8478	1605		1937		721	1693			3788				
99	6210			10811	1554		1815		790	1820			7385				
100	6270			6806	855		901		373	818			1853				
101	6330			7624	1002		1087		498	1071			4786				
102	6390			8574	1042		1024		397	846			2471				
103	6450			14872	1401		1691		801	1609			5836				
104	6510			24070	3936		5982		3171	7081			33032				
105	6570			8751	1222		1095		389	855			3866				
106	6630			11599	2487		3921		1568	3264			7877				
107	6690			6494	871		1109		455	1109			3553				
108	6750			7193	841		890		346	921			3441				
109	6810			9262	1289		1659		674	1675			5072				
110	6870			9588	1346		1850		824	1964			5979				
111	6930			9980	1654		2009		695	1673			4435				
112	6990			8955	2111		2900		973	2167			4653				
113	7050			12638	3889		5127		1465	3306			6034				
114	7110			19600	9570		10154		2283	4551			5255				
115	7170			37334	16974		19741		4764	9809			14900				
116	7230			39281	12767		17206		4911	10354			17686				
117	7290			28795	7107		9696		2982	6738			13970				
118	7350			17468	6464		8819		2679	5718			10785				
119	7410			6594	2193		3108		878	1667			2910				
120	7470			4974	1980		2619		674	1161			1389				
121	7530			5269	1971		2731		748	1247			1695				
122	7590			5190	1495		1614		388	574			600				
123	7650			3780	978		1108		268	410			537				
124	7710			3425	819		1117		301	516			861				

PBUR1 Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
125	7770			4640	803		1074		301	567			1017				
126	7830			3785	776		1217		398	827			1536				
127	7890			5412	1581		2130		574	945			1379				
128	7950			4149	1440		1971		536	934			1333				
129	8010			4976	1346		1622		421	655			923				
130	8070			8249	1824		5259		2408	5344			9320				
131	8130			13616	2922		5295		1935	4477			12657				
132	8190			7472	2308		3674		1149	2330			4040				
133	8250			12605	3663		6294		1579	3699			4970				
134	8310			11234	2328		3638		734	1866			1876				
135	8370			3758	1652		2331		411	1075			1032				
136	8430			3022	1537		2363		441	1203			1591				
137	8490			2021	817		1353		280	776			1056				
138	8550			3433	1170		1993		438	1190			1891				
139	8610			6166	1213		2166		501	1492			2529				
140	8670			6137	1249		2238		481	1685			2238				
141	8730			10032	2211		3400		609	2320			2783				
142	8790			7561	1841		2988		538	2181			2497				
143	8850			5710	2340		3181		495	1976			2188				
144	8900			732	490		491		414	665			184				
145	8910			27865	6691		6660		981	4116			4527				
146	8931			86	25		29		35	53			866				
147	8959			218	18		94		63	205			1203				
148	8970			9539	6073		6371		878	3733			5885				
149	8989			84	118		132		23	77			133				
150	9019			153	16		57		29	84			281				
151	9049			165	11		24		40	86			4608				
152	9079			114	7		14		25	52			5564				
153	9109			578	297		322		399	546			6009				
154	9139			108	1		2		10	31			9804				
155	9169			281	149		156		166	222			1967				

PBUR1 Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
156	9199			142	19		27		35	61			1871				
157	9229			6631	165		90		65	168			3015				
158	9259			130	14		22		37	72			51				
159	9332			46	5		77		61	182			2531				
160	9362			69	2		3		16	45			1339				
161	9392			186	5		11		20	63			1258				
162	9422			205	26		359		301	725			2228				
163	9452			666	28		155		193	604			2685				
164	9482			43	1		2		3	9			121				
165	9512			231	3		7		12	30			391				
166	9542			129	6		6		9	20			216				
167	9570			876	444		829		125	319			316				
168	9600			3796	718		722		106	268			250				
169	9625			148	34		78		11	36			124				
170	9670			9040	4719		4571		499	1606			1257				
171	9700			5561	1487		922		97	347			590				
172	9730			10343	4782		3337		325	772			527				

PBUR1 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	180			5032	356		153		34	66			241				
2	240			1431	82		33		7	14			83				
3	300			4693	256		99		23	42			176				
4	360			5708	397		184		42	84			293				
5	420			2168	72		25		6	10			51				
6	480			6095	553		235		54	95			241				
7	540			4879	267		104		24	41			140				
8	600			2539	60		19		4	7			40				
9	660			4282	216		67		17	22			82				
10	720			4687	169		58		13	22			93				
11	780			1463	74		33		7	15			62				
12	840			5058	336		165		35	78			230				
13	900			2743	105		41		7	17			68				
14	960			2785	102		36		9	14			43				
15	1020			4618	200		77		16	28			88				
16	1080			2478	68		25		5	10			40				
17	1140			2238	103		35		7	14			46				
18	1200			3724	123		39		9	16			35				
19	1260			2921	78		25		5	9			27				
20	1320			5160	273		109		25	43			107				
21	1380			5697	149		56		10	20			40				
22	1440			5850	631		284		63	114			238				
23	1500			2540	104		40		8	15			45				
24	1560			2093	105		43		9	17			33				
25	1620			6115	351		132		32	52			188				
26	1680			2709	154		67		16	27			73				
27	1740			2400	133		56		15	23			71				
28	1800			1285	48		18		3	7			24				
29	1860			1657	65		19		5	6			17				
30	1920			6379	676		263		50	89			149				
31	1980			1346	50		19		3	7			52				

PBUR1 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
32	2040			5898	484		177		41	61			132				
33	2100			1989	55		20		3	7			38				
34	2160			5847	360		129		27	40			71				
35	2220			5292	261		99		21	37			124				
36	2280			5575	396		146		34	50			101				
37	2340			4512	181		70		16	27			68				
38	2400			4319	186		79		18	33			114				
39	2460			4267	155		62		13	25			75				
40	2520			5293	176		65		16	25			73				
41	2580			3361	106		43		6	13			33				
42	2640			4417	103		40		9	17			78				
43	2700			31	74		33		8	14			107				
44	2760			2195	67		23		8	9			119				
45	2820			819	102		28		9	8			112				
46	2880			1228	49		19		8	7			125				
47	2940			1125	39		17		5	7			85				
48	3000			1734	19		7		2	3			71				
49	3060			1973	63		24		7	9			59				
50	3120			2145	58		23		7	9			96				
51	3180			2089	53		20		5	7			77				
52	3240			3190	67		26		5	10			57				
53	3300			4326	126		46		11	17			91				
54	3360			2997	36		13		3	5			50				
55	3420			2417	49		18		5	7			71				
56	3480			2065	65		19		5	7			56				
57	3540			4158	75		29		5	11			50				
58	3600			3021	75		26		6	10			60				
59	3660			2825	53		19		4	8			57				
60	3720			4898	58		19		6	7			60				
61	3780			4764	58		20		5	7			46				
62	3840			5277	171		63		14	24			77				

PBUR1 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
63	3900			6333	135		42		9	14			23				
64	3960			7338	147		18		3	4			13				
65	4020			27335	129		9		1	2			7				
66	4080			40034	258		39		3	7			12				
67	4140			19029	147		30		4	7			0				
68	4200			10529	126		39		8	12			17				
69	4260			25025	142		19		3	4			1				
70	4320			26330	264		35		8	8			36				
71	4380			18202	158		35		6	10			10				
72	4440			34843	162		23		4	5			20				
73	4500			39507	215		14		1	1			0				
74	4560			50574	429		34		3	5			0				
75	4620			46254	440		33		4	5			18				
76	4680			42030	228		21		3	4			23				
77	4740			42868	325		40		6	9			1				
78	4800			20105	102		15		2	4			22				
79	5010			33095	334		64		13	17			24				
80	5070			24489	128		14		2	3			23				
81	5130			16841	210		52		11	16			42				
82	5190			9605	130		38		9	13			63				
83	5250			9419	219		71		16	25			59				
84	5310			20860	156		19		3	4			34				
85	5370			16341	193		47		10	14			71				
86	5430			16145	124		16		2	4			41				
87	5490			646	13		4		0	1			8				
88	5550			651	4		1		0	0			13				
89	5610			563	7		2		0	0			16				
90	5670			460	3		0		0	0			30				
91	5730			726	9		2		0	1			64				
92	5790			611	16		7		13	8			355				
93	5850			833	125		106		86	152			1011				

PBUR1 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
94	5910			1328	294		528		299	883			3187				
95	5970			1265	420		1037		625	1879			4774				
96	6030			5621	2190		5453		4932	8696			34450				
97	6090			3714	1120		2893		2026	5622			17686				
98	6150			8509	1861		3909		2341	8522			28857				
99	6210			5086	1631		3699		2654	8025			31029				
100	6270			8093	1514		3011		1913	6190			25942				
101	6330			8826	2097		3851		2620	7183			2824				
102	6390			14652	1947		3394		2260	6458			29117				
103	6450			6192	1194		2597		1768	4667			20907				
104	6510			5656	265		960		1130	3864			25555				
105	6570			4450	1143		1829		1152	3334			19731				
106	6630			5256	1595		4333		2484	8023			26152				
107	6690			7261	1556		2799		1777	4903			21670				
108	6750			5310	938		1118		702	2274			14595				
109	6810			5007	861		1663		1044	3457			17886				
110	6870			5237	1512		3446		2122	6618			22366				
111	6930			4124	1406		2555		1328	4071			16341				
112	6990			7125	2867		6688		3269	9234			22593				
113	7050			5616	2470		5478		2738	8010			24899				
114	7110			12127	13291		28837		8953	23438			26251				
115	7170			6572	8498		21656		7702	20549			28544				
116	7230			6123	8346		24877		11258	28299			41262				
117	7290			1944	1758		6640		3075	9177			18755				
118	7350			3220	2096		6523		2884	8906			21425				
119	7410			2357	2384		7629		2698	7457			13117				
120	7470			3490	3424		10993		3547	8042			8774				
121	7530			2332	2584		8461		2978	6483			8706				
122	7590			4637	3411		8552		2518	4105			3536				
123	7650			4893	3229		8257		2613	4448			4284				
124	7710			3581	1890		5115		1795	3506			4758				

PBUR1 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
125	7770			3451	1456		4241		1845	4468			7219				
126	7830			1825	1671		5901		2411	4780			7488				
127	7890			4429	3748		10872		3405	6666			7449				
128	7950			2851	1173		3877		2123	5480			14953				
129	8010			6134	4516		11457		3345	5012			3671				
130	8070			3837	1589		10108		8237	21687			42774				
131	8130			1441	718		3084		1701	4981			15122				
132	8190			3932	2889		9476		3610	11733			20818				
133	8250			2036	2149		10203		3800	11536			13962				
134	8310			6224	3779		13543		3246	10973			8355				
135	8370			3098	3893		12828		2972	9468			7217				
136	8430			2179	2683		9731		2532	7932			6744				
137	8490			3721	3222		10921		2712	94599			3785				
138	8550			2448	2063		7325		2004	6892			8067				
139	8610			1848	1228		5887		2067	7239			8459				
140	8670			4388	2757		10861		2591	11515			889				
141	8730			3974	2815		10730		2575	11535			8844				
142	8790			3574	2290		8778		0	14799			10396				
143	8850			3504	3850		12073		2377	12460			10634				
144	8900			1618	5507		5879		692	2508			1749				
145	8910			2702	2186		6874		0	10445			10401				
146	8931			1011	152		161		48	133			416				
147	8959			2370	243		382		456	1443			7236				
148	8970			1604	1260		3663		723	4483			7072				
149	8989			1397	8865		12679		1526	5104			3684				
150	9019			6568	1551		3760		1329	5164			6784				
151	9049			5649	228		225		80	299			2221				
152	9079			4722	217		210		79	221			2525				
153	9109			6283	145		57		15	38			2389				
154	9139			10022	240		85		19	42			3597				
155	9169			2835	81		40		10	24			1661				

PBUR1 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
156	9199			8551	261		171		70	132			1416				
157	9229																
158	9259																
159	9332			6916	155		48		21	46			1932				
160	9362			5147	118		45		73	232			6604				
161	9392			6322	112		60		210	720			8008				
162	9422			2390	72		23		8	23			898				
163	9452																
164	9482			5912	147		54		21	61			1269				
165	9512			7495	162		51		12	19			286				
166	9542			5635	101		42		9	21			132				
167	9570			2782	88		42		9	31			219				
168	9600			3369	98		47		12	41			215				
169	9625			3710	117		324		36	168			321				
170	9670			598	432		1655		383	1677			2618				
171	9700			7544	7497		9477		1368	6003			6290				
172	9730			302	329		857		144	558			932				

APPENDIX VIII PBUS26 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
1	5002922047	240	CT	CQ	May 1990	Z	GG	September 1990
2	5002922047	360	CT	CQ	May 1990	Z	GG	September 1990
3	5002922047	480	CT	CQ	May 1990	Z	GG	September 1990
4	5002922047	560	CT	CP	May 1990	S	GM	May 1990
5	5002922047	560	GS	GB	May 1990	Z	GM	May 1990
6	5002922047	600	CT	CQ	May 1990	Z	GG	September 1990
7	5002922047	720	CT	CQ	May 1990	Z	GG	September 1990
8	5002922047	840	CT	CQ	May 1990	Z	GG	September 1990
9	5002922047	960	CT	CQ	May 1990	Z	GG	September 1990
10	5002922047	990	CT	CP	May 1990	S	GM	May 1990
11	5002922047	1110	CT	CQ	May 1990	Z	GG	September 1990
12	5002922047	1230	CT	CQ	May 1990	Z	GG	September 1990
13	5002922047	1350	CT	CQ	May 1990	Z	GG	September 1990
14	5002922047	1470	CT	CQ	May 1990	Z	GG	September 1990
15	5002922047	1590	CT	CQ	May 1990	Z	GG	September 1990
16	5002922047	1680	CT	CQ	May 1990	Z	GG	September 1990
17	5002922047	1770	CT	CQ	May 1990	Z	GG	September 1990
18	5002922047	1890	CT	CQ	May 1990	Z	GG	September 1990
19	5002922047	1980	CT	CP	May 1990	S	GM	May 1990
20	5002922047	2010	CT	CQ	May 1990	Z	GG	September 1990
21	5002922047	2160	CT	CQ	May 1990	Z	GG	September 1990
22	5002922047	2250	CT	CP	May 1990	S	GM	May 1990
23	5002922047	2280	CT	CQ	May 1990	Z	GG	September 1990
24	5002922047	2280	GS	GB	May 1990	Z	GM	May 1990
25	5002922047	2400	CT	CQ	May 1990	Z	GG	September 1990
26	5002922047	2520	CT	CQ	May 1990	Z	GG	September 1990
27	5002922047	2520	GS	GB	May 1990	Z	GM	May 1990
28	5002922047	2610	CT	CQ	May 1990	Z	GG	September 1990
29	5002922047	2670	CT	CP	May 1990	S	GM	May 1990
30	5002922047	2730	CT	CQ	May 1990	Z	GG	September 1990
31	5002922047	2820	CT	CQ	May 1990	Z	GG	September 1990

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
32	5002922047	2880	CT	CQ	May 1990	Z	GG	September 1990
33	5002922047	3000	CT	CQ	May 1990	Z	GG	September 1990
34	5002922047	3120	CT	CQ	May 1990	Z	GG	September 1990
35	5002922047	3410	CT	CQ	May 1990	Z	GG	September 1990
36	5002922047	4140	CT	CQ	May 1990	Z	GG	September 1990
37	5002922047	4290	CT	CQ	May 1990	Z	GG	September 1990
38	5002922047	4410	CT	CQ	May 1990	Z	GG	September 1990

PBUS26 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	240			5334	7		4		-	6	8	9					
2	360			8601	2		6		-	11	6	10					
3	480			4566	10		7		-	6	5	11		-85.59	-179		
4	560		0	2680.0	6.8	0.7	1.5	0.6	0.3	0.5			1600.0				
5	560		0	51.5	0.3	0.0	0.3	0.0	0.1	0.1			1600.0				
6	600			4430	8		5		-	4	-	6					
7	720			6348	12		-		-	-	-	-					
8	840			3514	-		-		-	-	-	-					
9	960			7970	20		-		-	-	-	-					
10	990		0	2740.0	9.5	0.5	1.7	0.5	0.4	0.8			1370.0				
11	1110			6895	1		-		-	-	-	-		-82.68	-189		
12	1230			3961	3		-		-	-	-	-					
13	1350			8168	2		-		-	-	-	-					
14	1470			2562	4		-		-	-	-	-					
15	1590			8193	4		-		-	-	-	-					
16	1680			6239	-		-		-	-	-	-					
17	1770			2724	-		-		-	-	-	-					
18	1890			1611	-		-		-	-	-	-		-64.17	-91		
19	1980		0	9930.0	12.5	0.3	1.2	0.4	0.2	0.4			2600.0				
20	2010			5627	4		-		-	-	-	-					
21	2160			4422	-		-		-	-	-	-		-78.74	-146		
22	2250		0	8160.0	11.2	0.3	1.8	0.4	0.3	0.6			1360.0				
23	2280			14307	12		4		-	-	-	-					
24	2280		0	1940.0	1.8	0.0	0.4	0.4	0.1	0.1			237.0				
25	2400			10594	10		1		-	-	-	-		-71.36	-203		
26	2520			17719	-		-		-	-	-	-					
27	2520		0	2440.0	0.7	0.0	0.3	0.5	0.0	0.0			156.0				
28	2610			13227	-		-		-	-	-	-					
29	2670		0	22550.0	11.0	0.5	2.3	0.5	0.4	0.4			1920.0				
30	2730			2853	2		14		10	19	10	8		-58.95	-149		
31	2820			16821	77		5		-	26	17	18					

PBUS26 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
32	2880			14042	9		4		-	5	4	3					
33	3000			14397	4		-		-	-	-	-		-55.24	-240		
34	3120			15046	5		3		-	4	3	3					
35	3410			23488	12		-		-	-	-	-		-48.69	-233		
36	4140			114574	79		4		-	-	-	-		-47.44	-291		
37	4290			89547	571		30		-	-	-	-					
38	4410			21364	68		7		-	-	-	-		-46.66	-246		

APPENDIX IX PBUZ7 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
1	5002922046	350	CT	CQ	May 1990	Z	GG	September 1990
2	5002922046	440	CT	CQ	May 1990	Z	GG	September 1990
3	5002922046	590	CT	CQ	May 1990	Z	GG	September 1990
4	5002922046	680	CT	CQ	May 1990	Z	GG	September 1990
5	5002922046	770	CT	CP	May 1990	S	GG	September 1990
6	5002922046	770	CT	CP	May 1990	S	GM	May 1990
7	5002922046	860	CT	CQ	May 1990	Z	GG	September 1990
8	5002922046	980	CT	CQ	May 1990	Z	GG	September 1990
9	5002922046	1100	CT	CQ	May 1990	Z	GG	September 1990
10	5002922046	1220	CT	CQ	May 1990	Z	GG	September 1990
11	5002922046	1310	CT	CQ	May 1990	Z	GG	September 1990
12	5002922046	1430	CT	CQ	May 1990	Z	GG	September 1990
13	5002922046	1550	CT	CQ	May 1990	Z	GG	September 1990
14	5002922046	1740	CT	CP	May 1990	S	GG	September 1990
15	5002922046	1740	CT	CP	May 1990	S	GM	May 1990
16	5002922046	1740	GS	GB	May 1990	Z	GM	May 1990
17	5002922046	1790	CT	CQ	May 1990	Z	GG	September 1990
18	5002922046	1910	CT	CQ	May 1990	Z	GG	September 1990
19	5002922046	2000	CT	CQ	May 1990	Z	GG	September 1990
20	5002922046	2040	CT	CP	May 1990	S	GG	September 1990
21	5002922046	2040	CT	CP	May 1990	S	GM	May 1990
22	5002922046	2090	CT	CP	May 1990	S	GG	September 1990
23	5002922046	2090	GS	GB	May 1990	Z	GG	September 1990
24	5002922046	2090	CT	CP	May 1990	S	GM	May 1990
25	5002922046	2090	GS	GB	May 1990	Z	GM	May 1990
26	5002922046	2120	CT	CQ	May 1990	Z	GG	September 1990
27	5002922046	2120	GS	GB	May 1990	Z	GG	September 1990
28	5002922046	2120	CT	CP	May 1990	S	GM	May 1990
29	5002922046	2180	CT	CQ	May 1990	Z	GG	September 1990
30	5002922046	2230	GS	GB	May 1990	Z	GG	September 1990
31	5002922046	2230	CT	CP	May 1990	S	GG	September 1990

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
32	5002922046	2230	CT	CP	May 1990	S	GM	May 1990
33	5002922046	2230	GS	GB	May 1990	Z	GM	May 1990
34	5002922046	2290	GS	GB	May 1990	Z	GG	September 1990
35	5002922046	2290	CT	CP	May 1990	S	GG	September 1990
36	5002922046	2290	CT	CP	May 1990	S	GM	May 1990
37	5002922046	2290	GS	GB	May 1990	Z	GM	May 1990
38	5002922046	2330	GS	GB	May 1990	Z	GG	September 1990
39	5002922046	2330	CT	CP	May 1990	S	GG	September 1990
40	5002922046	2330	CT	CP	May 1990	S	GM	May 1990
41	5002922046	2330	GS	GB	May 1990	Z	GM	May 1990
42	5002922046	2390	CT	CQ	May 1990	Z	GG	September 1990
43	5002922046	2390	GS	GB	May 1990	Z	GG	September 1990
44	5002922046	2390	GS	GB	May 1990	Z	GM	May 1990
45	5002922046	2450	CT	CQ	May 1990	Z	GG	September 1990
46	5002922046	2540	GS	GB	May 1990	Z	GG	September 1990
47	5002922046	2540	CT	CP	May 1990	S	GG	September 1990
48	5002922046	2540	CT	CP	May 1990	S	GM	May 1990
49	5002922046	2540	GS	GB	May 1990	Z	GM	May 1990
50	5002922046	2630	CT	CQ	May 1990	Z	GG	September 1990
51	5002922046	2690	CT	CQ	May 1990	Z	GG	September 1990
52	5002922046	2750	CT	CQ	May 1990	Z	GG	September 1990

PBUZ7 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	350			3069	4		-		-	-	-	-					
2	440			1635	-		-		-	-	-	-					
3	590			555	-		-		-	-	-	-					
4	680			131	3		-		-	-	-	-					
5	770			1587	8		-		-	-	-	-		-85.34	-142		
6	770		1700	2270.0	11.3	0.4	1.7	0.6	0.3	0.3			379.0				
7	860			33	-		-		-	-	-	-					
8	980			3010	10		3		-	-	-	-					
9	1100			314	-		-		-	-	-	-					
10	1220			53	-		-		-	-	-	-					
11	1310			19	-		-		-	-	-	-					
12	1430			44	-		-		-	-	-	-					
13	1550			128	-		-		-	-	-	-					
14	1740			8851	15		3		-	-	-	-		-66.08	-155		
15	1740		940	8890.0	18.3	0.5	1.8	0.8	1.7	4.6			704.0				
16	1740		0	11.4	0.0	0.0	0.0	0.0	0.0	0.0			5.0				
17	1790			177	-		-		-	-	-	-					
18	1910			5637	34		-		-	-	-	-					
19	2000			278	20		10		-	-	-	-					
20	2040			44678	2201		93		9	242	68	43		-47.67	-216		
21	2040		1500	37500.0	1010.0	0.2	85.5	0.4	11.1	260.0			640.0				
22	2090			61370	1940		75		6	328	128	82		-45.19	-210		
23	2090			101397	2390		63		7	114	24	11		-42.01	-168		
24	2090		1700	47900.0	2400.0	0.3	60.0	0.2	8.4	308.0			493.0				
25	2090		0	104900.0	3860.0	0.0	88.7	0.0	7.4	300.0			265.0				
26	2120			114055	1866		26		6	103	47	30		-46.76	-221		
27	2120			14599	310		9		-	29	8	6		-42.08	-157		
28	2120		0	19200.0	537.0	0.0	14.3	0.0	1.2	47.1			206.0				
29	2180			32403	264		5		-	24	14	15					
30	2230			5196	21		4		-	-	-	-		-52.06	-136		
31	2230			105409	773		32		11	141	68	42		-50.22	-261		

PBUZ7 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
32	2230		5100	112400.0	970.0	0.0	35.2	0.3	14.6	165.0			909.0				
33	2230		0	23400.0	171.0	0.0	5.0	0.0	0.6	19.2			38.1				
34	2290			233668	539		12		-	-	-	-		-49.56	-259		
35	2290			191888	778		33		12	140	72	44		-50.65	-266		
36	2290		6300	214400.0	4550.0	0.0	33.0	0.0	15.5	156.0			998.0				
37	2290		1800	234600.0	904.0	0.0	24.4	0.0	2.8	97.6			204.0				
38	2330			96513	118		5		-	21	9	5		-50.85	-256		
39	2330			158579	396		21		11	91	55	32		-50.53	-252		
40	2330		5800	173300.0	523.0	0.0	20.8	0.2	13.6	100.0			918.0				
41	2330		0	98300.0	282.0	0.0	7.9	0.0	1.1	35.7			88.6				
42	2390			96731	87		3		-	11	58	4		-46.22	-236		
43	2390			63822	75		3		-	3	4	-		-48.83	-244		
44	2390		0	69300.0	169.0	0.0	4.9	0.0	0.7	21.6			73.3				
45	2450			197937	173		6		4	22	13	10					
46	2540			161153	41		4		-	6	2	-		-49.86	-249		
47	2540			220473	179		19		12	35	28	15		-50.22	-263		
48	2540		940	213100.0	281.0	0.0	19.4	0.0	15.5	43.1			822.0				
49	2540		0	164700.0	103.0	0.0	5.5	0.0	0.7	7.6			81.5				
50	2630			10004	6		-		-	-	-	-					
51	2690			60709	11		-		-	-	-	-					
52	2750			13584	11		-		-	-	-	-		-25.27	-108		

APPENDIX X PBUZ8 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
1	5002921787	230	CT	CQ	March 1988	Z	GC	November 1988
2	5002921787	320	CT	CQ	March 1988	Z	GC	November 1988
3	5002921787	430	CT	CQ	March 1988	Z	GC	November 1988
4	5002921787	520	CT	CQ	March 1988	Z	GC	November 1988
5	5002921787	605	GS	VT	March 1988	N	GM	March 1988
6	5002921787	610	CT	CQ	March 1988	Z	GC	November 1988
7	5002921787	645	GS	VT	March 1988	N	GM	March 1988
8	5002921787	700	CT	CQ	March 1988	Z	GC	November 1988
9	5002921787	780	GS	VT	March 1988	N	GM	March 1988
10	5002921787	790	CT	CQ	March 1988	Z	GC	November 1988
11	5002921787	880	CT	CQ	March 1988	Z	GP	January 1989
12	5002921787	940	CT	CQ	March 1988	Z	GC	November 1988
13	5002921787	960	GS	VT	March 1988	N	GM	March 1988
14	5002921787	1000	CT	CQ	March 1988	Z	GC	November 1988
15	5002921787	1300	CT	CQ	March 1988	Z	GC	November 1988
16	5002921787	1390	CT	CQ	March 1988	Z	GC	November 1988
17	5002921787	1420	CT	CQ	March 1988	Z	GP	January 1989
18	5002921787	1510	CT	CQ	March 1988	Z	GC	November 1988
19	5002921787	1600	CT	CQ	March 1988	Z	GC	November 1988
20	5002921787	1660	CT	CP	March 1988	A	GM	March 1988
21	5002921787	1690	CT	CQ	March 1988	Z	GC	November 1988
22	5002921787	1780	CT	CQ	March 1988	Z	GC	November 1988
23	5002921787	1870	CT	CQ	March 1988	Z	GP	January 1989
24	5002921787	1900	CT	CQ	March 1988	Z	GC	November 1988
25	5002921787	1990	CT	CQ	March 1988	Z	GC	November 1988
26	5002921787	2050	CT	CQ	March 1988	Z	GC	November 1988
27	5002921787	2170	CT	CQ	March 1988	Z	GC	November 1988
28	5002921787	2240	CT	CP	March 1988	A	GM	March 1988
29	5002921787	2240	CT	CP	March 1988	A	GP	June 1988
30	5002921787	2260	CT	CQ	March 1988	Z	GC	November 1988
31	5002921787	2320	CT	CQ	March 1988	Z	GC	November 1988

PBUZ8 Sample ID

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
32	5002921787	2325	CT	CP	March 1988	A	GM	March 1988
33	5002921787	2350	CT	CQ	March 1988	Z	GP	January 1989
34	5002921787	2355	CT	CP	March 1988	A	GM	March 1988
35	5002921787	2355	CT	CP	March 1988	A	GP	June 1988
36	5002921787	2380	CT	CP	March 1988	Z	GG	December 1988
37	5002921787	2410	CT	CP	March 1988	A	GM	March 1988
38	5002921787	2410	CT	CQ	March 1988	Z	GC	November 1988
39	5002921787	2440	CT	CP	March 1988	Z	GG	December 1988
40	5002921787	2470	CT	CP	March 1988	A	GM	March 1988
41	5002921787	2470	CT	CP	March 1988	A	GP	June 1988
42	5002921787	2500	CT	CQ	March 1988	Z	GC	November 1988
43	5002921787	2530	CT	CP	March 1988	Z	GG	December 1988
44	5002921787	2550	CT	CP	March 1988	A	GM	March 1988
45	5002921787	2560	CT	CQ	March 1988	Z	GP	January 1989
46	5002921787	2590	CT	CQ	March 1988	Z	GC	November 1988
47	5002921787	2730	CT	CQ	March 1988	Z	GC	November 1988
48	5002921787	2790	CT	CP	March 1988	A	GM	March 1988
49	5002921787	2790	CT	CP	March 1988	A	GP	June 1988
50	5002921787	2820	CT	CQ	March 1988	Z	GC	November 1988
51	5002921787	2880	CT	CP	March 1988	A	GM	March 1988
52	5002921787	2880	CT	CP	March 1988	A	GP	June 1988
53	5002921787	2880	CT	CQ	March 1988	Z	GP	January 1989
54	5002921787	2910	CT	CP	March 1988	Z	GG	December 1988
55	5002921787	2940	CT	CQ	March 1988	Z	GC	November 1988
56	5002921787	3030	CT	CQ	March 1988	Z	GC	November 1988
57	5002921787	3120	CT	CQ	March 1988	Z	GC	November 1988
58	5002921787	3180	CT	CQ	March 1988	Z	GC	November 1988
59	5002921787	3270	CT	CQ	March 1988	Z	GC	November 1988
60	5002921787	3330	CT	CQ	March 1988	Z	GP	January 1989
61	5002921787	3390	CT	CQ	March 1988	Z	GC	November 1988
62	5002921787	3480	CT	CQ	March 1988	Z	GC	November 1988

	API Number	Depth (ft)	Sample Type	Container	Date Sampled	Bactericide	Laboratory	Date Analyzed
63	5002921787	3600	CT	CQ	March 1988	Z	GC	November 1988
64	5002921787	3660	CT	CQ	March 1988	Z	GC	November 1988
65	5002921787	3750	CT	CQ	March 1988	Z	GC	November 1988
66	5002921787	3840	CT	CQ	March 1988	Z	GP	January 1989
67	5002921787	3900	CT	CQ	March 1988	Z	GC	November 1988
68	5002921787	3990	CT	CP	March 1988	A	GM	March 1988
69	5002921787	3990	CT	CP	March 1988	A	GP	June 1988
70	5002921787	3990	CT	CQ	March 1988	Z	GC	November 1988
71	5002921787	4020	CT	CQ	March 1988	Z	GP	January 1989
72	5002921787	4080	CT	CQ	March 1988	Z	GC	November 1988
73	5002921787	4110	CT	CP	March 1988	A	GM	March 1988
74	5002921787	4140	CT	CQ	March 1988	Z	GC	November 1988
75	5002921787	4170	CT	CQ	March 1988	Z	GP	January 1989

PBUZ8 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	230			464.9	9.9		3.6		0.0	0.0			1119.9				
2	320			524.2	9.2		3.0		0.0	0.0			928.9				
3	430			748.5	6.0		1.8		0.0	0.0			798.9				
4	520			1300.3	12.9		3.2		0.0	0.0			773.4				
5	605			163.4	4	0.7	1.0	1.6	5.0	1.0			83				
6	610			514.1	6.8		2.2		0.0	0.0			475.8				
7	645			164.8	4	0.9	1.2	1.6	1.4	1.0			77				
8	700			3113.5	43.4		13.7		7.3	0.0			184.0				
9	780			201.9	5	1.2	1.3	1.8	1.1	1.1			79				
10	790			2500.6	35.3		8.1		0.0	0.0			240.2				
11	880	991000	-	8900	-		-							-			
12	940			2586.9	13.0		2.9		0.0	0.0			71.0				
13	960			182.3	4	1.2	1.3	1.7	1.0	1.0			93				
14	1000			6162.3	12.6		2.7		0.0	0.0			144.9				
15	1300			1778.0	11.3		2.6		0.0	0.0			219.5				
16	1390			1762.3	9.2		1.5		0.0	0.0			173.3				
17	1420	998200	1800	-	-		-							-			
18	1510			6973.7	23.8		3.1		0.0	0.0			137.3				
19	1600			7567.4	16.5		1.5		0.0	0.0			0.0				
20	1660			3000	10	0.5	2	1	0.4	1			125				
21	1690			3841.7	14.5		1.8		0.0	0.0			248.3				
22	1780			2794.1	15.6		2.9		0.0	0.0			266.4				
23	1870	999100	900	-	-		-							-			
24	1900			943.7	4.5		0.8		0.0	0.0			58.7				
25	1990			16934.8	33.4		4.0		0.0	0.0			328.4				
26	2050			5987.1	27.0		3.0		0.0	0.0			85.0				
27	2170			35688.9	66.5		5.1		12.6	0.0			222.0				
28	2240			79000	51	4.4	11	2	10	2			102				
29	2240													-49.37			
30	2260			31367.1	60.8		4.7		8.5	0.0			61.0				
31	2320			16343.0	25.2		2.3		4.4	0.0			0.0				

PBUZ8 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
32	2325			152000	52	6.8	14	5	8	1			120				
33	2350	898700	1900	99300	-		-							-49.45			
34	2355			125000	38	2.9	12	4	7	1			141				
35	2355	918500	-	81500	-		-		-	-			-	-49.88			
36	2380			110000	2100	-	1400	-	410	680	640	370		-50.69	-227		
37	2410			191000	50	9.2	14	2	9	1			40				
38	2410			22986.7	23.9		1.8		3.9	0.0			0.6				
39	2440			253000	130	-	45	-	29	47	110	53		-50.39	-263		
40	2470			187000	48	2.1	15	5	8	1			51				
41	2470	861300	-	138700	-		-		-	-			-	-49.86			
42	2500			37043.3	31.3		3.0		0.0	0.0			0.0				
43	2530			136000	100	-	54	-	29	64	140	61		-50.33	-263		
44	2550			153000	45	2.8	10	3	6	1			37				
45	2560	783500	1500	215000	-		-							-49.56			
46	2590			29929.1	38.5		3.2		5.8	0.0			0.0				
47	2730			8746.7	8.0		7.8		6.2	7.1			624.8				
48	2790			57000	23	0.7	9	1	5	5			230				
49	2790	927100	900	71300	-		-		-	-			700	-43.77			
50	2820			7959.9	8.2		0.5		0.0	0.0			32.0				
51	2880			135000	0.3	5.6	15	4	5	3			1757				
52	2880	929000	-	70100	-		-		-	-			900	-45.05			
53	2880	871700	-	128300	-		-							-46.19			
54	2910			28500	42	-	45	-	19	56	140	69		-46.79	-255		
55	2940			13675.2	4.0		11.2		0.0	0.0			1141.0				
56	3030			12397.4	12.0		3.6		0.0	0.0			364.7				
57	3120			11858.2	13.1		1.8		0.0	0.0			229.7				
58	3180			13577.7	34.6		1.6		0.0	0.0			0.0				
59	3270			49385.7	50.1		6.5		0.0	0.0			825.2				
60	3330	889800	7100	109400	-		-							-44.95			
61	3390			19985.8	33.4		1.1		0.0	0.0			73.3				
62	3480			10699.9	15.4		3.3		1.6	0.0			127.6				

PBUZ8 Headspace/Free Gas Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
63	3600			25315.6	36.2		0.0		0.0	0.0			195.0				
64	3660			14897.6	15.9		1.9		0.0	0.0			168.5				
65	3750			9018.9	50.3		3.3		0.0	0.0			114.9				
66	3840	798200	-	201800	-		-							-44.79			
67	3900			14229.9	114.6		6.7		2.0	0.0			51.3				
68	3990			149000	1	4.8	116	9	104	41			206				
69	3990	781400	1600	215300	1700		-		-	-			-	-41.77			
70	3990			12915.4	752.4		31.3		25.4	7.2			70.6				
71	4020	889700	-	110300	-		-							-41.85			
72	4080			13324.6	231.2		22.4		19.2	7.4			77.9				
73	4110			133000	11	5.9	115	7	83	43			138				
74	4140			118170.2	2351.1		215.0		177.9	60.8			499.6				
75	4170	802200	5000	192200	600		-							-42.08			

PBUZ8 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
1	230			1278.0	49.1		22.1		5.3	8.6			218.8				
2	320			1226.7	40.9		16.7		4.2	6.1			48.4				
3	430			1002.8	43.9		22.2		5.3	8.8			53.8				
4	520			1658.8	35.2		15.8		3.7	6.3			56.4				
5	605																
6	610			4516.3	71.2		31.8		8.1	12.0			119.3				
7	645																
8	700			2300.8	39.4		17.7		4.1	6.2			43.9				
9	780																
10	790			4788.5	96.8		45.2		10.7	18.1			84.8				
11	880																
12	940			2858.9	70.3		38.1		11.3	15.6			101.9				
13	960																
14	1000			2616.6	76.3		36.8		8.1	13.4			59.4				
15	1300			2385.7	48.6		22.3		5.2	8.3			65.9				
16	1390			2089.9	37.6		23.1		8.7	11.0			61.6				
17	1420																
18	1510			1114.2	35.6		15.0		3.5	5.6			54.3				
19	1600			1518.1	25.7		10.3		2.3	3.4			2.2				
20	1660																
21	1690			3970.9	13.8		7.1		1.7	2.8			23.8				
22	1780			5045.2	67.7		33.8		10.6	14.0			90.7				
23	1870																
24	1900			6216.3	36.2		15.0		3.5	5.9			40.7				
25	1990			3824.5	25.3		11.5		3.0	3.7			29.9				
26	2050			3649.2	13.5		6.2		1.6	2.4			24.2				
27	2170			6665.5	61.0		28.5		7.4	11.4			128.0				
28	2240																
29	2240																
30	2260			4778.8	24.7		11.8		3.3	4.6			45.2				
31	2320			5553.8	50.4		22.5		5.7	8.4			56.1				

PBUZ8 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
32	2325																
33	2350																
34	2355																
35	2355																
36	2380																
37	2410																
38	2410			5757.9	40.6		19.9		4.2	7.7			29.6				
39	2440																
40	2470																
41	2470																
42	2500			3780.6	27.0		11.4		2.7	4.0			33.5				
43	2530																
44	2550																
45	2560																
46	2590			4096.3	17.7		7.6		2.1	2.7			21.1				
47	2730			4694.4	30.9		15.2		4.3	6.5			861.2				
48	2790																
49	2790																
50	2820			981.7	12.5		5.0		2.1	2.2			69.1				
51	2880																
52	2880																
53	2880																
54	2910																
55	2940			1120.3	18.6		9.0		2.2	3.9			2236.4				
56	3030			1351.8	14.1		6.1		1.7	2.1			454.3				
57	3120			2306.5	30.8		11.3		2.7	3.5			239.3				
58	3180			5927.1	24.8		3.2		0.3	0.4			83.3				
59	3270			1701.4	19.8		7.3		1.8	2.2			255.9				
60	3330																
61	3390			6093.7	35.7		10.4		2.5	2.9			41.6				
62	3480			1303.9	19.0		8.5		2.4	2.9			112.7				

PBUZ8 Blended Headspace Analyses

	Depth (ft)	N2	CO2	C1	C2	C2:1	C3	C3:1	IC4	NC4	IC5	NC5	C5-C7	d13C1	dDC1	d13C2	d13CO2
63	3600			8890.2	63.1		18.4		4.2	4.8			78.8				
64	3660			2402.1	25.7		10.4		2.5	3.6			106.0				
65	3750			2666.9	33.5		11.2		2.8	3.9			149.8				
66	3840																
67	3900			14478.8	164.8		28.1		11.1	6.1			53.0				
68	3990																
69	3990																
70	3990			9324.2	341.9		54.2		38.9	20.3			116.7				
71	4020																
72	4080			5962.3	62.8		23.7		17.0	12.5			269.5				
73	4110																
74	4140			3978.1	26.8		10.1		3.4	3.8			37.9				
75	4170																