

**Sampling Plan Summary  
Cannon Air Force Base  
December 18, 2000 Sampling Event**

Sample Matrix	Site Location	Sample ID	Number/ Type of Samples	Date Collected	Sampling Rationale	Sample Container/ Preservative/ Analytical Method
GW	Landfill 3 & EOD Practice Range (SWMU 105)	CAFB-O	1 grab	12-18-00	This well is at the south margin of the landfill. It is also located about 1500 feet downgradient of the of the Explosive Ordnance Disposal (EOD) Practice Range.	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Landfill 4 & EOD Practice Range & Weapons Storage Area (SWMU 104)	CAFB-N	1 grab	12-18-00	This well is located 220 feet downgradient of the landfill. It is also located about 1300 feet downgradient of the Explosive Ordnance Disposal (EOD) Practice Range and the Weapons Storage Area and appears to be located in the middle of their groundwater flow paths.	2 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Sewage Lagoons (SWMU 101) & Landfill 25 (SWMU 97)	CAFB-P	1 grab	12-18-00	This well is located about 500 feet downgradient of the two sewage lagoons. It is also located about 350 feet downgradient of SWMU 97.	1 x 125 mL plastic bottle/4 °C/EPA Method 314.0
GW	Landfill 25 (SWMU 97)	CAFB-R	1 grab	12-18-00	This well is located 350 feet downgradient of SWMU 97.	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0

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2001

**Sampling Plan Summary  
Cannon Air Force Base  
December 18, 2000 Sampling Event**

**SITE DESCRIPTIONS & HISTORY:**

**Landfill 3 (SWMU 105):** Landfill No. 3 is an inactive cut and burn landfill that was in operation from 1959 to 1967. The 9-acre landfill is on the east boundary of the Base. The landfill received domestic and industrial wastes including solvents, paint, thinners, waste oils, and peroxide containers.

**Landfill 4 (SWMU 104):** Landfill No. 4 is an inactive 7-acre cut and burn landfill that was operated from 1967 to 1968. The landfill is located immediately north of Playa Lake on the east boundary of the Base. The landfill received domestic and industrial wastes including solvents, paint, thinners, waste oils, and peroxide containers.

**Landfill 5 (SWMU 113):** Landfill 5 is a 33-acre landfill on the southeast corner of the Base. The landfill was active from 1968 to 1988 and operated as a cut and burn landfill from 1968 to 1972. Thereafter, the wastes were buried. The landfill received domestic and industrial wastes and debris from 1984 to 1988, at which time it was deactivated.

A RCRA landfill cap was constructed over Cell 3 in 1988. This cell allegedly received RCRA-characteristic wastes, such as spent paint strippers, thinners, and solvents, for approximately six weeks following the landfill disposal restrictions on these wastes that became effective on 1 November 1980.

**Landfill Cell 25 (SWMU 97):** This unit occupies approximately 30 acres adjacent to the perimeter road on the east area of the Base. The Rubble Pile dates to the mid-1950s in historical aerial photographs. The rubble consists primarily of construction debris, bricks, concrete blocks, and asphalt road and runway material. Most of the material originated from demolished World War II era facilities.

An Environmental Assessment was performed on the Rubble Pile by the Corps of Engineers in February 1991. Material from nine backhoe trenches dug in the rubble were sampled for asbestos, PCBs, extractable organics, VOCs, herbicides, pesticides, and metals. None of the above parameters were detected in the rubble material. However, at least two cut and burn landfill trenches were discovered under the rubble. The trenches were an unexpected discovery; apparently, a portion of the land where the Rubble Pile now exists was once used as a landfill. Newspaper dating from 1943 was recovered from one of the trenches. Detectable levels of barium, cadmium were found in one trench; however, the levels were well below background. Benzidine was also found at extremely low levels.

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Because of piles of uncovered nonfriable asbestos debris and the unknowns buried under the rubble, Cannon AFB IRP/RFI personnel recommended that this site be left alone. Removing this rubble would necessitate an asbestos abatement project.

**Weapons Storage Area:** The Weapons Storage Area is located on the northeast part of Cannon AFB near SWMUs 96, 103, and 104.

**Sewage Lagoons (SWMU 101):** SWMU 101 consists of two surface impoundments that were in use from 1966 through 1999. Combined sanitary and industrial wastewater was treated in the sewage. The lagoons were constructed with bentonite clay-lined bottoms and concrete-lined banks. The average depth of water was 3.5 feet with a maximum of 4.5 feet. The treated wastewater was discharged to an on-base playa (SWMU 103) under a NPDES Permit. These lagoons are currently closed and dry and are scheduled for remediation this winter. The sludge from the North Lagoon will be placed in the South Lagoon and then an earthen cover will be placed over the sludge.

**Sampling Plan Summary  
Cannon Air Force Base  
March/April 2001 Sampling Event**

Sample Matrix	Site Location	Sample ID	Number/ Type of Samples	Date Collected	Sampling Rationale	Sample Container/ Preservative/ Analytical Method
GW	Landfill 5 (SWMU 113)	MW-S	1 grab	3-20-01	This well is 600 yards downgradient of Landfill 5 Cell 3 and is directly in middle of the groundwater flow path.	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Landfill 5 (SWMU 113)	MW-T and MW-TD (Duplicate)	2 grab	3-21-01	One groundwater sample and one duplicate will be collected from this well. This well is 50 yards downgradient of Landfill 5 Cell 3 and is in the middle of the groundwater flow path. This well was selected for a duplicate sample because it is located in the middle of the groundwater flow path.	2 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Landfill 5 (SWMU 113)	MW-U	1 grab	3-21-01	This well is 50 yards downgradient of Landfill 5 Cell 3 and is on the north edge of the groundwater flow path.	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Landfill 5 (SWMU 113)	MW-Q	1 grab	3-22-01	This well is the upgradient well for the Landfill 5 monitoring system and is located about 1/8 mile NW of the landfill.	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0

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<b>Sample Matrix</b>	<b>Site Location</b>	<b>Sample ID</b>	<b>Number/ Type of Samples</b>	<b>Date Collected</b>	<b>Sampling Rationale</b>	<b>Sample Container/ Preservative/ Analytical Method</b>
Sludge	North Sewage Lagoon (SWMU 101)	CNL-1 CNL-2 CNL-3 CNL-D (Duplicate)	4 grab	3-23-01	Three surface sludge samples and one duplicate will be collected from the inlet, middle, and outlet areas of the North Sewage Lagoon. A duplicate sample will be collected at the North Lagoon. It is expected that most of the sludge and contaminants would have settled out near the inlet. However because perchlorate is highly water soluble and mobile, it may be erratically distributed.	4 x 4 oz glass jar/ 4 °C/EPA Method 314.0
Sludge	South Sewage Lagoon (SWMU 101)	CSL-1 CSL-2 CSL-3 CSL-4 CSL-5	5 grab	.	Five surface sludge samples and one duplicate will be collected from the inlet, middle, and outlet areas of the South Sewage Lagoon. It is expected that most of the sludge and contaminants would have settled out near the inlet. However because perchlorate is highly water soluble and mobile, it may be erratically distributed.	5 x 4 oz glass jar/ 4 °C/EPA Method 314.0

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March/April 2001 Sampling Event**

<b>Sample Matrix</b>	<b>Site Location</b>	<b>Sample ID</b>	<b>Number/ Type of Samples</b>	<b>Date Collected</b>	<b>Sampling Rationale</b>	<b>Sample Container/ Preservative/ Analytical Method</b>
Surface Water	Playa Lake (SWMU 103)	SW-1, SW-2, SW-3, SW-4	4 grab	3-30-01	Four surface water samples were collected at this site. A duplicate sample was inadvertently not collected. Two samples will be collected from the south and east edges of the Playa Lake itself. The first sample and one duplicate will be collected near the inlet where it is expected higher concentrations may be present. The second sample will be collected near the middle of the Playa. The third sample will be collected near the outlet. It is expected that most of the sludge and contaminants would have settled out in the lagoons and that any contaminants entering the Playa Lake would be higher near the inlet. However because perchlorate is highly water soluble and mobile, it may be erratically distributed.	4 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Production Well	PW-3	1 grab	4-4-01	One groundwater sample will be collected from this well. This well was selected for sampling because perchlorate was detected in other production wells in 1999 (see Site History below).	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0

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<b>Sample Matrix</b>	<b>Site Location</b>	<b>Sample ID</b>	<b>Number/ Type of Samples</b>	<b>Date Collected</b>	<b>Sampling Rationale</b>	<b>Sample Container/ Preservative/ Analytical Method</b>
GW	Production Well	PW-5	1 grab	4-4-01	One groundwater sample will be collected from this well. This well was selected for sampling because perchlorate was detected in other production wells in 1999 (see Site History below).	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Production Well	PW-7& PW-7A (Duplicate)	2 grab	4-4-01	One groundwater sample and one duplicate sample will be collected from this well. This well was selected for sampling and for collection of a duplicate sample because perchlorate was detected in a sample collected from this well in 1999 (see Site History below).	2 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Production Well	PW-8	1 grab	4-4-01	One groundwater sample will be collected from this well. This well was selected for sampling because perchlorate was detected in other production wells in 1999 (see Site History below).	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Production Well	PW-12	1 grab	4-4-01	One groundwater sample will be collected from this well. This well was selected for sampling because perchlorate was detected in other production wells in 1999 (see Site History below).	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0

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MW-F and MW-G were originally selected for sampling but they were not sampled because they won't be sampled until August 2001 after the grant is over. MW-F was selected because it is located on the east side of the perimeter berm of the Sewage Lagoons and immediately downgradient. MW-G was selected because it is located on the east edge of the perimeter berm of the Sewage Lagoons and immediately downgradient.

Production Well 2 (PW-2) was originally scheduled for sampling because perchlorate was detected in a sample collected from this well in 1999 (see Site History below). However, the pump was broken and it was not possible to sample during before the grant was over.

GW - Ground Water  
SW - Surface Water  
PW - Production Well

**Sampling Plan Summary  
Cannon Air Force Base  
March/April 2001 Sampling Event**

**SITE DESCRIPTIONS & HISTORY:**

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**Landfill 4 (SWMU 104):** Landfill No. 4 is an inactive 7-acre cut and burn landfill that was operated from 1967 to 1968. The landfill is located immediately north of Playa Lake on the east boundary of the Base. The landfill received domestic and industrial wastes including solvents, paint, thinners, waste oils, and peroxide containers.

**Landfill 5 (SWMU 113):** Landfill 5 is a 33-acre landfill on the southeast corner of the Base. The landfill was active from 1968 to 1988 and operated as a cut and burn landfill from 1968 to 1972. Thereafter, the wastes were buried. The landfill received domestic and industrial wastes and debris from 1984 to 1988, at which time it was deactivated.

A RCRA landfill cap was constructed over Cell 3 in 1988. This cell allegedly received RCRA-characteristic wastes, such as spent paint strippers, thinners, and solvents, for approximately six weeks following the landfill disposal restrictions on these wastes that became effective on 1 November 1980.

**Landfill Cell 25 (SWMU 97):** This unit occupies approximately 30 acres adjacent to the perimeter road on the east area of the Base. The Rubble Pile dates to the mid-1950s in historical aerial photographs. The rubble consists primarily of construction debris, bricks, concrete blocks, and asphalt road and runway material. Most of the material originated from demolished World War II era facilities.

An Environmental Assessment was performed on the Rubble Pile by the Corps of Engineers in February 1991. Material from nine backhoe trenches dug in the rubble were sampled for asbestos, PCBs, extractable organics, VOCs, herbicides, pesticides, and metals. None of the above parameters were detected in the rubble material. However, at least two cut and burn landfill trenches were discovered under the rubble. The trenches were an unexpected discovery; apparently, a portion of the land where the Rubble Pile now exists was once used as a landfill. Newspaper dating from 1943 was recovered from one of the trenches. Detectable levels of barium, cadmium were found in one trench; however, the levels were well below background. Benzidine was also found at extremely low levels.

**Sampling Plan Summary  
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March/April 2001 Sampling Event**

Because of piles of uncovered nonfriable asbestos debris and the unknowns buried under the rubble, Cannon AFB IRP/RFI personnel recommended that this site be left alone. Removing this rubble would necessitate an asbestos abatement project.

**Weapons Storage Area:** The Weapons Storage Area is located on the northeast part of Cannon AFB near SWMUs 96, 103, and 104.

**Sewage Lagoons (SWMU 101):** SWMU 101 consists of two surface impoundments that were in use from 1966 through 1999. Combined sanitary and industrial wastewater was treated in the sewage. The lagoons were constructed with bentonite clay-lined bottoms and concrete-lined banks. The average depth of water was 3.5 feet with a maximum of 4.5 feet. The treated wastewater was discharged to an on-base playa (SWMU 103) under a NPDES Permit. These lagoons are currently closed and dry and are scheduled for remediation this winter. The sludge from the North Lagoon will be placed in the South Lagoon and then an earthen cover will be placed over the sludge.

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**Landfill 4 (SWMU 104):** Landfill No. 4 is an inactive 7-acre cut and burn landfill that was operated from 1967 to 1968. The landfill is located immediately north of Playa Lake on the east boundary of the Base. The landfill received domestic and industrial wastes including solvents, paint, thinners, waste oils, and peroxide containers.

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A RCRA landfill cap was constructed over Cell 3 in 1988. This cell allegedly received RCRA-characteristic wastes, such as spent paint strippers, thinners, and solvents, for approximately six weeks following the landfill disposal restrictions on these wastes that became effective on 1 November 1980.

**Landfill Cell 25:** This unit occupies approximately 30 acres adjacent to the perimeter road on the east area of the Base. The Rubble Pile dates to the mid-1950s in historical aerial photographs. The rubble consists primarily of construction debris, bricks, concrete blocks, and asphalt road and runway material. Most of the material originated from demolished World War II era facilities.

An Environmental Assessment was performed on the Rubble Pile by the Corps of Engineers in February 1991. Material from nine backhoe trenches dug in the rubble were sampled for asbestos, PCBs, extractable organics, VOCs, herbicides, pesticides, and metals. None of the above parameters were detected in the rubble material. However, at least two cut and burn landfill trenches were discovered under the rubble. The trenches were an unexpected discovery; apparently, a portion of the land where the Rubble Pile now exists was once used as a landfill. Newspaper dating from 1943 was recovered from one of the trenches. Detectable levels of barium, cadmium were found in one trench; however, the levels were well below background. Benzidine was also found at extremely low levels.

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**Sewage Lagoons (SWMU 101):** SWMU 101 consists of two surface impoundments that were in use from 1966 through 1999. Combined sanitary and industrial wastewater was treated in the sewage. The lagoons were constructed with bentonite clay-lined bottoms and concrete-lined banks. The average depth of water was 3.5 feet with a maximum of 4.5 feet. The treated wastewater was discharged to an on-base playa (SWMU 103) under a NPDES Permit. These lagoons are currently closed and dry and are scheduled for remediation this winter. The sludge from the North Lagoon will be placed in the South Lagoon and then an earthen cover will be placed over the sludge.

**Data Summary Table  
Cannon Air Force Base, New Mexico**

Sample Matrix	Site Location	Sample ID	Pinnacle Lab ID	Sample Depth/ Depth to Water <sup>A</sup>	Date Collected	TDS <sup>B</sup> (mg/L)	Perchlorate Concentration ug/L (water) ug/kg (solid) <sup>C,D</sup>
GW	Landfill 3 & EOD Practice Range (SWMU 105)	CAFB-O	012079-01	292.9 ft. <sup>G</sup>	12-18-00	1,020 mg/L	<5.00 ug/L
GW	Landfill 4 & EOD Practice Range & Weapons Storage Area (SWMU 104)	CAFB-N	012079-02	283.5 ft. <sup>G</sup>	12-18-00	468 mg/L	<5.00 ug/L
GW	Sewage Lagoons (SWMU 101) & Landfill 25 (SWMU 97)	CAFB-P	012079-03	286.1 ft. <sup>G</sup>	12-18-00	1,270 mg/L	<5.00 ug/L
GW	Landfill 25 (SWMU 97)	CAFB-R	012079-04	288.0 ft. <sup>G</sup>	12-18-00	589 mg/L	<5.00 ug/L
Sludge	North Sewage Lagoon (SWMU 101)	CNL-1	104053-01	0-3 in.	3-23-01	NA	<12.3 ug/kg
Sludge	North Sewage Lagoon (SWMU 101)	CNL-2	104053-02	0-3 in.	3-23-01	NA	<22.5 ug/kg
Sludge	North Sewage Lagoon (SWMU 101)	CNL-3	104053-03	0-3 in.	3-23-01	NA	<25.0 ug/kg
Sludge	North Sewage Lagoon (SWMU 101)	CNL-D (Duplicate)	104053-04	0-3 in.	3-23-01	NA	<25.7 ug/kg
Sludge	South Sewage Lagoon (SWMU 101)	CSL-1	104053-05	0-3 in.	3-23-01	NA	>27.2 ug/kg

CAFB  
2001

**Data Summary Table**  
**Cannon Air Force Base, New Mexico**

Sample Matrix	Site Location	Sample ID	Pinnacle Lab ID	Sample Depth/ Depth to Water <sup>A</sup>	Date Collected	TDS <sup>B</sup> (mg/L)	Perchlorate Concentration ug/L (water) ug/kg (solid) <sup>C,D</sup>
Sludge	South Sewage Lagoon (SWMU 101)	CSL-2	104053-06	0-3 in.	3-23-01	NA	<12.7 ug/kg
Sludge	South Sewage Lagoon (SWMU 101)	CSL-3	104053-07	0-3 in.	3-23-01	NA	<24.6 ug/kg
Sludge	South Sewage Lagoon (SWMU 101)	CSL-4	104053-08	0-3 in.	3-23-01	NA	<26.2 ug/kg
Sludge	South Sewage Lagoon (SWMU 101)	CSL-5	104053-09	0-3 in.	3-23-01	NA	<25.9 ug/kg
GW	Landfill 5, Cell 3, (SWMU 113) downgradient well	MW-S	104053-10	298.5 ft. <sup>E</sup>	3-20-01	530 mg/L	<5.00 ug/L
GW	Landfill 5, Cell 3, (SWMU 113) downgradient well	MW-T	104053-11	294.8 ft. <sup>E</sup>	3-21-01	594 mg/L	<5.00 ug/L
GW	Landfill 5, Cell 3, (SWMU 113) downgradient well	MW-TD (Duplicate)	104053-12	294.8 ft. <sup>E</sup>	3-21-01	587 mg/L	<5.00 ug/L
GW	Landfill 5, Cell 3, (SWMU 113) downgradient well	MW-U	104053-13	294.1 ft. <sup>E</sup>	3-21-01	524 mg/L	<5.00 ug/L
GW	Landfill 5, Cell 3, (SWMU 113) upgradient well	MW-Q	104053-14	287.1 ft. <sup>E</sup>	3-22-01	506 mg/L	<5.00 ug/L
GW	downgradient of golf course (GC) & housing	Prod. Well 3	104053-15	290 ft. <sup>F</sup>	4-4-01	568 mg/L	<5.00 ug/L
GW	upgradient of ordnance	Prod. Well 5	104053-16	273 ft. <sup>F</sup>	4-4-01	374 mg/L	<5.00 ug/L

**Data Summary Table  
Cannon Air Force Base, New Mexico**

Sample Matrix	Site Location	Sample ID	Pinnacle Lab ID	Sample Depth/ Depth to Water <sup>A</sup>	Date Collected	TDS <sup>B</sup> (mg/L)	Perchlorate Concentration ug/L (water) ug/kg (solid) <sup>C,D</sup>
	storage area downgradient of GC						
GW	sidegradient of GC	PW-7	104053-17	309 ft. <sup>F</sup>	4-4-01	502 mg/L	<5.00 ug/L
GW	sidegradient of GC	PW-7A (Duplicate)	104053-18	309 ft. <sup>F</sup>	4-4-01	500 mg/L	<5.00 ug/L
GW	sidegradient of GC, downgradient of housing area	PW-8	104053-19	314 ft. <sup>F</sup>	4-4-01	516 mg/L	<5.00 ug/L
GW	downgradient of PW-8, near and sidegradient of PW-3	PW-12	104053-20	300 ft. <sup>F</sup>	4-4-01	514 mg/L	<b>23.5 ug/L</b>
SW	Playa Lake (SWMU 103)	SW-1	104053-21	surface	3-30-01	642 mg/L	<5.00 ug/L
SW	Playa Lake (SWMU 103)	SW-2	104053-22	surface	3-30-01	780 mg/L	<5.00 ug/L
SW	Playa Lake (SWMU 103)	SW-3	104053-23	surface	3-30-01	787 mg/L	<5.00 ug/L
SW	Playa Lake (SWMU 103)	SW-4	104053-24	surface	3-30-01	827 mg/L	<5.00 ug/L

GW - Ground Water

PW - Production Well (all production wells are on-site facility wells)

SW - Surface Water

NA - Not Applicable

**Data Summary Table**  
**Cannon Air Force Base, New Mexico**

- A - Depth to water measured from top of casing (rounded off to tenths/foot).
- B - Conductivity is required by EPA Method 314.0; TDS was converted from the conductivity measurements.
- C - Concentrations in soil are reported on a dry weight basis
- D - Matrix spike and matrix spike duplicate (MS/MSD) recoveries for the soil samples was not acceptable. Sample CNL-1 was initially selected for the MS/MSD analyses and recoveries of 18% and 19% (respectively) were obtained. Reinjection of the MS produced a 16% recovery. A second sample (CNL-4) was selected for MS/MSD analysis and a recovery of 20% was obtained for the MS, but the MSD peak could not be integrated.
- E - Depth to water measured during August 10, 2000 sampling event.
- F - Depth to water measured during April 4, 2001 sampling event.
- G - Depth to water measured during December 18, 2000 sampling event.



DEPARTMENT OF THE AIR FORCE

27TH CIVIL ENGINEER SQUADRON (ACC)  
CANNON AIR FORCE BASE NEW MEXICO

CAFB  
1999

25 OCT 1999

Lt Colonel Eric J. Wilbur  
Commander  
506 N DL Ingram Blvd  
Cannon AFB NM 88103-5136

Mr. James Bearzi, Chief  
Hazardous and Radioactive Materials Bureau  
New Mexico Environment Department  
2044 Galisteo Street  
P O Box 26110  
Santa Fe NM 87502

Dear Mr. Bearzi

In response to the 29 Sep 99 letter from your office signed by Julie Wanslow requesting a survey of possible perchlorate contaminated sites on Cannon AFB and Melrose Air Force Range, attached are survey forms identifying four sites on each installation.

It is our belief that the potential for perchlorate contamination on Cannon AFB and Melrose Air Force Range is small given that perchlorate usage has been limited at the facilities.

If you have any questions, please contact Mr. Sanford Hutsell at (505) 784-6378 or Mr. John Pike at (505) 784-1092 of my environmental flight.

Sincerely

ERIC J. WILBUR, Lt Col, USAF

Attachment:  
Perchlorate Survey of Sites

cc:  
NMED ( J. Wanslow)  
EPA Region VI (D. Neleigh)  
EPA Region VI (B. Sturdivant)

*Global Power for America*

Facility Name: Melrose Air Force Range

September, 1999

Facility Contact Person: Sanford Hutsell

Phone Number: 505-784-6378

Date: 12 Oct 99

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### Perchlorate Survey of Sites in New Mexico

Please complete one sheet for each site. Complete Questions 1-18 for four sites with the most potential for perchlorate contamination. See instruction sheet for criteria for selecting the four sites. Please complete Questions 1-8 for all the rest of the perchlorate-related sites associated with your facility, including sites that are not considered RCRA- or HSWA-regulated sites and sites that are not located on your property.

1. Site Name: SWMU 118 Explosives Ordnance Disposal Open Burn Open Detonation Pit
2. Type of perchlorate-related site (see instructions for definition): Thermal Destruction, Open Detonation
3. Describe the management practices of perchlorate-contaminated materials and the estimated volumes that were managed:  
Open Burn, Volumes Unknown
4. Has groundwater ever been sampled for perchlorate? YES  NO   
If yes, indicate dates of sampling and maximum concentrations\*:
5. Has surface water ever been sampled for perchlorate? YES  NO   
If yes, indicate dates of sampling and maximum concentrations\*:
6. Has soil or sediment ever been sampled for perchlorate? YES  NO   
If yes, indicate dates of sampling and maximum concentrations\*:
7. Do you suspect this site to have perchlorate contamination? YES  NO   
If yes, specify which media is suspected as being contaminated?
8. Describe future plans for collecting groundwater, surface water, soil, sediment samples for perchlorate (also describe proposed analytical method and detection limit):  
None unless required

Questions 9-18 need to be completed for only four sites with the most potential for perchlorate contamination

9. Horizontal Distance to nearest downgradient GW monitor wells (in feet):  
200 ft
10. Specify dates for the next four scheduled GW sampling events: None scheduled
11. Depth to shallowest monitored zone (in feet): Unknown, cannot locate in records
12. Range of Total Dissolved Solids (TDS) in GW: Unknown
13. Horizontal Distance to Surface Water (in feet): None for miles
14. Range of TDS of Surface Water: N/A
15. Specify dates for the next four scheduled surface water sampling events: none scheduled
16. Would the facility like to split soil, sediment, GW, surface water samples with HRMB?  YES  NO
17. Could the facility provide GPS information and a map of the sample locations?  YES  NO
18. Site Access Problems (describe): None, except access to Melrose Range must be scheduled.

\* If concentrations were below detection, indicate the detection limit.

Facility Name: Melrose Air Force Range

September, 1999

Facility Contact Person: Sanford Hutcell

Phone Number: 505-784-6378

Date: 13 Oct 99

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### Perchlorate Survey of Sites in New Mexico

Please complete one sheet for each site. Complete Questions 1-18 for four sites with the most potential for perchlorate contamination. See instruction sheet for criteria for selecting the four sites. Please complete Questions 1-8 for all the rest of the perchlorate-related sites associated with your facility, including sites that are not considered RCRA- or HSWA-regulated sites and sites that are not located on your property.

1. Site Name: SWMU 118 Explosives Ordnance Disposal Pit Monitoring Well
2. Type of perchlorate-related site (see instructions for definition): Open Burn, Open Detonation
3. Describe the management practices of perchlorate-contaminated materials and the estimated volumes that were managed:  
Open Burning and detonation, volumes unknown
4. Has groundwater ever been sampled for perchlorate? YES  NO   
If yes, indicate dates of sampling and maximum concentrations\*:
5. Has surface water ever been sampled for perchlorate? YES  NO   
If yes, indicate dates of sampling and maximum concentrations\*:
6. Has soil or sediment ever been sampled for perchlorate? YES  NO   
If yes, indicate dates of sampling and maximum concentrations\*:
7. Do you suspect this site to have perchlorate contamination? YES  NO   
If yes, specify which media is suspected as being contaminated?
8. Describe future plans for collecting groundwater, surface water, soil, sediment samples for perchlorate (also describe proposed analytical method and detection limit):  
None unless required.

Questions 9-18 need to be completed for only four sites with the most potential for perchlorate contamination

9. Horizontal Distance to nearest downgradient GW monitor wells (in feet):
10. Specify dates for the next four scheduled GW sampling events: None scheduled
11. Depth to shallowest monitored zone (in feet): Unknown, cannot locate in records
12. Range of Total Dissolved Solids (TDS) in GW: Unknown
13. Horizontal Distance to Surface Water (in feet): Miles
14. Range of TDS of Surface Water: N/A
15. Specify dates for the next four scheduled surface water sampling events: N/A
16. Would the facility like to split soil, sediment, GW, surface water samples with HRMB?  YES  NO
17. Could the facility provide GPS information and a map of the sample locations?  YES  NO
18. Site Access Problems (describe): None, except access to Melrose Range must be scheduled.

\* If concentrations were below detection, indicate the detection limit.

Facility Name: Melrose Air Force Range  
Facility Contact Person: Sanford Hutsell  
Phone Number: 505-784-6378  
Date: 13 Oct 99  
Page 3 of 4

September, 1999

### Perchlorate Survey of Sites in New Mexico

Please complete one sheet for each site. Complete Questions 1-18 for four sites with the most potential for perchlorate contamination. See instruction sheet for criteria for selecting the four sites. Please complete Questions 1-8 for all the rest of the perchlorate-related sites associated with your facility, including sites that are not considered RCRA- or HSWA-regulated sites and sites that are not located on your property.

1. Site Name: SWMU 114 Ordnance Disposal Trenches
2. Type of perchlorate-related site (see instructions for definition): Land disposal
3. Describe the management practices of perchlorate-contaminated materials and the estimated volumes that were managed:  
It is thought that all ordnance was safed before burying in trenches.  
Potential for rockets.
4. Has groundwater ever been sampled for perchlorate? YES  NO  
If yes, indicate dates of sampling and maximum concentrations\*:
5. Has surface water ever been sampled for perchlorate? YES  NO  
If yes, indicate dates of sampling and maximum concentrations\*:
6. Has soil or sediment ever been sampled for perchlorate? YES  NO  
If yes, indicate dates of sampling and maximum concentrations\*:
7. Do you suspect this site to have perchlorate contamination?  YES  NO  
If yes, specify which media is suspected as being contaminated? Soil
8. Describe future plans for collecting groundwater, surface water, soil, sediment samples for perchlorate (also describe proposed analytical method and detection limit):  
None unless required.

Questions 9-18 need to be completed for only four sites with the most potential for perchlorate contamination

9. Horizontal Distance to nearest downgradient GW monitor wells (in feet):  
4 wells on site
10. Specify dates for the next four scheduled GW sampling events: None scheduled
11. Depth to shallowest monitored zone (in feet): 155 ft
12. Range of Total Dissolved Solids (TDS) in GW: Unknown
13. Horizontal Distance to Surface Water (in feet): Miles
14. Range of TDS of Surface Water: N/A
15. Specify dates for the next four scheduled surface water sampling events: None scheduled
16. Would the facility like to split soil, sediment, GW, surface water samples with HRMB?  YES  NO
17. Could the facility provide GPS information and a map of the sample locations?  YES  NO
18. Site Access Problems (describe): None

\* If concentrations were below detection, indicate the detection limit.

Facility Name: Melrose Air Force Range  
Facility Contact Person: Sanford Hutsell  
Phone Number: 505-784-6378  
Date: 13 Oct 99  
Page 4 of 4

September, 1999

### Perchlorate Survey of Sites in New Mexico

Please complete one sheet for each site. Complete Questions 1-18 for four sites with the most potential for perchlorate contamination. See instruction sheet for criteria for selecting the four sites. Please complete Questions 1-8 for all the rest of the perchlorate-related sites associated with your facility, including sites that are not considered RCRA- or HSWA-regulated sites and sites that are not located on your property.

1. Site Name: SWMU 115 Stock Pond
2. Type of perchlorate-related site (see instructions for definition): Land disposal site
3. Describe the management practices of perchlorate-contaminated materials and the estimated volumes that were managed:  
Possibly buried after being safed
4. Has groundwater ever been sampled for perchlorate? YES  NO   
If yes, indicate dates of sampling and maximum concentrations\*:
5. Has surface water ever been sampled for perchlorate? YES  NO   
If yes, indicate dates of sampling and maximum concentrations\*:
6. Has soil or sediment ever been sampled for perchlorate? YES  NO   
If yes, indicate dates of sampling and maximum concentrations\*:
7. Do you suspect this site to have perchlorate contamination? YES  NO   
If yes, specify which media is suspected as being contaminated?
8. Describe future plans for collecting groundwater, surface water, soil, sediment samples for perchlorate (also describe proposed analytical method and detection limit):  
None unless required

Questions 9-18 need to be completed for only four sites with the most potential for perchlorate contamination

9. Horizontal Distance to nearest downgradient GW monitor wells (in feet):  
Miles
10. Specify dates for the next four scheduled GW sampling events: N/A
11. Depth to shallowest monitored zone (in feet): 40 Ft
12. Range of Total Dissolved Solids (TDS) in GW: Unknown
13. Horizontal Distance to Surface Water (in feet): On site seasonally
14. Range of TDS of Surface Water: Unknown
15. Specify dates for the next four scheduled surface water sampling events: None scheduled
16. Would the facility like to split soil, sediment, GW, surface water samples with HRMB?  YES  NO
17. Could the facility provide GPS information and a map of the sample locations?  YES  NO
18. Site Access Problems (describe): None, except access to Melrose Range must be scheduled

\* If concentrations were below detection, indicate the detection limit.

Facility Name: Cannon AFB  
Facility Contact Person: Sanford Hutgell  
Phone Number: 505-784-6378  
Date: 12 Oct 99  
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September, 1999

### Perchlorate Survey of Sites in New Mexico

Please complete one sheet for each site. Complete Questions 1-18 for four sites with the most potential for perchlorate contamination. See instruction sheet for criteria for selecting the four sites. Please complete Questions 1-8 for all the rest of the perchlorate-related sites associated with your facility, including sites that are not considered RCRA- or HSWA-regulated sites and sites that are not located on your property.

1. Site Name: Weapons Storage Area
2. Type of perchlorate-related site (see instructions for definition): Storage
3. Describe the management practices of perchlorate-contaminated materials and the estimated volumes that were managed:  
Unknown
4. Has groundwater ever been sampled for perchlorate?  YES  NO  
If yes, indicate dates of sampling and maximum concentrations\*: 20 Apr 99, <5.0 mg/l
5. Has surface water ever been sampled for perchlorate? YES  NO  
If yes, indicate dates of sampling and maximum concentrations\*:
6. Has soil or sediment ever been sampled for perchlorate? YES  NO  
If yes, indicate dates of sampling and maximum concentrations\*:
7. Do you suspect this site to have perchlorate contamination? YES  NO  
If yes, specify which media is suspected as being contaminated?
8. Describe future plans for collecting groundwater, surface water, soil, sediment samples for perchlorate (also describe proposed analytical method and detection limit):  
If required, we will test monitor wells in vicinity of weapons storage area using Method 9056, ion chromatography, with detection limit of 0.1 ppm

Questions 9-18 need to be completed for only four sites with the most potential for perchlorate contamination

9. Horizontal Distance to nearest downgradient GW monitor wells (in feet):  
1500 feet
10. Specify dates for the next four scheduled GW sampling events: Once per year, date not known.
11. Depth to shallowest monitored zone (in feet): 290 feet
12. Range of Total Dissolved Solids (TDS) in GW: 440 - 1400 mg/l
13. Horizontal Distance to Surface Water (in feet): 1000
14. Range of TDS of Surface Water:
15. Specify dates for the next four scheduled surface water sampling events: None scheduled
16. Would the facility like to split soil, sediment, GW, surface water samples with HRMB?  YES  NO
17. Could the facility provide GPS information and a map of the sample locations?  YES  NO
18. Site Access Problems (describe): None

\* If concentrations were below detection, indicate the detection limit.

Facility Name: Cannon AFB

September, 1999

Facility Contact Person: Sanford Hutsell

Phone Number: 505-784-6378

Date: 12 Oct 99

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### Perchlorate Survey of Sites in New Mexico

Please complete one sheet for each site. Complete Questions 1-18 for four sites with the most potential for perchlorate contamination. See instruction sheet for criteria for selecting the four sites. Please complete Questions 1-8 for all the rest of the perchlorate-related sites associated with your facility, including sites that are not considered RCRA- or HSWA-regulated sites and sites that are not located on your property.

1. Site Name: Monitor Well N downgradient of weapons storage area.
2. Type of perchlorate-related site (see instructions for definition): Storage
3. Describe the management practices of perchlorate-contaminated materials and the estimated volumes that were managed:  
None known of
4. Has groundwater ever been sampled for perchlorate?  YES  NO  
If yes, indicate dates of sampling and maximum concentrations\*: 20 Apr 99, <5.0 mg/l
5. Has surface water ever been sampled for perchlorate? YES  NO  
If yes, indicate dates of sampling and maximum concentrations\*:
6. Has soil or sediment ever been sampled for perchlorate? YES  NO  
If yes, indicate dates of sampling and maximum concentrations\*:
7. Do you suspect this site to have perchlorate contamination? YES  NO  
If yes, specify which media is suspected as being contaminated?
8. Describe future plans for collecting groundwater, surface water, soil, sediment samples for perchlorate (also describe proposed analytical method and detection limit):  
None unless required.

Questions 9-18 need to be completed for only four sites with the most potential for perchlorate contamination

9. Horizontal Distance to nearest downgradient GW monitor wells (in feet):  
N/A
10. Specify dates for the next four scheduled GW sampling events: Once per year, dates  
unavailable
11. Depth to shallowest monitored zone (in feet): 290 ft
12. Range of Total Dissolved Solids (TDS) in GW: 400 - 600 mg/l
13. Horizontal Distance to Surface Water (in feet): 900 ft
14. Range of TDS of Surface Water: Unknown
15. Specify dates for the next four scheduled surface water sampling events: None scheduled
16. Would the facility like to split soil, sediment, GW, surface water samples with HRMB?  YES  NO
17. Could the facility provide GPS information and a map of the sample locations?  YES  NO
18. Site Access Problems (describe): None

\* If concentrations were below detection, indicate the detection limit.

Facility Name: Cannon AFB  
Facility Contact Person: Sanford Hutsell  
Phone Number: 505-784-6378  
Date: 12 Oct 99  
Page 3 of 4

September, 1999

### Perchlorate Survey of Sites in New Mexico

Please complete one sheet for each site. Complete Questions 1-18 for four sites with the most potential for perchlorate contamination. See instruction sheet for criteria for selecting the four sites. Please complete Questions 1-8 for all the rest of the perchlorate-related sites associated with your facility, including sites that are not considered RCRA- or HSWA-regulated sites and sites that are not located on your property.

1. Site Name: Explosives Ordnance Disposal Practice Range
2. Type of perchlorate-related site (see instructions for definition): Demolition Practice Facility  
(destruction and open detonation)
3. Describe the management practices of perchlorate-contaminated materials and the estimated volumes that were managed:  
None known of
4. Has groundwater ever been sampled for perchlorate?  YES  NO  
If yes, indicate dates of sampling and maximum concentrations\*: 20 Apr 99, <5.0 mg/l
5. Has surface water ever been sampled for perchlorate? YES  NO  
If yes, indicate dates of sampling and maximum concentrations\*: \_\_\_\_\_
6. Has soil or sediment ever been sampled for perchlorate? YES  NO  
If yes, indicate dates of sampling and maximum concentrations\*: \_\_\_\_\_
7. Do you suspect this site to have perchlorate contamination? YES  NO  
If yes, specify which media is suspected as being contaminated? \_\_\_\_\_
8. Describe future plans for collecting groundwater, surface water, soil, sediment samples for perchlorate (also describe proposed analytical method and detection limit):  
None unless required

Questions 9-18 need to be completed for only four sites with the most potential for perchlorate contamination

9. Horizontal Distance to nearest downgradient GW monitor wells (in feet):  
1500 ft
10. Specify dates for the next four scheduled GW sampling events: Aug annually
11. Depth to shallowest monitored zone (in feet): 290 feet
12. Range of Total Dissolved Solids (TDS) in GW: 440 - 1400 mg/l
13. Horizontal Distance to Surface Water (in feet): 2500 ft
14. Range of TDS of Surface Water: Unknown
15. Specify dates for the next four scheduled surface water sampling events: None scheduled.
16. Would the facility like to split soil, sediment, GW, surface water samples with HRMB?  YES  NO
17. Could the facility provide GPS information and a map of the sample locations?  YES  NO
18. Site Access Problems (describe): None

\* If concentrations were below detection, indicate the detection limit.

Facility Name: Cannon AFB  
Facility Contact Person: Sanford Hutsell  
Phone Number: 505-784-6378  
Date: 12 Oct 99  
Page 4 of 4

September, 1999

### Perchlorate Survey of Sites in New Mexico

Please complete one sheet for each site. Complete Questions 1-18 for four sites with the most potential for perchlorate contamination. See instruction sheet for criteria for selecting the four sites. Please complete Questions 1-8 for all the rest of the perchlorate-related sites associated with your facility, including sites that are not considered RCRA- or HSWA-regulated sites and sites that are not located on your property.

1. Site Name: Playa Lake downgradient from weapons storage
2. Type of perchlorate-related site (see instructions for definition): storage
3. Describe the management practices of perchlorate-contaminated materials and the estimated volumes that were managed:  
None known of
4. Has groundwater ever been sampled for perchlorate?  YES  NO  
If yes, indicate dates of sampling and maximum concentrations\*: 20 Apr 99, 5.0mg/l
5. Has surface water ever been sampled for perchlorate? YES  NO  
If yes, indicate dates of sampling and maximum concentrations\*:
6. Has soil or sediment ever been sampled for perchlorate? YES  NO  
If yes, indicate dates of sampling and maximum concentrations\*:
7. Do you suspect this site to have perchlorate contamination? YES  NO  
If yes, specify which media is suspected as being contaminated?
8. Describe future plans for collecting groundwater, surface water, soil, sediment samples for perchlorate (also describe proposed analytical method and detection limit):  
None unless required

Questions 9-18 need to be completed for only four sites with the most potential for perchlorate contamination

9. Horizontal Distance to nearest downgradient GW monitor wells (in feet):  
700 ft
10. Specify dates for the next four scheduled GW sampling events: Annually date  
unavailable
11. Depth to shallowest monitored zone (in feet): 290 feet
12. Range of Total Dissolved Solids (TDS) in GW: 440 - 1400 mg/l
13. Horizontal Distance to Surface Water (in feet): N/A
14. Range of TDS of Surface Water: Unknown
15. Specify dates for the next four scheduled surface water sampling events: None scheduled
16. Would the facility like to split soil, sediment, GW, surface water samples with HRMB?  YES  NO
17. Could the facility provide GPS information and a map of the sample locations?  YES  NO
18. Site Access Problems (describe): None

\* If concentrations were below detection, indicate the detection limit.

**Sampling Summary  
 Cannon Air Force Base  
 December 18-21, 2000 Sampling Event**

Sample Matrix	Site Location	Sample ID	Number of Samples	Date Collected	Sampling Rationale	Sample Container/ Preservative/ Analytical Method
GW	Landfill Cell 3 & EOD Practice Range	MW-O	1		This well is located about ?? feet downgradient of Landfill Cell 3 and in the middle of the flow path?. It is also located about ?? feet downgradient of the of the Explosive Ordnance Disposal (EOD) Practice Range and on the edge of the flow path.	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Landfill Cell 4 & EOD Practice Range & Weapons Storage Area	MW-N	1		This well is located about ?? feet downgradient of Landfill Cell 4 and in the middle of the flow path. It is also located about 200 yards downgradient of the Explosive Ordnance Disposal (EOD) Practice Range and the Weapons Storage Area and appears to be located in the middle of their groundwater flow paths.	2 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Sewage Lagoons & Landfill 25	MW-P	1		This well is located about 100 yards downgradient of the two Sewage Lagoons. It is also located about ?? yards downgradient of Landfill 25.	1 x 125 mL plastic bottle/4 °C/EPA Method 314.0
GW	Landfill 25	MW-R	1		This well is located about ?? yards downgradient of Landfill Cell 25.	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0

CAFB  
2000

**Sampling Plan Summary  
Cannon Air Force Base  
December 18-21, 2000 Sampling Event**

**Analytical Cost:** 4 samples @ \$159/sample = \$636  
(\$159 = \$150 analytical cost plus tax (tax rate is 5.8125% or approx. \$9/sample)

**Mapping of Sample Locations:** Cannon indicated on their Perchlorate Survey form that they would provide us with copies of maps showing the sample locations and would obtain GPS information for the samples. Please call Sanford and coordinate with the person that will be obtaining the GPS information for us for the soil sample locations.

We need to mark the soil sample locations with flags. If you end up doing the sampling, ask me to send you some flags.

Please get me copies of maps showing the locations of all the soil samples and wells that we sampled.

**SITE DESCRIPTION & HISTORY:**

**Landfill Cell 3:** GLENN, please describe this unit (e.g., unlined trenches and cells) and the types of contamination (e.g., HE, any nitrate-based HE?? like slurries?, spent rockets, ordnance, any OB/OD waste??, solid rocket fuel etc. ) that are associated with this unit. It is unknown if this cell received perchlorate because there is poor documentation of the site history.

**Landfill Cell 4:** GLENN, please describe this unit (e.g., unlined trenches and cells) and the types of contamination (e.g., HE, any nitrate-based HE?? like slurries?, spent rockets, ordnance, any OB/OD waste??, solid rocket fuel etc. ) that are associated with this unit. It is unknown if this cell received perchlorate because there is poor documentation of the site history.

**Landfill Cell 5:** GLENN, please describe this unit (e.g., unlined trenches and cells) and the types of contamination (e.g., HE, any nitrate-based HE?? like slurries?, spent rockets, ordnance, any OB/OD waste??, solid rocket fuel etc. ) that are associated with this unit. It is unknown if this cell received perchlorate because there is poor documentation of the site history.

**Landfill Cell 25:** GLENN, please describe this unit (e.g., unlined trenches and cells) and the types of contamination (e.g., HE, any nitrate-based HE?? like slurries?, spent rockets, ordnance, any OB/OD waste??, solid rocket fuel etc. ) that are associated with this unit. Glenn: If there are any outdoor weapon maintenance or storage areas now or in the past, then we should take soil samples there if possible. It is unknown if this cell received perchlorate because there is poor documentation of the site history.

**Weapons Storage Area:** GLENN, please describe this area: From (when??) to the present, this area is used for the indoor storage of ??? in bunkers. During this time period, this area has not been used for weapon maintenance or outdoor storage of weapons or munitions. It is unknown if this area is contaminated with perchlorate because there is poor documentation of the site history. It is unknown if this area or any other area was used for outdoor storage

**Sampling Plan Summary**  
**Cannon Air Force Base**  
**December 18-21, 2000 Sampling Event**

**or maintenance of weapons or munitions prior to (when??). It is unknown if the Weapons Storage Area contains any buried ordnance or munitions. Can you tell from aerial photos, how long the WSA has been used? If this area has been used since the early 40's and if it was once used for munition or ordnance storage, it is possible there are buried items (i.e., ordnance, munitions) in the area.**

**Sewage Lagoons:** There are two sewage lagoons at Cannon: the North Lagoon and South Lagoon. From the beginning of WW II until ???, these lagoons were used to treat all domestic and some industrial waste from the facility. These lagoons also received storm water from ?????the Weapons Storage Area???? It is unknown if perchlorate was discharged into these lagoons, but it is known that the lagoons received waste from oil/water separators from the flight line. These lagoons are currently closed and dry and are scheduled for remediation this winter. The sludge from the North Lagoon will be placed in the South Lagoon and then an earthen cover will be placed over the sludge. **GLENN: Please describe these units and the types of contamination (i.e., HE, solid rocket fuel etc. ) that are associated with these units.**

**Sampling Summary  
Cannon Air Force Base  
December 18-21, 2000 Sampling Event**

<b>Sample Matrix</b>	<b>Site Location</b>	<b>Sample ID</b>	<b>Number of Samples</b>	<b>Date Collected</b>	<b>Sampling Rationale</b>	<b>Sample Container/ Preservative/ Analytical Method</b>
GW	Landfill Cell 3 & EOD Practice Range	CAFB-O	1	12-18-00	This well is located about ?? feet downgradient of Landfill Cell 3 and in the middle of the flow path?. It is also located about ?? feet downgradient of the of the Explosive Ordnance Disposal (EOD) Practice Range and on the edge of the flow path.	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Landfill Cell 4 & EOD Practice Range & Weapons Storage Area	CAFB-N	1	12-18-00	This well is located about ?? feet downgradient of Landfill Cell 4 and in the middle of the flow path. It is also located about 200 yards downgradient of the Explosive Ordnance Disposal (EOD) Practice Range and the Weapons Storage Area and appears to be located in the middle of their groundwater flow paths.	2 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Sewage Lagoons & Landfill 25	CAFB-P	1	12-18-00	This well is located about 100 yards downgradient of the two Sewage Lagoons. It is also located about ?? yards downgradient of Landfill 25.	1 x 125 mL plastic bottle/4 °C/EPA Method 314.0
GW	Landfill 25	CAFB-R	1	12-18-00	This well is located about ?? yards downgradient of Landfill Cell 25.	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0

CAFB  
2000

**Sampling Plan Summary  
Cannon Air Force Base  
December 18-21, 2000 Sampling Event**

**Analytical Cost:** 4 samples @ \$159/sample = \$636  
(\$159 = \$150 analytical cost plus tax (tax rate is 5.8125% or approx. \$9/sample)

**Mapping of Sample Locations:** Cannon indicated on their Perchlorate Survey form that they would provide us with copies of maps showing the sample locations and would obtain GPS information for the samples. Please call Sanford and coordinate with the person that will be obtaining the GPS information for us for the soil sample locations.

We need to mark the soil sample locations with flags. If you end up doing the sampling, ask me to send you some flags.

Please get me copies of maps showing the locations of all the soil samples and wells that we sampled.

**SITE DESCRIPTION & HISTORY:**

**Landfill Cell 3:** GLENN, please describe this unit (e.g., unlined trenches and cells) and the types of contamination (e.g., HE, any nitrate-based HE?? like slurries?, spent rockets, ordnance, any OB/OD waste??, solid rocket fuel etc. ) that are associated with this unit. It is unknown if this cell received perchlorate because there is poor documentation of the site history.

**Landfill Cell 4:** GLENN, please describe this unit (e.g., unlined trenches and cells) and the types of contamination (e.g., HE, any nitrate-based HE?? like slurries?, spent rockets, ordnance, any OB/OD waste??, solid rocket fuel etc. ) that are associated with this unit. It is unknown if this cell received perchlorate because there is poor documentation of the site history.

**Landfill Cell 5:** GLENN, please describe this unit (e.g., unlined trenches and cells) and the types of contamination (e.g., HE, any nitrate-based HE?? like slurries?, spent rockets, ordnance, any OB/OD waste??, solid rocket fuel etc. ) that are associated with this unit. It is unknown if this cell received perchlorate because there is poor documentation of the site history.

**Landfill Cell 25:** GLENN, please describe this unit (e.g., unlined trenches and cells) and the types of contamination (e.g., HE, any nitrate-based HE?? like slurries?, spent rockets, ordnance, any OB/OD waste??, solid rocket fuel etc. ) that are associated with this unit. Glenn: If there are any outdoor weapon maintenance or storage areas now or in the past, then we should take soil samples there if possible. It is unknown if this cell received perchlorate because there is poor documentation of the site history.

**Weapons Storage Area:** GLENN, please describe this area: From (when??) to the present, this area is used for the indoor storage of ??? in bunkers. During this time period, this area has not been used for weapon maintenance or outdoor storage of weapons or munitions. It is unknown if this area is contaminated with perchlorate because there is poor documentation of the site history. It is unknown if this area or any other area was used for outdoor storage

**Sampling Plan Summary  
Cannon Air Force Base  
December 18-21, 2000 Sampling Event**

**or maintenance of weapons or munitions prior to (when??). It is unknown if the Weapons Storage Area contains any buried ordnance or munitions. Can you tell from aerial photos, how long the WSA has been used? If this area has been used since the early 40's and if it was once used for munition or ordnance storage, it is possible there are buried items (i.e., ordnance, munitions) in the area.**

**Sewage Lagoons:** There are two sewage lagoons at Cannon: the North Lagoon and South Lagoon. From the beginning of WW II until ???, these lagoons were used to treat all domestic and some industrial waste from the facility. These lagoons also received storm water from ?????the Weapons Storage Area???? It is unknown if perchlorate was discharged into these lagoons, but it is known that the lagoons received waste from oil/water separators from the flight line. These lagoons are currently closed and dry and are scheduled for remediation this winter. The sludge from the North Lagoon will be placed in the South Lagoon and then an earthen cover will be placed over the sludge. **GLENN: Please describe these units and the types of contamination (i.e., HE, solid rocket fuel etc. ) that are associated with these units.**

**Sampling Plan Summary  
Cannon Air Force Base  
February 2001 Sampling Event**

Sample Matrix	Site Location	Sample ID	Number of Samples	Date Collected	Sampling Rationale	Sample Container/ Preservative/ Analytical Method
GW	Sewage Lagoons	MW-F and MW-FA (Duplicate)	2	not sampled Aug. 2001 sampling scheduled for	One groundwater sample and one duplicate will be collected from this well. This well is located on the east side of the perimeter berm immediately downgradient of the Sewage Lagoons. This well was selected for a duplicate sample because it is located immediately downgradient of the lagoons.	2 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Sewage Lagoons	MW-G	1	not sampled	This well is located on the east edge of the perimeter berm immediately downgradient of the Sewage Lagoons.	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Landfill 5 Cell 3	MW-Q	1		This well is the upgradient well for the Landfill 5 monitoring system and is located about 1/8 mile NW of the landfill.	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Landfill 5 Cell 3	MW-S	1		This well is 600 yards downgradient of Landfill 5 Cell 3 and is directly in middle of the groundwater flow path.	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Landfill 5 Cell 3	MW-T and MW-TA (Duplicate)	2		One groundwater sample and one duplicate will be collected from this well. This well is 50 yards downgradient of Landfill 5 Cell 3 and is in the middle of the groundwater flow path. This well was selected for a duplicate sample because it is located in the middle of the groundwater flow path.	2 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Landfill 5 Cell 3	MW-U	1		This well is 50 yards downgradient of Landfill 5 Cell 3 and is on the north edge of the groundwater flow path.	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0

CAFB  
2001

**Sampling Plan Summary  
Cannon Air Force Base  
February 2001 Sampling Event**

Sample Matrix	Site Location	Sample ID	Number of Samples	Date Collected	Sampling Rationale	Sample Container/ Preservative/ Analytical Method
GW	Production Well	PW-2 & PW-2A (Duplicate)	2		One groundwater sample and one duplicate will be collected from this well. This well was selected for sampling and for collection of a duplicate sample because perchlorate was detected in a sample collected from this well in 1999 (see Site History below).	2 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Production Well	PW-3	1		One groundwater sample will be collected from this well. This well was selected for sampling because perchlorate was detected in other production wells in 1999 (see Site History below).	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Production Well	PW-5	1		One groundwater sample will be collected from this well. This well was selected for sampling because perchlorate was detected in other production wells in 1999 (see Site History below).	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Production Well	PW-7& PW-7A (Duplicate)	2		One groundwater sample and one duplicate sample will be collected from this well. This well was selected for sampling and for collection of a duplicate sample because perchlorate was detected in a sample collected from this well in 1999 (see Site History below).	2 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Production Well	PW-8	1		One groundwater sample will be collected from this well. This well was selected for sampling because perchlorate was detected in other production wells in 1999 (see Site History below).	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
GW	Production Well	PW-12	1		One groundwater sample will be collected from this well. This well was selected for sampling because perchlorate was detected in other production wells in 1999 (see Site History below).	1 x 125 mL plastic bottle/4 °C/ EPA Method 314.0

**Sampling Plan Summary  
Cannon Air Force Base  
February 2001 Sampling Event**

Sample Matrix	Site Location	Sample ID	Number of Samples	Date Collected	Sampling Rationale	Sample Container/Preservative/Analytical Method
Surface Water	Playa Lake	<del>Playa-1</del> <del>Playa-1A</del> (Duplicate) <del>Playa-2</del> <del>Playa-3</del> SW-1 SW-2 SW-3 SW-4 CNL-1	4		Three surface water samples and one duplicate will be collected from the inlet. Two samples will be collected from the south and east edges of the Playa Lake itself. The first sample and one duplicate will be collected near the inlet where it is expected higher concentrations may be present. The second sample will be collected near the middle of the Playa. The third sample will be collected near the outlet. It is expected that most of the sludge and contaminants would have settled out in the lagoons and that any contaminants entering the Playa Lake would be higher near the inlet. However because perchlorate is highly water soluble and mobile, it may be erratically distributed.	4 x 125 mL plastic bottle/4 °C/ EPA Method 314.0
Soil	Sewage Lagoons (two) North Lagoon and South Lagoon	<del>SL-N-1</del> <del>SL-N-2</del> <del>SL-N-3</del> <del>SL-N-4</del> CNL-D (Duplicate) SLS-1 C SL-1 SLS-2 C SL-2 SLS-3 C SL-3 SLS-4 C SL-4 SLS-5 C SL-5 (Duplicate)	9		Eight surface soil samples and one duplicate will be collected from the inlet, middle, and outlet areas of two Sewage Lagoons. Two samples will be collected from each lagoon near the inlet where it is expected higher concentrations may be present. One sample will be collected near the middle of the lagoon and one sample will be collected near the outlet. A duplicate sample will be collected near the middle of one of the lagoons (Glenn did one lagoon receive the wastewater first, if so, then we can pick that lagoon for the duplicate). It is expected that most of the sludge and contaminants would have settled out near the inlet. However because perchlorate is highly water soluble and mobile, it may be erratically distributed.	9 x 4 oz glass jar/ 4 °C/EPA Method 314.0

**Sampling Plan Summary  
Cannon Air Force Base  
February 2001 Sampling Event**

**Sampling Plan Summary  
Cannon Air Force Base  
February 2001 Sampling Event**

**Analytical Cost:** 33 samples @ \$159/sample = \$5,247  
(\$159 = \$150 analytical cost plus tax (tax rate is 5.8125% or approx. \$9/sample)

**Mapping of Sample Locations:** Cannon indicated on their Perchlorate Survey form that they would provide us with copies of maps showing the sample locations and would obtain GPS information for the samples. Please call Sanford and coordinate with the person that will be obtaining the GPS information for us for the soil sample locations.

We need to mark the soil sample locations with flags. If you end up doing the sampling, ask me to send you some flags.

Please get me copies of maps showing the locations of all the soil samples and wells that we sampled.

**SITE DESCRIPTION & HISTORY:**

**Landfill 5 (includes Cell 3):** GLENN, please describe this unit (e.g., unlined trenches and cells) and the types of contamination (e.g., HE, any nitrate-based HE?? like slurries?, spent rockets, ordnance, any OB/OD waste??, solid rocket fuel etc. ) that are associated with this unit. It is unknown if materials containing perchlorate were disposed of in this unit because the site history is poor.

**Landfill 4:** GLENN, please describe this unit (e.g., unlined trenches and cells) and the types of contamination (e.g., HE, any nitrate-based HE?? like slurries?, spent rockets, ordnance, any OB/OD waste??, solid rocket fuel etc. ) that are associated with this unit. It is unknown if materials containing perchlorate were disposed of in this unit because the site history is poor.

**Landfill 25:** GLENN, please describe this unit (e.g., unlined trenches and cells) and the types of contamination (e.g., HE, any nitrate-based HE?? like slurries?, spent rockets, ordnance, any OB/OD waste??, solid rocket fuel etc. ) that are associated with this unit. It is unknown if materials containing perchlorate were disposed of in this unit because the site history is poor.

**Weapons Storage Area:** GLENN, please describe this area: From (when??) to the present, this area is used for the indoor storage of ??? in bunkers. During this time period, this area has not been used for weapon maintenance or outdoor storage of weapons or munitions. It is unknown if this area or any other area was used for outdoor storage or maintenance of weapons or munitions prior to (when??) or materials containing perchlorate. It is unknown if the Weapons Storage Area contains any buried ordnance or munitions. Can you tell from aerial photos, how long the WSA has been used? If this area has been used since the early 40's and if it was once used for munition or ordnance storage, it is possible there are buried items (i.e., ordnance, munitions) in the area.

**Sampling Plan Summary  
Cannon Air Force Base  
February 2001 Sampling Event**

**Sewage Lagoons:** There are two sewage lagoons at Cannon: the North Lagoon and South Lagoon. From the beginning of WWII until ???, these lagoons were used to treat all domestic and some industrial waste from the facility. These lagoons also received storm water from ?????the Weapons Storage Area???? It is unknown if perchlorate was discharged into these lagoons, but it is known that the lagoons received waste from oil/water separators from the flight line. These lagoons are currently closed and dry and are scheduled for remediation this winter. The sludge from the North Lagoon will be placed in the South Lagoon and then an earthen cover will be placed over the sludge. **GLENN: Please describe these units and the types of contamination (i.e., HE, solid rocket fuel etc. ) that are associated with these units.**

**Playa Lake:** In the past, the Playa Lake received discharges from the Sewage Lagoons and storm water runoff from the ??. . Currently, the lake receives ???? .???? It is unknown if the discharges contained perchlorate.

**Production Well 2:** This production well is located downgradient of (what sites at Melrose?). The depth to water in this wells is approximately ?? feet below the ground surface. The screen length is approximately ??? feet. This was sampled for perchlorate in March and April of 1999. Perchlorate was detected at 46 ug/L in the March 1999 sample but was below detection in the April 1999 sample (<5 ug/L) and below detection in a duplicate sample (<5 ug/L).

**Production Well 3:** This production well is located downgradient of (what sites at Melrose?). The depth to water in this wells is approximately ?? feet below the ground surface. The screen length is approximately ??? feet. This was sampled for perchlorate in March of 1999 and perchlorate was below detection (<5 ug/L).

**Production Well 5:** This production well is located downgradient of (what sites at Melrose?). The depth to water in this wells is approximately ?? feet below the ground surface. The screen length is approximately ??? feet. This was sampled for perchlorate in March of 1999 and perchlorate was below detection (<5 ug/L).

**Production Well 7:** This production well is located downgradient of (what sites at Melrose?). The depth to water in this wells is approximately ?? feet below the ground surface. The screen length is approximately ??? feet. This was sampled for perchlorate in March and April of 1999. Perchlorate was detected at 21 ug/L in the March 1999 sample but was below detection in the April 1999 sample (<5 ug/L) and below detection in a duplicate sample (<5 ug/L).

**Production Well 8:** This production well is located downgradient of (what sites at Melrose?). The depth to water in this wells is approximately ?? feet below the ground surface. The screen length is approximately ??? feet. This was sampled for perchlorate in March of 1999 and perchlorate was below detection (<5 ug/L).

**Production Well 12:** This production well is located downgradient of (what sites at Melrose?).

**Sampling Plan Summary  
Cannon Air Force Base  
February 2001 Sampling Event**

The depth to water in this wells is approximately ?? feet below the ground surface. The screen length is approximately ??? feet. This was sampled for perchlorate in March of 1999 and perchlorate was below detection (<5 ug/L).

your request from Cannon AFB

CAFB  
2000

**Subject: Per your request from Cannon AFB**

**Date: Tue, 12 Sep 2000 13:41:19 -0600**

**From: Pike John S Civ 27CE/CEV <John.Pike@cannon.af.mil>**

**To: julie wanslow <julie\_wanslow@nmenv.state.nm.us>**

Julie

Did some research regarding oxygen generators, or more specifically how aircraft stationed at Cannon AFB have provided breathing oxygen for pilots, and all information indicates it has been supplied by pressurized or liquid oxygen in pressurized cylinders and not generators. This is confirmed by retired crewchiefs back for over 40 years of aircraft assigned here at Cannon. Prior to the advent of F-84 and F-86 aircraft (early 1950s), I do not have information, but I am fairly certain these previous aircraft used pressurized O2 systems as well. If I find out any more details, I will be sure to let you know.

Attached is the well sampling schedule for Cannon AFB monitoring wells. Please note that Melrose is not under order to sample the wells at the range at present.

<<GWMONWell.XLS>>

Hope this helps. Please call if you require other information.

John S. Pike  
27 CE/CEVP  
505 784-1092

---

 GWMONWell.XLS	<b>Name:</b> GWMONWell.XLS <b>Type:</b> Microsoft Excel Worksheet (application/vnd.ms-excel) <b>Encoding:</b> base64
---	--

RCRA /HSWA GROUNDWATER DETECTION MONITORING							SDH/CEVR	AS OF 11 SEP 00	
CANNON AFB,NM									
SWMU NUMBER	SWMU NAME	LOCATION	MONIT. WELLS	FREQUENCY	PARAMETERS	SCHEDULED MONTH	SERVICE CENTER	REMARKS/CONTRACTOR	
113	LF-5	LF-5,CELL3	A	semi-ann	6	FEB/AUG	USGS COE	SEMI-ANNUAL FOR CELL3 NEW WELL Q POST-CLOSURE 40CFR265 HLA-Feb,May,,Aug,Nov	
			B	semi-ann	5				
			C	semi-ann	5				
			D	semi-ann	5				
			I	semi-ann	1,2				
			J	semi-ann	6				
			L	semi-ann	1,2				
			M	semi-ann	1,2				
			Q	semi-ann	1,2				
			S	semi-ann	1,2				
I	semi-ann	1,2							
U	semi-ann	1,2							
101	SEWAGE LAGOONS		E	annual	3	AUG	USGS COE		
			F	annual	3				
			G	annual	3				
			H	annual	3				
97	LF-25		R	semi-ann	1,2	AUG/FEB	COE		
105	LF-3	} dry right now	O	annual	1,2	FEB			
104	LF-4		N	annual	1,2	FEB			
<b>Currently, no requirements exist for sampling of GW detection wells at Melrose AFR.</b>									
<b>PARAMETERS KEY:</b>		1 Appedix IX VOCs, SVOCs, PAHs,chlorinated pesticides and hebicides,dioxins.furans,metates							
		2 TOC,TOX,cyanide,sulfide,pH,conductivity							
		3 VOCs, pesticides,PCBs,metals,nitrates,sulfide,TDS							
		4 TOC,TOX,pH,SC							
		5 WATER LEVEL ONLY							
		6 NO CURRENT SAMPLING							
		REFERENCES: 40CFR 265.91 40CFR265.92,93 40CFR266APP IX							

Feb : Melrose - soil - OB/OP  
Je

Re: [Fwd: [CPEO-MEF] Perchlorate]

CAFB

2001

**Subject: Re: [Fwd: [CPEO-MEF] Perchlorate]**

**Date:** Thu, 22 Feb 2001 09:01:07 -0700

**From:** julie wanslow <julie\_wanslow@nmenv.state.nm.us>

**To:** julie jacobs <julie\_jacobs@nmenv.state.nm.us>

**CC:** Steve Pullen <Steve\_Pullen@nmenv.state.nm.us>,  
John Kieling <john\_kieling@nmenv.state.nm.us>

Julie,

Thanks for the message. The information that was posted on the CPEO website regarding Melrose is incorrect. The perchlorate was detected in an onsite facility production well and not a public water supply well. I will notify CPEO of this mistake.

I will send Steve Wust (DWB) an update on our perchlorate survey. One of our staff members will be going out to Cannon and Melrose next month to collect samples. Samples will be collected from the onsite production wells, monitor wells, and soil.

In the fall of 1999, I received information from Cannon (in response to the perchlorate survey that I sent out) that they detected some perchlorate in their onsite facility production wells. I contacted the DWB and was referred to Steve Wust. I told him about the hits at Melrose (and Cannon). In March 1999 sampling, perchlorate was detected in one Melrose and two Cannon onsite facility production wells. The Melrose and Cannon wells were resampled a month later in April 1999. Based on the April sampling, there were no perchlorate above detection in the Cannon wells, and the concentrations in the Melrose well had dropped to 11 ppb.

In September 1999, Cannon sent us a report that summarized these perchlorate results and they noted that the 11 ppb was below the California guideline of 18 ppb.

I spoke with Steve Wust back in 1999 about this data and he indicated that there was not alot they could do. At that point, there was no drinking water regulatory requirement to sample for perchlorate. As of Jan. 1, 2001, only public water systems serving more than 10,000 people need to sample for perchlorate (as an unregulated drinking water contaminant).

I'm hoping that NMWQCC decides to regulate perchlorate in the near future. Dennis mentioned that they were considering developing a state standard for it.

Thanks again. If you want a copy of the 1999 report that Cannon sent us, please let me know.

Julie

julie jacobs wrote:

> thanks, I was a bit suprised at the DW well in melrose that was 25 ppb. Hmmm,  
> should we tell DW  
> bureau?  
>

> julie wanslow wrote:  
>  
> > FYI.  
> >  
> > Julie  
> >  
> > -----  
> >  
> > Subject: [CPEO-MEF] Perchlorate  
> > Date: Wed, 21 Feb 2001 08:34:12 -0800  
> > From: duorganizer@miltoxproj.org  
> > To: cpeo-military <cpeo-military@igc.topica.com>  
> >  
> > "Something came across my desk that I think will be useful in the effort now  
> > underway to identify drinking water supplies vulnerable to contamination  
> > from military facilities. It is a list of locations where perchlorate has  
> > been found in soil and water, and not surprisingly, many of them are  
> > military and related facilities. Given that perchlorate is a serious  
> > health threat, especially to children, and is often released to the  
> > environment via open detonation and other ordnance practices, this is  
> > important information to share. EPA does not have a final toxicity  
> > assessment but recommends the continued use of a 1995 provisional  
> > referencedose range, which translates to 4 to 18 ppb in drinking water.  
> >  
> > I've listed below the facilities that appear to be related to military  
> > activity  
> > or manufacturing of explosives where, through wells or soil sampling,  
> > perchlorate has been found in the environment. Since only a small  
> > percentage of perchlorate-using and/or -manufacturing facilities have been  
> > investigated, the list does not give a full picture of where the  
> > contamination is. There are many states where there has been no testing for  
> > perchlorate. Apparently, at nearly every facility where an effort has  
> > been made to look for perchlorate in soil and groundwater, it has been  
> > found. The list is accurate as of Nov. 2000."  
> >  
> > Apache Nitrogen Products  
> > Benson, AZ  
> > (explosives manufacturing)  
> > monitoring well, max. conc. ppb: 670  
> >  
> > Aerodyne  
> > Gila River Ind. Res.  
> > Chandler, AZ  
> > (propellant testing)  
> > monitoring well, ppb: 18  
> >  
> > Davis Monthan AFB  
> > Tucson, AZ  
> > (explosives/propellant disposal)  
> > soil, max. conc. not confirmed  
> >  
> > Unidynamics Phoenix Inc.  
> > Phoenix Goodyear Airport  
> > Goodyear, AZ  
> > (explosives/ordnance manufacturing)  
> > monitoring well, ppb: 80  
> >  
> > Universal Propulsion  
> > Phoenix, AZ  
> > (rocket manufacturing)  
> > soil  
> >  
> > Unidynamics Phoenix. Inc.

> > White Tanks Disposal Area  
> > Maricopa County, AZ  
> > explosives/ordnance disposal  
> > public water supply well, unconfirmed report: 4 ppb  
> >  
> > Atlantic Research  
> > East Camden, AR  
> > rocket manufacturing  
> > disposal - OB/OD  
> > monitoring well 1,500 ppb  
> > surface water 480,000 ppb  
> > soil  
> >  
> > Aerojet General  
> > also affects Mather AFB  
> > Rancho Cordova, CA  
> > rocket manufacturing  
> > public water supply well 260 ppb  
> > monitoring well 640,000 ppb  
> >  
> > Alpha Explosives  
> > Lincoln, CA  
> > explosives manufacturing  
> > monitoring well 67,000 ppb  
> > reported in surface water  
> >  
> > Boeing/Rocketdyne, NASA at  
> > Santa Susana Field Lab USDOE  
> > Santa Susana, CA  
> > rocket research, testing and production  
> > monitoring well 750 ppb  
> >  
> > Edwards AFB  
> > Jet Propulsion Lab, North Base  
> > Edwards, CA  
> > rocket research  
> > monitoring well 300 ppb  
> >  
> > El Toro Marine Corps Air Station  
> > Orange Co. CA  
> > explosives disposal  
> > monitoring well 380 ppb  
> > Lawrence Livermore National Laboratory  
> > Site 300  
> > Tracy, CA  
> > U.S. DOE explosives research  
> > monitoring well 84 ppb  
> > Lockheed Propulsion  
> > Upper Santa Ana Valley  
> > Redlands, CA  
> > rocket manufacturing  
> > public water supply well 87 ppb  
> >  
> > Massachusetts Military Reservation  
> > Cape Cod, MA  
> > military training, weapons testing  
> > munitions disposal at Camp Edwards  
> > monitoring wells 300 ppb  
> >  
> > Fort Wingate Depot Activity  
> > Gallup, NM  
> > explosives disposal  
> > monitoring well 2,860 ppb

> >  
> > Holloman AFB  
> > Alamogordo, NM  
> > rocket testing  
> > monitoring well 40 ppb  
> > seasonal surface water 16,000 ppb  
> > soil  
> >  
> > Los Alamos National Lab  
> > Los Alamos, NM  
> > DOE chemicals lab  
> > public water supply well 3 ppb  
> > monitoring well 220 ppb  
> > deep borehole water 1,662 ppb  
> >  
> > Melrose Air Force Range  
> > Melrose, NM  
> > explosives  
> > public water supply well 25 ppb  
> >  
> > White Sands Missile Range  
> > White Sands, NM  
> > rocket testing  
> > monitoring well 21,000 ppb  
> > soil  
> >  
> > Longhorn Army Ammunition Depot  
> > Karnak, TX  
> > propellant handling  
> > monitoring well 91,000 ppb  
> > reported in surface water  
> > soil  
> >  
> > PANTEX Plant (DOE)  
> > Amarillo, TX  
> > explosives  
> > monitoring well 5 ppb  
> >  
> > Red River Army Depot  
> > Texarkana, TX  
> > propellant handling  
> > monitoring well 80 ppb  
> >  
> > ~~~~~  
> > You can find archived listserve messages on the CPEO website at  
> >  
> > <http://www.cpeo.org/lists/index.html>.  
> >  
> > If this email has been forwarded to you and you'd like to subscribe, please send  
a message to:  
> >  
> > [cpeo-military-subscribe@igc.topica.com](mailto:cpeo-military-subscribe@igc.topica.com)  
> >  
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> > <http://www.topica.com/partner/tag01>



GARY E. JOHNSON  
GOVERNOR

State of New Mexico  
ENVIRONMENT DEPARTMENT  
Hazardous & Radioactive Materials Bureau  
2044 Galisteo Street  
P.O. Box 26110  
Santa Fe, New Mexico 87502  
(505) 827-1557  
Fax (505) 827-1544



PETER MAGGIORE  
SECRETARY

CAFB  
2/1999

February 8, 1999

27 CES/CEV Attn: Mr. Danny Barnett  
506 N. D.L. Ingram Blvd.  
Cannon AFB, NM 88103

Dear Mr. Barnett:

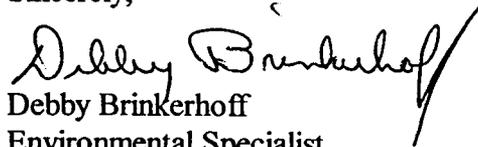
On the 5th of January I faxed a copy of the report from the American Water System that showed 2 wells on Cannon AFB having perchlorate contamination.

Mr. John Rebman replied, saying that he disagreed with the report and acknowledged that Cannon does not sample its drinking water wells, groundwater monitoring wells or wastewater effluent for the presence of perchlorate.

The New Mexico Environment Department Hazardous and Radioactive Materials Bureau recommends that Cannon do limited sampling of drinking water wells and groundwater monitoring wells for the presence of perchlorate to rule out the possibility of contamination.

Please respond within 30 days of receipt of this letter to let us know what Cannon intends to do about this request. Thank you for your cooperation.

Sincerely,

  
Debby Brinkerhoff  
Environmental Specialist

xc: Phyllis Bustamante, Ground Water Quality Bureau, NMED



GARY E. JOHNSON  
GOVERNOR

State of New Mexico  
ENVIRONMENT DEPARTMENT  
Hazardous & Radioactive Materials Bureau  
2044 Galisteo Street  
P.O. Box 26110  
Santa Fe, New Mexico 87502  
(505) 827-1557  
Fax (505) 827-1544



PETER MAGGIORE  
SECRETARY

CAFB  
1999

MEMORANDUM

January 20, 1999

To: Benito Garcia, Chief, HRMB  
Through: John Tymkowych, Program Manager, HRMB *J.T.*  
From: Debby Brinkerhoff, Environmental Specialist, HRMB *DB*  
Re: Occurrence of Perchlorate and MTBE in two Cannon AFB wells

According to a study performed by the American Water Works Service Co. Perchlorate and Methyl Tertiary Butyl Ether (MTBE) are found in two possibly three wells associated with Cannon AFB. The wells are # 44,45, and 48.

The levels found during the sampling were very low in the microgram/l level. The levels were well below the 18 microgram/l level used as a guideline by the California Department of Health.

The Roswell company, Longhorn Manufacturing Company received shipments of Perchlorate from Kerr-McGee sometime between 1978 and the present. An HRMB file search found no company with that name.

It is believed that when perchlorates are buried in landfills they may form compounds with other chemicals and then leach into the groundwater.

Cannon AFB contends that there is no reason to suspect that perchlorate is present in any of its wells and does not intend to do any sampling.

I recommend that Cannon should at least sample the three wells the American Water Works sampled and probably other wells in the vicinity for perchlorate and MTBE to protect the personnel from contaminated drinking water. In my opinion, it is better to be proactive than reactive in this situation.

I also recommend that the enforcement section inspect Longhorn Manufacturing if they still are operating in Roswell.

*on what basis?*  
*I agree*  
*Also agree*



**DEPARTMENT OF THE AIR FORCE**  
HEADQUARTERS 27th SUPPORT GROUP (ACC)  
CANNON AIR FORCE BASE NEW MEXICO

10 MAR 1998

Colonel James A. Thomas III  
Commander  
110 E Sextant Avenue Ste 1098  
Cannon AFB NM 88103-5323

CAFB  
1998

Ms. Debby Brinkerhoff  
Hazardous & Radioactive Materials Bureau  
New Mexico Environment Department  
2044 Galisteo Street  
PO Box 26110  
Santa Fe, NM 87502

Dear Ms. Brinkerhoff

The purpose of this letter is to inform you of actions Cannon Air Force Base (AFB) intends to take regarding your request for limited sampling of drinking water and groundwater monitoring wells for the presence of perchlorate. Prior to discussing our intentions, I want to emphasize that your assertion, as made in your 8 Feb 99 letter to Mr. Danny Barnett, that the American Water Works Service Company, Inc. report identified two wells on Cannon AFB as having perchlorate contamination, is incorrect.

As a result of data from three drinking water wells, the report identified Cannon AFB as a "possible source" for perchlorate contamination. These wells (see Attachment 1) are not on Cannon AFB, rather they are located south of Clovis, NM. In his 8 Jan 99 facsimile transmission to you, Mr. John Rebman stated neither drinking water wells, groundwater monitoring wells nor treated wastewater effluent have been analyzed for the presence of perchlorate. The report and Mr. Rebman's response to the report clearly indicate the wells are not located on Cannon AFB. The location of the base, in relation to the three wells, does not suggest Cannon AFB is a "possible source" for perchlorate contamination. It is much more likely, as the report mentions, that perchlorate contamination is the result of past mining activities involving flushing of ore cars into Santa Fe Lake. The lake is up-gradient (in relation to the south-easterly groundwater flows) of the wells identified in the report.

While, as Mr. Rebman indicated to you, there is no reason to suspect perchlorate is present, Cannon AFB will analyze the groundwater within six active drinking water production wells (see Attachment 2). This precautionary measure will help assure the protection of our consumers, however, as the report indicates, low levels of perchlorate do not pose a health or aesthetic risk. This view is shared by the Environmental Protection Agency and your department as drinking water systems are not tested for the presence of perchlorate. Results of this testing will be provided to you.

If you have any questions regarding this issue, please contact Mr. Rebman, Environmental Flight, at (505) 784-1099.

Sincerely

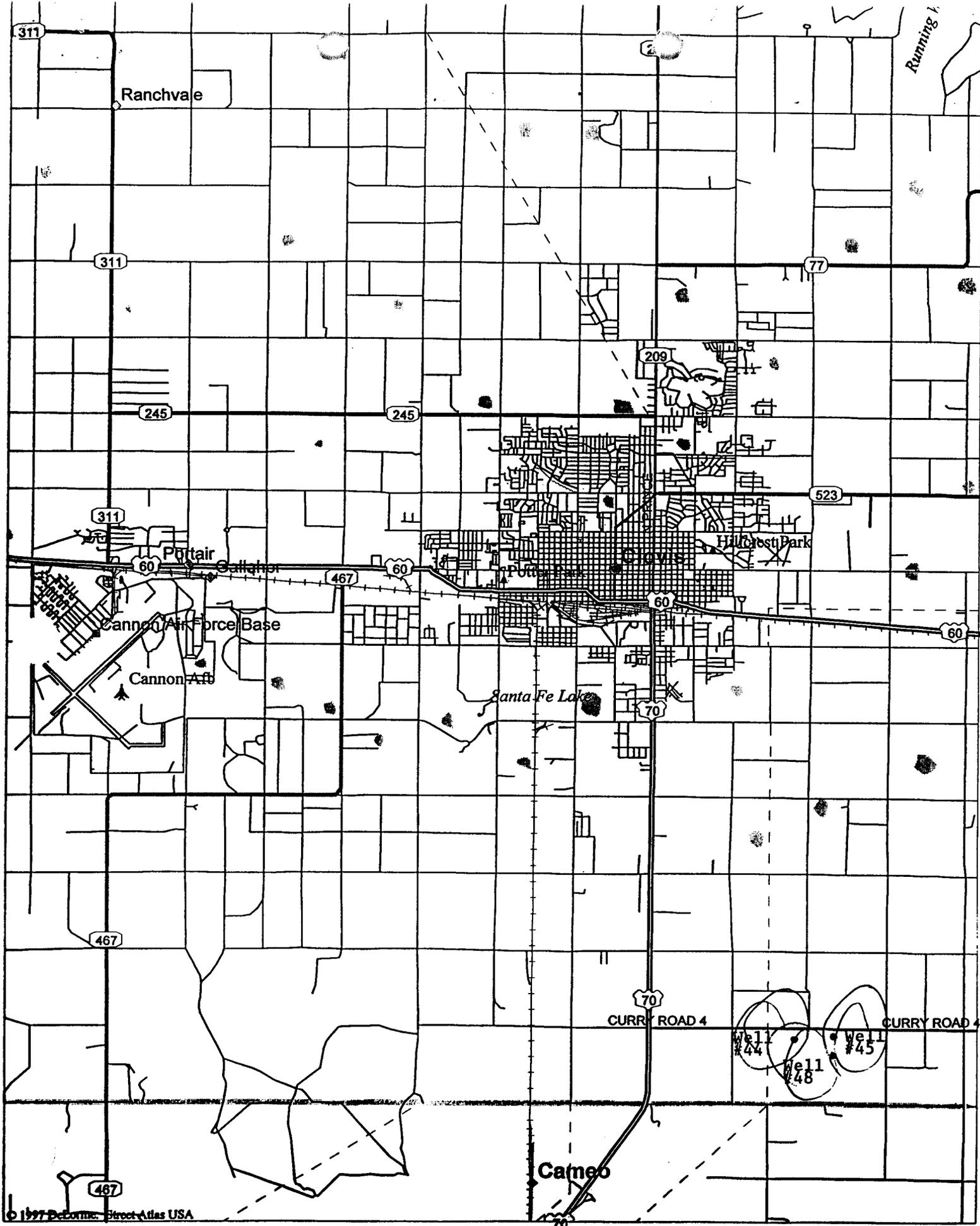
  
JAMES A. THOMAS III, Colonel, USAF

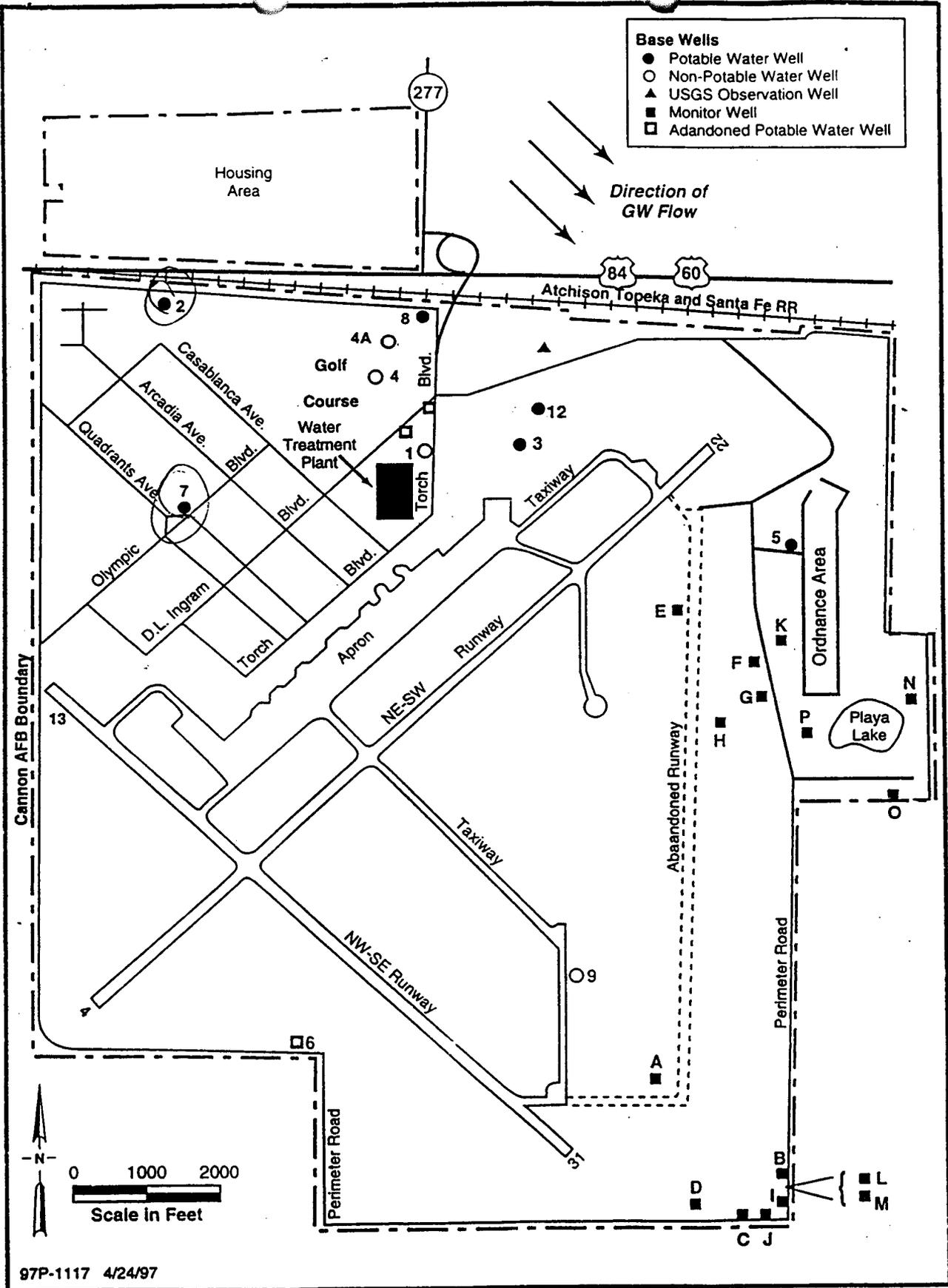
**Attachments:**

1. Map Identifying Wells in Report
2. Location of Active Drinking Water Wells

**cc:**

NMED, Ground Water Pollution Prevention Section (P. Bustamante)  
NMED, Clovis Field Office (D. Tanner)







DEPARTMENT OF THE AIR FORCE  
HEADQUARTERS 27TH SUPPORT GROUP (ACC)  
CANNON AIR FORCE BASE NEW MEXICO

CAFB  
1999

Colonel John T. Bowen  
Commander  
110 E Sextant Avenue Ste 1098  
Cannon AFB NM 88103-5323

16 SEP 1999

SEP 1999  
RECEIVED

Ms. Debby Brinkerhoff  
Hazardous & Radioactive Materials Bureau  
New Mexico Environment Department  
2044 Galisteo Street  
PO Box 26110  
Santa Fe NM 87502

Dear Ms. Brinkerhoff

Colonel James A. Thomas III, former Commander of the 27th Support Group, notified you in his 10 Mar 99 letter that Cannon Air Force Base (AFB) would analyze water within six active drinking water production wells for the presence of perchlorate. In addition to the six wells located on Cannon AFB (Water Supply System #679-05), water samples at the two production wells located on Melrose Air Force Range (WSS #803-05) were analyzed.

The following tables summarize sampling and analysis results:

**Table 1: Initial Sampling Event-23 Mar 99**

Production Well No.	Perchlorate Analysis Result ( $\mu\text{g/L}$ )	Comments
2	46	
3	<5.0	
5	<5.0	
7	21	
8	<5.0	
11	25	Well located on Melrose AFR.
12	<5.0	
13	Not Sampled	This well, located on Melrose AFR, was not connected to the potable water system at the time sampling took place.

**Notes:**

1.  $\mu\text{g/L}$  = micrograms per liter
2. 5.0  $\mu\text{g/L}$  = minimum detection limit for EPA Method used (EPA Method 600)

**Table 2: Confirmation and Duplicate Sampling Event-20 Apr 99**

<b>Production Well No.</b>	<b>Perchlorate Analysis Result (µg/L)</b>	<b>Comments</b>
2	<5.0	
7	<5.0	
11	11	Well located on Melrose AFR.
13	<5.0	Well, located on Melrose AFR, connected to potable water system.
2 (Duplicate)	<5.0	
7 (Duplicate)	<5.0	
11 (Duplicate)	--	Sample container broke in transit.
13 (Duplicate)	<5.0	

**Notes:**

1. µg/L = micrograms per liter
2. 5.0 µg/L = minimum detection limit for EPA Method used (EPA Method 600)

Confirmation samples were not collected from production wells 3, 5, 8 and 12 as initial results were below the minimum detection limit. Confirmation and duplicate samples were taken after dedicated chlorine injection systems at production wells 2, 7, 11 and 13 were shut off and purging of the wells (three well volumes of water). These measures, not conducted during initial sampling, ensured analysis results were not affected by chlorine. Production well 11 was the only well that indicated the presence of perchlorate. In the report, *Occurrence of Perchlorate and Methyl Tertiary Butyl Ether (MTBE) in Groundwater of the American Water System*, which you provided to Mrs. Vera Wood, Environmental Flight, the California Department of Health cited a guideline concentration of 18 µg/L. The detected concentration within well 11 was below this guideline concentration.

The aforementioned report (page 15) states: "Ammonia...can potentially react with chlorate present in several insecticides and pesticides to form perchlorate." Melrose AFR, located 30 miles west of Cannon AFB, is surrounded by agricultural lands for cattle grazing and crop production. It is conceivable perchlorate concentrations detected in well 11 are the result of this prolific agricultural industry. Past expended ordnance and explosives disposal practices on Melrose AFR may also have contributed to the detection of perchlorate. Two inactive solid waste management units (SWMUs) are under investigation. SWMU 114, *Expended Ordnance Burial Site*, and SWMU 115, *Explosives Contaminated Burial Site*, are Resource Conservation and Recovery Act subtitle C facilities being investigated under our restoration program.

If you have any questions regarding perchlorate sampling and analysis , please contact Mr. John Rebman, Environmental Flight, at (505) 784-1099.

Sincerely

A handwritten signature in black ink that reads "John T. Bowen". The signature is written in a cursive style with a large initial "J" and a long horizontal stroke at the end.

JOHN T. BOWEN, Colonel, USAF

cc:

NMED, Ground Water Pollution Prevention Section (P. Bustamante)

NMED, Clovis Field Office (D. Tanner)

AFCEE, Dallas Regional Office (T. Manning)

CAFB  
1998

<b>FAX TRANSMISSION</b>		
<b>TO:</b>	<b>NAME:</b>	<b>David S Vanlandingham</b>
	<b>ORGANIZATION:</b>	<b>US EPA Region 6</b>
	<b>MAIL CODE:</b>	<b>6PD-N</b>
	<b>FAX NUMBER:</b>	<b>(214) 665 7263</b>
	<b>PHONE NUMBER:</b>	<b>(214) 665-2254</b>
<b>FROM:</b>		Kevin Mayer U.S. Environmental Protection Agency Region IX, SFD-7-2 75 Hawthorne Street San Francisco, CA 94105-3901
	<b>DIVISION:</b>	Superfund
	<b>MAIL CODE:</b>	SFD-7-2
	<b>PHONE NUMBER:</b>	(415) 744-2248
	<b>FAX NUMBER:</b>	(415) 744-2180
<b>DATE:</b>	November 4, 1998	
<b>PAGES (Including Cover)</b>		
<b>SUBJECT:</b>	Perchlorate	
<b>NOTES:</b> This document was sent to me by Daniel Schechter, Director of Environmental Compliance of the American Water Works Service Company, Inc. in Voorhees, New Jersey (609) 346-8206. I will mail the other 30 pages of text. I am surprised that they published this before confirmatory sampling of wells where perchlorate had been detected, which I was told they had scheduled for this autumn. No region 6 wells had any MTBE detections (only NJ, NY, CT, MA, WV and CA)		

**OCCURRENCE OF PERCHLORATE AND  
METHYL TERTIARY BUTYL ETHER (MTBE)  
IN GROUNDWATER OF THE  
AMERICAN WATER SYSTEM**

**Mohamed Siddiqui, Mark W. LeChevallier  
American Water Works Service Company, Inc.  
1025 Laurel Oak Rd, P.O. Box 1770  
Voorhees, NJ 08043**

**John Ban, Twila Phillips, John Pivinski  
American Water Works Service Company, Inc.  
Quality Control and Research Laboratory  
1115 S. Illinois St.  
Belleville, IL 62220**

**September 30, 1998**

## EXECUTIVE SUMMARY

The occurrence of perchlorate and methyl tertiary butyl ether (MTBE) in groundwater supplies has generated a lot of concern. This report provides a literature review of both of these compounds addressing their chemical properties, occurrence, health effects, treatment, and regulatory status and summarizes monitoring data from groundwater sources in the American Water System.

Available literature indicate perchlorate can occur in levels of up to 165  $\mu\text{g/L}$  in surface waters and up to 280  $\mu\text{g/L}$  in some California ground waters. However, of the total 386 samples collected and analyzed from the American Water Works Service Company's ground water sources (from sixteen states and from diverse locations), only ten tested positive (<3%) indicating that perchlorate contamination is a localized problem for water sources located near ammunition factories, defense establishments and perchlorate manufacturing plants. The perchlorate concentrations ranged from <4 to 6  $\mu\text{g/L}$ , well within the guideline value of 18  $\mu\text{g/L}$ , suggested by California Department of Health. Treatment alternatives exist for decontamination of wastewater containing high concentration of perchlorate, but no effective techniques are presently available for removing low levels of perchlorate from drinking water sources.

A total of 2120 samples representing 450 wells (raw and treated) were tested from 16 states during 1997 for methyl tertiary butyl ether (MTBE). Only 44 samples (~2%) tested positive for MTBE, representing 17 wells (~4%), and the highest concentration (8.0  $\mu\text{g/L}$ ) was well below the EPA health advisory recommendation of 20-40  $\mu\text{g/L}$ . Of these 44 samples, 22 were raw water, 21 treated water and one was from a distribution system. The main sources of MTBE contamination are underground storage tanks, pipelines, and spills. As of the end of 1997, there have been over 340,000 confirmed releases from underground storage tanks in the U.S. MTBE and other gasoline constituents have also been detected in several lakes and reservoirs across the country, with the source of MTBE thought to be release from recreational boating. Preliminary results have indicated that GAC filtration and air stripping remove MTBE in the range of 27-55%, with the removal efficiency a function of the initial MTBE concentration. The application of these technologies as a combination treatment can be expected to enhance the removal of MTBE from contaminated sources.

Overall, while the study does detect low levels of perchlorate and MTBE in some groundwater sources, the levels do not pose a health or aesthetic risk. The report does highlight the need for American subsidiaries to remain vigilant with regard to potential sources of contamination within well fields, especially with underground storage tanks, landfills, and industrial pollutants. Not all American Systems have formal wellhead protection programs in place. Such guidelines should include coordination with State program, monitoring of activities on Company-owned property surrounding the wellhead, development of local wellhead protection ordinances, and an assessment of the need to acquire additional property around the well so as to exercise control of activity within the area of influence of the well.

## CONCLUSIONS AND RECOMMENDATIONS - PERCHLORATE

- Perchlorate is not a regulated compound under Safe Drinking Water Act, therefore currently there are limited data available regarding its occurrence. No comprehensive occurrence data is available for surface waters. A seasonal variation and occurrence data for both surface and ground source waters is needed since perchlorate's mobility in aqueous phase is temperature dependant.
- Recent detection of perchlorate in several surface waters and ground water wells used to supply drinking water has created an unforeseen water contamination crisis in the Western states, although problems are likely to emerge at other sites where perchlorate is used. Subsequent monitoring of 232 groundwater wells in California indicated perchlorate was in 69 wells (30%) and at concentrations above the action level in 20 wells (9%) (CDHS, 1997; AWWARF 1997). Samples taken from the Las Vegas Wash, which feeds Lake Mead and then the Colorado River, contained 1,500 to 1,680  $\mu\text{g}/\text{L}$  (Urbansky 1997). The Los Angeles Metropolitan Water District measured 8 ppb in water at its intake in Lake Mead, and the Southern Nevada Water Authority found 11 ppb in its tap water.
- Of the total 386 samples collected and analyzed from American Water Works Service Company's ground water sources from several states and a diverse set of locations, only ten tested positive for perchlorate. The perchlorate concentrations ranged from  $<4$  to 6  $\mu\text{g}/\text{L}$ , well within the guideline value of 18  $\mu\text{g}/\text{L}$ , suggested by California Department of Health.
- The presence of perchlorate in drinking water sources is not a widespread problem but rather a localized problem. The data indicates it is associated with ordnance facilities and perchlorate manufacturing facilities. Perchlorate is used in solid rocket propellants, and has been found in areas where aerospace materials such as rocket fuel, fireworks, and munitions were manufactured and tested.
- It is imperative that control measures be in place to further stop the spread of contamination. Source control of perchlorate using removal and disposal of contaminated soil/water, incineration, phytoremediation, and constructed wetlands is a long lasting cost-effective solution to perchlorate intrusion into drinking water sources.
- Treatment methods effective for the removal of other pollutants are ineffective in the treatment and removal of perchlorate from the water supply. As discoveries of perchlorate grow in number, the urgency to discover a safe and efficient system of removal is imperative. The need for treatability studies to address the feasibility of perchlorate treatment at high flow rates and low concentrations exist.

- **Recent improvements in analytical procedures allow identification of low concentrations of perchlorate in groundwater and surface water supplies. The current detection limit for this compound using ion chromatography method is 4  $\mu\text{g/L}$ .**
- **A better understanding of perchlorate toxicity may help refine risk assessment and arrive a cleanup goal for drinking water sources that is both cost effective and provides an adequate margin of safety for all potential users.**

be taken to correct for its background since they may elute close to each other. If the samples contain high concentration of sulfate and chloride, the samples should be treated with calcium chloride to remove sulfate ions by precipitating calcium sulfate and with silver containing cartridges to remove chloride ions by precipitating silver chloride to minimize peak masking interferences in the measurement of perchlorate.

## RESULTS AND DISCUSSION

**Occurrence.** The data collected and analyzed indicate that occurrence of perchlorate is a localized problem. But if the contamination is left unchecked, the occurrence of perchlorate will become widespread in view of the high mobility and transport of this compound in aqueous phase. Of the total 386 samples collected and analyzed from American Water System's ground water sources from sixteen states and a diverse set of locations, only ten tested positive for perchlorate (<3%). Sampling and testing was done in January, February, and March of 1998. The results of all sites tested positive are summarized in Table 2. The perchlorate concentrations ranged from 2 to 6  $\mu\text{g/L}$ , well within the guideline value of 18  $\mu\text{g/L}$ , suggested by California Department of Health. It is possible that the concentrations may vary due to seasonal variations or over time as the plume moves closer to drinking water sources.

**Sources.** Important sources within the radius of 30 mi were investigated. Preliminary calculations have indicated that for perchlorate levels to be  $\sim 5\text{-}10 \mu\text{g/L}$ , the concentrations of perchlorate required upstream are much smaller than 500-1,000  $\mu\text{g/L}$  seen at several places in Californian groundwaters. Considering the large-scale contamination of ground water these sources have caused it is reasonable to assume that contamination can occur easily from a source 30 mi away from the actual site. For example, in the San Gabriel Valley, the soil is very sandy and permeable. The perchlorate, which does not bind to the soil appreciably and thus moves quickly with groundwater flows, apparently has migrated 15 miles away to the La Puente Valley Water District. The source of contamination from hazardous waste landfills can be more severe if perchlorate waste is buried and other chemicals are present that can react to form additional perchlorate. Hazardous waste landfills can be considered as big chemical reactors where conditions are present for forming several chemical compounds. For e.g., if ammonia is present, it can easily react with perchloric acid or chlorate to produce ammonium chlorate [ $\text{NH}_3 + \text{ClO}_3 \rightarrow \text{NH}_4\text{ClO}_3$ ;  $\text{NH}_3 + \text{HClO}_4 \rightarrow \text{NH}_4\text{ClO}_4$ ] [ $2\text{HClO}_4 + \text{ClO}_2 + \text{H}_2\text{O} \rightarrow \text{ClO}_3 + \text{H}_2\text{O} + 2\text{Cl}^-$ ;  $\text{ClO}_3 + \text{HOCl} \rightarrow \text{ClO}_4 + \text{Cl}^- + \text{H}^+$ ]. Chlorate can also be converted to perchlorate by electrochemical conditions exist in landfills according to the reaction: [ $\text{ClO}_3 + \text{H}_2\text{O} \rightarrow \text{ClO}_4 + 2\text{H}^+ + 2\text{e}^-$ ]. Sodium chlorate is found in a variety of commercial herbicides. Some trade names for products containing sodium chlorate include Atlacide, Defol, De-Fol-Ate, Drop-Leaf, Fall, Harvest-Aid, Kusatol, Leafex, and Tumbleaf. The compound is also present in combination with other herbicides such as atrazine, 2,4-D, bromacil, diuron, and sodium metaborate. Sodium chlorate is a strong oxidizer also used in the manufacture of explosives.

Several of the California-American Water Company's *San Marino* District (proximity of Pasadena, CA) wells contained detectable amounts of perchlorate ( $>4 \mu\text{g/L}$ ) (Table 2). The San Marino district of California-American Water Co., Los Angeles supplies water to the communities

*John T -  
Perchlorate  
Info -  
Baird  
10/10/98*

Table 2. Occurrence and Suspected Sources of Perchlorate in American Groundwater Systems

WELL LOCATION	STATE	POSSIBLE SOURCES <sup>aa</sup>	1 <sup>st</sup> SAMPLING [µg/L]	2 <sup>nd</sup> SAMPLING <sup>a</sup> [µg/L]
San Marino Oak Knoll Circle Pattin Well	CA	San Gabriel Superfund site <sup>aa</sup> - AZUSA Landfill (10 mi E) <sup>a</sup> - Jet Propulsion Laboratory (2 mi N) <sup>a</sup> -	4.8 6.2	- -
Clovis Well 44 Well 45 Well 48	NM	Cannon Air Force Base (10 mi E) <sup>a</sup> - Fort Sumner Remains (30 mi E) <sup>a</sup> - Explosive Mining Activity (Vicinity) <sup>a</sup> - Research Laboratories (30-60 mi E) <sup>a</sup> - AT&SF Site (Proximity) <sup>a</sup> -	3.4 2.4 3.7	1.9 2.1 ND
Yardley Well 9	PA	Naval Air Develop. (10 mi W) <sup>aa</sup> - North Penn-Arca 2 (20 mi E) <sup>a</sup> - Moyert Landfill (20 mi E) <sup>a</sup> - Warminster Site (10 mi E) <sup>a</sup> -	5.0	ND
Monteary LaSalle Well	CA	Abandoned Fort Ord (<1 mi) <sup>a</sup> - Naval Training center (10 mi E) <sup>a</sup> - Ex-Ammunition Facilities (<30 mi) <sup>a</sup> -	2.7	-
Greenwood Marlin Well #1	IN	Naval Weapons Research (10 mi N) <sup>a</sup> - Military Camp (19 mi S) <sup>a</sup> - Fort Benjamin (20 mi N) <sup>a</sup> - Explosive Mining (proximity) <sup>a</sup> - Superfund Site, Indianapolis (<10 mi N) <sup>a</sup> - Electroplating Superfund Site (20 mi S) <sup>a</sup> -	4.0	ND
Davenport/Clinton Well 3 Well 9	IA	Savanna Army Depot. (20 mi N) <sup>aa</sup> -	5.8 6.4	ND ND

<sup>a</sup> Sources confirmed by maps and personal contacts

- Predicted by information from Chemical Propulsion Information Agency/USEPA Superfund Database

<sup>aa</sup> USEPA Superfund database

&& Although the sources are in the proximity of contaminated source waters, no actual testing has been done to confirm the movement of perchlorate to the water sources. Some groundwater contours do pass through these supposedly contaminated sites

\$ Many of the positive sites were resampled approximately 2 months after the first sample was collected. ND indicates that perchlorate was not detected. - indicates that a resample was not performed.

\* The initial samples from Davenport/Clinton contained a large masking peak which caused difficulties in assessing an accurate perchlorate level.

of San Amrino, Rosemead and portions of Temple City, San Gabriel, El Monte and Pasadena. The service area of the district lies in the west San Gabriel valley approximately 10 miles north east of LA. The water served by the district is about 90% local well water and 10% imported supply from the MWD. The wells are located in Oak Knoll, Oswego, Patton, Lamanda Park, Lombardy, Winston, Del Mar, Longden, Roanoke, Rosemead, Grand, Richardson, mariposa, Guess, Mission View, Ivar, Howland. Ground water in the nearby Pasadena area contains much higher levels of perchlorate and one well was closed down last year because perchlorate was in excess of California's advisory limit. The source of their contamination is supposedly Jet Propulsion research facility, where monitoring wells show very high levels ( $>1000 \mu\text{g/L}$ ), San Gabriel Superfund site. Aerojet incinerated several tons of perchlorate waste in open-air pits in accordance with federal rules at the time and this may have caused widespread deposition at other places by atmospheric transport (Armstrong, 1997). But the burning was not complete and perchlorate apparently seeped into the ground through contaminated soil. At this time no studies have been performed to trace the source of contamination in the San Marino wells, and potential sources are listed simply to assist in future studies.

The *Monterey* District of California-American Water Company (i.e., LaSalle well) is more than 300 miles away from Los Angeles. The water supply in Monterey consists of 36 wells, 2 reservoirs. The available water supply is produced from the following: 71% is supplied from wells from the Carmel Valley and Seaside Aquifers, and 29% is supplied from San Clemente and Los Padres Dams. The distribution system contains in excess of 507 miles of main, ranging in size from 1 inch to 32 inches in diameter and passes in the vicinity of several contaminated sites. The LaSalle well is in the city of Seaside, not too far from where Fort Ord was located. Transport and atmospheric deposition from explosive mining activities and eventual leaching into the surface and groundwater sources is a possibility. There are several superfund sites located in the 30 mi vicinity of the Monterey district. Future studies should examine these suspected sources: Fort Ord Site, landfills, or industrial contaminated sites.

The 29,440-acre *Fort Ord* site was established in 1917 by the US Army as a maneuver area and field artillery target range. Prior to closing in September 1994, the base's primary mission was training infantry military personnel. Several areas of contamination exist on site. The facility contained chemical storage areas, target ranges, and landfills. An 8,000-acre firing range, and other limited areas on-site, pose threats from unexploded ordnance. On-site groundwater is contaminated with volatile organic compounds (VOCs). The 125-acre *Crazy Horse Landfill* site has operated as a sanitary landfill since 1950. In 1977, the landfill received a permit from the State allowing it to accept various wastes. Some pesticide containers have been disposed of at the facility. Reportedly, from the early 1970s to 1982, large quantities of waste were disposed of on the site from its vulcanizing process, which included rubber, carbon black and other fillers, oils, and mixed solvents. The *Salinas Plant* site consists of a 43-acre former tire manufacturing plant on a 256-acre parcel of land. Solid and hazardous wastes from the manufacturing processes were disposed of in off-site facilities. An estimated 400 drinking water wells have been identified in the area.

Several sites were located in the vicinity of Indiana-American Water Company's Marlin well field, Greenwood, IN that could contribute to perchlorate contamination. There are several superfund

sites and hazardous waste landfills are located in the vicinity of wells. The landfills accept municipal and industrial wastes including solvents, acids, bases, paints, and heavy metals. Almost all hazardous waste landfills contain battery waste and magnesium perchlorate is one of the ingredients used in manganese dioxide-magnesium perchlorate primary batteries (Crompton, 1996). Ammonia, which is a common contaminant found in landfills can potentially react with chlorate present in several insecticides and pesticides to form perchlorate. Waste sludges such as clarifier sludges can also contain perchlorate from a variety of waste material.

The source of supply for the Clinton District, Iowa, is seven deep wells and the raw water is discharged to reservoirs from where distributive pumps deliver water to the main service distribution system. There is room for contamination from storm water runoff. The groundwater wells at *Iowa-American, Clinton and Davenport* are located within 20-30 mi of the 13,062-acre Savanna Army Depot site which is an Army munitions installation located on the eastern bank of the Mississippi River. The facility has handled, processed, and stored munitions, explosives, and industrial chemicals since operations began in 1918. Renovation and loading of artillery shells and bombs began at the site in the 1930s and has occurred intermittently. Several areas of the facility have been used for the demolition and burning of obsolete armaments. Approximately 70 areas within the facility have been identified as potential sources of hazardous waste. Public access to the site is restricted. There are approximately 650 people within 3 miles of the site, and a large wintering population of bald eagles resides on the facility. Groundwater is contaminated with various explosives, trichloroethylene (TCE), chloroform, and nickel. Sediments and surface water are contaminated with various explosives. Soil is contaminated with explosives and polycyclic aromatic hydrocarbons (PAHs). Potential health threats include drinking contaminated groundwater and coming in direct contact with surface water, soil, and sediments. Rock Island Arsenal, the US Army's largest armaments manufacturing facility and the command post of the US arsenal system is also located in the vicinity of Davenport. Further studies of perchlorate transport in this area are needed.

Groundwater at New Mexico-American Clovis site contained perchlorate in the amount of 2 to 4  $\mu\text{g/L}$  (Table 2). NM-AWC provides water from 39 wells ranging in depth from 315 ft to 438 ft. Several wells show amounts of mercury in excess of 0.002 mg/L, trace amounts of barium and arsenic. In an effort to provide proper maintenance of station facilities, an herbicide known as "Staykill" was applied to well sites and booster stations to control weed growth. This chemical has a long-lasting residual, and contains chlorate as an ingredient. Several cases of ground water contamination have been discovered within the vicinity of several NMAWC wells. The most notable of these is the Santa Fe Lake. The Lake has been contaminated by the railroad with heavy metals from the flushing of ore cars. Perchlorate compounds employed during explosive activities are normally part of mined ores and trace amounts of perchlorate can leach into source waters. Investigation of other sources in proximity of these wells indicated the presence of Cannon Air Force Base (10 mi E), Fort Summer remains (30 mi E), explosive mining activity in the vicinity, and research laboratories (30-60 mi E) which can potentially contribute to contamination (Table 2). A landfill is also located about four miles to the North. An industrial superfund site, about 1 mi S of the AT&SF switching board yard, Clovis, conducted railroad refueling and hopper car washing at railroad since 1950's. This site has been found to be contaminated with several hydrocarbons, trace heavy metals, and other

pollutants. Perchlorate may have been generated from hopper and washing operations from trucks hauling perchlorate materials. Perchlorate is also an ingredient in the manufacture of paint.

Ground water supply in the Yardley, PA area is supplied by 6 wells located in 3 different well fields. All wells are drilled into the Stockton formation and are between 300-600 ft deep. The well sources currently have no wellhead programs in place. A wellhead protection program is designed to protect ground water supplies from contamination. The program should be a proactive effort to apply proper management techniques and preventive measures in order to protect ground water supplies. The wells located in the College Avenue Station area are contaminated with VOCs and air stripping is employed to reduce their concentrations. Pressures in the gradient range from < 20 psi when the water level in the Oxford Valley Standpipe drops below 30 ft to close to 100 psi at lower elevations near the Delaware River Canal. There is a possibility in those circumstances to intrude contaminated surface water into the distribution system (LeChevallier 1998). Because sources of perchlorate are not readily obvious at this location, additional monitoring and transport studies are warranted.

The presence of perchlorate in the Yardley well of Pennsylvania-American Water Company can also be possibly related to several contaminated sites located in the area which have been shown to caused groundwater contamination. *Moyers Landfill Superfund Site, 20 mi E of Yardley*, operated from 1940 to 1981. The 44-acre Moyers Landfill accepted an unknown quantity of municipal, sewage, and industrial wastes. Solid and liquid hazardous wastes thought to have included polychlorinated biphenyls (PCBs), solvents, paints, low-level radioactive wastes, and incinerated materials were disposed of at the landfill site. Off-site ground water, leachates, and soil are contaminated with heavy metals and volatile organic compounds from former waste disposal practices. *Naval Air Development Center, 9 mi E of Yardley*. site, which covers 840 acres and is located in Warminster generated waste during aircraft maintenance and repair, pest control, firefighting training, machine and plating shop operations, spray painting, and various materials research and testing activities in laboratories. Ground water both on-site and off-site is contaminated. *North Penn Area, 15 mi E of Yardley*, located in Hatfield, Montgomery County, Pennsylvania, is a 350-acre area with volatile organic compound contamination in the ground water. Several industrial facilities are suspected of being sources of this contamination and are currently under investigation.

Synthetic organic contaminants such as trichloroethylene (TCE) and tetrachloroethylene (PCE) have been detected in several San Marino Wells (CA), Monterey well (CA), Yardley (PA) and several Clovis (NM) wells (< MCL). In addition, Clovis wells have been tested positive for trichloroethane (~1500 µg/L), dichloroethylene (~500 µg/L), Atrazine and Propazine (~2.0 µg/L). San Marino wells have high levels of nitrate. Elevated levels of barium were detected in the Marlin, IN wells (~200 µg/L). Barium could be associated with perchlorate as barium perchlorate. Organics such TCE and PCE are solvents employed in aircraft industry and also associated with operations where perchlorate is used. The perchlorate contamination in California sites also is in a TCE plume associated with past operations of propulsion companies (CDHS, 1997). Investigation of the hydrology of San Marino area indicated that contamination plumes are down gradient with the well off. Other synthetic organic contaminants which are also indirectly associated with the use of

explosives detected in San Marino wells are: 1,3-Dimethyl-2-Nitrogen, Triphenyl Phosphate, and Perylene-D12 ( $<7.0 \mu\text{g/L}$ ).

Although the sources are in the proximity of contaminated source waters, no actual testing has been done to confirm the movement of perchlorate to the water sources tested. But some groundwater contours examined do pass through these supposedly contaminated sites and may be related to the movement of contamination from the sites suggested in Table 2 and Figure 1. Figure 2 summarizes the various pathways through which perchlorate can reach drinking water sources.

*Seasonal variation.* It is highly possible to see seasonal changes in concentrations as the transport of perchlorate is temperature dependent and expected to be highest during summer months. This may lead to higher exposure to this chemical during summer months. Samples collected at two different times in Iowa (01/20/98; 02/25/98), Indiana (02/03/98; 03/30/98), and Pennsylvania (02/25/98; 02/09/98) produced different results (Table 2). The samples collected during the month of January/February tested positive and the samples tested during the month of February/March generally tested negative. This leads to the suggestion that perchlorate leaching and its transport from the contaminated site may be dependent upon rainfall and/or temperature. The variation in perchlorate levels could also be due to variations in analytical methodology. Samples collected from Clovis, New Mexico (01/12/98; 03/02/98) produced positive results during both testings. San Marino, CA (02/17/98) and LaSalle, CA (01/05/98) samples were collected only once and tested positive. Samples analyzed on a continuous basis in California for six months by the California Department of Health apparently showed no significant change in concentrations (Okamoto, 98; Lancaster, 98). Information gathered to investigate why there was no seasonal variation in California samples indicated that analytical methodology was not consistent throughout and there was not a significant variation in temperature during the sampling interval.

The transport of perchlorate from the contaminated site to source waters is dependent upon rainfall, distance from contaminated plume, type of soil, and temperature. For example, in the San Gabriel Valley, the soil is very sandy and permeable. The perchlorate, which does not bind to the soil appreciably and thus moves quickly with groundwater flows, apparently has migrated 15 miles away to the La Puente Valley Water District (The Sacramento Bee, 1998).

## SOURCE CONTROL OF CONTAMINATION

Further large-scale contamination can be minimized by physically removing perchlorate waste and stabilizing with impervious and inert material to further stop its transport into the water sources. Perchlorate is a chemically inert compound which is difficult to neutralize and stabilize with other chemicals but can be made immobilized by mixing with concrete or by vitrification. Incineration of contaminated soil can also be employed to convert perchlorates to chlorides. This method produces toxic hydrochloric acid in the gaseous stream which must be captured and disposed off. Phyto-remediation and constructed wetlands are a low-cost alternative for decontamination of wastewater and soil containing high concentration of perchlorate ([www.ibcusa.com/phyto](http://www.ibcusa.com/phyto)). If an appropriate plant

Cannon  
Red  
2001



Panhandle Region

4515 S. Georgia, Suite 129 -- Amarillo, TX 79110

806/355-3556 FAX 806/355-3773

Report Date: 05/03/2001

Page 1 of 13

27CES/CEV  
506 N. D.L. Ingram  
Contr. F2960599A0010  
Cannon AFB, NM 88103-5136  
Attention: Tommy Downing



Project Report: 155068  
Client: CAFB  
Project: CAFB 040401

Did not sample  
Production Well 2

Results for Project 155068 Perchlorate Results - Based on Cannon sampling

489200 CNL-1 Perchlorate Analysis/Call 1905 Soil Taken: 03/23/2001 0919 By: Client Rec:04/04/2001

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
Total Solids	88.9	%		0.1	EPA Method 160.3	04/05/2001 1635	EAM	
Perchlorate	ND *	mg/kg		0.0450	Ion Chromatography	05/01/2001 1215	GDG	

\* Dry Weight Basis

489201 CNL-2 Perchlorate Analysis/Call 1906 Soil Taken: 03/23/2001 0921 By: Client Rec:04/04/2001

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
Total Solids	90.0	%		0.1	EPA Method 160.3	04/05/2001 1635	EAM	
Perchlorate	ND *	mg/kg		0.444	Ion Chromatography	05/01/2001 1215	GDG	

\* Dry Weight Basis

489202 CNL-3 Perchlorate Analysis/Call 1907 Soil Taken: 03/23/2001 0930 By: Client Rec:04/04/2001

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
Total Solids	81.1	%		0.1	EPA Method 160.3	04/05/2001 1635	EAM	
Perchlorate	ND *	mg/kg		0.493	Ion Chromatography	05/01/2001 1215	GDG	

\* Dry Weight Basis

489203 CNL-D Perchlorate Analysis/Call 1908 Soil Taken: 03/23/2001 0935 By: Client Rec:04/04/2001

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
Total Solids	82	%		0.1	EPA Method 160.3	04/06/2001 1548	EAM	
Perchlorate	ND *	mg/kg		0.488	Ion Chromatography	05/01/2001 1215	GDG	

\* Dry Weight Basis

489204 CSL-1 Perchlorate Analysis/Call 1909 Soil Taken: 03/23/2001 0945 By: Client Rec:04/04/2001

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
Total Solids	84	%		0.1	EPA Method 160.3	04/06/2001 1548	EAM	
Perchlorate	ND *	mg/kg		0.476	Ion Chromatography	05/01/2001 1215	GDG	

\* Dry Weight Basis

489205 CSL-2 Perchlorate Analysis/Call 1910 Soil Taken: 03/23/2001 0950 By: Client Rec:04/04/2001

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
Total Solids	70	%		0.1	EPA Method 160.3	04/06/2001 1548	EAM	
Perchlorate	ND *	mg/kg		0.571	Ion Chromatography	05/01/2001 1215	GDG	

\* Dry Weight Basis

489206 CSL-3 Perchlorate Analysis/Call 1911 Soil Taken: 03/23/2001 1001 By: Client Rec:04/04/2001

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
Total Solids	88.0	%		0.1	EPA Method 160.3	04/06/2001 1548	EAM	
Perchlorate	ND *	mg/kg		0.455	Ion Chromatography	05/01/2001 1215	GDG	





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\* Dry Weight Basis

489207 CSL-4 Perchlorate Analysis/Call 1912

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
Total Solids	81.5	%		0.1	EPA Method 160.3	04/06/2001	1548 EAM	
Perchlorate	ND *	mg/kg		0.491	Ion Chromatography	05/01/2001	1215 GDG	

Soil Taken: 03/23/2001 1006 By: Client Rec:04/04/2001

\* Dry Weight Basis

489208 CSL-5 Perchlorate Analysis/Call 1913

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
Total Solids	82.5	%		0.1	EPA Method 160.3	04/06/2001	1548 EAM	
Perchlorate	ND *	mg/kg		0.485	Ion Chromatography	05/01/2001	1215 GDG	

Soil Taken: 03/23/2001 1014 By: Client Rec:04/04/2001

\* Dry Weight Basis

489209 SW-1 Perchlorate Analysis/Call 1914

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
Perchlorate	ND	mg/L		0.0400	Ion Chromatography	05/01/2001	1215 GDG	

Liquid Aqueous Taken: 03/30/2001 0828 By: Client

489210 SW-2 Perchlorate Analysis/Call 1915

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
Perchlorate	ND	mg/L		0.0400	Ion Chromatography	05/01/2001	1215 GDG	

Liquid Aqueous Taken: 03/30/2001 0835 By: Client

489211 SW-3 Perchlorate Analysis/Call 1916

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
Perchlorate	ND	mg/L		0.0400	Ion Chromatography	05/01/2001	1215 GDG	

Liquid Aqueous Taken: 03/30/2001 0840 By: Client

489212 SW-4 Perchlorate Analysis/Call 1917

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
Perchlorate	ND	mg/L		0.0400	Ion Chromatography	05/01/2001	1215 GDG	

Liquid Aqueous Taken: 03/30/2001 0846 By: Client

489213 Call 1918 Sample #1

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
TPH Diesel Range Organics	ND	mg/kg		2.0	EPA Method 8015B MOD 04/13/2001	0740 KLB		

Soil Taken: 03/28/2001 1125 By: Gene A Smith Rec:04/04/2001

489214 Call 1919 Sample #2

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
TPH Diesel Range Organics	61	mg/kg		2.0	EPA Method 8015B MOD 04/13/2001	0740 KLB		
Benzene	ND	ug/kg		50.0	EPA Method 8260B	04/10/2001	2116 GDG	71-43-2
Ethylbenzene	ND	ug/kg		250	EPA Method 8260B	04/10/2001	2116 GDG	100-41-4
Toluene	ND	ug/kg		250	EPA Method 8260B	04/10/2001	2116 GDG	108-88-3
Xylenes, Total	ND	ug/kg		250	EPA Method 8260B	04/10/2001	2116 GDG	95-47-6,

Soil Taken: 03/28/2001 1129 By: Gene A Smith Rec:04/04/2001

489215 Call 1920 Sample #3

Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
TPH Diesel Range Organics	50	mg/kg		2.0	EPA Method 8015B MOD 04/13/2001	0740 KLB		

Soil Taken: 03/28/2001 1132 By: Gene A Smith Rec:04/04/2001

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Results for Project 155068

489216 Call 1921 Sample #4  
 Parameter Result Unit Flag RL Method Analyzed By CAS  
 TPH Diesel Range Organics 20 mg/kg 2.0 EPA Method 8015B MOD 04/13/2001 0740 KLB  
 Soil Taken: 03/28/2001 1143 By: Gene A Smith Rec:04/04/2001

489217 Call 1922 Sample #5  
 Parameter Result Unit Flag RL Method Analyzed By CAS  
 TPH Diesel Range Organics 11200 mg/kg 20 EPA Method 8015B MOD 04/13/2001 0740 KLB  
 Soil Taken: 03/28/2001 1147 By: Gene A Smith Rec:04/04/2001

489218 Call 1923 Sample #6  
 Parameter Result Unit Flag RL Method Analyzed By CAS  
 Hydrazine ND \* mg/kg 52.4 ASTM Method D2790-83 04/09/2001 1400 MAM  
 Total Solids 95.5 % 0.1 EPA Method 160.3 04/06/2001 1548 EAM  
 Ammonia Nitrogen 47.7 \* mg/kg 1.05 EPA Method 350.1 04/16/2001 0900 RSV  
 Total Kjeldahl Nitrogen 445 \* mg/kg 10.5 EPA Method 351.2 04/05/2001 1500 RSV

\* Dry Weight Basis

Call 1924 Sample #7  
 Parameter Result Unit Flag RL Method Analyzed By CAS  
 Hydrazine ND \* mg/kg 64.9 ASTM Method D2790-83 04/09/2001 1400 MAM  
 Total Solids 77.0 % 0.1 EPA Method 160.3 04/06/2001 1548 EAM  
 Ammonia Nitrogen 41.6 \* mg/kg 1.30 EPA Method 350.1 04/16/2001 0900 RSV  
 Total Kjeldahl Nitrogen 362 \* mg/kg 13.0 EPA Method 351.2 04/05/2001 1500 RSV

\* Dry Weight Basis

489220 Call 1925 Sample #8  
 Parameter Result Unit Flag RL Method Analyzed By CAS  
 TPH Diesel Range Organics 14100 mg/kg 20 EPA Method 8015B MOD 04/13/2001 0740 KLB  
 Benzene 408 ug/kg 200 EPA Method 8260B 04/11/2001 1307 GDG 71-43-2  
 Ethylbenzene 26900 ug/kg 1000 EPA Method 8260B 04/11/2001 1307 GDG 100-41-4  
 Toluene 13800 ug/kg 1000 EPA Method 8260B 04/11/2001 1307 GDG 108-88-3  
 Xylenes, Total 49500 ug/kg 1000 EPA Method 8260B 04/11/2001 1307 GDG 95-47-6,  
 Soil Taken: 03/28/2001 1254 By: Gene A Smith Rec:04/04/2001

489221 Call 1926 Sample #9  
 Parameter Result Unit Flag RL Method Analyzed By CAS  
 TPH Diesel Range Organics ND mg/kg 2.0 EPA Method 8015B MOD 04/13/2001 0740 KLB  
 Soil Taken: 03/28/2001 1156 By: Gene A Smith Rec:04/04/2001

489222 Call 1927 Sample #10  
 Parameter Result Unit Flag RL Method Analyzed By CAS  
 TPH Diesel Range Organics 11700 mg/kg 20 EPA Method 8015B MOD 04/13/2001 0740 KLB  
 Soil Taken: 03/28/2001 1252 By: Gene A Smith Rec:04/04/2001

489223 Call 1928 Sample #11  
 Parameter Result Unit Flag RL Method Analyzed By CAS  
 TPH Diesel Range Organics 5280 mg/kg 20 EPA Method 8015B MOD 04/13/2001 0740 KLB  
 Soil Taken: 03/28/2001 1258 By: Gene A Smith Rec:04/04/2001





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Results for Project 155068

Sample ID	Call	Sample #	Parameter	Result	Unit	Flag	RL	Method	Analyzed	By	CAS
489224	Call 1929	Sample #12	TPH Diesel Range Organics	14000	mg/kg		20	EPA Method 8015B MOD	04/13/2001	0740	KLB
489225	Call 1930	Sample #13	TPH Diesel Range Organics	16.5	mg/kg		2.0	EPA Method 8015B MOD	04/13/2001	0740	KLB
489226	Call 1931	Sample #14	TPH Diesel Range Organics	8.7	mg/kg		2.0	EPA Method 8015B MOD	04/13/2001	0740	KLB
489227	Call 1904		TCLP Lead (Reg. Limit 5.0)	ND	mg/L		1.25	EPA Method 6020	04/11/2001	0800	WOB 7439-92-1

Sample Preparation Steps for Project 155068

Sample ID	Analysis/Call	Parameter	Result	Unit	Method	Analyzed	By	CAS
489200	CNL-1 Perchlorate Analysis/Call 1905	As Received to Dry Weight	Converted		Calculation	05/03/2001	CAL	
		Water Extract-ion	40/4	mL/g	EPA Method 300.0	04/06/2001	1100	ESI
489201	CNL-2 Perchlorate Analysis/Call 1906	As Received to Dry Weight	Converted		Calculation	05/03/2001	CAL	
		Water Extract-ion	40/4	mL/g	EPA Method 300.0	04/06/2001	1100	ESI
489202	CNL-3 Perchlorate Analysis/Call 1907	As Received to Dry Weight	Converted		Calculation	05/03/2001	CAL	
		Water Extract-ion	40/4	mL/g	EPA Method 300.0	04/06/2001	1100	ESI
489203	CNL-D Perchlorate Analysis/Call 1908	As Received to Dry Weight	Converted		Calculation	05/03/2001	CAL	
		Water Extract-ion	40/4	mL/g	EPA Method 300.0	04/06/2001	1100	ESI
489204	CSL-1 Perchlorate Analysis/Call 1909	As Received to Dry Weight	Converted		Calculation	05/03/2001	CAL	
		Water Extract-ion	40/4	mL/g	EPA Method 300.0	04/06/2001	1100	ESI



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489205 CSL-2 Perchlorate Analysis/Call 1910

Parameter	Result	Unit
As Received to Dry Weight	Converted	
Water Extract-Ion	40/4	mL/g

Soil Taken: 03/23/2001 0950 By: Client Rec:04/04/2001

Method	Analyzed	By
Calculation	05/03/2001	CAL
EPA Method 300.0	04/06/2001	1100 ESI

489206 CSL-3 Perchlorate Analysis/Call 1911

Parameter	Result	Unit
As Received to Dry Weight	Converted	
Water Extract-Ion	40/4	mL/g

Soil Taken: 03/23/2001 1001 By: Client Rec:04/04/2001

Method	Analyzed	By
Calculation	05/03/2001	CAL
EPA Method 300.0	04/06/2001	1100 ESI

489207 CSL-4 Perchlorate Analysis/Call 1912

Parameter	Result	Unit
As Received to Dry Weight	Converted	
Water Extract-Ion	40/4	mL/g

Soil Taken: 03/23/2001 1006 By: Client Rec:04/04/2001

Method	Analyzed	By
Calculation	05/03/2001	CAL
EPA Method 300.0	04/06/2001	1100 ESI

489208 CSL-5 Perchlorate Analysis/Call 1913

Parameter	Result	Unit
As Received to Dry Weight	Converted	
Water Extract-Ion	40/4	mL/g

Soil Taken: 03/23/2001 1014 By: Client Rec:04/04/2001

Method	Analyzed	By
Calculation	05/03/2001	CAL
EPA Method 300.0	04/06/2001	1100 ESI

489213 Call 1918 Sample #1

Parameter	Result	Unit
GC TPH Liquid-Solid Extraction	1/30	m/g

Soil Taken: 03/28/2001 1125 By: Gene A Smith Rec:04/04/2001

Method	Analyzed	By
Methods 8000/8100MOD	04/11/2001	1000 DLH

489214 Call 1919 Sample #2

Parameter	Result	Unit
BTEX by GCMS	Verified	
GC TPH Liquid-Solid Extraction	1/30	m/g

Soil Taken: 03/28/2001 1129 By: Gene A Smith Rec:04/04/2001

Method	Analyzed	By
EPA Method 8260B	04/10/2001	2116 GDG
Methods 8000/8100MOD	04/11/2001	1000 DLH

489215 Call 1920 Sample #3

Parameter	Result	Unit
GC TPH Liquid-Solid Extraction	1/30	m/g

Soil Taken: 03/28/2001 1132 By: Gene A Smith Rec:04/04/2001

Method	Analyzed	By
Methods 8000/8100MOD	04/11/2001	1000 DLH

489216 Call 1921 Sample #4

Parameter	Result	Unit
GC TPH Liquid-Solid Extraction	1/30	m/g

Soil Taken: 03/28/2001 1143 By: Gene A Smith Rec:04/04/2001

Method	Analyzed	By
Methods 8000/8100MOD	04/11/2001	1000 DLH

489217 Call 1922 Sample #5

Parameter	Result	Unit
GC TPH Liquid-Solid Extraction	1/30	m/g

Soil Taken: 03/28/2001 1147 By: Gene A Smith Rec:04/04/2001

Method	Analyzed	By
Methods 8000/8100MOD	04/11/2001	1000 DLH

489218 Call 1923 Sample #6

Parameter	Result	Unit
As Received to Dry Weight	Converted	
Ammonia Distillation	50/1	mL/g

Soil Taken: 03/28/2001 1152 By: Gene A Smith Rec:04/04/2001

Method	Analyzed	By
Calculation	05/03/2001	CAL
EPA Method 350.2	04/09/2001	0900 MDW





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### Sample Preparation Steps for Project 155068

**489218 Call 1923 Sample #6**

Parameter	Result	Unit
TKN Block Digestion	20/1	mL/g

Soil Taken: 03/28/2001 1152 By: Gene A Smith Rec:04/04/2001  
**Method Analyzed By**  
 EPA Method 351.2 04/05/2001 0830 PJD

**489219 Call 1924 Sample #7**

Parameter	Result	Unit
As Received to Dry Weight	Converted	
Ammonia Distillation	50/1 A/B/S	mL/g
TKN Block Digestion	20/1	mL/g

Soil Taken: 03/28/2001 1200 By: Gene A Smith Rec:04/04/2001  
**Method Analyzed By**  
 Calculation 05/03/2001 CAL  
 EPA Method 350.2 04/09/2001 0900 MDW  
 EPA Method 351.2 04/05/2001 0830 PJD

**489220 Call 1925 Sample #8**

Parameter	Result	Unit
BTEX by GCMS	Verified	
GC TPH Liquid-Solid Extraction	1/30	ml/g

Soil Taken: 03/28/2001 1254 By: Gene A Smith Rec:04/04/2001  
**Method Analyzed By**  
 EPA Method 8260B 04/11/2001 1307 GDG  
 Methods 8000/8100MOD 04/11/2001 1000 DLH

**489221 Call 1926 Sample #9**

Parameter	Result	Unit
GC TPH Liquid-Solid Extraction	1/30	ml/g

Soil Taken: 03/28/2001 1156 By: Gene A Smith Rec:04/04/2001  
**Method Analyzed By**  
 Methods 8000/8100MOD 04/11/2001 1000 DLH

**489222 Call 1927 Sample #10**

Parameter	Result	Unit
GC TPH Liquid-Solid Extraction	1/30	ml/g

Soil Taken: 03/28/2001 1252 By: Gene A Smith Rec:04/04/2001  
**Method Analyzed By**  
 Methods 8000/8100MOD 04/11/2001 1000 DLH

**489223 Call 1928 Sample #11**

Parameter	Result	Unit
GC TPH Liquid-Solid Extraction	1/30	ml/g

Soil Taken: 03/28/2001 1258 By: Gene A Smith Rec:04/04/2001  
**Method Analyzed By**  
 Methods 8000/8100MOD 04/11/2001 1000 DLH

**489224 Call 1929 Sample #12**

Parameter	Result	Unit
GC TPH Liquid-Solid Extraction	1/30	ml/g

Soil Taken: 03/28/2001 1300 By: Gene A Smith Rec:04/04/2001  
**Method Analyzed By**  
 Methods 8000/8100MOD 04/11/2001 1000 DLH

**489225 Call 1930 Sample #13**

Parameter	Result	Unit
GC TPH Liquid-Solid Extraction	1/30	ml/g

Soil Taken: 03/28/2001 1128 By: Gene A Smith Rec:04/04/2001  
**Method Analyzed By**  
 Methods 8000/8100MOD 04/11/2001 1000 DLH

**489226 Call 1931 Sample #14**

Parameter	Result	Unit
GC TPH Liquid-Solid Extraction	1/30 A/B	ml/g

Soil Taken: 03/28/2001 1140 By: Gene A Smith Rec:04/04/2001  
**Method Analyzed By**  
 Methods 8000/8100MOD 04/11/2001 1000 DLH

**489227 Call 1904**

Parameter	Result	Unit
TCLP Extraction: Non-Volatile	SOL EXT #1	
Metals Digestion - TCLP 3050 FI	50/4 A/S/S	ml/g

Organic Liquid Taken: 04/03/2001 0751 By: SCT Rec:04/04/2001  
**Method Analyzed By**  
 EPA Method 1311 04/05/2001 1555 KKM  
 EPA Method 3050B 04/10/2001 0830 PJD





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### Sample Preparation Steps for Project 155068

489228 Call 1932 - Contract Support Comp: 4/3 0730 - 900 Liquid Aqueous Taken: 04/03/2001 COMP By: SCT/SC

Parameter	Result	Unit	Method	Analyzed	By
Special Sampling Fee	Verified			04/05/2001	CAL

### Sample Specific Quality Control/Quality Assurance

489214 Call 1919 Sample #2

Soil Taken: 03/28/2001 1129 By: Gene A Smith Rec:04/04/2001

EPA Method 8260B	Surrogate/Spike on Sample	489214	04/10/2001	1
Compound	Result	Concentration	Recovery	
Dibromofluoromethane-SURR	24.9	24.0	104 (74.53-117.2)	
Toluene-d8 -SURR	25.4	24.0	106 (86.32-110.5)	
Bromofluorobenzene-SURR	21.0	24.0	87.5 (76.35-127.2)	

Internal Standard Areas on Sample 489214 04/10/2001 1

Compound	IS Area	CCC IS Area	Status
Pentachlorobenzene-ISTD	100300	104400	
1,4-Difluorobenzene-ISTD	163800	170200	
Chlorobenzene-d5-ISTD	45170	44030	
1,4-Dichlorobenzene-d4-ISTD	88830	80600	

489220 Call 1925 Sample #8

Soil Taken: 03/28/2001 1254 By: Gene A Smith Rec:04/04/2001

EPA Method 8260B	Surrogate/Spike on Sample	489220	04/11/2001	1
Compound	Result	Concentration	Recovery	
Dibromofluoromethane-SURR	22.0	24.0	91.7 (74.53-117.2)	
Toluene-d8 -SURR	21.5	24.0	89.6 (86.32-110.5)	
Bromofluorobenzene-SURR	26.2	24.0	109 (76.35-127.2)	

Internal Standard Areas on Sample 489220 04/11/2001 1

Compound	IS Area	CCC IS Area	Status
Pentafluorobenzene-ISTD	101400	108800	
1,4-Difluorobenzene-ISTD	164700	172000	
Chlorobenzene-d5-ISTD	49900	45850	
1,4-Dichlorobenzene-d4-ISTD	99110	86790	

### Organic Quality Control/Quality Assurance for Project 155068

EPA Method 8260B	Blank	04/10/2001	1
Compound	Result		
benzene	ND		
Chlorobenzene	ND		
1,1-Dichloroethylene	ND		
tetrachloroethylene Chloride	ND		
Trichloroethylene	ND		



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Organic Quality Control/Quality Assurance for Project 155068

EPA Method 8260B	Instrument Tune	04/10/2001	1		
Mass	Reference Mass	Min Abundance	Max Abundance	Result	Status
BFB Mass 50	95	15.0	40.0	23.1	PASS
BFB Mass 75	95	30.0	60.0	50.9	PASS
BFB Mass 95	95	100	100	100.0	PASS
BFB Mass 96	95	5.00	9.00	6.5	PASS
BFB Mass 173	174	0	2.00	0.0	PASS
BFB Mass 174	95	50.0	100	74.2	PASS
BFB Mass 175	174	5.00	9.00	5.1	PASS
BFB Mass 176	174	95.0	101	97.0	PASS
BFB Mass 177	176	5.00	9.00	6.3	PASS

Instrument Calibration Check		04/10/2001	1		
Compound	Max %Rel. Std.	%Deviation	Status		
Chloroform	20.0	3.9	PASS		
1,1-Dichloroethylene	20.0	1.4	PASS		
1,2-Dichloropropane	20.0	6.0	PASS		
Ethylbenzene	20.0	3.9	PASS		
Toluene	20.0	3.1	PASS		
Vinyl Chloride	20.0	7.1	PASS		

EPA Method 8260B	Blank	04/11/2001	1		
Compound	Result				
Benzene	ND				
Chlorobenzene	ND				
1,1-Dichloroethylene	ND				
Methylene Chloride	ND				
Toluene	ND				
Trichloroethylene	ND				

EPA Method 8260B	Instrument Tune	04/11/2001	1		
Mass	Reference Mass	Min Abundance	Max Abundance	Result	Status
BFB Mass 50	95	15.0	40.0	24.1	PASS
BFB Mass 75	95	30.0	60.0	50.5	PASS
BFB Mass 95	95	100	100	100.0	PASS
BFB Mass 96	95	5.00	9.00	7.1	PASS
BFB Mass 173	174	0	2.00	0.0	PASS
BFB Mass 174	95	50.0	100	73.1	PASS
BFB Mass 175	174	5.00	9.00	5.2	PASS
BFB Mass 176	174	95.0	101	96.4	PASS
BFB Mass 177	176	5.00	9.00	6.6	PASS

Instrument Calibration Check		04/11/2001	1		
Compound	Max %Rel. Std.	%Deviation	Status		
Chloroform	20.0	5.1	PASS		

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Organic Quality Control/Quality Assurance for Project 155068

1,1-Dichloroethylene	20.0	3.4	PASS
1,2-Dichloropropane	20.0	2.2	PASS
Ethylbenzene	20.0	1.4	PASS
Toluene	20.0	-2.4	PASS
Vinyl Chloride	20.0	.1	PASS

EPA Method 8260B Instrument System Performance Check 04/11/2001 1

Compound	Min Response Factor	Response Factor	Status
Bromoform	.1010	0.747	PASS
Chlorobenzene	.3000	3.015	PASS
Chloromethane	.1000	0.472	PASS
1,1-Dichloroethane	.1000	0.783	PASS
1,1,2,2-Tetrachloroethane	.3000	0.739	PASS

SET Quality Control/Quality Assurance for Project 155068

TPH Diesel Range Organics (DRO)

(Analyzed: 04/13/2001 0740 KLB Verified: 04/16/2001 10:40 LES)

Sample	Type	Result	Value	Unit	Percent
	Standard	1030	1000	mg/l	3.0
	Standard	1030	1000	mg/l	3.0
	Standard	1120	1000	mg/l	12.0
	Standard	1090	1000	mg/l	9.0
	Standard	1010	1000	mg/l	1.0
	Blank	<2		mg/l	

Perchlorate

(Analyzed: 05/01/2001 1215 GDG Verified: / / )

Sample	Type	Result	Value	Unit	Percent
	Standard	560	500	PPM	12.0
	Standard	534	500	PPM	6.8
	Standard	564	500	PPM	12.8
	Standard	568	500	PPM	13.6
489212	Duplicate	<0.0200	<0.0200	mg/L	0.0
489212	Spike		1.00	mg/L	119

Perchlorate

(Analyzed: 05/01/2001 1215 GDG Verified: 05/03/2001 12:11 WJP)

Sample	Type	Result	Value	Unit	Percent
	Standard	560	500	PPM	12.0
	Standard	534	500	PPM	6.8
	Standard	564	500	PPM	12.8
	Standard	568	500	PPM	13.6
489208	Duplicate	<0.0400	<0.0400	mg/kg	0.0
	Spike		0.500	mg/kg	106

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SET Quality Control/Quality Assurance for Project 155068

Hydrazine

Sample	Type	Result	Value	Unit	Percent
489218	Duplicate	ND	ND	mg/kg	0.0
489218	Spike		100	mg/kg	111

(Analyzed: 04/09/2001 1400 MAM Verified: 04/10/2001 15:17 MAM)

TCLP Lead (Reg. Limit 5.0)

Sample	Type	Result	Value	Unit	Percent
	Standard	0.101	0.100	ppm	1.0
	Standard	0.305	0.300	ppm	1.7
	Standard	0.301	0.300	ppm	0.3
	Standard	0.307	0.300	ppm	2.3
	Standard	0.304	0.300	ppm	1.3
	Standard	0.305	0.300	ppm	1.7
	Standard	0.311	0.300	ppm	3.7
	Standard	0.311	0.300	ppm	3.7
	Standard	0.312	0.300	ppm	4.0
	Standard	0.311	0.300	ppm	3.7
	Standard	0.101	0.100	ppm	1.0
	Standard	0.307	0.300	ppm	2.3
	Standard	0.307	0.300	ppm	2.3
	Standard	0.311	0.300	ppm	3.7
	Standard	0.301	0.300	ppm	0.3
	Standard	0.302	0.300	ppm	0.7
	Standard	0.298	0.300	ppm	-0.7
	Standard	0.303	0.300	ppm	1.0
	Standard	0.305	0.300	ppm	1.7
	LCS	0.102	0.100	ppm	2.0
	LCS	0.518	0.500	ppm	3.6
	LCS	0.521	0.500	ppm	4.2
	LCS	0.0987	0.100	ppm	-1.3
	LCS	0.502	0.500	ppm	0.4
	LCS	0.528	0.500	ppm	5.6
	Blank	<0.100		ppm	
	Blank	<0.0200		ppm	
	Blank	<0.0200		ppm	
	Blank	<0.100		ppm	
	Blank	<0.0200		ppm	
	Blank	<0.0200		ppm	
489227	Spike		0.100	ppm	105
489227	Spike		0.100	ppm	101
489290	Spike		0.500	ppm	97.2
489290	Spike		0.500	ppm	98.0

(Analyzed: 04/11/2001 0800 WOB Verified: 04/11/2001 16:40 SAH)

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Panhandle Region

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Project Report: 155068

Client: CAFB

Project:  
CAFB 040401

SET Quality Control/Quality Assurance for Project 155068

TCLP Lead (Reg. Limit 5.0)

(Analyzed: 04/11/2001 0800 WOB Verified: 04/11/2001 16:40 SAH)

Sample	Type	Result	Value	Unit	Percent
489291	Spike		0.500	ppm	90.4
489362	Spike		0.500	ppm	94.6
489365	Spike		0.500	ppm	98.6
489365	Spike		0.500	ppm	98.6
489476	Spike		0.500	ppm	101
489585	Spike		0.500	ppm	97.4
489585	Spike		0.500	ppm	103
489625	Spike		0.500	ppm	93.6
489626	Spike		0.500	ppm	99.4
489627	Spike		0.500	ppm	98.0
489628	Spike		0.500	ppm	92.6
489629	Spike		0.500	ppm	94.2
	Spike		0.500	ppm	92.8
	Spike		0.500	ppm	96.4
489632	Spike		0.500	ppm	96.0
489633	Spike		0.500	ppm	105
489662	Spike		0.500	ppm	95.0
489693	Spike		0.500	ppm	102
489736	Spike		0.500	ppm	102

Ammonia Nitrogen

(Analyzed: 04/16/2001 0900 RSV Verified: 04/17/2001 13:06 CRS)

Sample	Type	Result	Value	Unit	Percent
	Standard	2.00	2.0	ppm	0.0
	Standard	3.01	3.0	ppm	0.3
	Standard	3.01	3.0	ppm	0.3
	Standard	3.01	3.0	ppm	0.3
	Standard	3.01	3.0	ppm	0.3
	Standard	3.01	3.0	ppm	0.3
	Standard	3.01	3.0	ppm	0.3
LCS	LCS	2.04	2.00	ppm	2.0
LCS	LCS	1.86	2.00	ppm	-7.0
LCS	LCS	2.13	2.00	ppm	6.5
LCS	LCS	2.16	2.00	ppm	8.0
LCS	LCS	2.13	2.00	ppm	6.5
LCS	LCS	2.14	2.00	ppm	7.0
	Blank	0.0341		ppm	
	Blank	0.0307		ppm	
	Blank	<0.020		ppm	
	Blank	0.0440		ppm	
	Blank	<0.020		ppm	

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Project Report: 15506  
Client: CAFB  
Project:  
CAFB 040401

SET Quality Control/Quality Assurance for Project 155068

Ammonia Nitrogen

Sample	Type	Result	Value	Unit	Percent
	Blank	0.0320		ppm	
	Blank	0.0326		ppm	
489219	Duplicate	31.0	33.7	mg/kg	5.6
489487	Duplicate	18.7	19.1	mg/L	1.4
489681	Duplicate	1.06	1.11	mg/L	3.1
489869	Duplicate	0.199	0.161	mg/L	13.6
489219	Spike		100	ppm	100
489487	Spike		2.00	ppm	100
489681	Spike		2.00	ppm	99
489869	Spike		2.00	ppm	100

(Analyzed: 04/16/2001 0900 RSV Verified: 04/17/2001 13:06 CRS)

Total Kjeldahl Nitrogen

Sample	Type	Result	Value	Unit	Percent
	Standard	1.09	1.0	ppm	9.0
	Standard	2.00	2.0	ppm	0.0
	Standard	2.00	2.0	ppm	0.0
	Standard	2.00	2.0	ppm	0.0
	Standard	2.00	2.0	ppm	0.0
LCS	LCS	0.897	1.00	ppm	-10.3
LCS	LCS	0.870	1.00	ppm	-13.0
LCS	LCS	1.07	1.00	ppm	7.0
	Blank	<0.050		ppm	
	Blank	<0.050		ppm	
	Blank	<0.050		ppm	
488438	Duplicate	3190	3310	mg/kg	2.5
488804	Duplicate	0.397	0.348	mg/L	8.6
489046	Duplicate	0.330	0.359	mg/L	5.7
488438	Spike		20	ppm	3400
488804	Spike		1.00	ppm	100
489046	Spike		1.00	ppm	110

(Analyzed: 04/05/2001 1500 RSV Verified: 04/05/2001 18:35 CRS)

Total Solids

Sample	Type	Result	Value	Unit	Percent
	Blank	0.0000		grams	
488518	Duplicate	79.5	80.0	%	0.4
488519	Duplicate	82.5	84.1	%	1.3
488520	Duplicate	84.3	85.0	%	0.6
	Blank	0.0000		grams	
489203	Duplicate	81.3	81.9	%	0.5
489204	Duplicate	84.0	83.5	%	0.4

(Analyzed: 04/05/2001 1635 EAM Verified: 04/09/2001 10:44 CRS)

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Project Report: 155068

Client: CAFB

Project:  
CAFB 040401

### SET Quality Control/Quality Assurance for Project 155068

Total Solids		(Analyzed: 04/06/2001 1548 EAM Verified: 04/09/2001 10:51 CRS)			
Sample	Type	Result	Value	Unit	Percent
489205	Duplicate	69.9	69.6	%	0.3

RL is our Reporting Limit, or MAL (Minimum Analytical Level/Minimum Quantitation Level). The MAL takes into account the Instrument Detection Limit (IDL), Method Detection Limit (MDL), and Practical Quantitation Limit (PQL), and any dilutions and/or concentrations performed during sample preparation (EQL). Our analytical result must be above this MAL before we report a value in the "Results" column of our report. Otherwise, we report ND (Not Detected above MAL), because the result is "<" (less than) the number in the MAL column.

Unless otherwise noted, testing was performed at Ana-lab's corporate laboratory that holds the following Federal and State certificates: ISO Guide 25 (A2LA Certificate #637.01), EPA National Lead Laboratory Accreditation Program #637.01, Texas Department of Agriculture Soil Import Permit S-37592, State of Texas Narcotics Permit 1261, Texas Department of Health Drinking Water Laboratory Certificate TX219, EPA Lab Number TX00063, Oklahoma Department of Environmental Quality Laboratory Certificate 8125, Arkansas Department of Environmental Quality Certification, Louisiana Department of Environmental Quality Laboratory Certification (NELAC), Texas Department of Health Lead Firm Certificate 2110076, Entidad Mexicana de Acreditacion, A.C. (EMA) (pending), US Department of Energy Approved.

These analytical results relate to the sample tested. This report may NOT be reproduced EXCEPT in FULL without written approval of Ana-Lab Corp.

I certify the above results were obtained using the methods specified.

\_\_\_\_\_  
C. H. Whiteside, Ph. D., President

