

**INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT**

1988

ANNUAL MONITORING REPORT - VOLUME III

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H-2 01L811 01U806 01U805 01U808 01U803
H-3 01L813
H-4 01L816 01L821 01L822 01L823 01U072
H-5 01U011 01U035 01U034 01U122 01U101 01U100
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H-12 01U621 01U620 01U618 01U623 01U619
H-13 01U652 01U631 01U632 01U642 01U064

I. UNIT 3 GROUNDWATER HYDROGRAPHS

I-1 03L002 03U021 03F305 03U700 03F304 03U671
I-2 03L010 03U011 03U082 03U022 03U023
I-3 03L012 03U025 03U083 03U088 03U089
I-4 03L014 03L081 03L086 03U099 03U006 03L005
I-5 03L028 03U647 03U659 03U658 03U004 03L832
I-6 03L029 03U301 03U674 03L003 03U672
I-7 03L078 03F303 03U703 03F302 03L079 03U710
I-8 03L806 03U711 03U804 03U801 03L802
I-9 03L811 03L809 03U803 03L673 03L841 03L848
I-10 03L813 03U856 03M843 03L859 03L854 03L860
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I-17 03U087 03U521 03U032 03U124 03L113
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I-19 03U702 03U701 03F307 03L077 03F306 03L832

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J-1 04U001 04U701 04U702 04U077 04U806 04U709
J-2 04U002 04U711 04U802 04U003 04U673
J-3 04U843 04U821 409595 04U861
J-4 04U847 04U841 04U848
J-5 04U850 04U877 04U851 04U852
J-6 04U859 04U845 04U854 04U860
J-7 04U875 04U880 04U881 04U882
J-8 04U879 04U871 04U872 04U883
J-9 409595 409598 117NB 409596 04U844 04U832
J-10 PJ#74 PJ#508 04U020 04U027
J-11 PJ#501 PJ#502 PJ#503 PJ#506 PJ#507

K. MONITOR WELL NEST GROUNDWATER HYDROGRAPHS

K-1 01L821 03U821 04U821
K-2 01L822 03L822 03U822
K-3 01U011 03U011
K-4 01U012 03L012 03M012 03U012 04U012
K-5 01U624B 01U624D 01U624C
K-6 01U625A 01U625B 01U625C 01U625D
K-7 01U626A 01U626B 01U626C 01U626D
K-8 01U627A 01U627B 01U627C 01U627D
K-9 01U628A 01U628B 01U628C 01U628D
K-10 01U803 03U803
K-11 03L001 03M001 03U001 04U001
K-12 03L002 03M002 03U002 04U002
K-13 03L003 03M003 03U003 04U003 PJ#003
K-14 03L004 03M004 03U004
K-15 03L005 03M005 03U005
K-16 03L007 03M007 03U007 04U007
K-17 03L010 03M010 03U010
K-18 03L013 03M013 03U013
K-19 03L014 03U014
K-20 03L017 03M017 03U017
K-21 03L018 03U018
K-22 03L020 03M020 03U020 04U020
K-23 03L021 03U021

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K-24 03L027 03U027 04U027 PJ#027
K-25 03L028 03U028
K-26 03L077 03U077 04U077
K-27 03L078 03U078
K-28 03L802 03M802 04U802 PJ#802
K-29 03L806 03M806 03U806 04U806 PJ#806
K-30 03L832 03U832 04U832
K-31 03L841 04U841
K-32 03L848 03M848 04U848
K-33 03L859 04U859
K-34 03L860 04U860
K-35 03L861 04U861

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L-1 Unit 1 Total VOCs Isoconcentrations (Q16)
L-2 Unit 1 (Site A Area) Total VOC Isoconcentrations (Q16)
L-3 Unit 1 (Honeywell Bldg 103 Area) Total VOCs Isoconcentrations (Q16)
L-4 Unit 1 (Trichloroethylene Isoconcentrations (Q16)
L-5 Unit 1 (Site A) Trichloroethylene Isoconcentrations (Q16)
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M. UNIT 3 GROUNDWATER QUALITY ISOCONCENTRATION MAPS - ORGANICS

M-1 Unit 3 Total VOC Isoconcentrations (Q16)
M-2 Unit 3 Trichloroethylene Isoconcentrations (Q16)
M-3 Upper Unit 3 Trichloroethylene Isoconcentrations (Q16)
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- P-6 Quarter 16 Beta Radionuclides Concentrations
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- P-8 Quarter 18 Nickel Concentrations
- P-9 Quarter 18 Lead Concentrations
- P-10 Quarter 19 Cyanide Concentrations
- P-11 Quarter 19 Nickel Concentrations
- P-12 Quarter 19 Lead Concentrations
- P-13 Quarter 20 Nickel Concentrations
- P-14 Quarter 20 Lead Concentrations

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- Q-3 Quarter 16 Lead Concentrations
- Q-4 Quarter 16 Alpha Radionuclides Concentrations
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**1987 GROUNDWATER MONITORING PLAN,
SCOPE OF WORK**

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT
MONITORING-QUARTERLY GROUNDWATER
SCOPE OF WORK

1. OBJECTIVE.

The objective of this Scope of Work (SOW) is to conduct quarterly groundwater monitoring consisting of sampling and analysis of groundwater, and collection of groundwater level measurements from wells located within the Twin Cities Army Ammunition Plant (TCAAP) vicinity. Sampling and analysis shall be conducted in accordance with the "U.S. Army Toxic & Hazardous Materials Agency, Installation Restoration Program, Quality Assurance Program, December 1985, Revision 1." All data generated shall be entered into the U.S. Army Toxic & Hazardous Materials Agency (USATHAMA) Installation Restoration Data Management System (IRDMS).

2. STATEMENT OF WORK.

All work performed under this SOW shall be coordinated with USATHAMA and TCAAP prior to execution.

The technical proponent of this project is USATHAMA located at Aberdeen Proving Ground (Edgewood Area), Maryland. Technical assistance and evaluation of the project shall be exercised by USATHAMA through the U.S. Army Armament, Munitions and Chemical Command, Rock Island, Illinois, and TCAAP.

The contractor shall provide all the appropriate equipment and personnel to perform the following services:

a. Project Quality Control (QC) Plan.

A Project QC Plan shall be submitted by the contractor and be approved by USATHAMA prior to collection of samples for analysis. The Plan shall conform with requirements of the USATHAMA Installation Restoration Program, Quality Assurance Program, December 1985, Revision 1 (Appendix 1), hereinafter known as the Quality Assurance Program. Details for development of the Plan are provided in Chapter 3.0 of the Quality Assurance Program.

b. Laboratory Certification.

(1) The contractor shall ensure all analytical determinations for chemical compounds in groundwater, identified in Table 1, shall be made from laboratories and methods certified by USATHAMA under the Quality Assurance Program.

(2) The Quality Assurance Program contains all USATHAMA requirements for establishing and maintaining laboratory practices to ensure scientific reliability and compatibility of laboratory data in support of USATHAMA programs. QC practices performed under this SOW, summarized in Table 2, shall be in compliance with guidelines of the Quality Assurance Program.

TABLE 1
GROUNDWATER MONITORING
CHEMICAL ANALYSIS CATEGORIES (CERTIFICATION CLASSES)

CATEGORY 1: GAS CHROMATOGRAPHY/CONDUCTIVITY DETECTOR (CLASS 1B)

COMPOUND	TEST NAME	TARGET REPORTING LIMIT (ug/l)
Carbon Tetrachloride	CCL4	1.0
Chloroform	CHCL3	1.0
Methylene Chloride	CH2CL2	1.0
1,1,2,2-Tetrachloroethylene	TCLEE	2.0
Trichloroethylene	TRCLE	1.0
1,1,-Dichloroethane	11DCLE	1.0
1,1,-Dichloroethylene	11DCE	2.0
1,2-Dichloroethane	12DCLE	1.0
1,2-Dichloroethylenes	12DCE	1.0
1,1,1-Trichloroethane	111TCE	2.0
1,1,2-Trichloroethane	112TCE	2.0

CATEGORY 2: FURNACE ATOMIC ABSORPTION (CLASS 1)

COMPOUND	TEST NAME	TARGET REPORTING LIMIT (ug/l)
Cadmium	CD	0.1
Lead	PB	1.0
Nickel	NI	1.0
Zinc	ZN	0.05

CATEGORY 3: COLD VAPOR ATOMIC ABSORPTION (CLASS 1)

COMPOUND	TEST NAME	TARGET REPORTING LIMIT (ug/l)
Mercury	HG	0.2

CATEGORY 4: SPECTROPHOTOMETRY (CLASS 1)

COMPOUND	TEST NAME	TARGET REPORTING LIMIT (ug/l)
Cyanide (Total)	CYN	10.0

CATEGORY 5: GAS CHROMATOGRAPHY/ELECTRON CAPTURE (CLASS 1B)

COMPOUND	TEST NAME	TARGET REPORTING LIMIT (ug/l)
Aroclor 1016	PCB016	0.05
Aroclor 1248	PCB248	0.05
Aroclor 1254	PCB254	0.05
Aroclor 1260	PCB260	0.05

c. Groundwater Sampling & Analysis.

(1) Groundwater monitoring shall be conducted to determine changes in spatial extent and magnitude of contamination present at TCAAP and associated off-plant monitor wells including wells installed by Honeywell, Inc. (Honeywell). Results of past chemical sampling and analysis and geohydrologic data collected under the Installation Restoration Program at TCAAP and Honeywell investigations were evaluated to determine sampling locations, sampling frequency and chemical compound/element analyses. The monitoring scheme detailed in this SOW can be modified, only through a contract modification, when directed by USATHAMA, if contaminant results dictate changes in sampling locations, sampling frequency and/or chemical compound/element analyses.

(2) Groundwater samples shall be collected from well locations listed in Table 3 for chemical compounds/elements at frequencies as indicated. No groundwater samples shall be collected during the winter season quarter due to undesirable weather conditions. However, groundwater level measurements shall be collected as indicated in paragraph 2.d.

(3) The Minnesota Pollution Control Agency (MPCA) and Honeywell may plan to split samples during the sampling effort. Federal Cartridge Corporation shall coordinate the sampling activities of the three parties. The contractor shall provide sampling services and containers for split samples, if required. In addition, the contractor shall fill sample container prepared by MPCA and/or Honeywell for this use, if required. It is estimated approximately 20 samples per quarter may be split with MPCA and/or Honeywell.

d. Static Groundwater Level Measurements.

Static groundwater level measurements shall be collected from wells listed in Table 4 for each of the four (4) quarters under this SOW. Quarterly measurements shall be collected over a fourteen (14) day consecutive period. The length of riser stick up (well casing above ground level) of each well shall be measured to the nearest tenth of a foot during the first quarter only and provided to the Government in feet and centimeters. Depth to groundwater from ground surface in centimeters shall be required in reporting in the IRDMS per paragraph 2.f.

e. Daily QC/Quality Assurance.

Control Charts and laboratory bench sheets (or copies thereof) for chemical analyses shall be provided to USATHAMA during each week of analyses in accordance with the Quality Assurance Program.

f. Data Management.

(1) All chemical analysis and static groundwater level measurements shall be entered into the IRDMS. Quarterly results shall be entered and processed into Level 2 of the IRDMS 45 days after the chemical sample or static groundwater level is collected.

TABLE 2
GROUNDWATER MONITORING
CALIBRATION AND DAILY QC REQUIREMENTS PER LOT
(Minimum Tested Range - Zero Intercept Calibration)

USATHAMA CLASS 1 CERTIFIED METHOD

DAILY QC (Initial Lot):

- 1 - Method Blank
- 3 - Standard Matrix Spikes, approx 2, 10, 10 CRL*
- 7 - Initial Calibration Standards, approx 0, 0.5, 1, 2, 5, 10 TRL*
(beginning of day), 10 TRL (end of day)
- 2 - Calibration Check Standards, approx 10, 10 TRL (beginning and end of day)

DAILY QC (Additional Lots):

- 1 - Method Blank
- 3 - Standard Matrix Spikes, approx 2, 10, 10 CRL
- 2 - Daily Calibration Standards, approx 10, 10 TRL (beginning and end of day)

USATHAMA CLASS 1B CERTIFIED METHOD

DAILY QC (Initial Lot):

- 1 - Method Blank
- 1 - Standard Matrix Spike, approx 10 CRL
- 5 - Initial Calibration Standards, approx 0, 0.5, 2, 10 TRL (beginning of day), 10 TRL (end of day)
- 1 - Calibration Check Standard, approx 10 TRL (beginning of day)

DAILY QC (Additional Lots):

- 1 - Method Blank
- 1 - Standard Matrix Spike, approx 10 CRL
- 2 - Daily Calibration Standards, approx 10, 10 TRL (beginning and end of day)

* Certified Reporting Limit; Spike level must fall within certified range

** Target Reporting Limit; Standards must bracket tested concentration range

TABLE 3
GROUNDWATER MONITORING
WELL LOCATIONS/SAMPLING & ANALYSIS REQUIREMENTS (1)

SITE A	WELL ID	SAMPLING QUARTERS			
		1QTR	2QTR	3QTR	4QTR
	01U102	--	--	1,2	--
	01U103	--	--	1,2	--
	01U104	--	--	1,2	--
	01U105	--	--	1,2	--
	01U108	--	1,2	--	1
	01U115 (2)	--	1,2	1	1
	01U116 (2)	--	1,2	1	1
	01U117 (2)	--	1,2	1	1
	01U118 (2)	--	1,2	1	1
	01U119 (2)	--	1,2	1	1
	01U120	--	1,2	1	1
	03U023	--	--	1,2	--
SITE B	WELL ID	1QTR	2QTR	3QTR	4QTR
	01U034	--	--	1,2	--
	01U035	--	--	1,2	--
	01U036	--	--	1,2	--
	01U100	--	--	1,2	--
	01U101	--	--	1,2	--
SITE C	WELL ID	1QTR	2QTR	3QTR	4QTR
	01U045	--	--	1,2	--
	01U085	--	--	1,2	--
SITE D	WELL ID	1QTR	2QTR	3QTR	4QTR
	03U093	--	1,2,5	--	1,5
	03U096	--	1,2,5	--	1,5
	03L091	--	1,2,5	--	1,5
SITE E	WELL ID	1QTR	2QTR	3QTR	4QTR
	03U015	--	1,2	1	1
	03U088	--	1,2	--	1
	03U089	--	1,2	--	1

SITE F	WELL ID	1QTR	2QTR	3QTR	4QTR
	03U018	--	1,2,3,4	--	--
	03U019	--	1,2,3,4	1,4	1,4
	03U026	--	1,2,3,4	--	1,4
	03U090	--	1,2,3,4	1,4	1,4
	03U092	--	1,2,3,4	--	1,4
	03U112	--	1,2,3,4	1,4	1,4
	03U113	--	1,2,3,4	--	1,4
	03U114	--	1,2,3,4	--	1,4
	03U121 (2)	--	1,2,3,4	1,4	1,4
	03L018	--	1,2,3,4	--	1,4
	03L113	--	1,2,3,4	--	1,4

SITE G	WELL ID	1QTR	2QTR	3QTR	4QTR
	03U014	--	--	1,2	--
	03U020	--	--	1,2	--
	03U094	--	--	1,2	--
	03M020	--	--	1,2	--
	03L014	--	1,2	1	1
	03L020	--	--	1,2	--
	04U020	--	--	1,2	--
	PJ#074 (3)	--	1,2	--	1
	PJ#508 (3)	--	--	1,2	--

SITE H	WELL ID	1QTR	2QTR	3QTR	4QTR
	01U060	--	1,2	--	1
	01U098	--	1,2	--	1
	03U005	--	1,2	--	1
	03U099	--	1,2	1	1

SITE I	WELL ID	1QTR	2QTR	3QTR	4QTR
	03U003	--	--	1,2,5	--
	03U004	--	--	1,2,5	--
	03U027	--	--	1,2,5	--
	03U028	--	--	1,2,5	--
	03U029	--	--	1,2,5	--
	03U030	--	--	1,2,5	--
	03U078	--	--	1,2,5	--
	03U079	--	--	1,2,5	--
	03U671	--	--	1,2,5	--
	03M003	--	--	1,2	--
	03M004	--	--	1,2	--
	03L003	--	--	1,2	--
	03L004	--	--	1,2	--
	03L078	--	--	1,2	--
	03L079	--	--	1,2	--
	PJ#003 (3)	--	--	1,2	--

SITE J	WELL ID	1QTR	2QTR	3QTR	4QTR
	01U050	--	1,2	1	1
	01U051	--	1,2	1	1
	01U062	--	1,2	1	1
	01U524	--	1,2	1	1
	01U525	--	1,2	1	1
	01U526	--	1,2	1	1
	01U527	--	1,2	1	1

SITE K	WELL ID	1QTR	2QTR	3QTR	4QTR
	01U602	--	--	1,2	--
	03U013	--	--	1,2	--
	03U075	--	--	1,2	--
	03U076	--	--	1,2	--

SITE 129-3	WELL ID	1QTR	2QTR	3QTR	4QTR
	03U087	--	1,2	1	1
	03U521	--	1,2	1	1

SITE 129-5	WELL ID	1QTR	2QTR	3QTR	4QTR
	01U072	--	--	1,2	--
	03U097	--	1,2	1	1
	03U111	--	1,2	1	1

SITE 129-15	WELL ID	1QTR	2QTR	3QTR	4QTR
	03U032	--	1,2	1	1

TRIANGLE AREA	WELL ID	1QTR	2 QTR	3QTR	4QTR
	03U801	--	1,2,3	--	--
	03U803	--	1,2,3	--	--
	03U804	--	1,2,3	--	--
	03U805	--	1,2,3	--	--
	03U806	--	1,2,3	--	--
	03M802	--	1,2,3	--	1
	03M805	--	1,2,3	--	1
	03M806	--	1,2,3	--	1
	03L802	--	1,2,3	--	1
	03L806	--	1,2,3	--	--
	04U802	--	1,2,3	--	1
	04U806	--	1,2,3	--	--
	PJ#802 (3)	--	1,2,3	--	1
	PJ#806 (3)	--	1,2,3	--	--

NORTHWEST PETROLEUM	WELL ID	1QTR	2QTR	3QTR	4QTR
	01L821(2)	--	1,2,3	--	1
	01L822(2)	--	1,2,3	--	1
	01L823(2)	--	1,2,3	--	1
	03U821(2)	--	1,2,3	1	1
	03U822(2)	--	1,2,3	1	1
	03U824(2)	--	1,2,3	1	1
	03L822(2)	--	1,2,3	1	1
	04U821(2)	--	1,2,3	1	1
HERBST LANDFILL	WELL ID	1QTR	2QTR	3QTR	4QTR
	01L811(2)	--	1,2,3	--	1
	01L813(2)	--	1,2,3	--	1
	01L816(2)	--	1,2,3	--	1
	03U811(2)	--	1,2,3	--	1
	03L811(2)	--	1,2,3	--	1
	03L813(2)	--	1,2,3	--	1
MILLER DUMP	SITE ID	1QTR	2QTR	3QTR	4QTR
	03U831(2)	--	1,2,3	1	1
	03U832(2)	--	1,2,3	1	1
	03U833(2)	--	1,2,3	1	1
	03L832(2)	--	1,2,3	1	1
	04U832(2)	--	1,2,3	1	1
TRIO SOLVENTS	SITE ID	1QTR	2QTR	3QTR	4QTR
	409595	--	1,2,3	1	1
	409598	--	1,2,3	1	1
	409596	--	1,2,3	1	1
	409597	--	1,2,3	1	1
	191942	--	1,2,3	1	1
HONEYWELL (PHASE III)	SITE ID	1QTR	2QTR	3QTR	4QTR
	03M843(2)	--	1	1	1
	03M848(2)	--	1	1	1
	03L848(2)	--	1	1	1
	03L853(2)	--	1	1	1
	03L854(2)	--	1	1	1
	03L858(2)	--	1	1	1
	04U841(2)	--	1	1	1
	04U843(2)	--	1	1	1
	04U844(2)	--	1	1	1
	04U845(2)	--	1	1	1
	04U846(2)	--	1	1	1

04U847(2)	--	1	1	1
04U848(2)	--	1	1	1
04U849(2)	--	1	1	1
04U850(2)	--	1	1	1
04U851(2)	--	1	1	1
04U852(2)	--	1	1	1
04U855(2)	--	1	1	1
04U856(2)	--	1	1	1

TOTAL SAMPLES/QUARTER	0	99	99	90
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TOTAL SAMPLES: 288

(1) The above total number of samples do not include required quality control samples as specified in Appendix 1.

(2) Well planned for completion in calendar year 1987.

(3) For bulk samples, maintain the pump fully within the solidly cased portion of the well.

TABLE 4
 STATIC GROUNDWATER LEVEL MEASUREMENT
 WELL LOCATIONS

UNIT 1

SITE TYPE	SITE ID	SITE TYPE	SITE ID
WELL	01U003	WELL	01U107
WELL	01U004	WELL	01U108
WELL	01U011	WELL	01U109
WELL	01U012	WELL	01U110
WELL	01U022	WELL	01U524
WELL	01U033	WELL	01U525
WELL	01U034	WELL	01U526
WELL	01U035	WELL	01U527
WELL	01U036	WELL	01U601
WELL	01U037	WELL	01U602
WELL	01U038	WELL	01U603
WELL	01U039	WELL	01U604
WELL	01U040	WELL	01U605
WELL	01U041	WELL	01U607
WELL	01U043	WELL	01U608
WELL	01U044	WELL	01U609
WELL	01U045	WELL	01U611
WELL	01U046	WELL	01U612
WELL	01U047	WELL	01U613
WELL	01U048	WELL	01U615
WELL	01U050	WELL	01U616
WELL	01U051	WELL	01U617
WELL	01U052	WELL	01U618
WELL	01U053	WELL	01U619
WELL	01U054	WELL	01U620
WELL	01U060	WELL	01U621
WELL	01U062	WELL	01U622
WELL	01U063	WELL	01U623
WELL	01U064	WELL	01U631
WELL	01U065	WELL	01U632
WELL	01U067	WELL	01U634
WELL	01U072	WELL	01U635
WELL	01U085	WELL	01U636
WELL	01U098	WELL	01U638
WELL	01U100	WELL	01U639
WELL	01U101	WELL	01U640
WELL	01U102	WELL	01U642
WELL	01U103	WELL	01U652
WELL	01U104	WELL	01U666
WELL	01U105	WELL	01U667
WELL	01U106		

UNIT 1

SITE TYPE	SITE ID
WELL	01U668
WELL	01U803
WELL	01U805
WELL	01U806
WELL	01U807
WELL	01U808
WELL	01L811
WELL	01L813
WELL	01L816
WELL	01L821
WELL	01L822
WELL	01L823

UNIT 3 (UPPER)

SITE TYPE	SITE ID	SITE TYPE	SITE ID
WELL	03U001	WELL	03U093
WELL	03U002	WELL	03U094
WELL	03U003	WELL	03U096
WELL	03U004	WELL	03U097
WELL	03U005	WELL	03U099
WELL	03U006	WELL	03U111
WELL	03U007	WELL	03U112
WELL	03U008	WELL	03U113
WELL	03U009	WELL	03U114
WELL	03U010	WELL	03U301
WELL	03U011	WELL	03U521
WELL	03U012	WELL	03U528
WELL	03U013	WELL	03U647
WELL	03U014	WELL	03U648
WELL	03U015	WELL	03U658
WELL	03U016	WELL	03U659
WELL	03U017	WELL	03U671
WELL	03U018	WELL	03U672
WELL	03U019	WELL	03U673
WELL	03U020	WELL	03U674
WELL	03U021	WELL	03U801
WELL	03U022	WELL	03U803
WELL	03U023	WELL	03U804
WELL	03U024	WELL	03U805
WELL	03U025	WELL	03U806
WELL	03U026	WELL	03U811
WELL	03U027	WELL	03U821
WELL	03U028	WELL	03U822
WELL	03U029	WELL	03U824
WELL	03U030	WELL	03U831
WELL	03U031	WELL	03U832
WELL	03U032	WELL	03U833
WELL	03U075	WELL	109UH
WELL	03U076	WELL	117UH
WELL	03U077	WELL	118UH
WELL	03U078		
WELL	03U079		
WELL	03U082		
WELL	03U083		
WELL	03U084		
WELL	03U087		
WELL	03U088		
WELL	03U089		
WELL	03U090		
WELL	03U092		

UNIT 3 (MIDDLE)

SITE TYPE	SITE ID
WELL	03M001
WELL	03M002
WELL	03M003
WELL	03M004
WELL	03M007
WELL	03M010
WELL	03M012
WELL	03M013
WELL	03M017
WELL	03M020
WELL	03M505
WELL	03M509
WELL	03M802
WELL	03M806
WELL	03M843
WELL	03M848

UNIT 3 (LOWER)

SITE TYPE	SITE ID	SITE TYPE	SITE ID
WELL	03L001	WELL	03L080
WELL	03L002	WELL	03L081
WELL	03L003	WELL	03L086
WELL	03L004	WELL	03L091
WELL	03L005	WELL	03L113
WELL	03L007	WELL	03L522
WELL	03L010	WELL	03L523
WELL	03L012	WELL	03L673
WELL	03L013	WELL	03L802
WELL	03L014	WELL	03L806
WELL	03L017	WELL	03L811
WELL	03L018	WELL	03L813
WELL	03L020	WELL	03L822
WELL	03L021	WELL	03L832
WELL	03L027	WELL	03L848
WELL	03L028	WELL	03L853
WELL	03L029	WELL	03L854
WELL	03L077	WELL	03L858
WELL	03L078	WELL	118LH
WELL	03L079		

UNIT 4

SITE TYPE	SITE ID
WELL	04U001
WELL	04U002
WELL	04U003
WELL	04U007
WELL	04U012
WELL	04U020
WELL	04U027
WELL	04U510
WELL	04U673
WELL	04U802
WELL	04U806
WELL	04U821
WELL	04U832
WELL	04U841
WELL	04U843
WELL	04U844
WELL	04U845
WELL	04U846
WELL	04U847
WELL	04U848
WELL	04U849
WELL	04U850
WELL	04U851
WELL	04U852
WELL	04U855
WELL	04U856
WELL	118PD

PRAIRIE DU CHIEN/JORDAN

SITE TYPE	SITE ID
WELL	PJ#003
WELL	PJ#027
WELL	PJ#074
WELL	PJ#501
WELL	PJ#502
WELL	PJ#503
WELL	PJ#506
WELL	PJ#507
WELL	PJ#508
WELL	PJ#802
WELL	PJ#806

(2) Procedures, equipment, and requirements for conducting data management requirements of the SOW are provided in the Installation Restoration Program, Data Management System Requirements (Appendix 2).

g. Monitor Well Protective Casing Renumbering.

All protective casings of on-plant monitor wells shall be inspected, repainted with orange paint after proper metal surface preparation, and renumbered according to the "Installation Restoration Program Twin Cities Army Ammunition Plant Data Management System Well/Bore Inventory" (Appendix 3). The WELL ID shall be stenciled on the side of each protective casing (paint) in a neat fashion with a contrasting color (white) to facilitate easy identification. Painting on the casings shall have a minimum expected life of 5 years.

3. SCHEDULE.

Chemical sampling and/or static groundwater level measurements shall be collected on a quarterly basis as detailed in the SOW. Federal Cartridge Corporation shall schedule the sampling activity in concert with the MPCA and Honeywell.

4. METHOD OF PAYMENT.

Payment of this effort (quarterly) shall be contingent on completion of all data entry and all data acceptance into Level 2 of the USATHAMA IRDMS. Payment will be authorized quarterly only after acceptance of all water level and chemical analytical data into Level 2 of the USATHAMA IRDMS.

The Government reserves the option to require additional quarterly sampling and analysis of groundwater and surface water samples as directed by USATHAMA only. The contractor shall complete the "Additional Sampling and Analysis Option" section in the attached cost proposal.

5. COST PROPOSAL.

The contractor shall complete the attached cost proposal and provide to USATHAMA. Award of this SOW is contingent upon USATHAMA and AMCCOM (RI) approval.

APPENDIX B

**1988 GROUNDWATER MONITORING PLAN,
SCOPE OF WORK**

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT
MONITORING-QUARTERLY GROUNDWATER AND SURFACE WATER
STATEMENT OF WORK

I. OBJECTIVE: The objective of this statement of work (SOW) is to conduct quarterly groundwater and surface water monitoring consisting of sampling and analysis of groundwater and surface water, and collection of groundwater level measurements from wells located within the Twin Cities Army Ammunition Plant (TCAAP) vicinity. Sampling and analysis shall be conducted in accordance with the "U.S. Army Toxic and Hazardous Materials Agency, Installation Restoration Program, Quality Assurance Program, December 1985, Revision 2." All data generated shall be entered into the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), Installation Restoration Data Management System (IRDMS).

II. STATEMENT OF WORK:

All work performed under this SOW shall be coordinated with USATHAMA and TCAAP prior to execution.

The technical proponent of this project USATHAMA located at Aberdeen Proving Ground (Edgewood Area), Maryland. Technical assistance and evaluation of the project shall be exercised by USATHAMA through the U.S. Army Armament, Munitions and Chemical Command, Rock Island, Illinois, and TCAAP.

The contractor shall provide all the appropriate equipment and personnel to perform the following services:

a. Project Quality Control (QC) Plan.

A Project QC Plan shall be submitted by the contractor and be approved by USATHAMA prior to collection of samples for analysis. The Plan shall conform with requirements of the Installation Restoration Program, Twin Cities Army Ammunition Plant, Remedial Investigation/Feasibility Study, Quality Assurance Project Plan (QAPP) (available from TCAAP) and the USATHAMA Installation Restoration Program, Quality Assurance Program, December 1985, Revision 2 (Appendix 1), hereinafter known as the Quality Assurance Program (QAP). Details for development of the QC Plan are provided in Chapter 3.0 of the QAP.

b. Laboratory Certification.

(1) The contractor shall ensure all analytical determinations for chemical compounds in groundwater, identified in Table 1, shall be made from laboratories and methods certified by USATHAMA under the QAP.

(2) The QAPP and QAP contain all USATHAMA requirements for establishing and maintaining laboratory practices to ensure scientific reliability and compatibility of laboratory data in support of USATHAMA programs. QC practices performed under this SOW, shall be in compliance with guidelines of the QAPP and QAP.

c. Groundwater Sampling & Analysis.

(1) Groundwater monitoring shall be conducted to determine changes in spatial extent and magnitude of contamination present at TCAAP and associated wells installed by Honeywell, Inc., (Honeywell). Results of past chemical sampling and analysis and geohydrologic data collected under the Installation Restoration Program at TCAAP and Honeywell investigations were evaluated to determine sampling locations, sampling frequency and chemical compound/element analyses. The monitoring scheme detailed in this SOW can be modified, only through a contract modification, when directed by USATHAMA, if contaminant results dictate changes in sampling locations, sampling frequency and/or chemical compound/element analyses.

(2) Groundwater samples shall be collected from well locations listed in Table 2 for chemical compounds/elements at frequencies as indicated. No groundwater samples shall be collected during the winter season quarter due to undesirable weather conditions. However, groundwater level measurements shall be collected as indicated in paragraph 2e.

(3) The Minnesota Pollution Control Agency (MPCA) and Honeywell may plan to split samples during the sampling effort. Federal Cartridge Corporation shall coordinate the sampling activities of the three parties. The contractor shall provide sampling services and containers for split samples, if required. In addition, the contractor shall fill sample containers prepared by MPCA and/or Honeywell for this use, if required. It is estimated approximately 20 samples per quarter may be split with MPCA and/or Honeywell.

d. Surface Water Sampling & Analysis.

(1) Surface water samples shall be collected from well locations listed in Table 3 for chemical compounds/elements at frequencies as indicated. No surface water samples shall be collected during the winter season quarter due to undesirable weather conditions.

(2) The Minnesota Pollution Control Agency (MPCA) and Honeywell may plan to split samples during the sampling effort. Federal Cartridge Corporation shall coordinate the sampling activities of the three parties. The contractor shall provide sampling services and containers for split samples, if required. In addition, the contractor shall fill sample containers prepared by MPCA and/or Honeywell for this use, if required. It is estimated approximately 5 samples per quarter may be split with MPCA and/or Honeywell.

e. Static Groundwater Level Measurements.

Static groundwater level measurements shall be collected from wells listed in Table 4 for each of the four (4) quarters under this SOW. Quarterly measurements shall be collected over a fourteen (14) day consecutive period. The length of riser stick up (well casing above ground level) of each well shall be measured to the nearest tenth of a foot during the first quarter only and provided

to the Government in feet and centimeters. Depth to groundwater from ground surface in centimeters shall be required in reporting in the IRDMS per paragraph 2g.

f. Daily QC/Quality Assurance.

Control Charts and laboratory bench sheets (or copies thereof) for chemical analyses shall be provided to USATHAMA during each week of analyses in accordance with the QAPP and QAP.

g. Data Management.

(1) All chemical analysis and static groundwater level measurements shall be entered into the IRDMS. Quarterly results shall be entered and processed into Level 2 of the IRDMS not later than 45 days after the chemical sample or static groundwater level is collected.

(2) Procedures, equipment, and requirements for conducting data management requirements of the SOW are provided in the Installation Restoration Program, Data Management System Requirements (Appendix 2).

h. Reporting.

(1) Quarterly Monitoring Reports shall be submitted to USATHAMA at least twenty-one (21) days prior to the next quarterly sampling. The reports shall include:

(a) Table listing water level measurements with IRDMS Site ID Number and Minnesota Unique Number for each aquifer for the three (3) month quarter.

(b) Laboratory reporting sheets for chemical sampling and analysis.

(c) Sample dates and times.

(d) Discussion of any problems encountered.

(e) Table listing of samples with IRDMS Site ID Number and Minnesota Unique Number exceeding criteria listed in Table 5 and their concentrations from the previous quarterly sampling.

Computer software will be available from the Government to generate tabular listings for water level measurements and chemical analysis reporting.

(2) Annual Monitoring Reports shall be submitted to USATHAMA by 15 January of each year documenting the results of all monitoring conducted during the previous year (calendar). The report shall include the following information for each aquifer monitored:

(a) Tables listing all water level measurements and chemical analyses with IRDMS Site ID Number and Minnesota Unique Number for the previous calendar year.

(b) A water level contour map for each aquifer, for each measuring period with elevations (MSL) labeled at each well (maps at a scale of 1:12,000).

(c) A water chemistry isoconcentration map for each aquifer, for each sampling event with concentrations of total VOC's, metals and radionuclides. Individual concentrations should be labeled by the location of each well (logarithmic contour intervals for VOC's at same scale as item b).

(d) A discussion of the groundwater quality and water level monitoring results with respect to those criteria listed in Table 5. A table listing those wells which exceed the criteria and their concentrations for each sampling event should be generated and supplied with the discussion. Annual hydrographs illustrating water levels vs. time shall also be prepared and presented for selected wells.

(e) A table listing those surface water samples which exceeded the criteria listed in Table 6 and their concentrations for each sampling event.

(f) A proposal of any monitoring modifications.

III. SCHEDULE: Chemical sampling and/or static groundwater level measurements shall be collected on a quarterly basis as detailed in the SOW. Federal Cartridge Corporation shall schedule the sampling activity in concert with the MPCA and Honeywell.

IV. METHOD OF PAYMENT:

Payment of this effort (quarterly) shall be contingent on completion of all data entry and all data acceptance into Level 2 of the USATHAMA IRDMS. Payment will be authorized quarterly only after acceptance of all water level and chemical analytical data into Level 2 of the USATHAMA IRDMS.

The Government reserves the option to require additional quarterly sampling and analysis of groundwater and surface water samples as directed by USATHAMA only. The contractor shall complete the "Additional Sampling and Analysis Option" section in the attached cost proposal.

V. COST PROPOSAL:

The contractor shall complete the attached cost proposal and provide to USATHAMA. Award of this SOW is contingent upon USATHAMA and AHCCOM (RI) approval.

TABLE 1. CHEMICAL ANALYSIS CATEGORIES (CERTIFICATION CLASSES)

CATEGORY 1: GAS CHROMATOGRAPHY/CONDUCTIVITY DETECTOR (EPA METHOD 601 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	TARGET REPORTING LIMIT (TRL)		TESTED RANGE
		WATER (ug/l)	SOIL (ug/g)	
Chloroform	CHCL3	1	N/R	0 - 50 TRL
Vinyl Chloride	C2H3CL	1	N/R	0 - 50 TRL
Tetrachloroethylene	TCLEE	2	N/R	0 - 50 TRL
Trichloroethylene	TRCLE	1	N/R	0 - 50 TRL
1,1-Dichloroethylene	11DCE	2	N/R	0 - 50 TRL
1,1,1-Trichloroethane	111TCE	2	N/R	0 - 50 TRL
1,1,2-Trichloroethane	112TCE	2	N/R	0 - 50 TRL
1,2-Dichloroethylenes	12DCE	1	N/R	0 - 50 TRL
1,2-Dichloroethane	12DCL	1	N/R	0 - 50 TRL
1,2-Dichloropropane	12DCLP	2	N/R	0 - 50 TRL

CATEGORY 2: FURNACE ATOMIC ABSORPTION (EPA METHOD 2__2 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	TARGET REPORTING LIMIT (TRL)		TESTED RANGE
		WATER (ug/l)	*SOIL (ug/g)	
Arsenic	AS	5	N/R	0 - 20 TRL
Barium	BA	10	N/R	0 - 20 TRL
Cadmium	CD	0.5	N/R	0 - 20 TRL
Chromium	CR	5	N/R	0 - 20 TRL
Nickel	NI	5	N/R	0 - 10 TRL
Lead	PB	2	N/R	0 - 20 TRL

* Direct Aspiration Atomic Absorption may be substituted for the Furnace Technique.

CATEGORY 3: COLD VAPOR ATOMIC ABSORPTION (EPA METHOD 245 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	TARGET REPORTING LIMIT (TRL)		TESTED RANGE
		WATER (ug/l)	SOIL (ug/g)	
Mercury	HG	0.2	N/R	0 - 50 TRL

TABLE 1. CHEMICAL ANALYSIS CATEGORIES (CERTIFICATION CLASSES) (Cont)

CATEGORY 4: SPECTROPHOTOMETRY/COLORIMETRY (EPA METHOD SERIES 300 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	TARGET REPORTING LIMIT (TRL)		TESTED RANGE
		WATER (ug/l)	SOIL (ug/g)	
Cyanide	CYN	5	N/R	0 - 50 TRL

CATEGORY 5: GAS CHROMATOGRAPHY/ELECTRON CAPTURE (EPA METHOD 608 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	TARGET REPORTING LIMIT (TRL)		TESTED RANGE
		WATER (ug/l)	SOIL (ug/g)	
Aroclor 1016	PCB016	0.05	N/R	0 - 10 TRL
Aroclor 1242	PCB242	0.05	N/R	0 - 10 TRL
Aroclor 1248	PCB248	0.05	N/R	0 - 10 TRL
Aroclor 1254	PCB254	0.05	N/R	0 - 10 TRL
Aroclor 1260	PCB260	0.05	N/R	0 - 10 TRL
Dibutylchlorendate	DBUCLE	0.1	N/R	0 - 10 TRL

CATEGORY 6: GAS CHROMATOGRAPHY/MASS SPECTROMETRY (EPA METHOD 625 TYPE)
(EXTRACTABLE ORGANICS) USATHAMA CLASS 1A

COMPOUND	TEST NAME	TARGET REPORTING LIMIT (TRL)		TESTED RANGE
		WATER (ug/l)	SOIL (ug/g)	
Nitrobenzene-d5	NBD5	2	N/R	0 - 50 TRL
Phenol-d6	PHEND6	5	N/R	0 - 50 TRL
Terphenyl-d14	TRPD14	2	N/R	0 - 50 TRL
2-Fluorobiphenyl	2FBP	2	N/R	0 - 50 TRL
2-Fluorophenol	2FP	5	N/R	0 - 50 TRL
2,4,6-Tribromophenol	246TBP	5	N/R	0 - 50 TRL

Environmental samples requiring Category 6 analysis shall require reporting of compounds other than those found in Table 14 for identification and concentration when detected above 5 ug/l for the groundwater/surface water matrix and 5 ug/g for the soil/sediment matrix.

CATEGORY 7: GAS CHROMATOGRAPHY/PHOTOIONIZATION (EPA METHOD 602 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	TARGET REPORTING LIMIT (TRL)		TESTED RANGE
		WATER (ug/l)	SOIL (ug/g)	
Benzene	C6H6	0.5	N/R	0 - 50 TRL
Toluene	MEC6H5	1	N/R	0 - 50 TRL
Total Xylenes	Txylen	3	N/R	0 - 50 TRL

TABLE 1. CHEMICAL ANALYSIS CATEGORIES (CERTIFICATION CLASSES) (Cont)

CATEGORY 8: RADIONUCLIDES

USATHAMA CERTIFICATION NOT REQUIRED

COMPOUND	TEST NAME	TARGET REPORTING LIMIT (TRL)		TESTED RANGE
		WATER (pCi/l)	SOIL (pCi/g)	
Cesium 137	CS137	1	N/R	--
Cobalt 60	CO60	1	N/R	--
Gross Alpha	ALPHAG	1	N/R	--
Gross Beta	BETAG	1	N/R	--
Gamma Scan	GAMMAS	1	N/R	--
Uranium 234	U234	1	N/R	--
Uranium 238	U238	1	N/R	--

Radionuclides analysis shall be conducted in the following manner: Sample analysis will initially consist of a gross alpha and gross beta analysis. When the alpha analysis exceeds 15 pCi/l and/or beta analysis exceeds 50 pCi/l for the surface/groundwater matrix, a gamma scan will be conducted in order to identify contributing isotopes including as a minimum the isotopes listed.

CATEGORY 9: DIRECT ASPIRATION ATOMIC ABSORPTION (EPA METHOD 2__1 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	TARGET REPORTING LIMIT (TRL)		TESTED RANGE
		WATER (ug/l)	SOIL (ug/g)	
Zinc	ZN	50	N/R	0 - 20 TRL

N/R = Not required.

TBD = To be determined.

TABLE 2

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT
QUARTERLY GROUNDWATER CHEMICAL MONITORING

SITE	WELL ID	MINNESOTA #	DTR	QTR 1	QTR 2	QTR 3	QTR 4
A	01U022	234201	---	1 2	7		
	01U037	234207	---	1 2	7		
	01U038	234208	---	1 2	7		
	01U039	234209	---	1 2	7		
	01U040	234210	---	1 2	7		
	01U041	234211	---	1 2	7		
	01U063	234239	---	1 2	7		
	01U067	234243	---	1 2	7		
	01U100	236497	---	1 2	7		
	01U102	236499	---			1 2	7
	01U103	236500	---			1 2	7
	01U104	236501	---			1 2	7
	01U105	236502	---			1 2	7
	01U107	236504	---	1 2	7		
	01U108	236505	---	1 2	4	7	
	01U109	236506	---	1 2	7		
	01U110	236507	---	1 2	7		
	01U115	427411	---	1 2	4	7	1 1
	01U116	427412	---	1 2	4	7	1 1
	01U117	427413	---	1 2	4	7	1 1
	01U118	427414	---	1 2	4	7	1 1
	01U119	427415	---	1 2	4	7	1 1
	01U120	427416	---	1 2	4	7	1 1
	01U125 (1)		---	1 2	4	7	1 1
	01U126 (1)		---	1 2	4	7	1 1
	01U127 (1)		---	1 2	4	7	1 1
	03U011	234158	---				
03U022		---	1 2	7			
03U023		---			1 2	7	
B	01U034	234204	---			1 2	7
	01U035		---			1 2	7
	01U036	234206	---			1 2	7
	01U100	236497	---			1 2	7
	01U101	236498	---			1 2	7
	01U122 (1)		---	1 2	7		
C	01U045	234215	---			1 2	7 9
	01U085	236479	---			1 2	7 9
	03U024		---			1 2	7
	03U025		---			1 2	7 9
	03U031		---			1 2	7
	03U083	236478	---			1 2	7
D	03U018	234171	---			1 2	4
	03U093	236489	---			1 2	4
	03U096	236491	---			1 2	4
	03L091	236067	---			1 2	4
E	03U015	234166	---	1 2	4	7	1 1

TABLE 2
(continued)

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT
QUARTERLY GROUNDWATER CHEMICAL MONITORING

SITE	WELL ID	MINNESOTA #	QTR 1	QTR 2	QTR 3	QTR 4
	03U088	236482	---	1 2 4 7	1 1	1 1
	03U089	236483	---	1 2 4 7	1 1	1 1
	03U704		---	1 2 4 7	1 1	1 1
F	03U026		---	1 2 4 7	1 1	1 1
	03U090	236485	---	1 2 4 7	1 1	1 1
	03U092	236487	---	1 2 4 7	1 1	1 1
	03U112	236510	---	1 2 4 7	1 1	1 1
	03U113		---	1 2 4 7	1 1	1 1
	03U114		---	1 2 4 7	1 1	1 1
	03U121 (11)		---	1 2 4 7	1 1	1 1
	03L018	235749	---	1 2 4 7	1 1	1 1
	03L113	236080	---	1 2 4 7	1 1	1 1
B	03U014	234165	---		1 2 7	1 1
	03U019	234172	---		1 2 4 7	1 1
	03U020	234173	---		1 2 7	1 1
	03U094	236066	---		1 2 4 7	1 1
	03M020	234174	---		1 2 7	1 1
	03L014	235748	---		1 2 7	1 1
	03L020	234175	---		1 2 7	1 1
	04U020	234197	---		1 2 7	1 1
	PJ8074		---		1 2 7	1 1
	PJ8508	206759	---		1 2 7	1 1
H	01U060	234235	---	1 2 7		1 1
	01U098	236494	---	1 2 7		1 1
	03U005	234148	---	1 2 7		1 1
	03U099	236495	---	1 2 7	1 1	1 1
	03M005 (11)		---	1 2 7	1 1	1 1
I	03U003	234142	---		1 2 7	1 1
	03U004		---		1 2 7	1 1
	03U027		---		1 2 7	1 1
	03U028		---		1 2 7	1 1
	03U029		---		1 2 7	1 1
	03U030		---		1 2 7	1 1
	03U078	236073	---		1 2 7	1 1
	03U079	236072	---		1 2 7	1 1
	03U671		---		1 2 7	1 1
	03M003	234143	---		1 2 7	1 1
	03M004	234146	---		1 2 7	1 1
	03L003	234144	---		1 2 7	1 1
	03L004	234147	---		1 2 7	1 1
	03L078	236074	---		1 2 7	1 1
	03L079		---		1 2 7	1 1
J	01U050		---	1 2 7	1 1	1 1
	01U051	234222	---	1 2 7	1 1	1 1
	01U053		---	1 1	1 2 7 9	1 1

TABLE 2
(continued)

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT
QUARTERLY GROUNDWATER CHEMICAL MONITORING

SITE	WELL ID	MINNESOTA #	QTR 1	QTR 2	QTR 3	QTR 4
	01U054		1 1		1 1 2	7 9 1 1
	01U062	234237	1 1 2	7	1 1	1 1
	01U130		1 1		1 1 2	7 9 1 1
	01U131		1 1		1 1 2	7 9 1 1
	01U132		1 1		1 1 2	7 9 1 1
	01U524		1 1 2	7	1 1	1 1
	01U525		1 1 2	7	1 1	1 1
	01U526		1 1 2	7	1 1	1 1
	01U527		1 1 2	7	1 1	1 1
K	01U128 (1)		1 1 2	7 9	1 1 2	7 9 1 1 7 9
	01U601		1 1		1 1 2	7 9 1 1
	01U602		1 1		1 1 2	7 9 1 1
	01U603		1 1		1 1 2	7 9 1 1
	01U604		1 1		1 1 2	7 9 1 1
	01U605		1 1		1 1 2	7 9 1 1
	01U617		1 1		1 1 2	7 9 1 1
	01U618		1 1		1 1 2	7 9 1 1
	01U619		1 1		1 1 2	7 9 1 1
	01U622	194703	1 1		1 1 2	7 9 1 1
	03U075	236078	1 1		1 1 2	7 9 1 1
	03U076	236077	1 1		1 1 2	7 9 1 1
129- 3	03U087	236480	1 1 2	7	1 1	1 1 2 6
	03U521		1 1 2	7	1 1	1 1 2
129- 5	01U072		1 1 2	4 7	1 1	1 1 1 1 6
	03U097	236493	1 1 2	4 7	1 1	1 1 1 1
	03U111	236508	1 1 2	4 7	1 1	1 1 1 1
	03U129 (1)		1 1 2	4 7	1 1	1 1 1 1
129-15	03U032		1 1 2	7	1 1	1 1 1 1
	03U124 (1)		1 1 2	7	1 1	1 1 1 1
BKBRD WELLS	03U007	234150	1 1		1 1	1 1 1 1
	03U008	234153	1 1		1 1	1 1 1 1
	03U009	234154	1 1		1 1	1 1 1 1
	03U010	234155	1 1		1 1	1 1 1 1
	03U012	234159	1 1		1 1	1 1 1 1
	03L007	234152	1 1		1 1	1 1 1 1
	03L010	234157	1 1		1 1	1 1 1 1
	03L012	234161	1 1		1 1	1 1 1 1
	04U007	234195	1 1		1 1	1 1 1 1
	04U012	234196	1 1		1 1	1 1 1 1
	04U510	231742	1 1		1 1	1 1 1 1

TABLE 3

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT
SURFACE WATER QUALITY-CHEMICAL MONITORING

AREA	SITE TYPE	SITE ID	ANALYTICAL CATEGORIES			
SITE A	MT	SW050	1	2	3	
	DTCH	SW052	1	2	3	
SITE B	MT	SW054	1	2		
	MT	SW056	1	2		
SITE C	STRM	SW029	1	2		
SITE D	--	--				
SITE E	--	--				
SITE F	--	--				
SITE G	LAFL	SW046	1	2		3
SITE H	STRM	SW042	1	2	3	
	DTCH	SW038	1	2	3	
SITE I	SWER	SW033	1	2	3	6
	SWER	SW042	1	2	3	3 9
SITE J	SWER	SW031	1	2	3 4	6 9
	DTCH	SW022	1	2	3 4	8 9
SITE K	SWER	SW059	1	2		9
SITE 129-3	--	--				
SITE 129-5	--	--				
SITE 129-15	MT	SW047	1	2	3 4	
RICE CREEK	CRK	SW030	1	2		9
MARSDEN LAKE	LAKE	SW034	1	2		9

TABLE 4

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT
QUARTERLY GROUNDWATER LEVEL MEASUREMENTS

WELL ID	WELL ID	MINNESOTA #	QTR 1	QTR 2	QTR 3	QTR 4
01L811	01L811		x	x	x	x
01L813	01L813		x	x	x	x
01L816	01L816		x	x	x	x
01L821	01L821		x	x	x	x
01L822	01L822		x	x	x	x
01L823	01L823		x	x	x	x
01U003	01U003		x	x	x	x
01U004	01U004	234198	x	x	x	x
01U011	01U011	234199	x	x	x	x
01U012	01U012	234200	x	x	x	x
01U022	01U022	234201	x	x	x	x
01U033	01U033	234202	x	x	x	x
01U034	01U034	234204	x	x	x	x
01U035	01U035		x	x	x	x
01U036	01U036	234206	x	x	x	x
01U037	01U037	234207	x	x	x	x
01U038	01U038	234208	x	x	x	x
01U039	01U039	234209	x	x	x	x
01U040	01U040	234210	x	x	x	x
01U041	01U041	234211	x	x	x	x
01U043	01U043		x	x	x	x
01U044	01U044	234212	x	x	x	x
01U045	01U045	234215	x	x	x	x
01U046	01U046	234216	x	x	x	x
01U047	01U047	234217	x	x	x	x
01U048	01U048		x	x	x	x
01U050	01U050		x	x	x	x
01U051	01U051	234222	x	x	x	x
01U052	01U052	234223	x	x	x	x
01U053	01U053		x	x	x	x
01U054	01U054		x	x	x	x
01U060	01U060	234235	x	x	x	x
01U062	01U062	234237	x	x	x	x
01U063	01U063	234239	x	x	x	x
01U064	01U064	234240	x	x	x	x
01U065	01U065	234241	x	x	x	x
01U067	01U067	234243	x	x	x	x
01U072	01U072		x	x	x	x
01U085	01U085	236479	x	x	x	x
01U098	01U098	236494	x	x	x	x
01U100	01U100	236497	x	x	x	x
01U101	01U101	236498	x	x	x	x
01U102	01U102	236499	x	x	x	x
01U103	01U103	236500	x	x	x	x
01U104	01U104	236501	x	x	x	x
01U105	01U105	236502	x	x	x	x
01U106	01U106	236503	x	x	x	x
01U107	01U107	236504	x	x	x	x
01U108	01U108	236505	x	x	x	x
01U109	01U109	236506	x	x	x	x

TABLE 4
(continued)

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT
QUARTERLY GROUNDWATER LEVEL MEASUREMENTS

WELL ID	WELL ID	MINNESOTA #	QTR 1	QTR 2	QTR 3	QTR 4
01U110	01U110	236507	x	x	x	x
01U115	01U115	427411	x	x	x	x
01U116	01U116	427412	x	x	x	x
01U117	01U117	427413	x	x	x	x
01U118	01U118	427414	x	x	x	x
01U119	01U119	427415	x	x	x	x
01U120	01U120	427410	x	x	x	x
01U122 (1)	01U122 (1)		x	x	x	x
01U125 (1)	01U125 (1)		x	x	x	x
01U126 (1)	01U126 (1)		x	x	x	x
01U127 (1)	01U127 (1)		x	x	x	x
01U128 (1)	01U128 (1)		x	x	x	x
01U130 (1)	01U130 (1)		x	x	x	x
01U131 (1)	01U131 (1)		x	x	x	x
01U132 (1)	01U132 (1)		x	x	x	x
01U524	01U524		x	x	x	x
01U525	01U525		x	x	x	x
01U526	01U526		x	x	x	x
01U527	01U527		x	x	x	x
01U537	01U537		x	x	x	x
01U601	01U601		x	x	x	x
01U602	01U602		x	x	x	x
01U603	01U603		x	x	x	x
01U604	01U604		x	x	x	x
01U605	01U605		x	x	x	x
01U607	01U607		x	x	x	x
01U608	01U608		x	x	x	x
01U609	01U609		x	x	x	x
01U611	01U611		x	x	x	x
01U612	01U612	194758	x	x	x	x
01U613	01U613	194759	x	x	x	x
01U615	01U615	194760	x	x	x	x
01U616	01U616	194761	x	x	x	x
01U617	01U617	194770	x	x	x	x
01U618	01U618	194771	x	x	x	x
01U619	01U619	194772	x	x	x	x
01U620	01U620	194701	x	x	x	x
01U621	01U621	194702	x	x	x	x
01U622	01U622	194703	x	x	x	x
01U623	01U623	194704	x	x	x	x
01U624A	01U624A		x	x	x	x
01U624B	01U624B		x	x	x	x
01U624C	01U624C		x	x	x	x
01U624D	01U624D		x	x	x	x
01U625A	01U625A		x	x	x	x
01U625B	01U625B		x	x	x	x
01U625C	01U625C		x	x	x	x
01U625D	01U625D		x	x	x	x
01U626A	01U626A		x	x	x	x
01U626B	01U626B		x	x	x	x

TABLE 4
(continued)

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT
QUARTERLY GROUNDWATER LEVEL MEASUREMENTS

WELL ID	WELL ID	MINNESOTA #	QTR 1	QTR 2	QTR 3	QTR 4
01U626C	01U626C		x	x	x	x
01U626D	01U626D		x	x	x	x
01U627A	01U627A		x	x	x	x
01U627B	01U627B		x	x	x	x
01U627C	01U627C		x	x	x	x
01U627D	01U627D		x	x	x	x
01U628A	01U628A		x	x	x	x
01U628B	01U628B		x	x	x	x
01U628C	01U628C		x	x	x	x
01U628D	01U628D		x	x	x	x
01U631	01U631		x	x	x	x
01U632	01U632		x	x	x	x
01U634	01U634		x	x	x	x
01U635	01U635		x	x	x	x
01U636	01U636		x	x	x	x
01U638	01U638		x	x	x	x
01U639	01U639		x	x	x	x
01U640	01U640		x	x	x	x
01U642	01U642		x	x	x	x
01U652	01U652		x	x	x	x
01U666	01U666		x	x	x	x
01U667	01U667		x	x	x	x
01U668	01U668		x	x	x	x
01U675	01U675		x	x	x	x
01U803	01U803		x	x	x	x
01U805	01U805		x	x	x	x
01U806	01U806		x	x	x	x
01U807	01U807		x	x	x	x
01U808	01U808		x	x	x	x
01U813	01U813		x	x	x	x
03U001	03U001	234135	x	x	x	x
03U002	03U002	234139	x	x	x	x
03U003	03U003	234142	x	x	x	x
03U004	03U004		x	x	x	x
03U005	03U005	234148	x	x	x	x
03U006	03U006	234149	x	x	x	x
03U007	03U007	234150	x	x	x	x
03U008	03U008	234153	x	x	x	x
03U009	03U009	234154	x	x	x	x
03U010	03U010	234155	x	x	x	x
03U011	03U011	234158	x	x	x	x
03U012	03U012	234159	x	x	x	x
03U013	03U013	234162	x	x	x	x
03U014	03U014	234165	x	x	x	x
03U015	03U015	234166	x	x	x	x
03U016	03U016	234167	x	x	x	x
03U017	03U017	234168	x	x	x	x
03U018	03U018	234171	x	x	x	x
03U019	03U019	234172	x	x	x	x

TABLE 4
(continued)

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT
QUARTERLY GROUNDWATER LEVEL MEASUREMENTS

WELL ID	WELL ID	MINNESOTA #	QTR 1	QTR 2	QTR 3	QTR 4
03U020	03U020	234173	x	x	x	x
03U021	03U021	234176	x	x	x	x
03U022	03U022		x	x	x	x
03U023	03U023		x	x	x	x
03U024	03U024		x	x	x	x
03U025	03U025		x	x	x	x
03U026	03U026		x	x	x	x
03U027	03U027		x	x	x	x
03U028	03U028		x	x	x	x
03U029	03U029		x	x	x	x
03U030	03U030		x	x	x	x
03U031	03U031		x	x	x	x
03U032	03U032		x	x	x	x
03U075	03U075	236078	x	x	x	x
03U076	03U076	236077	x	x	x	x
03U077	03U077	236075	x	x	x	x
03U078	03U078	236073	x	x	x	x
03U079	03U079	236072	x	x	x	x
03U082	03U082	236476	x	x	x	x
03U083	03U083	236478	x	x	x	x
03U084	03U084	236069	x	x	x	x
03U087	03U087	236480	x	x	x	x
03U088	03U088	236482	x	x	x	x
03U089	03U089	236483	x	x	x	x
03U090	03U090	236485	x	x	x	x
03U092	03U092	236487	x	x	x	x
03U093	03U093	236489	x	x	x	x
03U094	03U094	236066	x	x	x	x
03U096	03U096	236491	x	x	x	x
03U097	03U097	236493	x	x	x	x
03U099	03U099	236495	x	x	x	x
03U111	03U111	236508	x	x	x	x
03U112	03U112	236510	x	x	x	x
03U113	03U113		x	x	x	x
03U114	03U114		x	x	x	x
03U121 (1)	03U121 (1)		x	x	x	x
03U124 (1)	03U124 (1)		x	x	x	x
03U129 (1)	03U129 (1)		x	x	x	x
03U301	03U301		x	x	x	x
03U521	03U521		x	x	x	x
03U528	03U528		x	x	x	x
03U647	03U647		x	x	x	x
03U648	03U648		x	x	x	x
03U658	03U658		x	x	x	x
03U659	03U659		x	x	x	x
03U671	03U671		x	x	x	x
03U672	03U672		x	x	x	x
03U673	03U673		x	x	x	x
03U674	03U674		x	x	x	x
03U675	03U675		x	x	x	x

TABLE 4
(continued)

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT
QUARTERLY GROUNDWATER LEVEL MEASUREMENTS

WELL ID	WELL ID	MINNESOTA #	QTR 1	QTR 2	QTR 3	QTR 4
03U701	03U701		x	x	x	x
03U702	03U702		x	x	x	x
03U703	03U703		x	x	x	x
03U704	03U704		x	x	x	x
03U705	03U705		x	x	x	x
03U706	03U706		x	x	x	x
03U707	03U707		x	x	x	x
03U708	03U708		x	x	x	x
03U709	03U709		x	x	x	x
03U710	03U710		x	x	x	x
03U711	03U711		x	x	x	x
03U801	03U801		x	x	x	x
03U803	03U803	421434	x	x	x	x
03U804	03U804	421433	x	x	x	x
03U805	03U805	421432	x	x	x	x
03U806	03U806	421429	x	x	x	x
03U811	03U811	426808	x	x	x	x
03U815	03U815	426862	x	x	x	x
03U821	03U821	426810	x	x	x	x
03U822	03U822	426812	x	x	x	x
03U824	03U824	426814	x	x	x	x
03U831	03U831	426862	x	x	x	x
03U832	03U832	426864	x	x	x	x
		409595	x	x	x	x
		409598	x	x	x	x
		409596	x	x	x	x
409550	409550	MPCA6 (03U)	x	x	x	x
03M001	03M001	234136	x	x	x	x
03M002	03M002	234140	x	x	x	x
03M003	03M003	234143	x	x	x	x
03M004	03M004	234146	x	x	x	x
03M005 (1)	03M005 (1)		x	x	x	x
03M007	03M007	234151	x	x	x	x
03M010	03M010	234156	x	x	x	x
03M012	03M012	234160	x	x	x	x
03M013	03M013	234163	x	x	x	x
03M017	03M017	234169	x	x	x	x
03M020	03M020	234174	x	x	x	x
03M505	03M505		x	x	x	x
03M532	03M532		x	x	x	x
03M802	03M802		x	x	x	x
03M806	03M806		x	x	x	x
03M843	03M843		x	x	x	x
03M848	03M848		x	x	x	x
409556	409556	MPCA4 (03M)	x	x	x	x
409557	409557	MPCA1 (03M)	x	x	x	x
03L001	03L001	234137	x	x	x	x
03L002	03L002	234141	x	x	x	x

TABLE 4
(continued)

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT
QUARTERLY GROUNDWATER LEVEL MEASUREMENTS

WELL ID	WELL ID	MINNESOTA #	QTR 1	QTR 2	QTR 3	QTR 4
03L003	03L003	234144	x	x	x	x
03L004	03L004	234147	x	x	x	x
03L005	03L005	236079	x	x	x	x
03L007	03L007	234152	x	x	x	x
03L010	03L010	234157	x	x	x	x
03L012	03L012	234161	x	x	x	x
03L013	03L013	234164	x	x	x	x
03L014	03L014	235748	x	x	x	x
03L017	03L017	234170	x	x	x	x
03L018	03L018	235749	x	x	x	x
03L020	03L020	234175	x	x	x	x
03L021	03L021	235750	x	x	x	x
03L027	03L027	235751	x	x	x	x
03L028	03L028	235752	x	x	x	x
03L029	03L029	235753	x	x	x	x
03L077	03L077		x	x	x	x
03L078	03L078	236074	x	x	x	x
03L079	03L079		x	x	x	x
03L080	03L080	236071	x	x	x	x
03L081	03L081	236070	x	x	x	x
03L084 (1)	03L084 (1)		x	x	x	x
03L086	03L086	236068	x	x	x	x
03L091	03L091	236067	x	x	x	x
03L113	03L113	236080	x	x	x	x
03L522	03L522	231854	x	x	x	x
03L523	03L523	206725	x	x	x	x
03L529	03L529		x	x	x	x
03L673	03L673	426815	x	x	x	x
03L802	03L802	426817	x	x	x	x
03L806	03L806	421429	x	x	x	x
03L809	03L809	426868	x	x	x	x
03L811	03L811	426809	x	x	x	x
03L813	03L813	426818	x	x	x	x
03L822	03L822	426813	x	x	x	x
03L832	03L832	426863	x	x	x	x
03L841 (1)	03L841 (1)		x	x	x	x
03L848	03L848	416199	x	x	x	x
03L853	03L853	426858	x	x	x	x
03L854	03L854	426859	x	x	x	x
03L856	03L856	426861	x	x	x	x
03L858	03L858	416081	x	x	x	x
03L859 (1)	03L859 (1)		x	x	x	x
03L860 (1)	03L860 (1)		x	x	x	x
03L861 (1)	03L861 (1)		x	x	x	x
		409597	x	x	x	x
409546	409546	MPCA2 (03L)	x	x	x	x
03F302	03F302	426842	x	x	x	x
03F303	03F303	426843	x	x	x	x
03F304	03F304	426844	x	x	x	x

TABLE 4
(continued)

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT
QUARTERLY GROUNDWATER LEVEL MEASUREMENTS

WELL ID	WELL ID	MINNESOTA #	QTR 1	QTR 2	QTR 3	QTR 4
03F305	03F305	426845	x	x	x	x
03F306	03F306	426846	x	x	x	x
03F307	03F307	426847	x	x	x	x
04U001	04U001	234138	x	x	x	x
04U002	04U002	234194	x	x	x	x
04U003	04U003	234193	x	x	x	x
04U007	04U007	234195	x	x	x	x
04U012	04U012	234196	x	x	x	x
04U020	04U020	234197	x	x	x	x
04U027	04U027		x	x	x	x
04U077	04U077		x	x	x	x
04U510	04U510	231742	x	x	x	x
04U673	04U673	426857	x	x	x	x
04U701	04U701		x	x	x	x
04U702	04U702		x	x	x	x
04U708	04U708		x	x	x	x
04U709	04U709		x	x	x	x
04U711	04U711		x	x	x	x
04U802	04U802	236450	x	x	x	x
04U806	04U806	236464	x	x	x	x
04U821	04U821	426811	x	x	x	x
04U832	04U832	426866	x	x	x	x
04U841	04U841	426851	x	x	x	x
04U843	04U843	426853	x	x	x	x
04U844	04U844	426854	x	x	x	x
04U845	04U845	426855	x	x	x	x
04U846	04U846	426856	x	x	x	x
04U847	04U847	426857	x	x	x	x
04U848	04U848	416078	x	x	x	x
04U849	04U849	416082	x	x	x	x
04U850	04U850	416200	x	x	x	x
04U851	04U851	416198	x	x	x	x
04U852	04U852	416080	x	x	x	x
04U854	04U854		x	x	x	x
04U855	04U855	426860	x	x	x	x
04U859	04U859		x	x	x	x
04U860	04U860		x	x	x	x
04U861	04U861		x	x	x	x
409548	409548	MPCA2A (04U)	x	x	x	x
409549	409549	MPCA3 (04U)	x	x	x	x
409555	409555	MPCAS (04U)	x	x	x	x
		191942	x	x	x	x
PJ#003	PJ#003	236468	x	x	x	x
PJ#027	PJ#027	236469	x	x	x	x
PJ#074	PJ#074		x	x	x	x
PJ#501	PJ#501	206754	x	x	x	x
PJ#502	PJ#502	206756	x	x	x	x
PJ#503	PJ#503	206758	x	x	x	x

TABLE 4
(continued)

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT
QUARTERLY GROUNDWATER LEVEL MEASUREMENTS

WELL ID	WELL ID	MINNESOTA #	QTR 1	QTR 2	QTR 3	QTR 4
PJ#506	PJ#506	206753	x	x	x	x
PJ#507	PJ#507	206755	x	x	x	x
PJ#508	PJ#508	206759	x	x	x	x
PJ#802	PJ#802	236437	x	x	x	x
PJ#806	PJ#806	236465	x	x	x	x
409547	409547	MPCA1A(PJ#)	x	x	x	x

UNIT	TOTAL/QTR
UNIT 1	130
UNIT 3 (U)	96
UNIT 3 (M)	19
UNIT 3 (L)	48
UNIT 4	39
PJ#	12
TOTAL/QTR	344
TOTAL/YR	1376

TABLE 5
TWIN CITIES ARMY AMMUNITION PLANT
GROUND WATER CRITERIA

CATEGORY 1: GAS CHROMATOGRAPHY/CONDUCTIVITY DETECTOR (EPA METHOD 601 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Chloroform	CHCL3	2.00
Vinyl Chloride	C2H3CL	0.18
Tetrachloroethylene	TCLEE	0.88
Trichloroethylene	TRCLE	5.00
1,1 Dichloroethylene	11DCE	7.00
1,1,1-Trichloroethane	111TCE	200.00
1,1,2-Trichloroethane	112TCE	0.60
1,2-Dichloroethylenes	12DCE	70.00
1,2-Dichloroethane	12DCLE	5.00
1,2-Dichloropropane	12DCLP	6.00

CATEGORY 2: FURNACE ATOMIC ABSORPTION (EPA METHOD 2__2 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Arsenic	AS	50.00
Barium	BA	1500.00
Cadmium	CD	5.00
Chromium	CR	120.00
Nickel	NI	150.00
Lead	PB	20.00

CATEGORY 3: COLD VAPOR ATOMIC ABSORPTION (EPA METHOD 245 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Mercury	HG	3.00

TABLE 5 (Cont)

CATEGORY 4: SPECTROPHOTOMETRY/COLORIMETRY (EPA METHOD SERIES 300 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Cyanide	CYN	200.00

CATEGORY 5: GAS CHROMATOGRAPHY/ELECTRON CAPTURE (EPA METHOD 608 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Aroclor 1016	PCB016	0.08
Aroclor 1242	PCB242	0.08
Aroclor 1248	PCB248	0.08
Aroclor 1254	PCB254	0.08
Aroclor 1260	PCB260	0.08

CATEGORY 7: GAS CHROMATOGRAPHY/PHOTOIONIZATION (EPA METHOD 602 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Benzene	C6H6	5.00
Toluene	MEC6H5	2000.00
Total Xylenes	TXYLEN	440.00

CATEGORY 8: RADIONUCLIDES

USATHAMA CERTIFICATION NOT REQUIRED

COMPOUND	TEST NAME	CRITERIA (pci/l)
Gross Alpha	ALPHAG	15.00
Gross Beta	BETAG	50.00
Gamma Scan	GAMMAS	50.00

CATEGORY 9: DIRECT ASPIRATION ATOMIC ABSORPTION (EPA METHOD 2__1 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Zinc	ZN	5000.00

TABLE 6

TWIN CITIES ARMY AMMUNITION PLANT
SURFACE WATER CRITERIA

CATEGORY 1: GAS CHROMATOGRAPHY/CONDUCTIVITY DETECTOR (EPA METHOD 601 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Chloroform	CHCL3	1.90
Vinyl Chloride	C2H3CL	20.00
Tetrachloroethylene	TCLEE	8.00
Trichloroethylene	TRCLE	27.00
1,1 Dichloroethylene	11DCE	0.33
1,1,1-Trichloroethane	111TCE	18,000.00
1,1,2-Trichloroethane	112TCE	6.00
1,2-Dichloroethylenes	12DCE	70.00
1,2-Dichloroethane	12DCLE	9.40
1,2-Dichloropropane	12DCLP	5,700.00

CATEGORY 2: FURNACE ATOMIC ABSORPTION (EPA METHOD 2__2 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Arsenic	AS	50.00
Barium	BA	1500.00
Cadmium	CD	$e (0.7852(\ln(\text{hardness}))) - 3.490$
Chromium	CR	50.00
Nickel	NI	13.40
Lead	PB	$e 1.273(\ln(\text{hardness})) - 4.705$

CATEGORY 3: COLD VAPOR ATOMIC ABSORPTION (EPA METHOD 245 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Mercury	HG	0.144

TABLE 6 (Cont)

CATEGORY 4: SPECTROPHOTOMETRY/COLORIMETRY (EPA METHOD SERIES 300 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Cyanide	CYN	5.20

CATEGORY 5: GAS CHROMATOGRAPHY/ELECTRON CAPTURE (EPA METHOD 608 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Aroclor 1016	PCB016	0.08
Aroclor 1242	PCB242	0.08
Aroclor 1248	PCB248	0.08
Aroclor 1254	PCB254	0.08
Aroclor 1260	PCB260	0.08

CATEGORY 7: GAS CHROMATOGRAPHY/PHOTOIONIZATION (EPA METHOD 602 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA
Benzene	C6H6	6.60
Toluene	MEC6H5	14,300.00
Total Xylenes	TXYLEN	440.00

CATEGORY 8: RADIONUCLIDES
USATHAMA CERTIFICATION NOT REQUIRED

COMPOUND	TEST NAME	CRITERIA (pci/l)
Gross Alpha	ALPHAG	15.00
Gross Beta	BETAG	50.00
Gamma Scan	GAMMAS	50.00

CATEGORY 9: DIRECT ASPIRATION ATOMIC ABSORPTION (EPA METHOD 2__1 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Zinc	ZN	47.00

USATHANA QA PROGRAM

DECEMBER 1983
1ST EDITION

U.S. ARMY TOXIC AND HAZARDOUS MATERIALS
ABERDEEN PROVING GROUND MD 285-5000

TABLE 7. HAZARDOUS SUBSTANCE LIST

COMPOUND (Volatiles)	TEST NAME
1. Chloromethane	CH3CL
2. Bromomethane	CH3BR
3. Vinyl Chloride	C2H3CL
4. Chloroethane	C2H5CL
5. Methylene Chloride	CH2CL2
6. Acetone	ACET
7. Carbon Disulfide	CS2
8. 1,1-Dichloroethene	11DCE
9. 1,1-Dichloroethane	11DCLE
10. trans-1,2-Dichloroethene (1,2-Dichloroethylenes)	12DCE
11. Chloroform	CHCL3
12. 1,2-Dichloroethane	12DCLE
13. 2-Butanone	MEK
14. 1,1,1-Trichloroethane	111TCE
15. Carbon Tetrachloride	CCL4
16. Vinyl Acetate	C2AVE
17. Bromodichloromethane	BRDCLM
18. 1,1,2,2-Tetrachloroethane	TCLEA
19. 1,2-Dichloropropane	12DCLP
20. trans-1,3-Dichloropropene (1,3-Dichloropropenes)	130CP
21. Trichloroethene	TRCLE
22. Dibromochloromethane	DBRCLM
23. 1,1,2-Trichloroethane	112TCE
24. Benzene	C6H6
25. cis-1,3-Dichloropropene (1,3-Dichloropropenes)	130CP
26. 2-Chloroethyl Vinyl Ether	2CLEVE
27. Bromoform	CHBR3
28. 2-Hexanone	MNBK
29. 4-Methyl-2-pentanone	MIBK
30. Tetrachloroethene	TCLEE
31. Toluene	MEC6H5
32. Chlorobenzene	CLC6H5
33. Ethyl Benzene	ETC6H5
34. Styrene	STYR
35. Xylenes (meta)	130MB
(ortho & para)	XYLEN
(total)	TXYLEN
(Semi-Volatiles)	
36. Phenol	PHENOL
37. bis(2-Chloroethyl) ether	B2CLEE
38. 2-Chlorophenol	2CLP
39. 1,3-Dichlorobenzene	130CLB
40. 1,4-Dichlorobenzene	140CLB
41. Benzyl Alcohol	BZALC

TABLE 7. HAZARDOUS SUBSTANCE LIST (Cont)

42.	1,2-Dichlorobenzene	12DCLB
43.	2-Methylphenol	2MP
44.	bis(2-Chloroisopropyl) ether	B2CIPE
45.	4-Methylphenol	4MP
46.	N-Nitroso-Dipropylamine	NNDNPA
47.	Hexachloroethane	CL6ET
48.	Nitrobenzene	NB
49.	Isophorone	ISOPHR
50.	2-Nitrophenol	2NP
51.	2,4-Dimethylphenol	24DMPN
52.	Benzoic Acid	BENZOA
53.	bis(2-Chloroethoxy) methane	B2CEXM
54.	2,4-Dichlorophenol	24DCLP
55.	1,2,4-Trichlorobenzene	124TCB
56.	Naphthalene	NAP
57.	4-Chloroaniline	4CANIL
58.	Hexachlorobutadiene	HCBD
59.	4-Chloro-3-methylphenol (para-chloro-meta-cresol)	4CL3C
60.	2-Methylnaphthalene	2MNAP
61.	Hexachlorocyclopentadiene	CL6CP
62.	2,4,6-Trichlorophenol	246TCP
63.	2,4,5-Trichlorophenol	245TCP
64.	2-Chloronaphthalene	2CNAP
65.	2-Nitroaniline	2NANIL
66.	Dimethyl Phthalate	DMP
67.	Acenaphthylene	ANAPYL
68.	3-Nitroaniline	3NANIL
69.	Acenaphthene	ANAPNE
70.	2,4-Dinitrophenol	24DNP
71.	4-Nitrophenol	4NP
72.	Dibenzofuran	DBZFUR
73.	2,4-Dinitrotoluene	24DNT
74.	2,6-Dinitrotoluene	26DNT
75.	Diethylphthalate	DEP
76.	4-Chlorophenyl Phenyl ether	4CLPPE
77.	Fluorene	FLRENE
78.	4-Nitroaniline	4NANIL
79.	4,6-Dinitro-2-methylphenol	46DN2C
80.	N-nitrosodiphenylamine	NNDPA
81.	4-Bromophenyl Phenyl ether	4BRPPE
82.	Hexachlorobenzene	CL6BZ
83.	Pentachlorophenol	PCP
84.	Phenanthrene	PHANTR
85.	Anthracene	ANTRC
86.	Di-n-butylphthalate	DNBP
87.	Fluoranthene	FANT
88.	Pyrene	PYR
89.	Butyl Benzyl Phthalate	BBZP

TABLE 7. HAZARDOUS SUBSTANCE LIST (Cont)

90.	3,3'-Dichlorobenzidine	33DC8D
91.	Benzo(a)anthracene	BAANTR
92.	bis(2-ethylhexyl)phthalate	B2EHP
93.	Chrysene	CHRY
94.	Di-n-octyl Phthalate	DNOP
95.	Benzo(b)fluoranthene	BBFANT
96.	Benzo(k)fluoranthene	BKFANT
97.	Benzo(a)pyrene	BAPYR
98.	Indeno(1,2,3-cd)pyrene	ICDPYR
99.	Dibenz(a,h)anthracene	DBAHA
100.	Benzo(g,h,i)perylene	BGHIPIY

(Pesticides)

101.	alpha-BHC	ABHC
102.	beta-BHC	BBHC
103.	delta-BHC	DBHC
104.	gamma-BHC (Lindane)	LIN
105.	Heptachlor	HPCL
106.	Aldrin	ALDRN
107.	Heptachlor Epoxide	HPCLE
108.	Endosulfan I	AENSLF
109.	Dieldrin	DLDRN
110.	4,4'-DDE	PPDDE
111.	Endrin	ENDRN
112.	Endosulfan II	BENSLF
113.	4,4'-DDD	PPDD
114.	Endosulfan Sulfate	ESFS04
115.	4,4'-DDT	PPDDT
116.	Endrin Ketone	ENDRNK
117.	Methoxychlor	MEXCLR
118.	Chlordane	CLDAN
119.	Toxaphene	TXPHEN
120.	AROCLOR-1016	PCB016
121.	AROCLOR-1221	PCB221
122.	AROCLOR-1232	PCB232
123.	AROCLOR-1242	PCB242
124.	AROCLOR-1248	PCB248
125.	AROCLOR-1254	PCB254
126.	AROCLOR-1260	PCB260

INSTALLATION RESTORATION PROGRAM
TWIN CITIES ARMY AMMUNITION PLANT
MONITORING - QUARTERLY
GROUNDWATER & SURFACE WATER
COST PROPOSAL

ITEM			COST
1. PROJECT QUALITY CONTROL PLAN			\$
2. GROUNDWATER STABILIZED MEASUREMENTS:			
FOUR(4) QUARTERS @	344 WELLS/QTR		
1376 WELLS @	/WELL		\$ 0
3. GROUNDWATER SAMPLING:			
1ST QTR:	0 WELLS @	/WELL	\$ 0
2ND QTR:	53 WELLS @	0 /WELL	\$ 0
3RD QTR:	93 WELLS @	0 /WELL	\$ 0
4TH QTR:	55 WELLS @	0 /WELL	\$ 0
4. SURFACE WATER SAMPLING:			
1ST QTR:	0 SAMPL @	/SAMP	\$ 0
2ND QTR:	16 SAMPL @	0 /SAMP	\$ 0
3RD QTR:	16 SAMPL @	0 /SAMP	\$ 0
4TH QTR:	16 SAMPL @	0 /SAMP	\$ 0
5. GROUNDWATER CHEMICAL ANALYSIS			
DATES 1:	219 SAMPL @	/SAMP	\$ 0
DATES 2:	220 SAMPL @	/SAMP	\$ 0
DATES 3:	0 SAMPL @	/SAMP	\$ 0
DATES 4:	42 SAMPL @	/SAMP	\$ 0
DATES 5:	0 SAMPL @	/SAMP	\$ 0
DATES 6:	5 SAMPL @	/SAMP	\$ 0
DATES 7:	120 SAMPL @	/SAMP	\$ 0
DATES 8:	0 SAMPL @	/SAMP	\$ 0
DATES 9:	22 SAMPL @	/SAMP	\$ 0
6. SURFACE WATER CHEMICAL ANALYSIS			
DATES 1:	16 SAMPL @	/SAMP	\$ 0
DATES 2:	16 SAMPL @	/SAMP	\$ 0
DATES 3:	9 SAMPL @	/SAMP	\$ 0
DATES 4:	9 SAMPL @	/SAMP	\$ 0
DATES 5:	0 SAMPL @	/SAMP	\$ 0
DATES 6:	0 SAMPL @	/SAMP	\$ 0
DATES 7:	0 SAMPL @	/SAMP	\$ 0
DATES 8:	0 SAMPL @	/SAMP	\$ 0
DATES 9:	0 SAMPL @	/SAMP	\$ 0

INSTALLATION WATER SUPPLY PROGRAM
 WEST DISTRICT ARMY AMMUNITION CENTER
 MONITORING - SUMMARY
 GROUND WATER & SURFACE WATER
 COST SUMMARY

1. DATA MANAGEMENT

GROUNDWATER STATIONFIELD	1074
CHEMICAL PRODUCTION	
DATE 1	219
DATE 2	220
DATE 3	0
DATE 4	0
DATE 5	0
DATE 6	500
DATE 7	500
DATE 8	0
DATE 9	0
TOTAL	1000
DATE 1	0
DATE 2	0
DATE 3	0
DATE 4	0
DATE 5	0
DATE 6	0
DATE 7	0
DATE 8	0
DATE 9	0
TOTAL	0
GROUNDWATER STATIONFIELD	
DATE 1	1000
DATE 2	100
TOTAL	1100

2. SUBJECT COMMENTS

DATE 1	1000
DATE 2	100
TOTAL	1100
DATE 1	1000
DATE 2	100
TOTAL	1100

APPENDIX 2

**Installation Restoration Program
U.S. Army Toxic & Hazardous Materials Agency
Data Management System Requirements**

DATA MANAGEMENT

The contractor shall establish a Data Management Program to implement the contract requirements. The Data Management Program shall be described in the Data Management Plan and shall detail the contractor's procedures, organization, and methodology to be used to satisfy the below stated requirements. The Data Management Program shall conform to the policies and procedures of the USATHAMA Installation Restoration Data Management System (IRDMS) described below. Should modifications in these policies and/or procedures be indicated, the Government shall notify the contractor, who shall make the required modification(s) to this Data Management Program.

The flow of data from their creation through processing and storage to retrieval is schematically presented in Figure 1.

The contractor shall propose a means of capturing and electronically recording the data in a form corresponding to that described in the most current version of the IRDMS User's Guide for the appropriate type of record. The Government will make available software which will assist in the entry, editing and error checking of data.

The contractor shall have available the following minimum microcomputer hardware and software configuration on which to process IR data:

IBM PC-AT microcomputer or functional equivalent, configured with one 20MB hard disk, one 360KB diskette drive, one 1.2MB diskette drive, 512K of RAM, and a math coprocessor.

Hayes or Microcom 1200 baud modem or functional equivalent
Graphic printer for output (wide carriage)
D-Base III
DOS version 3.2
3+ Remote version 1.1 (3 COM Corp)
ZSTEMPC-4014 Tektronix 4014 emulator software
Crosstalk communications software

A color monitor with adapter capable of resolutions of 640 x 480 pixels will be useful in graphics applications in the IRDMS.

This equipment will be used for all data entry and error checking processes. Only when all errors have been corrected will a file be transmitted to the IRDMS Local Area Network at Edgewood, MD. The contractor may seek reimbursement for telephone charges related to data transmission.

There are three levels of data recognized in the IRDMS. Level 1 consists of all files generated by the contractor on his microcomputer, either as a result of data entry, or generated by the error checking program. The only Level 1 files which are present on the UNIVAC are program files. Program files are files composed of several elements. An element may contain various contractor-written utilities or programs, add-streams, or other recurringly used set of commands. Each contractor is authorized two program files, the names of which shall be furnished to the Government within 7 calendar days of their creation.

Error-free files should be transmitted at least weekly to the IRDMS network. Each received file will be processed through an error checking program identical to that on the contractor's microcomputer, in order to verify acceptance. Accepted files will then be sent to the UNIVAC. Should any files fail this final error check, the submitting contractor will be notified and required to correct detected errors and retransmit the data.

Upon arrival at the UNIVAC, files are classified as Level 2 files. These records are protected by write keys, and therefore may not be modified by the contractor. They may be read by the contractor, provided the appropriate read key is specified. All Level 2 files are the responsibility of the Government. Level 2 files exist only until the data are loaded into the appropriate installation data base, normally less than 10 working days.

Data in the installation data base are considered Level 3 data. They may be accessed by the contractor using government supplied report programs and the appropriate read key, but are protected from changes by write keys. The installation data bases are the responsibility of the Government.

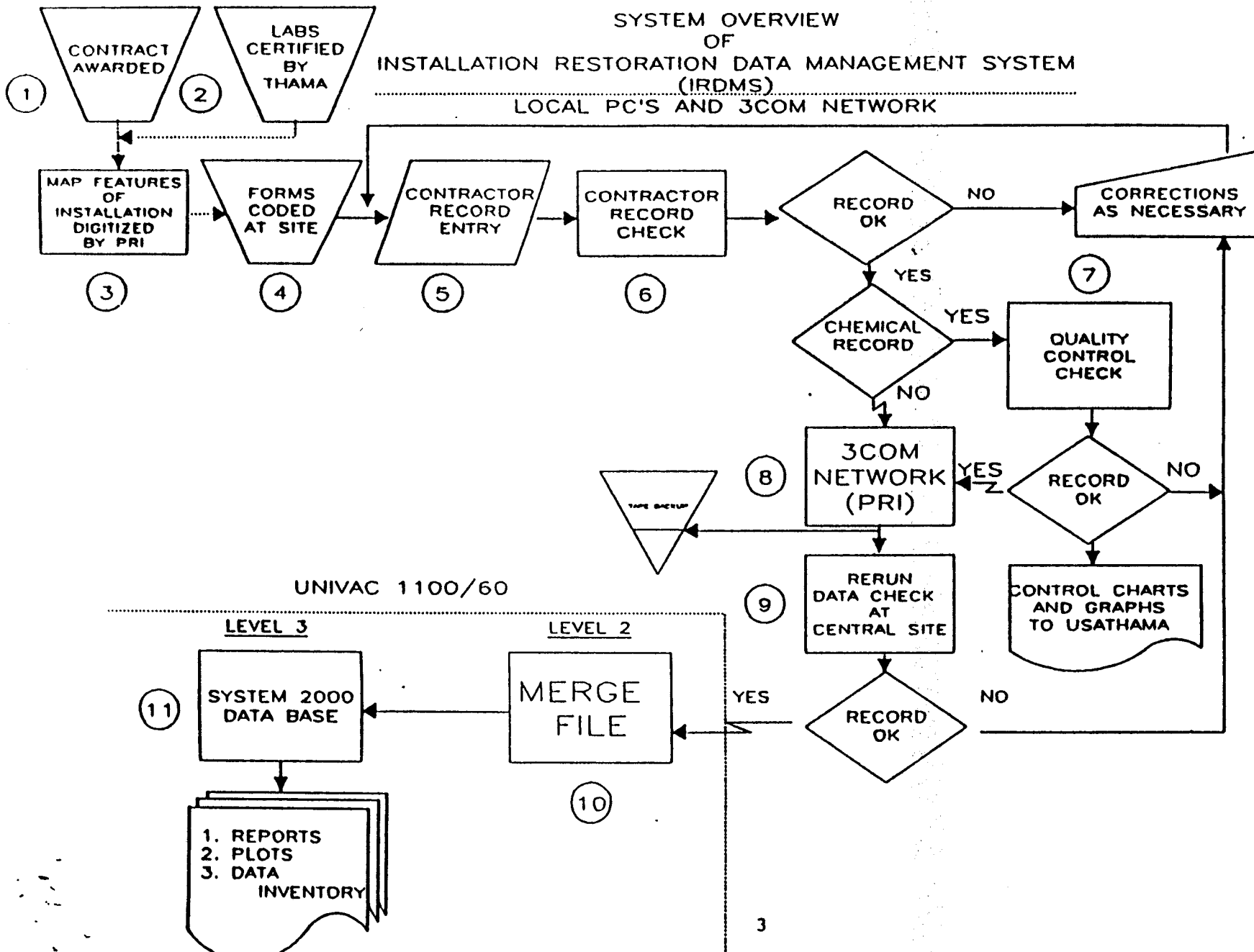
The contractor shall be responsible for the accuracy of all data he submits to the IRDMS. He shall insure that all data entered into and resident in the IRDMS as a result of the contract exactly correspond to the data contained in the original books of entry (i.e. laboratory bench sheets). The accuracy verification shall be accomplished, and the CO or his technical representative notified, within 5 working days following transfer or any data from Level 1 to Level 2.

The type of data to be entered into the IRDMS is specified elsewhere in the contract. Map location data must be submitted before any other data. Methods certification must be approved by the Government prior to submission of any chemical data analyzed by the method.

Communications difficulties between the contractor's microcomputer and the IRDMS 3COM Local Area Network, or between the contractor's microcomputer and the central site processor should be documented to the attention of USATHAMA. Particular note should be made of time and date, type of microcomputer and modem, communications software and settings, number called, and nature of the problem. Hard copies of any error messages are particularly helpful.

SYSTEM OVERVIEW
OF
INSTALLATION RESTORATION DATA MANAGEMENT SYSTEM
(IRDMS)

LOCAL PC'S AND 3COM NETWORK



APPENDIX C

1989 QUARTER 22 MONITORING PLAN,
SCOPE OF WORK

INSTALLATION RESTORATION PROGRAM (IRP)
TWIN CITIES ARMY AMMUNITION PLANT (TCAAP)
GROUNDWATER MONITORING
STATEMENT OF WORK

I. OBJECTIVE: The objective of this statement of work (SOW) is to conduct groundwater monitoring consisting of sampling and analysis of groundwater, and collection of groundwater level measurements from wells located within the Twin Cities Army Ammunition Plant (TCAAP) vicinity. Sampling and analysis shall be conducted in accordance with the "U.S. Army Toxic and Hazardous Materials Agency, Installation Restoration Program, Quality Assurance Program, Second Edition, March 1987." All data generated shall be entered into the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), Installation Restoration Data Management System (IRDMS).

II. STATEMENT OF WORK:

All work performed under this SOW shall be coordinated with USATHAMA and TCAAP prior to execution.

The technical proponent of this project USATHAMA located at Aberdeen Proving Ground (Edgewood Area), Maryland. Technical assistance and evaluation of the project shall be exercised by USATHAMA through the U.S. Army Armament, Munitions and Chemical Command, Rock Island, Illinois, and TCAAP.

The contractor shall provide all the appropriate equipment and personnel to perform the following services:

a. Project Quality Control (QC) Plan.

A Project QC Plan shall be submitted by the contractor and be approved by USATHAMA prior to collection of samples for analysis. The Plan shall conform with requirements of the Installation Restoration Program, Twin Cities Army Ammunition Plant, Remedial Investigation/Feasibility Study, Quality Assurance Project Plan (QAPP) (available from TCAAP) and the USATHAMA Installation Restoration Program. Quality Assurance Program, Second Edition, March 1987. (Appendix 1), hereinafter known as the Quality Assurance Program (QAP). Details for development of the QC Plan are provided in Chapter 3.0 of the QAP.

b. Laboratory Certification.

(1) The contractor shall ensure all analytical determinations for chemical compounds in groundwater, identified in Table 1, shall be made from laboratories and methods certified by USATHAMA under the QAP.

(2) The QAPP and QAP contain all USATHAMA requirements for establishing and maintaining laboratory practices to ensure scientific reliability and compatibility of laboratory data in support of USATHAMA programs. QC practices performed under this SOW, shall be in compliance with guidelines of the QAPP and QAP.

c. Groundwater Sampling & Analysis.

(1) Groundwater monitoring shall be conducted to determine changes in spatial extent and magnitude of contamination present at TCAAP and associated wells installed by Honeywell, Inc., (Honeywell). Results of past chemical sampling and analysis and geohydrologic data collected under the Installation Restoration Program at TCAAP and Honeywell investigations were evaluated to determine sampling locations and chemical compound/element analyses. The monitoring scheme detailed in this SOW can be modified, only through a contract modification, when directed by USATHAMA, if contaminant results dictate changes in sampling locations, sampling frequency and/or chemical compound/element analyses.

(2) Groundwater samples shall be collected from well locations listed in Table 2 for chemical compounds/elements indicated. Groundwater level measurements shall be collected as indicated in paragraph 2d.

(3) The Minnesota Pollution Control Agency (MPCA) and Honeywell may plan to split samples during the sampling effort. Federal Cartridge Corporation shall coordinate the sampling activities of the three parties. The contractor shall provide sampling services and containers for split samples, if required. In addition, the contractor shall fill sample containers prepared by MPCA and/or Honeywell for this use, if required.

d. Static Groundwater Level Measurements.

Static groundwater level measurements shall be collected from wells listed in Table 2. The length of riser stick up (well casing above ground level) of each well shall be measured to the nearest tenth of a foot and provided to the Government in feet and centimeters. Depth to groundwater from ground surface in centimeters shall be required in reporting in the IRDMS per paragraph 1f.

e. Daily QC/Quality Assurance.

Control Charts and laboratory bench sheets (or copies thereof) for chemical analyses shall be provided to USATHAMA during each week of analyses in accordance with the QAPP and QAP.

f. Data Management.

(1) All chemical analysis and static groundwater level measurements shall be entered into the IRDMS. Results shall be entered and processed into Level 2 of the IRDMS not later than 45 days after the chemical sample or static groundwater level is collected.

(2) Procedures, equipment, and requirements for conducting data management requirements of the SOW are provided in the Installation Restoration Program, Data Management System Requirements (Appendix 2).

g. Reporting.

(1) Monitoring Reports shall be submitted to USATHAMA, the reports shall include:

(a) Table listing water level measurements with IRDMS Site ID Number and Minnesota Unique Number for each aquifer.

(b) Laboratory reporting sheets for chemical sampling and analysis.

(c) Sample dates and times.

(d) Discussion of any problems encountered.

(e) Table listing of samples with IRDMS Site ID Number and Minnesota Unique Number exceeding criteria listed in Table 3 and their concentrations from the previous sampling.

Computer software will be available from the Government to generate tabular listings for water level measurements and chemical analysis reporting.

III. SCHEDULE: Chemical sampling and/or static groundwater level measurements shall be collected as detailed in the SOW. Federal Cartridge Corporation shall schedule the sampling activity in concert with the MPCA and Honeywell.

IV. METHOD OF PAYMENT:

Payment of this effort shall be contingent on completion of all data entry and all data acceptance into Level 2 of the USATHAMA IRDMS. Payment will be authorized only after acceptance of all water level and chemical analytical data into Level 2 of the USATHAMA IRDMS.

The Government reserves the option to require additional sampling and analysis of groundwater samples as directed by USATHAMA only.

V. COST PROPOSAL:

The contractor shall complete the attached cost proposal and provide to USATHAMA. Award of this SOW is contingent upon USATHAMA and AMCCOM (RI) approval.

TABLE 1. CHEMICAL ANALYSIS CATEGORIES (CERTIFICATION CLASSES)

CATEGORY 1: GAS CHROMATOGRAPHY/CONDUCTIVITY DETECTOR (EPA METHOD 601 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	TARGET REPORTING WATER (ug/l)	TESTED RANGE
Chloroform	CHCL3	1	0 - 50 TRL
Vinyl Chloride	C2H3CL	1	0 - 50 TRL
Tetrachloroethylene	TCLEE	2	0 - 50 TRL
Trichloroethylene	TRCLE	1	0 - 50 TRL
1,1-Dichloroethylene	11DCE	2	0 - 50 TRL
1,1,1-Trichloroethane	111TCE	2	0 - 50 TRL
1,1,2-Trichloroethane	112TCE	2	0 - 50 TRL
1,2-Dichloroethylenes	12DCE	1	0 - 50 TRL
1,2-Dichloroethane	12DCLE	1	0 - 50 TRL
1,2-Dichloropropane	12DCLP	2	0 - 50 TRL

TABLE 2 MONITOR WELL LOCATIONS

UNIT 1 WELL ID	MINNESOTA #	UNIT 3 WELL ID	MINNESOTA #	UNIT 4 WELL ID	MINNESOTA #
01U036	234206	234430	234430	04U847	426857
01U101	236498	234305	234305	04U67	
01U102	236499	03L848	416199	04U848	416078
01U103	236500	234357	234357	04U845	426855
01U107	236504	234356	234356	04U854	
01U108	236505	234353	234353	304U4	
01U115	427411	03L809	426868	306U4	
01U116	427412	234425	234425	409548	409548
01U117	427413	409550	409550	04U850	416200
01U118	427414	03L811	426809	407U4	
01U119	427415	03U811	426808	401U4	
01U120	427410	409557	409557	402U4	
01U126		03L854	426859	318U4	
01U127		03U831	426852	GROSS	
01U135		03U832	426864	200515	200515
01U136		03L832	426865	HONEYWELL RIDGEWAY	
01U052	234223	409546	409546	REUBIN MEAT	
01U047	234217	03L853	426858	206693	206693
01U048		03U821	426810	206689	206689
01U065	234241	03U822	426812	233241	233241
01U526		03L822	426813	406U4	
01U062	234237	303M3		*206723	206723
01U525		306L3		*(Lowry Grove	
01U653		03L856	426861	Mobile homes)	
01U054		03L813	426818		
01U635		409856	409556		
01U636		234463	234463		
01U003		03L858	416081		
01U634					
01U004	234198				
01U652					
01U064	234240				
01U666					
01U638					
01U639					
01U640					

TABLE 3

TWIN CITIES ARMY AMMUNITION PLANT
GROUND WATER CRITERIACATEGORY 1: CAS CHROMATOGRAPHY/CONDUCTIVITY DETECTOR (EPA METHOD 601 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Chloroform	CHCL3	2.00
Vinyl Chloride	C2H3CL	0.18
Tetrachloroethylene	TCLEE	0.88
Trichloroethylene	TRCLE	5.00
1,1 Dichloroethylene	11DCE	7.00
1,1,1-Trichloroethane	111TCE	200.00
1,1,2-Trichloroethane	112TCE	0.60
1,2-Dichloroethylene	12DCE	70.00
1,2-Dichloroethane	12DCLE	5.00
1,2-Dichloropropane	12DCLP	6.00

CONTRACTOR COST PROPOSAL

1. EPA METHOD 601 x 86 wells	\$
2. MONITOR WELL SAMPLING/LEVEL MEASUREMENTS x 86 wells	\$
3. FEDERAL CARTRIDGE FEE	\$
TOTAL	\$

USATHAMA

ON PROGRESS

DECEMBER 1982

2ND EDITION MARCH 1983

U.S. ARMY TOXIC AND HAZARDOUS MATERIALS CENTER

BERKEEN PROVING GROUND RD 21510-21

APPENDIX 2

Installation Restoration Program
U.S. Army Toxic & Hazardous Materials Agency
Data Management System Requirements

DATA MANAGEMENT

The contractor shall establish a Data Management Program to implement the contract requirements. The Data Management Program shall be described in the Data Management Plan and shall detail the contractor's procedures, organization, and methodology to be used to satisfy the below stated requirements. The Data Management Program shall conform to the policies and procedures of the USATHAMA Installation Restoration Data Management System (IRDMS) described below. Should modifications in these policies and/or procedures be indicated, the Government shall notify the contractor, who shall make the required modification(s) to this Data Management Program.

The flow of data from their creation through processing and storage to retrieval is schematically presented in Figure 1.

The contractor shall propose a means of capturing and electronically recording the data in a form corresponding to that described in the most current version of the IRDMS User's Guide for the appropriate type of record. The Government will make available software which will assist in the entry, editing and error checking of data.

The contractor shall have available the following minimum microcomputer hardware and software configuration on which to process IR data:

IBM PC-AT microcomputer or functional equivalent, configured with one 20MB hard disk, one 360KB diskette drive, one 1.2MB diskette drive, 512K of RAM, and a math coprocessor.

Hayes or Microcom 1200 baud modem or functional equivalent
Graphic printer for output (wide carriage)
D-Base III
DOS version 3.2
3+ Remote version 1.1 (3 COM Corp)
ZSTEMPC-4014 Tektronix 4014 emulator software
Crosstalk communications software

A color monitor with adapter capable of resolutions of 640 x 480 pixels will be useful in graphics applications in the IRDMS.

This equipment will be used for all data entry and error checking processes. Only when all errors have been corrected will a file be transmitted to the IRDMS Local Area Network at Edgewood, MD. The contractor may seek reimbursement for telephone charges related to data transmission.

There are three levels of data recognized in the IRDMS. Level 1 consists of all files generated by the contractor on his microcomputer, either as a result of data entry, or generated by the error checking program. The only Level 1 files which are present on the UNIVAC are program files. Program files are files composed of several elements. An element may contain various contractor-written utilities or programs, add-streams, or other recurringly used set of commands. Each contractor is authorized two program files, the names of which shall be furnished to the Government within 7 calendar days of their creation.

Error-free files should be transmitted at least weekly to the IRDMS network. Each received file will be processed through an error checking program identical to that on the contractor's microcomputer, in order to verify acceptance. Accepted files will then be sent to the UNIVAC. Should any files fail this final error check, the submitting contractor will be notified and required to correct detected errors and retransmit the data.

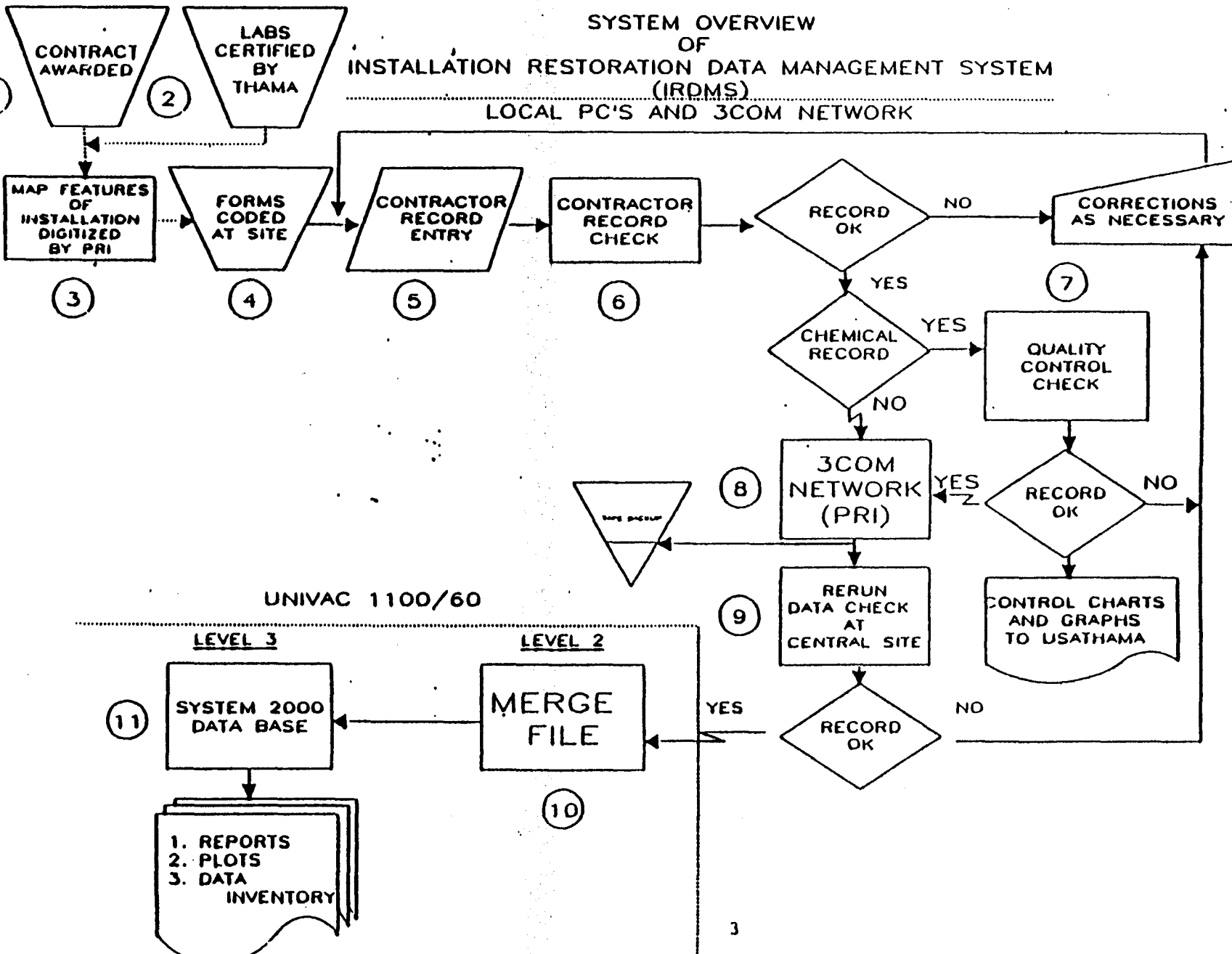
Upon arrival at the UNIVAC, files are classified as Level 2 files. These records are protected by write keys, and therefore may not be modified by the contractor. They may be read by the contractor, provided the appropriate read key is specified. All Level 2 files are the responsibility of the Government. Level 2 files exist only until the data are loaded into the appropriate installation data base, normally less than 10 working days.

Data in the installation data base are considered Level 3 data. They may be accessed by the contractor using government supplied report programs and the appropriate read key, but are protected from changes by write keys. The installation data bases are the responsibility of the Government.

The contractor shall be responsible for the accuracy of all data he submits to the IRDMS. He shall insure that all data entered into and resident in the IRDMS as a result of the contract exactly correspond to the data contained in the original books of entry (i.e. laboratory bench sheets). The accuracy verification shall be accomplished, and the CO or his technical representative notified, within 5 working days following transfer or any data from Level 1 to Level 2.

The type of data to be entered into the IRDMS is specified elsewhere in the contract. Map location data must be submitted before any other data. Methods certification must be approved by the Government prior to submission of any chemical data analyzed by the method.

Communications difficulties between the contractor's microcomputer and the IRDMS 3COM Local Area Network, or between the contractor's microcomputer and the central site processor should be documented to the attention of USATHAMA. Particular note should be made of time and date, type of microcomputer and modem, communications software and settings, number called, and nature of the problem. Hard copies of any error messages are particularly helpful.



APPENDIX D

**1989 QUARTER 23 and 24 MONITORING PLAN,
SCOPE OF WORK**

INSTALLATION RESTORATION PROGRAM (IRP)
TWIN CITIES ARMY AMMUNITION PLANT (TCAAP)
GROUNDWATER MONITORING
STATEMENT OF WORK

I. OBJECTIVE: The objective of this statement of work (SOW) is to conduct groundwater monitoring consisting of sampling and analysis of groundwater, and collection of groundwater level measurements from wells located within the Twin Cities Army Ammunition Plant (TCAAP) vicinity. Sampling and analysis shall be conducted in accordance with the "U.S. Army Toxic and Hazardous Materials Agency, Installation Restoration Program, Quality Assurance Program, Second Edition, March 1987." All data generated shall be entered into the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), Installation Restoration Data Management System (IRDMS).

II. STATEMENT OF WORK:

All work performed under this SOW shall be coordinated with USATHAMA and TCAAP prior to execution.

The technical proponent of this project USATHAMA located at Aberdeen Proving Ground (Edgewood Area), Maryland. Technical assistance and evaluation of the project shall be exercised by USATHAMA through the U.S. Army Armament, Munitions and Chemical Command, Rock Island, Illinois, and TCAAP.

The contractor shall provide all the appropriate equipment and personnel to perform the following services:

a. Project Quality Control (QC) Plan.

A Project QC Plan shall be submitted by the contractor and be approved by USATHAMA prior to collection of samples for analysis. The Plan shall conform with requirements of the Installation Restoration Program, Twin Cities Army Ammunition Plant, Remedial Investigation/Feasibility Study, Quality Assurance Project Plan (QAPP) (available from TCAAP) and the USATHAMA Installation Restoration Program, Quality Assurance Program, Second Edition, March 1987. (Appendix 1), hereinafter known as the Quality Assurance Program (QAP). Details for development of the QC Plan are provided in Chapter 3.0 of the QAP.

b. Laboratory Certification.

(1) The contractor shall ensure all analytical determinations for chemical compounds in groundwater, identified in Table 1, shall be made from laboratories and methods certified by USATHAMA under the QAP.

(2) The QAPP and QAP contain all USATHAMA requirements for establishing and maintaining laboratory practices to ensure scientific reliability and compatibility of laboratory data in support of USATHAMA programs. QC practices performed under this SOW, shall be in compliance with guidelines of the QAPP and QAP.

Encl 1

c. Groundwater Sampling & Analysis.

(1) Groundwater monitoring shall be conducted to determine changes in spatial extent and magnitude of contamination present at TCAAP and associated wells installed by Honeywell, Inc., (Honeywell). Results of past chemical sampling and analysis and geohydrologic data collected under the Installation Restoration Program at TCAAP and Honeywell investigations were evaluated to determine sampling locations and chemical compound/element analyses. The monitoring scheme detailed in this SOW can be modified, only through a contract modification, when directed by USATHAMA, if contaminant results dictate changes in sampling locations, sampling frequency and/or chemical compound/element analyses.

(2) Groundwater samples shall be collected from well locations listed in Table 2 for chemical compounds/elements indicated. Groundwater level measurements shall be collected as indicated in paragraph 2d.

(3) The Minnesota Pollution Control Agency (MPCA) and Honeywell may plan to split samples during the sampling effort. Federal Cartridge Corporation shall coordinate the sampling activities of the three parties. The contractor shall provide sampling services and containers for split samples, if required. In addition, the contractor shall fill sample containers prepared by MPCA and/or Honeywell for this use, if required.

d. Static Groundwater Level Measurements.

Static groundwater level measurements shall be collected from wells listed in Table 2. The length of riser stick up (well casing above ground level) of each well shall be measured to the nearest tenth of a foot and provided to the Government in feet and centimeters. Depth to groundwater from ground surface in centimeters shall be required in reporting in the IRDMS per paragraph 1f.

e. Daily QC/Quality Assurance.

Control Charts and laboratory bench sheets (or copies thereof) for chemical analyses shall be provided to USATHAMA during each week of analyses in accordance with the QAPP and QAP.

f. Data Management.

(1) All chemical analysis and static groundwater level measurements shall be entered into the IRDMS. Results shall be entered and processed into Level 2 of the IRDMS not later than 45 days after the chemical sample or static groundwater level is collected.

(2) Procedures, equipment, and requirements for conducting data management requirements of the SOW are provided in the Installation Restoration Program, Data Management System Requirements (Appendix 2).

g. Reporting.

(1) Monitoring Reports shall be submitted to USATHAMA, the reports shall include:

(a) Table listing water level measurements with IRDMS Site ID Number and Minnesota Unique Number for each aquifer.

(b) Laboratory reporting sheets for chemical sampling and analysis.

(c) Sample dates and times.

(d) Discussion of any problems encountered.

(e) Table listing of samples with IRDMS Site ID Number and Minnesota Unique Number exceeding criteria listed in Table 3 and their concentrations from the previous sampling.

Computer software will be available from the Government to generate tabular listings for water level measurements and chemical analysis reporting.

III. SCHEDULE: Chemical sampling and/or static groundwater level measurements shall be collected as detailed in the SOW. Federal Cartridge Corporation shall schedule the sampling activity in concert with the MPCA and Honeywell.

IV. METHOD OF PAYMENT:

Payment of this effort shall be contingent on completion of all data entry and all data acceptance into Level 2 of the USATHAMA IRDMS. Payment will be authorized only after acceptance of all water level and chemical analytical data into Level 2 of the USATHAMA IRDMS.

The Government reserves the option to require additional sampling and analysis of groundwater samples as directed by USATHAMA only.

V. COST PROPOSAL:

The contractor shall complete the attached cost proposal and provide to USATHAMA. Award of this SOW is contingent upon USATHAMA and AMCCOM (RI) approval.

TABLE 1. CHEMICAL ANALYSIS CATEGORIES (CERTIFICATION CLASSES)

CATEGORY 1: GAS CHROMATOGRAPHY/CONDUCTIVITY DETECTOR (EPA METHOD 601 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	TARGET REPORTING WATER (ug/l)	TESTED RANGE
Chloroform	CHCL3	1	0 - 50 TRL
Vinyl Chloride	C2H3CL	1	0 - 50 TRL
Tetrachloroethylene	TCLEE	2	0 - 50 TRL
Trichloroethylene	TRCLE	1	0 - 50 TRL
1,1-Dichloroethylene	11DCE	2	0 - 50 TRL
1,1,1-Trichloroethane	111TCE	2	0 - 50 TRL
1,1,2-Trichloroethane	112TCE	2	0 - 50 TRL
1,2-Dichloroethylenes	12DCE	1	0 - 50 TRL
1,2-Dichloroethane	12DCLE	1	0 - 50 TRL
1,2-Dichloropropane	12DCLP	2	0 - 50 TRL

CATEGORY 7: GAS CHROMATOGRAPHY/PHOTOIONIZATION (EPA METHOD 602 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	TARGET REPORTING WATER (ug/l)	LIMIT (TRL) SOIL (ug/g)	TESTED RANGE
Benzene	C6H6	0.5	N/R	0 - 50 TRL
Toluene	MEC6H5	1	N/R	0 - 50 TRL
Total Xylenes	Txylen	3	N/R	0 - 50 TRL

TABLE 3

TWIN CITIES ARMY AMMUNITION PLANT
GROUND WATER CRITERIA

CATEGORY 1: CAS CHROMATOGRAPHY/CONDUCTIVITY DETECTOR (EPA METHOD 601 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Chloroform	CHCL3	2.00
Vinyl Chloride	C2H3CL	0.18
Tetrachloroethylene	TCLEE	0.88
Trichloroethylene	TRCLE	5.00
1,1 Dichloroethylene	11DCE	7.00
1,1,1-Trichloroethane	111TCE	200.00
1,1,2-Trichloroethane	112TCE	0.60
1,2-Dichloroethylene	12DCE	70.00
1,2-Dichloroethane	12DCLE	5.00
1,2-Dichloropropane	12DCLP	6.00

CATEGORY 7: CAS CHROMATOGRAPHY/PHOTOIONIZATION (EPA METHOD 602 TYPE)
USATHAMA CLASS 1

COMPOUND	TEST NAME	CRITERIA (ug/L)
Benzene	C6H6	5.00
Toluene	MEC6H5	2000.00
Total Xylenes	Txylen	440.00

TABLE 2

WELL#	FRS	SITE	SITE ID1	MUNICIP	SITE ID2	D1	D2	FR	DEPTH	SAMP. DAT
1	Q23	WELL	01U003	236176		X	X		611.0	/ /
2	Q23	WELL	01U004	234198		X	X		426.7	/ /
3	Q23	WELL	01U036	234206		X	X		335.0	/ /
4	Q23	WELL	01U047	234217		X	X		243.9	/ /
5	Q23	WELL	01U048	234218		X	X		365.8	/ /
6	Q23	WELL	01U052	234223		X	X		426.7	/ /
7	Q23	WELL	01U054	234227		X	X		335.0	/ /
8	Q23	WELL	01U062	234237		X	X		457.2	/ /
9	Q23	WELL	01U064	234240		X	X		548.6	/ /
10	Q23	WELL	01U065	234241		X	X		365.8	/ /
11	Q23	WELL	01U101	236498		X	X		457.2	/ /
12	Q23	WELL	01U102	236499		X	X		609.6	/ /
13	Q23	WELL	01U103	236500		X	X		609.6	/ /
14	Q23	WELL	01U107	236504		X	X		487.7	/ /
15	Q23	WELL	01U108	236505		X	X		624.8	/ /
16	Q23	WELL	01U115	427411		X	X		487.7	/ /
17	Q23	WELL	01U116	427412		X	X		579.1	/ /
18	Q23	WELL	01U117	427413		X	X		548.6	/ /
19	Q23	WELL	01U119	427414		X	X		518.2	/ /
20	Q23	WELL	01U119	427415		X	X		335.0	/ /
21	Q23	WELL	01U120	427410		X	X		518.2	/ /
22	Q23	WELL	01U126	440890		X	X		579.1	/ /
23	Q23	WELL	01U127	440891		X	X		0.0	/ /
24	Q23	WELL	01U135	447998		X	X		609.6	/ /
25	Q23	WELL	01U136	447999		X	X		701.0	/ /
26	Q23	WELL	01U525	236196		X	X		374.9	/ /
27	Q23	WELL	01U526	236197		X	X		350.5	/ /
28	Q23	WELL	01U634	194716	OW504U1	X	X		288.0	/ /
29	Q23	WELL	01U635	194722	OW505U1	X	X		-999.9	/ /
30	Q23	WELL	01U636	194723	OW506U1	X	X		442.0	/ /
31	Q23	WELL	01U638	194717	OW508U1	X	X		-999.9	/ /
32	Q23	WELL	01U639	194718	OW509U1	X	X		320.0	/ /
33	Q23	WELL	01U640	194719	OW510U1	X	X		335.0	/ /
34	Q23	WELL	01U652	242134	OW522U1	X	X		396.2	/ /
35	Q23	WELL	01U666	242135		X	X		-999.9	/ /
36	Q23	WELL	01U901	505210		X	X		701.0	/ /
37	Q23	WELL	01U902	505209		X	X		579.1	/ /
38	Q23	WELL	03L809	426868	T9L3	X	X		0.0	/ /
39	Q23	WELL	03L811	426809	H1L3	X	X		2194.6	/ /
40	Q23	WELL	03L813	426816	H3L3	X	X		1097.3	/ /
41	Q23	WELL	03L822	426813	NW2L3	X	X		1216.5	/ /
42	Q23	WELL	03L832	426865	OM2L3	X	X		1767.8	/ /
43	Q23	WELL	03L846	447899	306L3	X	X	X	1828.8	/ /
44	Q23	WELL	03L848	416199	308L3	X	X		2042.2	/ /
45	Q23	WELL	03L853	426858	313L3	X	X		1859.3	/ /
46	Q23	WELL	03L854	426859	314L3	X	X		1767.8	/ /
47	Q23	WELL	03L856	426861	315L3	X	X		1219.2	/ /
48	Q23	WELL	03L858	416081	318L3	X	X		3109.0	/ /
49	Q23	WELL	03M843	426852	303M3	X	X		1706.9	/ /
50	Q23	WELL	03U811	426808	H1U3	X	X		2194.6	/ /
51	Q23	WELL	03U821	426810	NW1U3	X	X		1493.5	/ /
52	Q23	WELL	03U822	426812	NW2U3	X	X		1493.5	/ /
53	Q23	WELL	03U831	426863	OM1U3	X	X		1859.3	/ /
54	Q23	WELL	03U832	426864	OM2U3	X	X		1737.4	/ /
55	Q23	WELL	04U673	426867	303U4	X	X		1828.8	/ /
56	Q23	WELL	04U844	426854	304U4	X	X		0.0	/ /
57	Q23	WELL	04U845	426855	305U4	X	X		1950.7	/ /
58	Q23	WELL	04U846	426856	306U4	X	X		2133.6	/ /
59	Q23	WELL	04U847	426857	307U4	X	X		2377.4	/ /
60	Q23	WELL	04U848	416078	308U4	X	X		2011.7	/ /
61	Q23	WELL	04U850	416200	310U4	X	X	X	2797.8	/ /
62	Q23	WELL	04U854	439701	314U4	X	X		1869.6	/ /

64	Q23	WELL	040870	447882	402U4	X	X		4400.1	/	/
65	Q23	WELL	040875	447878	408U4	X	X	X	6001.5	/	/
66	Q23	WELL	040877	447896	407U4	X	X	X	2930.7	/	/
67	Q23	WELL	040879	447900	409U4	X	X	X	3715.6	/	/
68	Q23	WELL	040880	447895	410U4	X	X	X	5120.4	/	/
69	Q23	WELL	040881	447891	411U4	X	X	X	5334.0	/	/
70	Q23	WELL	040882	447890	412U4	X	X	X	5241.3	/	/
71	Q23	WELL	040883	447892	413U4	X	X	X	4937.3	/	/
72	Q23	WELL	134318	134318	LWSEUTTER	X	X		2103.1	/	/
73	Q23	WELL	139033	139033	WATERGATEM	X	X		0.0	/	/
74	Q23	WELL	200154	200154	UMGOLFGRSE	X	X		0.0	/	/
75	Q23	WELL	200157	200157	KOPFRGCKHE	X	X		0.0	/	/
76	Q23	WELL	200197	200197	SNOWFLAKED	X	X		0.0	/	/
77	Q23	WELL	200384	200384	METALLURGL	X	X		0.0	/	/
78	Q23	WELL	200599	200599	CEDARAVTRI	X	X		0.0	/	/
79	Q23	WELL	200602	200629	ATKINSNMIL	X	X		0.0	/	/
80	Q23	WELL	200629	200629	GENERLMILS	X	X		0.0	/	/
81	Q23	WELL	200814	200814	AMER LINEN	X	X		1829.9	/	/
82	Q23	WELL	201074	201074	SLEASNMORT	X	X		0.0	/	/
83	Q23	WELL	206688	206682	406U4	X	X	X	0.0	/	/
84	Q23	DTON	21800		ROUNDKOUT	X	X	X	0.0	/	/
85	Q23	WELL	233221	233221	REUBENMEAT	X	X		0.0	/	/
86	Q23	WELL	233533	233533	ROSELWNCEN	X	X		0.0	/	/
87	Q23	WELL	234353	234353	JACK LEE	X	X		2804.2	/	/
88	Q23	WELL	234356	234356	BNORDQUIST	X	X		914.4	/	/
89	Q23	WELL	234357	234357	PHILLIPS66	X	X		0.0	/	/
90	Q23	WELL	234425	234425	JACK LEE	X	X		0.0	/	/
91	Q23	WELL	234430	234430	H CMIEL	X	X		2286.0	/	/
92	Q23	WELL	234463	234463	KEN SOLIE	X	X		0.0	/	/
93	Q23	WELL	234547	234547	HONEYWELL	X	X		0.0	/	/
94	Q23	WELL	235619	235619	SHRINRHOSP	X	X		0.0	/	/
95	Q23	WELL	235735	235735	FLOURCITYA	X	X		0.0	/	/
96	Q23	WELL	405651	405651	METALMATIC	X	X		0.0	/	/
97	Q23	WELL	409546	409546	MPCA2	X	X		1371.6	/	/
98	Q23	WELL	409548	409548	MPCA2A	X	X		1402.1	/	/
99	Q23	WELL	409550	409550	MPCA6	X	X		0.0	/	/
100	Q23	WELL	409556	409556	MPCA4	X	X		4145.3	/	/
101	Q23	WELL	409557	409557	MPCA1	X	X		2011.7	/	/
102	Q23	WELL	PJ#318	447894	318U4	X	X	X	5638.8	/	/

CONTRACTOR COST PROPOSAL

1. EPA METHOD 601/602			
102 samples @ \$	each	=	\$
2. SAMPLING AND LEVEL MEASUREMENTS			
102 samples @ \$	each	=	\$
3. PHOSPHOROUS SAMPLES -			
13 samples @ \$	each	=	\$
FEDERAL CARTRIDGE FEE (percent)			\$
	TOTAL		\$

APPENDIX 2

Installation Restoration Program
U.S. Army Toxic & Hazardous Materials Agency
Data Management System Requirements

DATA MANAGEMENT

The contractor shall establish a Data Management Program to implement the contract requirements. The Data Management Program shall be described in the Data Management Plan and shall detail the contractor's procedures, organization, and methodology to be used to satisfy the below stated requirements. The Data Management Program shall conform to the policies and procedures of the USATHAMA Installation Restoration Data Management System (IRDMS) described below. Should modifications in these policies and/or procedures be indicated, the Government shall notify the contractor, who shall make the required modification(s) to this Data Management Program.

The flow of data from their creation through processing and storage to retrieval is schematically presented in Figure 1.

The contractor shall propose a means of capturing and electronically recording the data in a form corresponding to that described in the most current version of the IRDMS User's Guide for the appropriate type of record. The Government will make available software which will assist in the entry, editing and error checking of data.

The contractor shall have available the following minimum microcomputer hardware and software configuration on which to process IR data:

IBM PC-AT microcomputer or functional equivalent, configured with one 20MB hard disk, one 360KB diskette drive, one 1.2MB diskette drive, 512K of RAM, and a math coprocessor.

Hayes or Microcom 1200 baud modem or functional equivalent
Graphic printer for output (wide carriage)
D-Base III
DOS version 3.2
3+ Remote version 1.1 (3 COM Corp)
ZSTEMPC-4014 Tektronix 4014 emulator software
Crosstalk communications software

A color monitor with adapter capable of resolutions of 640 x 480 pixels will be useful in graphics applications in the IRDMS.

This equipment will be used for all data entry and error checking processes. Only when all errors have been corrected will a file be transmitted to the IRDMS Local Area Network at Edgewood, MD. The contractor may seek reimbursement for telephone charges related to data transmission.

There are three levels of data recognized in the IRDMS. Level 1 consists of all files generated by the contractor on his microcomputer, either as a result of data entry, or generated by the error checking program. The only Level 1 files which are present on the UNIVAC are program files. Program files are files composed of several elements. An element may contain various contractor-written utilities or programs, add-streams, or other recurringly used set of commands. Each contractor is authorized two program files, the names of which shall be furnished to the Government within 7 calendar days of their creation.

Error-free files should be transmitted at least weekly to the IRDMS network. Each received file will be processed through an error checking program identical to that on the contractor's microcomputer, in order to verify acceptance. Accepted files will then be sent to the UNIVAC. Should any files fail this final error check, the submitting contractor will be notified and required to correct detected errors and retransmit the data.

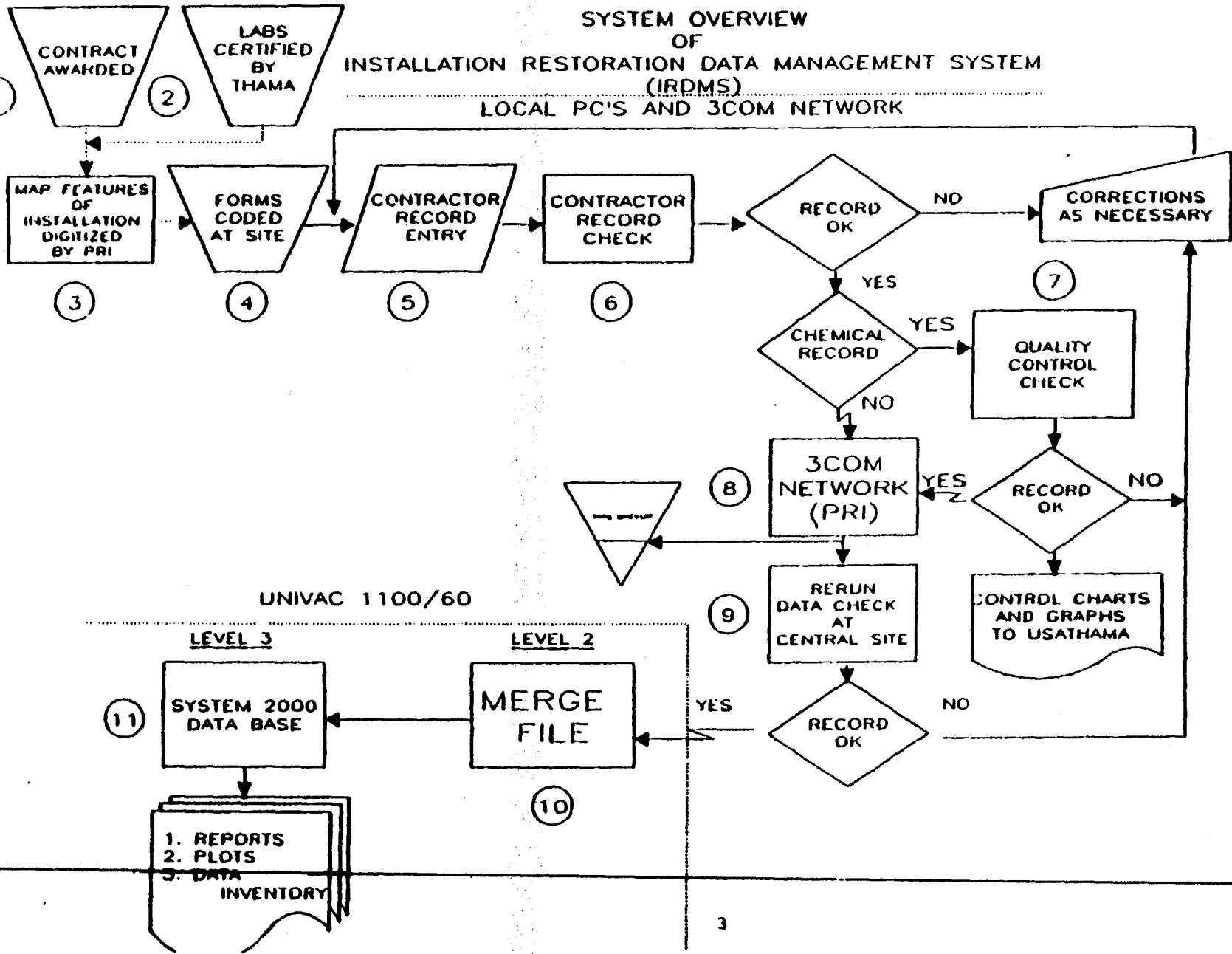
Upon arrival at the UNIVAC, files are classified as Level 2 files. These records are protected by write keys, and therefore may not be modified by the contractor. They may be read by the contractor, provided the appropriate read key is specified. All Level 2 files are the responsibility of the Government. Level 2 files exist only until the data are loaded into the appropriate installation data base, normally less than 10 working days.

Data in the installation data base are considered Level 3 data. They may be accessed by the contractor using government supplied report programs and the appropriate read key, but are protected from changes by write keys. The installation data bases are the responsibility of the Government.

The contractor shall be responsible for the accuracy of all data he submits to the IRDMS. He shall insure that all data entered into and resident in the IRDMS as a result of the contract exactly correspond to the data contained in the original books of entry (i.e. laboratory bench sheets). The accuracy verification shall be accomplished, and the CO or his technical representative notified, within 5 working days following transfer or any data from Level 1 to Level 2.

The type of data to be entered into the IRDMS is specified elsewhere in the contract. Map location data must be submitted before any other data. Methods certification must be approved by the Government prior to submission of any chemical data analyzed by the method.

Communications difficulties between the contractor's microcomputer and the IRDMS 3COM Local Area Network, or between the contractor's microcomputer and the central site processor should be documented to the attention of USATHAMA. Particular note should be made of time and date, type of microcomputer and modem, communications software and settings, number called, and nature of the problem. Hard copies of any error messages are particularly helpful.



APPENDIX E

TCAAP ON SITE MONITORING WELL LOCATIONS MAPS

APPENDIX F

MONITOR WELL DESIGNATION CROSS REFERENCE

APPENDIX F

Monitor Well Designation Cross Reference Table

Common Name	USATHAMA IRDMS Designation	Minnesota Unique Number
-----	-----	-----
	01L811	424055
	01L821	424054
	01L822	424052
S3U1	01U003	
S4U1	01U004	234198
S11U1	01U011	234199
S12U1	01U012	234200
S22U1	01U022	234201
S33U1	01U033	234202
S34U1	01U034	234204
S35U1	01U035	
S36U1	01U036	234206
S37U1	01U037	234207
S38U1	01U038	234208
S39U1	01U039	234209
S40U1	01U040	234210
S41U1	01U041	234211
S43AU1	01U043	
S44U1	01U044	234212
S45U1	01U045	234215
S46U1	01U046	234216
S47U1	01U047	234217
S48U1	01U048	
S50AU1	01U050	
S51U1	01U051	234222
S52U1	01U052	234223
S53AU1	01U053	
S54AU1	01U054	
S60U1	01U060	234235
S62U1	01U062	234237
S63U1	01U063	234239
S64U1	01U064	234240
S65U1	01U065	234241
S67U1	01U067	234243
S72AU1	01U072	
S85U1	01U085	236479
S98U1	01U098	236494
S100U1	01U100	236497
S101U1	01U101	236498
S102U1	01U102	236499
S103U1	01U103	236500
S104U1	01U104	236501
S105U1	01U105	236502
S106U1	01U106	236503

APPENDIX F

Monitor Well Designation Cross Reference Table

Common Name	USATHAMA IRDMS Designation	Minnesota Unique Number
S107U1	01U107	236504
S108U1	01U108	236505
S109U1	01U109	236506
S110U1	01U110	236507
FA4U1	01U524	236194
FW5U1	01U525	236196
FV12U1	01U526	236197
FV8U1	01U527	236197
OW101U1	01U601	236189
OW102U1	01U602	236190
OW103U1	01U603	236191
OW104U1	01U604	236192
OW10571	01U605	236193
OW107U1	01U607	232127
OW108U1	01U608	242128
OW109U1	01U609	242129
OW110U1	01U610	242130
OW111U1	01U611	242131
OW112U1	01U612	194758
OW113U1	01U613	194759
OW115U1	01U615	194760
OW116U1	01U616	194761
OW117U1	01U617	194770
OW118U1	01U618	194771
PW119U1	01U619	194772
OW120U1	01U620	194701
PW121U1	01U621	194702
OW122U1	01U622	194703
OW123U1	01U623	194704
OW501U1	01U631	194720
OW502U1	01U632	194721
OW504U1	01U634	194716
OW505U1	01U635	194722
OW506U1	01U636	194723
OW508U1	01U638	194717
OW509U1	01U639	194718
OW510U1	01U640	194719
OW512U1	01U642	194727
OW522U1	01U652	242134
OW536U1	01U666	
OW537U1	01U667	
OW538U1	01U668	
S20U3	03U020	234173
S1U3	03U001	234135

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Monitor Well Designation Cross Reference Table

Common Name	USATHAMA IRDMS Designation	Minnesota Unique Number
-----	-----	-----
S1M3	03M001	234136
S1L3	03L001	234137
S1U4	04U001	234138
S2U3	03U002	234139
S2M3	03M002	234140
S2L3	03L002	234141
S2U4	04U002	234194
S3U3	03U003	234142
S3M3	03M003	234143
S3L3	03L003	234144
S3U4	04U003	234193
S3PJ	PJ#003	
S4U3	03U004	
S4M3	03M004	234146
S4L3	03L004	234147
S5U3	03U005	234148
	03M005	
S5L3	03L005	
S6U3	03U006	234149
	PJ#006	
S7U3	03U007	234150
S7M3	03M007	234151
S7L3	03L007	234152
S7U4	04U007	234195
S8U3	03U008	234153
S9U3	03U009	234154
S10U3	03U010	234155
S10M3	03M010	234156
S10L3	03L010	234157
S11U3	03U011	234158
S12U3	03U012	234159
S12M3	03M012	234160
S12L3	03L012	234161
S12U4	04U012	234196
S13U3	03U013	234162
S13M3	03M013	234163
S13L3	03L013	234164
S14U3	03U014	234165
S14L3	03L014	235748
S15U3	03U015	234166
S16U3	03U016	234167
S17U3	03U017	234168
S17M3	03N017	234169
S17L3	03L017	234170

APPENDIX F

Monitor Well Designation Cross Reference Table

Common Name	USATHAMA IRDMS Designation	Minnesota Unique Number
-----	-----	-----
S18U3	03U018	234171
S18L3	03L018	235749
S19U3	03U019	234172
ST20U3	03U020	234173
S20M3	03M020	234174
S20L3	03L020	234175
S20U4	04U020	234197
S21U3	03U021	234176
S21L3	03L021	235750
S22U3	03U022	
S23U3	03U023	
S24U3	03U024	
S25U3	03U025	
S26U3	03U026	
S27U3	03U027	
S27L3	03L027	235751
S27U4	04U027	
S27PJ	PJ#027	
S28U3	03U028	
S28L3	03L028	235752
S29U3	03U029	
S29L3	03L029	235753
S30U3	03U030	
S31U3	03U031	
S32U3	03U032	
S74PJ	PJ#074	
S75U3	03U075	236078
S76U3	037076	236077
S77U3	03U077	236075
S77L3	03L077	236076
	04U077	426877
	04J077	
S78U3	03U078	236073
S78L3	03L078	236074
S79U3	03U079	234077
S79L3	03L079	242160
S80L3	03L080	236071
S81L3	03L081	236070
S82U3	03U082	236476
S83U3	03U083	236478
S84U3	03U084	236069
ST84L3	03L084	440887
S86L3	03L086	236068

APPENDIX F

Monitor Well Designation Cross Reference Table

Common Name	USATHAMA IRDMS Designation	Minnesota Unique Number
-----	-----	-----
S87U3	03U087	236480
S88U3	03U088	236482
S89U3	03U089	236483
S90U3	03U090	236485
S91L3	03L091	236067
S92U3	03U092	236487
S93U3	03U093	236489
S94U3	03U094	236066
S96U3	03U096	236491
S97U3	03U097	236493
S99U3	03U099	236495
S111U3	03U111	236508
S112U3	03U112	236510
WF1U3	03U113	242124
WF1L3	03L113	236080
WF2U3	03U114	242125
SC1	03U301	
B1	03U302	426842
B2	03F303	426843
B3	03F304	426844
B4	03F305	426845
B5	03F306	426846
B6	03F307	426847
B7	03F308	
P0-1	03U671	421438
OW541U3	03U674	
OW541U3		
701U3	03U701	426848
701U4	04U701	426849
702U3	03U702	426850
702U4	04U702	426876
	04J702	
703U3	03U703	426878
704U3	03U704	426883
705U3	03U705	426884
706U3	03U706	426885
707U3	03U707	426886
708U3	03U708	426879
708U4	04U708	426880
	04J708	
709U3	03U709	426881
709U4	04U709	426882
710U3	03U710	434032
	03M713	

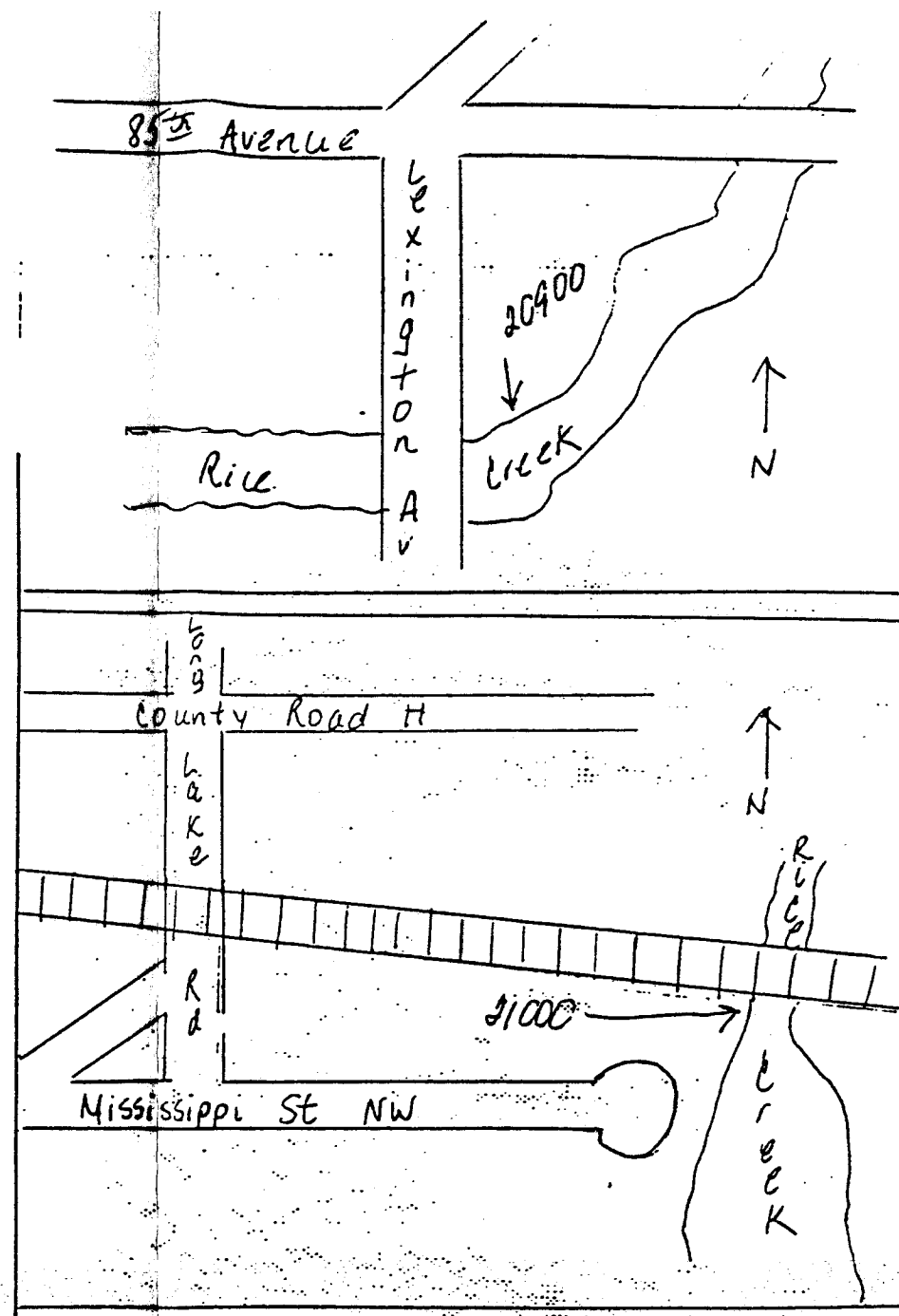
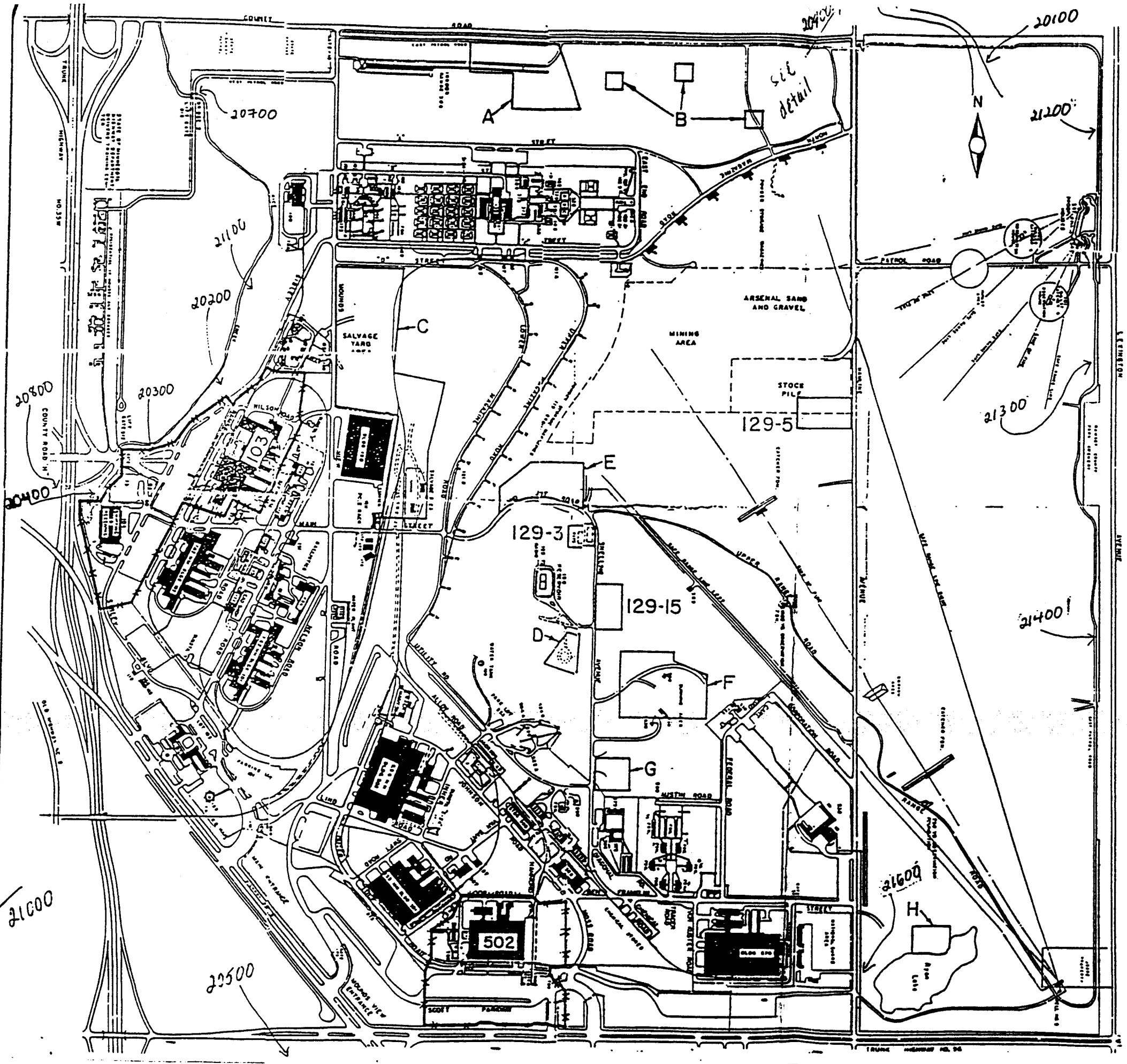
APPENDIX F

Monitor Well Designation Cross Reference Table

Common Name	USATHAMA IRDMS Designation	Minnesota Unique Number
	04U713	
	04J713	
	04U714	
	04J714	
SM1	03U715	
SM2	03U716	
319U4	03L859	434036
320L3	03L860	434038
320U4	04U860	434035
321L3	03L861	434039
321U4	04U861	434034
401U4	04U871	447889
402U4	04U872	447988
405U4	04U875	447898
407U4	04U877	447896
409U4	04U879	447900
410U4	04U880	447895
411U4	04U881	447891
412U4	04U882	447890
413U4	04U883	447892
711U3	03U711	434033
711U4	04U711	434031
::		

APPENDIX G

NPDES SAMPLE POINT LOCATIONS



Title: NPDOS Sample Point Locations
 Spec. #969
 Dwg. #46814

APPENDIX H

QUARTERLY SURFACE WATER AND NPDES ANALYSIS



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

February 12, 1988

PARAMETER: TL, Method SD07
DETECTION LIMIT: 2.70 ug/L
UNITS: ug/L
PREP DATE: 1/5/88
ANALYSIS DATE: 1/5/88
ANALYST: BJN
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW052	12/11/87	5585-02	ADM003	< 2.70	1
SW056	12/11/87	5585-03	ADM004	< 2.70	1
01U127	12/11/87	5586-01	ADM005	< 2.70	1
01U133	12/11/87	5586-02	ADM006	< 2.70	1
01U133	12/11/87	5586-02D	ADM007	< 2.70	1
Field Blank	12/11/87	5586-04	ADM008	< 2.70	1
SW058	12/17/87	5610-06	ADM009	< 2.70	1
SW059	12/17/87	5610-07	ADM010	< 2.70	1
SW060	12/17/87	5610-08	ADM011	< 2.70	1
High Spike			ADM002	30.0	
High Spike			ADM013	30.0	
High Spike True Value				30.0	
Low Spike			ADM012	6.10	
Low Spike True Value				6.00	
HQ Blank			ADM001	< 2.70	

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

January 30, 1988

PARAMETER: NI, Method SD07
DETECTION LIMIT: 5.94 ug/L
UNITS: ug/L
PREP DATE: 12/3/87
ANALYSIS DATE: 12/3/87
ANALYST: PMM
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW034	11/2/87	5416-01	ALB003	< 5.94	1
SW045	11/2/87	5416-03	ALB004	6.00	1
SW035	11/2/87	5416-05	ALB005	< 5.94	1
SW039	11/2/87	5416-07	ALB006	< 5.94	1
SW041	11/2/87	5416-09	ALB007	< 5.94	1
SW065	11/2/87	5416-11	ALB008	< 5.94	1
SW029	11/2/87	5416-13	ALB009	< 5.94	1
SW028	11/3/87	5424-02	ALB010	< 5.94	1
SW031	11/3/87	5424-04	ALB011	< 5.94	1
SW030	11/3/87	5424-06	ALB012	6.50	1
SW036	11/5/87	5434-02	ALB013	< 5.94	1
SW038	11/5/87	5434-04	ALB014	< 5.94	1
SW037	11/5/87	5434-05	ALB015	< 5.94	1
SW040	11/5/87	5434-08	ALB016	< 5.94	1
03H505	11/9/87	5445-01	ALB017	< 5.94	1
03U007	11/9/87	5445-02	ALB018	< 5.94	1
03L007	11/9/87	5445-03	ALB019	< 5.94	1
04U007	11/9/87	5445-04	ALB020	< 5.94	1
03U008	11/9/87	5445-05	ALB021	< 5.94	1
03U010	11/9/87	5445-06	ALB022	< 5.94	1
03L010	11/9/87	5445-07	ALB023	< 5.94	1
04U012	11/9/87	5445-08	ALB024	< 5.94	1
03L012	11/9/87	5445-09	ALB025	< 5.94	1
03U012	11/9/87	5445-11	ALB026	< 5.94	1

Interpoll Laboratories
 USATHAMA Laboratory Report
 Federal Cartridge Company
 Page Two

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW032	11/10/87	5450-01	ALB027	< 5.94	1
SW062	11/10/87	5450-03	ALB028	< 5.94	1
SW064	11/10/87	5450-05	ALB029	< 5.94	1
SW063	11/10/87	5450-07	ALB030	< 5.94	1
SW061	11/10/87	5450-09	ALB031	7.50	1
03U013	11/10/87	5451-01	ALB032	< 5.94	1
03M013	11/10/87	5451-02	ALB033	< 5.94	1
03L013	11/10/87	5451-03	ALB034	< 5.94	1
03U017	11/10/87	5451-04	ALB035	< 5.94	1
03M017	11/10/87	5451-05	ALB036	< 5.94	1
03L017	11/10/87	5451-06	ALB037	< 5.94	1
03U076	11/10/87	5451-07	ALB038	< 5.94	1
03U704	11/10/87	5451-08	ALB039	< 5.94	1
03U075	11/10/87	5451-09	ALB040	< 5.94	1
03U023	11/10/87	5451-10	ALB041	< 5.94	1
High Spike			ALB002	33.5	
High Spike			ALB043	33.5	
High Spike True Value				35.0	
Low Spike			ALB042	13.0	
Low Spike True Value				12.0	
MQ Blank			ALB001	< 5.94	

Respectfully submitted,

Gregg W. Holman

Gregg W. Holman,
 Inorganic Chemistry Department Manager

GMH/cg

< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/788-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

December 13, 1987

PURCHASE ORDER: #7194-01

PARAMETER: Cyanide, Method TY02
DETECTION LIMIT: 8.35 ug/L
UNITS: ug/L
ANALYSIS DATE: 11/10/87
ANALYST: MP

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW034	11/2/87	5416-01	AIV003	< 8.35	1
SW045	11/2/87	5416-03	AIV004	< 8.35	1
SW035	11/2/87	5416-05	AIV005	17.0	1
SW039	11/2/87	5416-07	AIV006	< 8.35	1
SW041	11/2/87	5416-09	AIV007	< 8.35	1
SW065	11/2/87	5416-11	AIV009	< 8.35	1
SW028	11/3/87	5424-02	AIV010	< 8.35	1
SW031	11/3/87	5424-04	AIV011	13.3	1
SW030	11/3/87	5424-06	AIV012	< 8.35	1
SW036	11/5/87	5434-02	AIV014	< 8.35	1
SW038	11/5/87	5434-04	AIV015	< 8.35	1
SW037	11/5/87	5434-05	AIV016	< 8.35	1
SW040	11/5/87	5434-08	AIV017	< 8.35	1
High Spike			AIV008	95.4	
High Spike			AIV013	101	
High Spike True Value				100	
Low Spike			AIV002	9.62	
Low Spike True Value				10.0	
HQ Blank			AIV001	< 8.35	

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



INTERPOLL INC.
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CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

December 30, 1987

PARAMETER: BA, Method SD07
DETECTION LIMIT: 20.0 ug/L
UNITS: ug/L
PREP DATE: 12/4/87
ANALYSIS DATE: 12/4/87
ANALYST: PHW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW034	11/2/87	5416-01	AJX003	86.0	1
SW045	11/2/87	5416-03	AJX004	122	1
SW035	11/2/87	5416-05	AJX005	60.0	1
SW039	11/2/87	5416-07	AJX006	52.0	1
SW041	11/2/87	5416-09	AJX007	56.0	1
SW065	11/2/87	5416-11	AJX008	44.0	1
SW029	11/2/87	5416-13	AJX009	24	11
SW028	11/3/87	5424-02	AJX010	180	1
SW031	11/3/87	5424-04	AJX011	184	1
SW030	11/3/87	5424-06	AJX012	185	1
SW036	11/5/87	5434-02	AJX013	46.0	1
SW038	11/5/87	5434-04	AJX014	51.0	1
SW037	11/5/87	5434-05	AJX015	41.0	1
SW040	11/5/87	5434-08	AJX016	51.5	1
03M505	11/9/87	5445-01	AJX017	124	1
03U007	11/9/87	5445-02	AJX018	26	11
03L007	11/9/87	5445-03	AJX019	22	11
04U007	11/9/87	5445-04	AJX020	190	1
03U008	11/9/87	5445-05	AJX021	34	11
03U010	11/9/87	5445-06	AJX022	127	1
03L010	11/9/87	5445-07	AJX023	32.0	1
04U012	11/9/87	5445-08	AJX024	10	50
03L012	11/9/87	5445-09	AJX025	167	1
03U012	11/9/87	5445-11	AJX026	20	11

Interpoll Laboratories
 USATHAMA Laboratory Report
 Federal Cartridge Company
 Page Two

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW032	11/10/87	5450-01	AJX027	112	1
SW062	11/10/87	5450-03	AJX028	12	50
SW064	11/10/87	5450-05	AJX029	128	1
SW063	11/10/87	5450-07	AJX030	146	1
SW061	11/10/87	5450-09	AJX031	152	1
03U013	11/10/87	5451-01	AJX032	11	11
03M013	11/10/87	5451-02	AJX033	145	1
03L013	11/10/87	5451-03	AJX034	18	11
03U017	11/10/87	5451-04	AJX035	52.5	1
03M017	11/10/87	5451-05	AJX036	65.0	1
03L017	11/10/87	5451-06	AJX037	126	1
03U076	11/10/87	5451-07	AJX038	136	1
03U704	11/10/87	5451-08	AJX039	46.0	1
03U075	11/10/87	5451-09	AJX040	52.0	1
03U023	11/10/87	5451-10	AJX041	60.0	1
High Spike			AJX002	158	
High Spike			AJX043	157	
High Spike True Value				150	
Low Spike			AJX042	36.0	
Low Spike True Value				40.0	
MQ Blank			AJX001	< 20.0	

Respectfully submitted,

Gregg W. Holman

Gregg W. Holman,
 Inorganic Chemistry Department Manager

BWH/cg

< = less than



interpoll

INTERPOLL LABORATORIES, INC.
 4500 BALL ROAD N.E.
 CIRCLE PINES, MINNESOTA 55014-1819
 TEL: 612/786-6020
 FAX: 612/786-7854

Federal Cartridge Company
 Twin Cities Army Ammunition Plant
 New Brighton, MN 55112

Attention: Paula Connell

LABORATORY REPORT: #5585A & #5586A
 PURCHASE ORDER: #7194-01

October 24, 1988

SAMPLES COLLECTED: December 11, 1987
 SAMPLES RECEIVED: December 11, 1987
 PREP DATE: December 17, 1987

METHOD: UM09

Sample Identification:
 Laboratory Log Number:
 USATHAMA ID Number:

Method	SW028	SW052
Blank/ Spike	5585-01	5585-02
<u>AGN001</u>	<u>AGN002</u>	<u>AGN003</u>

<u>Parameter, ug/L</u>	<u>Analysis</u>							
	<u>Date & Initials</u>	<u>Detect Limit</u>						
	1/22/88							
PHENOL	JB	80	<	80	<	80	<	80
ZOLP	JB	50	<	50	<	50	<	50
NNDMEA	JB	35	<	35	<	35	<	35
B2CLFE	JB	10	<	10	<	10	<	10
13DCLB	JB	15	<	15	<	15	<	15
14DCLB	JB	15	<	15	<	15	<	15
12DCLB	JB	15	<	15	<	15	<	15
B2CIPE	JB	10	<	10	<	10	<	10
NNDNPA	JB	20	<	20	<	20	<	20
CL6ET	JB	15	<	15	<	15	<	15
ZNP	JB	40	<	40	<	40	<	40
24DMFN	JB	50	<	50	<	50	<	50
24DCLP	JB	35	<	35	<	35	<	35
4CL3C	JB	35	<	35	<	35	<	35
246TOP	JB	35	<	35	<	35	<	35
NB	JB	15	<	15	<	15	<	15
ISOPHR	JB	10	<	10	<	10	<	10

Sample Identification:	Method	SW02B	SW052
Laboratory Log Number:	Blank/ Spike	5585-01	5585-02
USATHAMA ID Number:	<u>AGN001</u>	<u>AGN002</u>	<u>AGN003</u>

<u>Parameter, ug/L</u>	<u>Analysis</u>					
	<u>Date & Initials</u>	<u>Detect Limit</u>				
	1/22/88					
BZCEXM	JB	30	<	30	<	30
124TCB	JB	15	<	15	<	15
NAP	JB	15	<	15	<	15
24DNP	JB	70	<	70	<	70
4NP	JB	70	<	70	<	70
HCB0	JB	15	<	15	<	15
CL6CP	JB	10	<	10	<	10
2DNAP	JB	15	<	15	<	15
DMP	JB	50	<	50	<	50
ANAPYL	JB	30	<	30	<	30
46DN2C	JB	50	<	50	<	50
PCP	JB	30	<	30	<	30
ANAPNE	JB	45	<	45	<	45
24DNT	JB	35	<	35	<	35
26DNT	JB	60	<	60	<	60
DEP	JB	10	<	10	<	10
4CLPPE	JB	40	<	40	<	40
FLRENE	JB	25	<	25	<	25
NNDPA	JB	25	<	25	<	25
4BRPPE	JB	10	<	10	<	10
CL6BZ	JB	10	<	10	<	10
PHANTR	JB	20	<	20	<	20
ANTRC	JB	25	<	25	<	25
DNEP	JB	50	<	50	<	50
FANT	JB	40	<	40	<	40
BENZID	JB	60	<	60	<	60
PYR	JB	15	<	15	<	15
BBZP	JB	30	<	30	<	30
33DCB0	JB	30	<	30	<	30
BAANTR	JB	10	<	10	<	10
BZEHP	JB	10	<	10	<	10
CHRY	JB	20	<	20	<	20
DNOP	JB	15	<	15	<	15
BEFANT	JB	60	<	60	<	60
BKFANT	JB	60	<	60	<	60
BAPYR	JB	60	<	60	<	60
ICDPYR	JB	15	<	15	<	15
DBAHA	JB	20	<	20	<	20
BGHIPY	JB	10	<	10	<	10

Sample Identification:	Method					
Laboratory Log Number:	Blank/	SW028	SW052			
USATHAMA ID Number:	Spike	5585-01	5585-02			
	<u>AGN001</u>	<u>AGN002</u>	<u>AGN003</u>			
<u>Parameter, ug/L</u>	<u>Analysis</u>					
	<u>Date & Initials</u>	<u>Detect Limit</u>				
	1/22/88					
ALDRN	JB	10	<	10	<	10
BBHC	JB	10	<	10	<	10
DBHC	JB	10	<	10	<	10
CLDAN	JB	50	<	50	<	50
PPDDD	JB	10	<	10	<	10
PPDDE	JB	10	<	10	<	10
PPDDT	JB	10	<	10	<	10
DLDAN	JB	10	<	10	<	10
ESFS04	JB	10	<	10	<	10
ENDRNA	JB	10	<	10	<	10
HPCL	JB	10	<	10	<	10
HPCLE	JB	10	<	10	<	10
PCB016	JB	1.0	<	1.0	<	1.0
PCB221	JB	1.0	<	1.0	<	1.0
PCB232	JB	1.0	<	1.0	<	1.0
PCB242	JB	1.0	<	1.0	<	1.0
PCB248	JB	1.0	<	1.0	<	1.0
PCB254	JB	6.0	<	6.0	<	6.0
PCB260	JB	6.0	<	6.0	<	6.0
TXPHEN	JB	500	<	500	<	500
ABHC	JB	10	<	10	<	10
LIN	JB	10	<	10	<	10
AENSLF	JB	10	<	10	<	10
BENSLF	JB	10	<	10	<	10
ENDRN	JB	10	<	10	<	10
Dilution factor				1		1.02
						1.02



INTERPOLL LABORATORIES, INC.
 4500 BALL ROAD N.E.
 CIRCLE PINES, MINNESOTA 55014-1819
 TEL: 612/786-6020
 FAX: 612/786-7854

Federal Cartridge Company
 Twin Cities Army Ammunition Plant
 New Brighton, MN 55112

Attention: Paula Connell

LABORATORY REPORT: #5610A
 PURCHASE ORDER: #7194-01

March 11, 1988

SAMPLES COLLECTED: December 17, 1987
 SAMPLES RECEIVED: December 17, 1987
 PREP DATE: December 21, 1987

METHOD: LM09

Sample Identification:
 Laboratory Log Number:
 USATHAMA ID Number:

Method	SW059
Blank/	
Spike	5610-07
<u>ARG001</u>	<u>ARG002</u>

<u>Parameter, ug/L</u>	<u>Analysis</u>				
	<u>Date & Initials</u>	<u>Detect Limit</u>			
	1/23/88				
PHENOL	JB	80	<	80	< 80
ZOLP	JB	50	<	50	< 50
NNDMEA	JB	35	<	35	< 35
BZOLEE	JB	10	<	10	< 10
13DCLB	JB	15	<	15	< 15
14DCLB	JB	15	<	15	< 15
12DCLB	JB	15	<	15	< 15
BZCIPE	JB	10	<	10	< 10
NNDNPA	JB	20	<	20	< 20
CLAET	JB	15	<	15	< 15
ZNP	JB	40	<	40	< 40
24DMPN	JB	50	<	50	< 50
24DCLP	JB	35	<	35	< 35
4CL3C	JB	35	<	35	< 35
246TOP	JB	35	<	35	< 35
NB	JB	15	<	15	< 15
ISOPHR	JB	10	<	10	< 10

Interpoll Laboratories
 USATHAMA Laboratory Report #5610A (continued)
 Federal Cartridge Company
 Page Two

Sample Identification:	Method	SW059
Laboratory Log Number:	Blank/ Spike	5610-07
USATHAMA ID Number:	<u>ARG001</u>	<u>ARG002</u>

<u>Parameter, ug/L</u>	<u>Analysis</u>				
	<u>Date & Initials</u>	<u>Detect Limit</u>			
	1/23/88				
B2CEXM	JB	30	<	30	< 30
124TCB	JB	15	<	15	< 15
NAP	JB	15	<	15	< 15
24DNP	JB	70	<	70	< 70
4NP	JB	70	<	70	< 70
HCBD	JB	15	<	15	< 15
CL6CP	JB	10	<	10	< 10
2ONAP	JB	15	<	15	< 15
DMP	JB	50	<	50	< 50
ANAPYL	JB	30	<	30	< 30
46DN2C	JB	50	<	50	< 50
POP	JB	30	<	30	< 30
ANAPNE	JB	45	<	45	< 45
24DNT	JB	35	<	35	< 35
26DNT	JB	60	<	60	< 60
DEP	JB	10	<	10	< 10
4CLPPE	JB	40	<	40	< 40
FLRENE	JB	25	<	25	< 25
NNDPA	JB	25	<	25	< 25
4BRPPE	JB	10	<	10	< 10
CL6BZ	JB	10	<	10	< 10
PHANTR	JB	20	<	20	< 20
ANTRC	JB	25	<	25	< 25
DNBP	JB	50	<	50	< 50
FANT	JB	40	<	40	< 40
BENZID	JB	60	<	60	< 60
PYR	JB	15	<	15	< 15
BBZP	JB	30	<	30	< 30
33DCBD	JB	30	<	30	< 30
BAANTR	JB	10	<	10	< 10
BZEHP	JB	10	<	10	< 20
CHRY	JB	20	<	20	< 20
DNOP	JB	15	<	15	< 15
BBFANT	JB	60	<	60	< 60
BKFANT	JB	60	<	60	< 60
BAFYR	JB	60	<	60	< 60
ICDPYR	JB	15	<	15	< 15
DBAHA	JB	20	<	20	< 20
BGHIPY	JB	10	<	10	< 10

Interpoll Laboratories
 USATHAMA Laboratory Report #5610A (continued)
 Federal Cartridge Company
 Page Three

Sample Identification:	Method	SW059
Laboratory Log Number:	Blank/ Spike	5610-07
USATHAMA ID Number:	<u>ARG001</u>	<u>ARG002</u>

<u>Parameter, ug/L</u>	<u>Analysis</u>				
	<u>Date & Initials</u>	<u>Detect Limit</u>			
	1/23/88				
ALDRN	JB	10	<	10	< 10
BBHC	JB	10	<	10	< 10
DBHC	JB	10	<	10	< 10
CLDAN	JB	50	<	50	< 50
PPDDD	JB	10	<	10	< 10
PPDDE	JB	10	<	10	< 10
PPDDT	JB	10	<	10	< 10
DLDRN	JB	10	<	10	< 10
ESFS04	JB	10	<	10	< 10
ENDRNA	JB	10	<	10	< 10
HPOL	JB	10	<	10	< 10
HPOLE	JB	10	<	10	< 10
PCB016	JB	1.0	<	1.0	< 1.0
PCB221	JB	1.0	<	1.0	< 1.0
PCB232	JB	1.0	<	1.0	< 1.0
PCB242	JB	1.0	<	1.0	< 1.0
PCB248	JB	1.0	<	1.0	< 1.0
PCB254	JB	6.0	<	6.0	< 6.0
PCB260	JB	6.0	<	6.0	< 6.0
TXPHEN	JB	500	<	500	< 500
ABHC	JB	10	<	10	< 10
LIN	JB	10	<	10	< 10
AENSLF	JB	10	<	10	< 10
BEENSLF	JB	10	<	10	< 10
ENDRN	JB	10	<	10	< 10
Dilution factor				1	1.02

Interpoll Laboratories
USATHAMA Laboratory Report #5610A (continued)
Federal Cartridge Company
Page Four

Sample Identification:
Laboratory Log Number:
USATHAMA ID Number:

Method
Blank/ Spike
ARG001 ARG002
SW059
5610-07

<u>Parameter</u>	<u>Spike Conc.</u> <u>ug/L</u>		
Surrogate Standards:			
NE05	28	24	25
2FBP	22	20	22
TRPD14	21	50	42
PHEND6	71	30	27
2FP	57	34	32
246TBP	55	50	50

Respectfully submitted,



Wayne A. Olson,
Organic Chemistry Department Manager

WAO/cg
< = less than

Interpoll Laboratories
 USATHAMA Laboratory Report #5566B, #5568B & #5578B (continued)
 Federal Cartridge Company
 Page Eleven

Sample Identification:
 Laboratory Log Number:
 USATHAMA ID Number:

5W035
 557B-05
AQJ010

<u>Parameter, ug/L</u>	<u>Analysis</u>			
	<u>Date & Initials</u>	<u>Detect Limit</u>		
	1/20/88			
BZCEXM	JB	30	<	30
124TCB	JB	15	<	15
NAP	JB	15	<	15
24DNP	JB	70	<	70
4NP	JB	70	<	70
HCB0	JB	15	<	15
CL6CP	JB	10	<	10
20NAP	JB	15	<	15
DMP	JB	50	<	50
ANAPYL	JB	30	<	30
46DNZC	JB	50	<	50
PCP	JB	30	<	30
ANAPNE	JB	45	<	45
24DNT	JB	35	<	35
26DNT	JB	60	<	60
DEP	JB	10	<	10
4CLPPE	JB	40	<	40
FLRENE	JB	25	<	25
NNDPA	JB	25	<	25
4BRPPE	JB	10	<	10
CL6BZ	JB	10	<	10
PHANTR	JB	20	<	20
ANTRC	JB	25	<	25
DNEP	JB	50	<	50
FANT	JB	40	<	40
BENZID	JB	60	<	60
PYR	JB	15	<	15
BBZP	JB	30	<	30
33DCBD	JB	30	<	30
BAANTR	JB	10	<	10
BZEP	JB	10	<	10
CHRY	JB	20	<	20
DNOP	JB	15	<	15
BEFANT	JB	60	<	60
BKFANT	JB	60	<	60
BAPYR	JB	60	<	60
ICOPYR	JB	15	<	15
DBAHA	JB	20	<	20
BGHIFY	JB	10	<	10

Interpoll Laboratories
 USATHAMA Laboratory Report #5566B, #5568B & #5578B (continued)
 Federal Cartridge Company
 Page Twelve

Sample Identification: SW035
 Laboratory Log Number: 5578-05
 USATHAMA ID Number: AQJ010

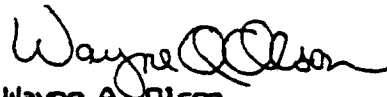
Parameter, ug/L	Analysis			
	Date & Initials	Detect Limit		
	1/20/88			
ALDRN	JB	10	<	10
BBHC	JB	10	<	10
DBHC	JB	10	<	10
CLDAN	JB	50	<	50
PPDDD	JB	10	<	10
PPDDE	JB	10	<	10
PPDDT	JB	10	<	10
DLDRN	JB	10	<	10
ESFS04	JB	10	<	10
ENDRNA	JB	10	<	10
HPCL	JB	10	<	10
HPCLE	JB	10	<	10
PCB016	JB	1.0	<	1.0
PCB221	JB	1.0	<	1.0
PCB232	JB	1.0	<	1.0
PCB242	JB	1.0	<	1.0
PCB248	JB	1.0	<	1.0
PCB254	JB	6.0	<	6.0
PCB260	JB	6.0	<	6.0
TXPHEN	JB	500	<	500
ABHC	JB	10	<	10
LIN	JB	10	<	10
AENSLF	JB	10	<	10
BENSLF	JB	10	<	10
ENDRN	JB	10	<	10
Dilution factor				1.02

Interpoll Laboratories
USATHAMA Laboratory Report #5566B, #5568B & #5578B (continued)
Federal Cartridge Company
Page Thirteen

Sample Identification: SW035
Laboratory Log Number: 5578-05
USATHAMA ID Number: AQJ010

<u>Parameter</u>	<u>Spike Conc. ug/L</u>	
Surrogate Standards:		
NB05	28	26
ZFBP	22	22
TRPD14	21	35
PHEND6	71	40
ZFP	57	47
246TBP	55	58

Respectfully submitted,



Wayne A. Olson,
Organic Chemistry Department Manager

WAO/cg
< = less than



INTERPOLL LABORATORIES, INC.
 4500 BALL ROAD N.E.
 CIRCLE PINES, MINNESOTA 55014-1819
 TEL: 612/786-6020
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Federal Cartridge Company
 Twin Cities Army Ammunition Plant
 New Brighton, MN 55112

Attention: Paula Connell

LABORATORY REPORT: #5450A
 PURCHASE ORDER: #7194-01

October 24, 1988

SAMPLES COLLECTED: November 10, 1987
 SAMPLES RECEIVED: November 10, 1987
 PREP DATE: November 16, 1987

METHOD: UM09

Sample Identification:
 Laboratory Log Number:
 USATHAMA ID Number:

Method
 Blank/
 Spike
AGD001

SW032
 5450-01
AGD002

SW062
 5450-03
AGD003

Parameter, ug/L	Analysis		Method			
	Date & Initials	Detect Limit	Blank/ Spike <u>AGD001</u>	SW032 5450-01 <u>AGD002</u>	SW062 5450-03 <u>AGD003</u>	
	12/4/87					
PHENDL	JB	80	< 80	< 80	< 80	< 80
ZOLP	JB	50	< 50	< 50	< 50	< 50
NDMEA	JB	35	< 35	< 35	< 35	< 35
BZOLEE	JB	10	< 10	< 10	< 10	< 10
13DCLB	JB	15	< 15	< 15	< 15	< 15
14DCLB	JB	15	< 15	< 15	< 15	< 15
12DCLB	JB	15	< 15	< 15	< 15	< 15
BZCIFE	JB	10	< 10	< 10	< 10	< 10
MNDNPA	JB	20	< 20	< 20	< 20	< 20
CL6ET	JB	15	< 15	< 15	< 15	< 15
ZNP	JB	40	< 40	< 40	< 40	< 40
240MPN	JB	50	< 50	< 50	< 50	< 50
24DCLP	JB	35	< 35	< 35	< 35	< 35
4CL3C	JB	35	< 35	< 35	< 35	< 35
246TOP	JB	35	< 35	< 35	< 35	< 35
NB	JB	15	< 15	< 15	< 15	< 15
ISOPHR	JB	10	< 10	< 10	< 10	< 10

Interpoll Laboratories
 USATHAMA Laboratory Report #5450A (continued)
 Federal Cartridge Company
 Page Two

Sample Identification:
 Laboratory Log Number:
 USATHAMA ID Number:

Method
 Blank/
 Spike
AGD001

SW032
 5450-01
AGD002

SW062
 5450-03
AGD003

<u>Parameter, ug/L</u>	<u>Analysis</u>						
	<u>Date & Initials</u>	<u>Detect Limit</u>					
	12/4/87						
BZCEXM	JB	30	<	30	<	30	< 30
124TCB	JB	15	<	15	<	15	< 15
NAP	JB	15	<	15	<	15	< 15
24DNP	JB	70	<	70	<	70	< 70
4NP	JB	70	<	70	<	70	< 70
HCBD	JB	15	<	15	<	15	< 15
CL6CP	JB	10	<	10	<	10	< 10
2ONAP	JB	15	<	15	<	15	< 15
DMP	JB	50	<	50	<	50	< 50
ANAPYL	JB	30	<	30	<	30	< 30
46DNZC	JB	50	<	50	<	50	< 50
POP	JB	30	<	30	<	30	< 30
ANAPNE	JB	45	<	45	<	45	< 45
24DNT	JB	35	<	35	<	35	< 35
26DNT	JB	60	<	60	<	60	< 60
DEP	JB	10	<	10	<	10	< 10
4CLPPE	JB	40	<	40	<	40	< 40
FLRENE	JB	25	<	25	<	25	< 25
NNDPA	JB	25	<	25	<	25	< 25
4BRPPE	JB	10	<	10	<	10	< 10
CL6BZ	JB	10	<	10	<	10	< 10
PHANTR	JB	20	<	20	<	20	< 20
ANTRC	JB	25	<	25	<	25	< 25
DNEP	JB	50	<	50	<	50	< 50
FANT	JB	40	<	40	<	40	< 40
BENZID	JB	60	<	60	<	60	< 60
PYR	JB	15	<	15	<	15	< 15
BBZP	JB	30	<	30	<	30	< 30
33DCBD	JB	30	<	30	<	30	< 30
BAANTR	JB	10	<	10	<	10	< 10
BZEHP	JB	10	<	10	<	10	< 10
CHRY	JB	20	<	20	<	20	< 20
DNOP	JB	15	<	15	<	15	< 15
BBFANT	JB	60	<	60	<	60	< 60
BKFANT	JB	60	<	60	<	60	< 60
BAPYR	JB	60	<	60	<	60	< 60
ICDPYR	JB	15	<	15	<	15	< 15
DBAHA	JB	20	<	20	<	20	< 20
BGHIPY	JB	10	<	10	<	10	< 10

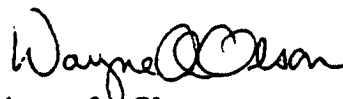
Interpoll Laboratories
 USATHAMA Laboratory Report #5450A (continued)
 Federal Cartridge Company
 Page Three

Sample Identification:	Method					
Laboratory Log Number:	Blank/	SW032	SW062			
USATHAMA ID Number:	Spike	5450-01	5450-03			
	<u>AGD001</u>	<u>AGD002</u>	<u>AGD003</u>			
Parameter, ug/L	Analysis					
	Date & Initials	Detect Limit				
	12/4/87					
ALDRN	JB	10	<	10	<	10
BBHC	JB	10	<	10	<	10
DBHC	JB	10	<	10	<	10
CLDAN	JB	50	<	50	<	50
PPDDD	JB	10	<	10	<	10
PPDDE	JB	10	<	10	<	10
PPDDT	JB	10	<	10	<	10
DLDRN	JB	10	<	10	<	10
ESFS04	JB	10	<	10	<	10
ENDRNA	JB	10	<	10	<	10
HPCL	JB	10	<	10	<	10
HPCLE	JB	10	<	10	<	10
PCB016	JB	1.0	<	1.0	<	1.0
PCB221	JB	1.0	<	1.0	<	1.0
PCB232	JB	1.0	<	1.0	<	1.0
PCB242	JB	1.0	<	1.0	<	1.0
PCB248	JB	1.0	<	1.0	<	1.0
PCB234	JB	6.0	<	6.0	<	6.0
PCB260	JB	6.0	<	6.0	<	6.0
TXPHEN	JB	500	<	500	<	500
ABHC	JB	10	<	10	<	10
LIN	JB	10	<	10	<	10
AENSLF	JB	10	<	10	<	10
BENSLF	JB	10	<	10	<	10
ENDRN	JB	10	<	10	<	10
Dilution factor				1		1.02

Sample Identification:	Method	SW032	SW062
Laboratory Log Number:	Blank/	5450-01	5450-03
USATHAMA ID Number:	Spike	<u>AGD002</u>	<u>AGD003</u>
		<u>AGD001</u>	

<u>Parameter</u>	<u>Spike</u> <u>Conc.</u> <u>ug/L</u>			
Surrogate Standards:				
NEOS	28	38	61	56
ZFBP	22	22	30	27
TRPD14	21	28	40	31
PHEND6	71	16	36	35
ZFP	57	31	60	62
246TBP	55	87	100	130

Respectfully submitted,



Wayne A. Olson,
Organic Chemistry Department Manager

WAO/cg
< = less than



INTERPOLL LABORATORIES, INC.
 4500 BALL ROAD N.E.
 CIRCLE PINES, MINNESOTA 55014-1819
 TEL: 612/786-6020
 FAX: 612/786-7854

Federal Cartridge Company
 Twin Cities Army Ammunition Plant
 New Brighton, MN 55112

Attention: Paula Connell

LABORATORY REPORT: #5578A
 PURCHASE ORDER: #7194-01

October 24, 1988

SAMPLES COLLECTED: December 10, 1987
 SAMPLES RECEIVED: December 10, 1987
 PREP DATE: December 14, 1987

METHOD: UM09

Sample Identification:
 Laboratory Log Number:
 USATHAMA ID Number:

Method			
Blank/		SW035	SW045
Spike		5578-05D	5578-07
<u>AGK001</u>		<u>AGK002</u>	<u>AGK003</u>

<u>Parameter</u> , ug/L	<u>Analysis</u> Date & <u>Initials</u>	<u>Detect</u> <u>Limit</u>	Method			
			Blank/ Spike <u>AGK001</u>	SW035 5578-05D <u>AGK002</u>	SW045 5578-07 <u>AGK003</u>	
	1/21/88					
PHENOL	JB	80	< 80	< 80	< 80	< 80
ZOLP	JB	50	< 50	< 50	< 50	< 50
NNDMEA	JB	35	< 35	< 35	< 35	< 35
BZOLEE	JB	10	< 10	< 10	< 10	< 10
13DCLB	JB	15	< 15	< 15	< 15	< 15
14DCLB	JB	15	< 15	< 15	< 15	< 15
12DCLB	JB	15	< 15	< 15	< 15	< 15
BZCIFE	JB	10	< 10	< 10	< 10	< 10
NNDNPA	JB	20	< 20	< 20	< 20	< 20
CL6ET	JB	15	< 15	< 15	< 15	< 15
ZNP	JB	40	< 40	< 40	< 40	< 40
24DMPN	JB	50	< 50	< 50	< 50	< 50
24DCLP	JB	35	< 35	< 35	< 35	< 35
4CL3C	JB	35	< 35	< 35	< 35	< 35
246TCP	JB	35	< 35	< 35	< 35	< 35
NB	JB	15	< 15	< 15	< 15	< 15
ISOPHR	JB	10	< 10	< 10	< 10	< 10

Interpoll Laboratories
 USATHAMA Laboratory Report #5578A (continued)
 Federal Cartridge Company
 Page Two

Sample Identification:	Method					
Laboratory Log Number:	Blank/ Spike	SW035	SW045			
USATHAMA ID Number:	<u>AGK001</u>	<u>5578-05D</u> <u>AGK002</u>	<u>5578-07</u> <u>AGK003</u>			
<u>Parameter, ug/L</u>	<u>Analysis</u>					
	<u>Date & Initials</u>	<u>Detect Limit</u>				
	1/21/88					
BZCEXM	JB	30	<	30	<	30
124TCB	JB	15	<	15	<	15
NAP	JB	15	<	15	<	15
24DNP	JB	70	<	70	<	70
4NP	JB	70	<	70	<	70
HCBD	JB	15	<	15	<	15
CL6CP	JB	10	<	10	<	10
2DNAP	JB	15	<	15	<	15
DMP	JB	50	<	50	<	50
ANAPYL	JB	30	<	30	<	30
46DNZC	JB	50	<	50	<	50
PCP	JB	30	<	30	<	30
ANAPNE	JB	45	<	45	<	45
24DNT	JB	35	<	35	<	35
26DNT	JB	60	<	60	<	60
DEP	JB	10	<	10	<	10
4CLPPE	JB	40	<	40	<	40
FLRENE	JB	25	<	25	<	25
MNDPA	JB	25	<	25	<	25
4BRPPE	JB	10	<	10	<	10
CL6BZ	JB	10	<	10	<	10
PHANTR	JB	20	<	20	<	20
ANTRC	JB	25	<	25	<	25
DNEP	JB	50	<	50	<	50
FANT	JB	40	<	40	<	40
BENZID	JB	60	<	60	<	60
PYR	JB	15	<	15	<	15
BBZP	JB	30	<	30	<	30
33DCBD	JB	30	<	30	<	30
BAANTR	JB	10	<	10	<	10
BZEHP	JB	10	<	10	<	10
CHRY	JB	20	<	20	<	20
DNCP	JB	15	<	15	<	15
BBFANT	JB	60	<	60	<	60
BKFANT	JB	60	<	60	<	60
BAPYR	JB	60	<	60	<	60
ICDPYR	JB	15	<	15	<	15
DBAHA	JB	20	<	20	<	20
BGHIPY	JB	10	<	10	<	10

Interpoll Laboratories
 USATHAMA Laboratory Report #5578A (continued)
 Federal Cartridge Company
 Page Three

Sample Identification:	Method	SW035	SW045
Laboratory Log Number:	Blank/	5578-05D	5578-07
USATHAMA ID Number:	Spike	AGK002	AGK003
	<u>AGK001</u>		

<u>Parameter, ug/L.</u>	<u>Analysis</u>					
	<u>Date & Initials</u>	<u>Detect Limit</u>				
	1/21/88					
ALDRN	JB	10	<	10	<	10
BBHC	JB	10	<	10	<	10
DBHC	JB	10	<	10	<	10
CLDAN	JB	50	<	50	<	50
FPDDD	JB	10	<	10	<	10
FPDDE	JB	10	<	10	<	10
FPDDT	JB	10	<	10	<	10
DLDRN	JB	10	<	10	<	10
ESFS04	JB	10	<	10	<	10
ENDRNA	JB	10	<	10	<	10
HPCL	JB	10	<	10	<	10
HPCL	JB	10	<	10	<	10
PCB016	JB	1.0	<	1.0	<	1.0
PCB221	JB	1.0	<	1.0	<	1.0
PCB232	JB	1.0	<	1.0	<	1.0
PCB242	JB	1.0	<	1.0	<	1.0
PCB248	JB	1.0	<	1.0	<	1.0
PCB254	JB	6.0	<	6.0	<	6.0
PCB260	JB	6.0	<	6.0	<	6.0
TXPHEN	JB	500	<	500	<	500
ABHC	JB	10	<	10	<	10
LIN	JB	10	<	10	<	10
AENSLF	JB	10	<	10	<	10
BENSLF	JB	10	<	10	<	10
ENDRN	JB	10	<	10	<	10
Dilution factor				1		1.02
						1.02

Interpoll Laboratories
 USATHAMA Laboratory Report #5578A (continued)
 Federal Cartridge Company
 Page Four

Sample Identification:	Method	SW035	SW045
Laboratory Log Number:	Blank/	5578-05D	5578-07
USATHAMA ID Number:	Spike	<u>AGK002</u>	<u>AGK003</u>
	<u>AGK001</u>		

<u>Parameter</u>	<u>Spike Conc.</u>	<u>ug/L</u>		
Surrogate Standards:				
NBD5	28	26	25	27
2FBP	22	23	21	23
TRPD14	21	41	40	41
PHEND6	71	24	38	37
2FP	57	30	44	43
246TBP	55	53	57	58

Sample Identification:	SW034	SW030	SW031
Laboratory Log Number:	5578-09	5578-11	5578-13
USATHAMA ID Number:	<u>AGK004</u>	<u>AGK005</u>	<u>AGK006</u>

<u>Parameter, ug/L</u>	Analysis		<	<	<
	<u>Date & Initials</u>	<u>Detect Limit</u>			
	1/21/88				
PHENOL	JB	80	<	80	<
ZOLP	JB	50	<	50	<
NNDMEA	JB	35	<	35	<
B2CLEE	JB	10	<	10	<
13DCLB	JB	15	<	15	<
14DCLB	JB	15	<	15	<
12DCLB	JB	15	<	15	<
B2CIPE	JB	10	<	10	<
NNDNPA	JB	20	<	20	<
CL6ET	JB	15	<	15	<
ZNP	JB	40	<	40	<
24DMPN	JB	50	<	50	<
24DCLP	JB	35	<	35	<
4CL3C	JB	35	<	35	<
246TCP	JB	35	<	35	<
NB	JB	15	<	15	<
ISOPHR	JB	10	<	10	<

Interpoll Laboratories
 USATHAMA Laboratory Report #5578A (continued)
 Federal Cartridge Company
 Page Five

Sample Identification:	SW034	SW030	SW031
Laboratory Log Number:	5578-09	5578-11	5578-13
USATHAMA ID Number:	<u>ADK004</u>	<u>ADK005</u>	<u>ADK006</u>

<u>Parameter, ug/L</u>	<u>Analysis</u>							
	<u>Date & Initials</u>	<u>Detect Limit</u>						
	1/21/88							
BZCEXM	JB	30	<	30	<	30	<	30
124TCB	JB	15	<	15	<	15	<	15
NAP	JB	15	<	15	<	15	<	15
24DNP	JB	70	<	70	<	70	<	70
4NP	JB	70	<	70	<	70	<	70
HCBD	JB	15	<	15	<	15	<	15
CL6CP	JB	10	<	10	<	10	<	10
2ONAP	JB	15	<	15	<	15	<	15
DMP	JB	50	<	50	<	50	<	50
ANAPYL	JB	30	<	30	<	30	<	30
46DN2C	JB	50	<	50	<	50	<	50
PCP	JB	30	<	30	<	30	<	30
ANAPNE	JB	45	<	45	<	45	<	45
24DNT	JB	35	<	35	<	35	<	35
26DNT	JB	60	<	60	<	60	<	60
DEP	JB	10	<	10	<	10	<	10
4CLPPE	JB	40	<	40	<	40	<	40
FLRENE	JB	25	<	25	<	25	<	25
NNDPA	JB	25	<	25	<	25	<	25
4BRPPE	JB	10	<	10	<	10	<	10
CL6BZ	JB	10	<	10	<	10	<	10
PHANTR	JB	20	<	20	<	20	<	20
ANTRC	JB	25	<	25	<	25	<	25
DNEP	JB	50	<	50	<	50	<	50
FANT	JB	40	<	40	<	40	<	40
BENZID	JB	60	<	60	<	60	<	60
PYR	JB	15	<	15	<	15	<	15
BBZP	JB	30	<	30	<	30	<	30
33DCBD	JB	30	<	30	<	30	<	30
BAANTR	JB	10	<	10	<	10	<	10
BZEHP	JB	10	<	10	<	10	<	10
CHRY	JB	20	<	20	<	20	<	20
DNOP	JB	15	<	15	<	15	<	15
BBFANT	JB	60	<	60	<	60	<	60
BKFANT	JB	60	<	60	<	60	<	60
BAPYR	JB	60	<	60	<	60	<	60
ICDPYR	JB	15	<	15	<	15	<	15
DBAHA	JB	20	<	20	<	20	<	20
BGHIPY	JB	10	<	10	<	10	<	10

Inter-Cell Laboratories
 USATHAMA Laboratory Report #5578A (continued)
 Federal Cartridge Company
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Sample Identification:	SW034	SW030	SW031
Laboratory Log Number:	5578-09	5578-11	5578-13
USATHAMA ID Number:	<u>AGK004</u>	<u>AGK005</u>	<u>AGK006</u>

<u>Parameter, ug/L</u>	<u>Analysis</u>					
	<u>Date & Initials</u>	<u>Detect Limit</u>				
	1/21/88					
ALDRN	JB	10	<	10	<	10
BBHC	JB	10	<	10	<	10
DBHC	JB	10	<	10	<	10
CLDAN	JB	50	<	50	<	50
FPDDD	JB	10	<	10	<	10
FPDDE	JB	10	<	10	<	10
FPDDT	JB	10	<	10	<	10
DLDRN	JB	10	<	10	<	10
ESFS04	JB	10	<	10	<	10
ENDRNA	JB	10	<	10	<	10
HPCL	JB	10	<	10	<	10
HPOLE	JB	10	<	10	<	10
PCB016	JB	1.0	<	1.0	<	1.0
PCB221	JB	1.0	<	1.0	<	1.0
PCB232	JB	1.0	<	1.0	<	1.0
PCB242	JB	1.0	<	1.0	<	1.0
PCB248	JB	1.0	<	1.0	<	1.0
PCB254	JB	6.0	<	6.0	<	6.0
PCB260	JB	6.0	<	6.0	<	6.0
TXPHEN	JB	500	<	500	<	500
ABHC	JB	10	<	10	<	10
LIN	JB	10	<	10	<	10
AENSLF	JB	10	<	10	<	10
BENSLF	JB	10	<	10	<	10
ENDRN	JB	10	<	10	<	10
Dilution factor				1.02		1.02
						1.02

Intertoll Laboratories
USATHAMA Laboratory Report #5578A (continued)
Federal Cartridge Company
Page Seven

Sample Identification:	SW034	SW030	SW031
Laboratory Log Number:	5578-09	5578-11	5578-13
USATHAMA ID Number:	<u>AQK004</u>	<u>AQK005</u>	<u>AQK006</u>

<u>Parameter</u>	Spike Conc. <u>ug/L</u>			
Surrogate Standards:				
NB05	28	27	24	15
ZFBP	22	23	21	12
TRPD14	21	52	35	14
PHEND6	71	38	33	16
ZFP	57	44	34	15
246TBP	55	55	58	38

Respectfully submitted,


Wayne A. Olson,
Organic Chemistry Department Manager

WAO/cg
< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

LABORATORY REPORT: #5416 & #5424
PURCHASE ORDER: #7194-01

December 11, 1987

SAMPLES COLLECTED: November 2 & 3, 1987
SAMPLES RECEIVED: November 3 & 4, 1987

Sample Identification:	SW034	SW045	SW035
Laboratory Log Number:	5416-01	5416-03	5416-05
USATHAMA ID Number:	<u>AIT003</u>	<u>AIT004</u>	<u>AIT005</u>

METHOD: USATHAMA U601

<u>Parameter, ug/L</u>	<u>Analysis</u>				
	<u>Date & Initials</u>	<u>Detect Limit</u>			
	11/5/87				
C2H3CL	MJE 1.5	< 1.5	< 1.5	< 1.5	< 1.5
CH2CL2	MJE 1.8	< 1.8	< 1.8	< 1.8	< 1.8
11DCE	MJE 0.49	< 0.49	< 0.49	< 0.49	< 0.49
11DCLE	MJE 0.72	< 0.72	< 0.72	< 0.72	< 0.72
12DCE	MJE 0.56	< 0.56	< 0.56	< 0.56	< 0.56
CHCL3	MJE 0.41	< 0.41	< 0.41	< 0.41	< 0.41
TCLTFE	MJE 4.5	< 4.5	< 4.5	< 4.5	< 4.5
12DCLE	MJE 0.51	< 0.51	< 0.51	< 0.51	< 0.51
111TCE	MJE 0.81	< 0.81	< 0.81	< 0.81	< 0.81
CCL4	MJE 1.1	< 1.1	< 1.1	< 1.1	< 1.1
12DCLP	MJE 0.62	< 0.62	< 0.62	< 0.62	< 0.62
TRCLE	MJE 1.1	< 1.1	< 1.1	< 1.1	< 1.1
112TCE	MJE 0.99	< 0.99	< 0.99	< 0.99	< 0.99
TCLEE	MJE 0.88	< 0.88	< 0.88	< 0.88	< 0.88

Volume used	5 mL	5 mL	5 mL
Dilution factor	1	1	1

Sample Identification:	SM039	SM041	SM065
Laboratory Log Number:	5416-07	5416-09	5416-11
USATHAMA ID Number:	<u>AIT006</u>	<u>AIT007</u>	<u>AIT008</u>

METHOD: USATHAMA U601

<u>Parameter, ug/L</u>	<u>Analysis</u>				
	<u>Date & Initials</u>	<u>Detect Limit</u>			
	11/5/87				
C2H3CL	MJE	1.5	< 1.5	< 1.5	< 1.5
CH2CL2	MJE	1.8	< 1.8	< 1.8	< 1.8
11DCE	MJE	0.49	< 0.49	< 0.49	< 0.49
11DCLE	MJE	0.72	< 0.72	< 0.72	< 0.72
12DCE	MJE	0.56	< 0.56	< 0.56	< 0.56
CHCL3	MJE	0.41	< 0.41	< 0.41	< 0.41
TCLTFE	MJE	4.5	< 4.5	< 4.5	< 4.5
12DCLE	MJE	0.51	< 0.51	< 0.51	< 0.51
111TCE	MJE	0.81	< 0.81	< 0.81	< 0.81
CCL4	MJE	1.1	< 1.1	< 1.1	< 1.1
12DCLP	MJE	0.62	< 0.62	< 0.62	< 0.62
TRCLE	MJE	1.1	< 1.1	< 1.1	< 1.1
112TCE	MJE	0.99	< 0.99	< 0.99	< 0.99
TCLEE	MJE	0.88	< 0.88	< 0.88	< 0.88
Volume used			5 mL	5 mL	5 mL
Dilution factor			1	1	1

Sample Identification:	SM029
Laboratory Log Number:	5416-13
USATHAMA ID Number:	<u>AIT009</u>

METHOD: USATHAMA U601

<u>Parameter, ug/L</u>	<u>Analysis</u>				
	<u>Date & Initials</u>	<u>Detect Limit</u>			
	11/5/87				
C2H3CL	MJE	1.5	< 1.5		
CH2CL2	MJE	1.8	< 1.8		
11DCE	MJE	0.49	< 0.49		
11DCLE	MJE	0.72	< 0.72		
12DCE	MJE	0.56	< 0.56		
CHCL3	MJE	0.41	< 0.41		
TCLTFE	MJE	4.5	< 4.5		
12DCLE	MJE	0.51	< 0.51		
111TCE	MJE	0.81	< 0.81		
CCL4	MJE	1.1	< 1.1		
12DCLP	MJE	0.62	< 0.62		
TRCLE	MJE	1.1	< 1.1		
112TCE	MJE	0.99	< 0.99		
TCLEE	MJE	0.88	< 0.88		
Volume used			5 mL		
Dilution factor			1		

Sample Identification:	SM028	SM031	SM030
Laboratory Log Number:	5424-02	5424-04	5424-06
USATHAMA ID Number:	<u>AIT010</u>	<u>AIT011</u>	<u>AIT012</u>

METHOD: USATHAMA U801

<u>Parameter, ug/L</u>	<u>Analysis</u>				
	<u>Date & Initials</u>	<u>Detect Limit</u>			
	11/5/87				
C2H3CL	MJE	1.5	< 1.5	< 1.5	< 1.5
CH2CL2	MJE	1.8	< 1.8	< 1.8	< 1.8
11DCE	MJE	0.49	< 0.49	< 0.49	< 0.49
11DCLE	MJE	0.72	< 0.72	< 0.72	< 0.72
12DCE	MJE	0.56	< 0.56	< 0.56	< 0.56
CHCL3	MJE	0.41	< 0.41	< 0.41	< 0.41
TCLTFE	MJE	4.5	< 4.5	< 4.5	< 4.5
12DCLE	MJE	0.51	< 0.51	< 0.51	< 0.51
111TCE	MJE	0.81	< 0.81	< 0.81	< 0.81
CCL4	MJE	1.1	< 1.1	< 1.1	< 1.1
12DCLP	MJE	0.62	< 0.62	< 0.62	< 0.62
TRCLE	MJE	1.1	1.66	< 1.1	< 1.1
112TCE	MJE	0.99	< 0.99	< 0.99	< 0.99
TCLEE	MJE	0.88	< 0.88	< 0.88	< 0.88
Volume used			5 mL	5 mL	5 mL
Dilution factor			1	1	1

Sample Identification:	MQ Blank	2 CRL QC	2 CRL QC
USATHAMA ID Number:	<u>AIT001</u>	<u>AIT002</u>	<u>True Value</u>

METHOD: USATHAMA U801

<u>Parameter, ug/L</u>	<u>Analysis</u>				
	<u>Date & Initials</u>	<u>Detect Limit</u>			
	11/5/87				
C2H3CL	MJE	1.5	< 1.5	< 1.5	
CH2CL2	MJE	1.8	< 1.8	< 1.8	
11DCE	MJE	0.49	< 0.49	0.407	0.944
11DCLE	MJE	0.72	< 0.72	< 0.72	
12DCE	MJE	0.56	< 0.56	0.580	1.16
CHCL3	MJE	0.41	< 0.41	< 0.41	
TCLTFE	MJE	4.5	< 4.5	< 4.5	
12DCLE	MJE	0.51	< 0.51	0.464	0.984
111TCE	MJE	0.81	< 0.81	1.26	1.65
CCL4	MJE	1.1	< 1.1	< 1.1	
12DCLP	MJE	0.62	< 0.62	< 0.62	
TRCLE	MJE	1.1	< 1.1	8.97	2.14
112TCE	MJE	0.99	< 0.99	2.23	1.93
TCLEE	MJE	0.88	< 0.88	1.25	1.75
Volume used			5 mL	5 mL	
Dilution factor			1	1	

Interpoll Laboratories
 Laboratory Report #5416 & #5424 (continued)
 Federal Cartridge Company
 Page Four

Sample Identification: 10 CRL QC
 USATHAMA ID Number: AIT013 10 CRL QC AIT014 10 CRL QC
 True Value

METHOD: USATHAMA U601

Parameter, ug/L	Analysis		10 CRL QC		10 CRL QC
	Date & Initials	Detect Limit	AIT013	AIT014	True Value
	11/5/87				
C2H3CL	MJE	1.5	< 1.5	< 1.5	
CH2CL2	MJE	1.8	< 1.8	< 1.8	
11DCE	MJE	0.49	2.95	3.18	4.72
11DCL	MJE	0.72	< 0.72	< 0.72	
12DCE	MJE	0.56	4.25	4.52	5.81
CHCL3	MJE	0.41	< 0.41	< 0.41	
TCLTFE	MJE	4.5	< 4.5	< 4.5	
12DCL	MJE	0.51	3.42	3.73	4.92
111TCE	MJE	0.81	7.93	8.28	8.27
CCL4	MJE	1.1	< 1.1	< 1.1	
12DCLP	MJE	0.62	< 0.62	< 0.62	
TRCLE	MJE	1.1	7.96	8.02	10.7
112TCE	MJE	0.99	9.30	9.99	9.66
TCLEE	MJE	0.88	6.63	6.74	8.76
Volume used			5 mL	5 mL	
Dilution factor			1	1	

Note: To obtain correct detection limits for each sample, stated detection limits must be multiplied by the dilution factor.

Respectfully submitted,

Wayne A. Olson

Wayne A. Olson,
 Organic Chemistry Department Manager

MAO/cg
 < = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

LABORATORY REPORT: #5434 & #5450
PURCHASE ORDER: #7194-01

December 11, 1987

SAMPLES COLLECTED: November 5 & 10, 1987
SAMPLES RECEIVED: November 5 & 10, 1987

Sample Identification:
Laboratory Log Number:
USATHAMA ID Number:

SW036
5434-02
AIU003

SW038
5434-04
AIU004

SW037
5434-05
AIU005

METHOD: USATHAMA U601

Parameter, ug/L	Analysis					
	Date & Initials	Detect Limit				
	11/11/87					
C2H3CL	NJE	1.5	< 1.5	< 1.5	< 1.5	< 1.5
CH2CL2	NJE	1.8	< 1.8	< 1.8	< 1.8	< 1.8
11DCE	NJE	0.49	< 0.49	< 0.49	< 0.49	< 0.49
11DCLE	NJE	0.72	< 0.72	< 0.72	< 0.72	< 0.72
12DCE	NJE	0.56	< 0.56	< 0.56	< 0.56	< 0.56
CHCL3	NJE	0.41	< 0.41	< 0.41	< 0.41	< 0.41
TCLTFE	NJE	4.5	< 4.5	< 4.5	< 4.5	< 4.5
12DCLE	NJE	0.51	< 0.51	< 0.51	< 0.51	< 0.51
111TCE	NJE	0.81	< 0.81	< 0.81	< 0.81	< 0.81
CCL4	NJE	1.1	< 1.1	< 1.1	< 1.1	< 1.1
12DCLP	NJE	0.62	< 0.62	< 0.62	< 0.62	< 0.62
TRCLE	NJE	1.1	< 1.1	< 1.1	< 1.1	< 1.1
112TCE	NJE	0.99	< 0.99	< 0.99	< 0.99	< 0.99
TCLEE	NJE	0.88	< 0.88	< 0.88	< 0.88	< 0.88
Volume used			5 mL	5 mL	5 mL	5 mL
Dilution factor			1	1	1	1

Sample Identification: SW040
 Laboratory Log Number: 5434-08
 USATHAMA ID Number: AIU006

METHOD: USATHAMA U601

Parameter, ug/L	Analysis		Detect
	Date & Initials	Limit	
	11/11/87		
C2H3CL	MJE	1.5	< 1.5
CH2CL2	MJE	1.8	< 1.8
11DCE	MJE	0.49	< 0.49
11DCLE	MJE	0.72	< 0.72
12DCE	MJE	0.56	< 0.56
CHCL3	MJE	0.41	< 0.41
TCLTFE	MJE	4.5	< 4.5
12DCLE	MJE	0.51	< 0.51
111TCE	MJE	0.81	< 0.81
CCL4	MJE	1.1	< 1.1
12DCLP	MJE	0.62	< 0.62
TRCLE	MJE	1.1	< 1.1
112TCE	MJE	0.99	< 0.99
TCLEE	MJE	0.88	< 0.88

Volume used 5 mL
 Dilution factor 1

Sample Identification: SW032 SW062 SW064
 Laboratory Log Number: 5450-01 5450-03 5450-05
 USATHAMA ID Number: AIU007 AIU008 AIU009

METHOD: USATHAMA U601

Parameter, ug/L	Analysis		Detect
	Date & Initials	Limit	
	11/11/87		
C2H3CL	MJE	1.5	< 1.5
CH2CL2	MJE	1.8	< 1.8
11DCE	MJE	0.49	< 0.49
11DCLE	MJE	0.72	< 0.72
12DCE	MJE	0.56	< 0.56
CHCL3	MJE	0.41	< 0.41
TCLTFE	MJE	4.5	< 4.5
12DCLE	MJE	0.51	< 0.51
111TCE	MJE	0.81	< 0.81
CCL4	MJE	1.1	< 1.1
12DCLP	MJE	0.62	< 0.62
TRCLE	MJE	1.1	< 1.1
112TCE	MJE	0.99	< 0.99
TCLEE	MJE	0.88	< 0.88

Volume used 5 mL 5 mL 5 mL
 Dilution factor 1 1 1

Sample Identification:	9W063	9W061
Laboratory Log Number:	5450-07	5450-09
USATHAMA ID Number:	<u>AIU010</u>	<u>AIU011</u>

METHOD: USATHAMA U801

<u>Parameter, ug/L</u>	<u>Analysis</u>		<u>Detect</u>	<u>Limit</u>
	<u>Date & Initials</u>	<u>Limit</u>		
	11/11/87			
C2H3CL	MJE	1.5	< 1.5	< 1.5
CH2CL2	MJE	1.8	< 1.8	< 1.8
11DCE	MJE	0.49	< 0.49	< 0.49
11DCLE	MJE	0.72	< 0.72	< 0.72
12DCE	MJE	0.56	< 0.56	< 0.56
CHCL3	MJE	0.41	< 0.41	< 0.41
TCLTFE	MJE	4.5	< 4.5	< 4.5
12DCLE	MJE	0.51	< 0.51	< 0.51
111TCE	MJE	0.81	< 0.81	< 0.81
CCL4	MJE	1.1	< 1.1	< 1.1
12DCLP	MJE	0.62	< 0.62	< 0.62
TRCLE	MJE	1.1	< 1.1	< 1.1
112TCE	MJE	0.99	< 0.99	< 0.99
TCLEE	MJE	0.88	< 0.88	< 0.88
Volume used		5 mL		5 mL
Dilution factor		1		1

Sample Identification:	MG Blank	2 CRL QC	2 CRL QC
USATHAMA ID Number:	<u>AIU001</u>	<u>AIU002</u>	<u>True Value</u>

METHOD: USATHAMA U801

<u>Parameter, ug/L</u>	<u>Analysis</u>		<u>Detect</u>	<u>Limit</u>	
	<u>Date & Initials</u>	<u>Limit</u>			
	11/11/87				
C2H3CL	MJE	1.5	< 1.5	< 1.5	
CH2CL2	MJE	1.8	< 1.8	< 1.8	
11DCE	MJE	0.49	< 0.49	0.549	0.944
11DCLE	MJE	0.72	< 0.72	< 0.72	
12DCE	MJE	0.56	< 0.56	0.886	1.16
CHCL3	MJE	0.41	< 0.41	< 0.41	
TCLTFE	MJE	4.5	< 4.5	< 4.5	
12DCLE	MJE	0.51	< 0.51	0.694	0.984
111TCE	MJE	0.81	< 0.81	1.58	1.65
CCL4	MJE	1.1	< 1.1	< 1.1	
12DCLP	MJE	0.62	< 0.62	< 0.62	
TRCLE	MJE	1.1	< 1.1	2.15	2.14
112TCE	MJE	0.99	< 0.99	1.90	1.93
TCLEE	MJE	0.88	< 0.88	1.37	1.75
Volume used		5 mL		5 mL	
Dilution factor		1		1	

Sample Identification: USATHAMA ID Numbers: 10 CRL QC AIU012 10 CRL QC AIU013 10 CRL QC True Value

METHOD: USATHAMA U601

Parameter, ug/L	Analysis		10 CRL QC		10 CRL QC True Value
	Date & Initials	Detect Limit	AIU012	AIU013	
	11/11/87				
C2H3CL	MJE	1.5	< 1.5	< 1.5	
CH2CL2	MJE	1.8	< 1.8	1.81	
11DCE	MJE	0.49	3.50	3.92	4.72
11DCLE	MJE	0.72	< 0.72	< 0.72	
12DCE	MJE	0.56	5.00	5.21	5.81
CHCL3	MJE	0.41	< 0.41	< 0.41	
TCLTFE	MJE	4.5	< 4.5	< 4.5	
12DCLE	MJE	0.51	3.87	4.24	4.92
111TCE	MJE	0.81	8.23	8.80	8.27
CCL4	MJE	1.1	< 1.1	< 1.1	
12DCLP	MJE	0.62	< 0.62	< 0.62	
TRCLE	MJE	1.1	8.09	8.60	10.7
112TCE	MJE	0.99	9.83	9.43	9.66
TCLEE	MJE	0.88	6.98	7.25	8.76
Volume used			5 mL	5 mL	
Dilution factor			1	1	

Note: To obtain correct detection limits for each sample, stated detection limits must be multiplied by the dilution factor.

Respectfully submitted,

Wayne A. Olson

Wayne A. Olson,
 Organic Chemistry Department Manager

MAO/cg
 < = less than



interpoll

INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

January 4, 1988

PARAMETER: SB, Method SD07
DETECTION LIMIT: 10.0 ug/L
UNITS: ug/L
PREP DATE: 12/29/87
ANALYSIS DATE: 12/29/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW058	12/17/87	5610-06	ANN003	< 10.0	1
SW059	12/17/87	5610-07	ANN004	< 10.0	1
SW060	12/17/87	5610-08	ANN005	< 10.0	1
SW052	12/11/87	5585-02	ANN006	< 10.0	1
SW056	12/11/87	5585-03	ANN007	< 10.0	1
01U127	12/11/87	5586-01	ANN008	11.5	1
01U133	12/11/87	5586-02	ANN009	11.5	1
01U133	12/11/87	5586-02D	ANN010	13.0	1
Field Blank	12/11/87	5586-04	ANN011	< 10.0	1
High Spike			ANN002	94.0	
High Spike			ANN013	100	
High Spike True Value				100	
Low Spike			ANN012	18.5	
Low Spike True Value				20.0	
NR Blank			ANN001	< 10.0	

Respectfully submitted,

Gregg M. Holan,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
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Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

January 4, 1988

PARAMETER: CR, Method SD07
DETECTION LIMIT: 2.18 ug/L
UNITS: ug/L
PREP DATE: 12/17/87
ANALYSIS DATE: 12/17/87
ANALYST: BJN
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW052	12/11/87	5585-02	ANH003	< 2.18	1
SW056	12/11/87	5585-03	ANH004	< 2.18	1
01U127	12/11/87	5586-01	ANH005	2.50	1
01U133	12/11/87	5586-02	ANH006	< 2.18	1
01U133	12/11/87	5586-02D	ANH007	< 2.18	1
Field Blank	12/11/87	5586-04	ANH008	< 2.18	1
High Spike			ANH002	16.0	
High Spike			ANH009	16.5	
High Spike True Value				15.0	
Low Spike			ANH010	4.40	
Low Spike True Value				4.00	
MQ Blank			ANH001	< 2.18	

Respectfully submitted,

Gregg M. Holman,
Inorganic Chemistry Department Manager

GMH/cg
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612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

January 4, 1988

PARAMETER: AG, Method SD07
DETECTION LIMIT: 1.93 ug/L
UNITS: ug/L
PREP DATE: 12/16/87
ANALYSIS DATE: 12/16/87
ANALYST: BJN
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW052	12/11/87	5585-02	ANC003	< 1.93	1
SW056	12/11/87	5585-03	ANC004	< 1.93	1
01U127	12/11/87	5586-01	ANC005	< 1.93	1
01U133	12/11/87	5586-02	ANC006	< 1.93	1
01U133	12/11/87	5586-02D	ANC007	< 1.93	1
Field Blank	12/11/87	5586-04	ANC008	< 1.93	1
High Spike			ANC002	18.0	
High Spike			ANC010	18.0	
High Spike True Value				20.0	
Low Spike			ANC009	4.00	
Low Spike True Value				4.00	
HQ Blank			ANC001	< 1.93	

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

BWH/cg
< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

January 15, 1988

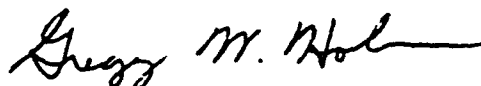
PARAMETER: TL, Method SD07
DETECTION LIMIT: 2.70 ug/L
UNITS: ug/L
PREP DATE: 11/20/87
ANALYSIS DATE: 11/20/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW034	11/2/87	5416-01	ANQ003	< 2.70	1
SW045	11/2/87	5416-03	ANQ004	4.00	1
SW035	11/2/87	5416-05	ANQ005	< 2.70	1
SW039	11/2/87	5416-07	ANQ006	< 2.70	1
SW041	11/2/87	5416-09	ANQ007	< 2.70	1
SW065	11/2/87	5416-11	ANQ008	< 2.70	1
SW029	11/2/87	5416-13	ANQ009	4.50	1
SW028	11/3/87	5424-02	ANQ010	< 2.70	1
SW031	11/3/87	5424-04	ANQ011	< 2.70	1
SW030	11/3/87	5424-06	ANQ012	< 2.70	1
SW036	11/5/87	5434-02	ANQ013	< 2.70	1
SW038	11/5/87	5434-04	ANQ014	< 2.70	1
SW037	11/5/87	5434-05	ANQ015	< 2.70	1
SW040	11/5/87	5434-08	ANQ016	< 2.70	1
03H505	11/9/87	5445-01	ANQ017	3.00	1
03U007	11/9/87	5445-02	ANQ018	45.0	1
03L007	11/9/87	5445-03	ANQ019	5.00	1
04U007	11/9/87	5445-04	ANQ020	< 2.70	1
03U008	11/9/87	5445-05	ANQ021	4.00	1
03U010	11/9/87	5445-06	ANQ022	< 2.70	1
03L010	11/9/87	5445-07	ANQ023	< 2.70	1
04U012	11/9/87	5445-08	ANQ024	4.90	1
03L012	11/9/87	5445-09	ANQ025	< 2.70	1
03U012	11/9/87	5445-11	ANQ026	5.00	1

Interpoll Laboratories
 USATHAMA Laboratory Report
 Federal Cartridge Company
 Page Two

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW032	11/10/87	5450-01	AMQ027	< 2.70	1
SW062	11/10/87	5450-03	AMQ028	10.0	1
SW064	11/10/87	5450-05	AMQ029	< 2.70	1
SW063	11/10/87	5450-07	AMQ030	< 2.70	1
SW061	11/10/87	5450-09	AMQ031	< 2.70	1
03U013	11/10/87	5451-01	AMQ032	< 2.70	1
03M013	11/10/87	5451-02	AMQ033	< 2.70	1
03L013	11/10/87	5451-03	AMQ034	< 2.70	1
03U017	11/10/87	5451-04	AMQ035	< 2.70	1
03M017	11/10/87	5451-05	AMQ036	< 2.70	1
03L017	11/10/87	5451-06	AMQ037	< 2.70	1
03U076	11/10/87	5451-07	AMQ038	< 2.70	1
03U704	11/10/87	5451-08	AMQ039	< 2.70	1
03U075	11/10/87	5451-09	AMQ040	< 2.70	1
03U023	11/10/87	5451-10	AMQ041	< 2.70	1
High Spike			AMQ002	27.0	
High Spike			AMQ043	27.0	
High Spike True Value				30.0	
Low Spike			AMQ042	5.80	
Low Spike True Value				6.00	
MQ Blank			AMQ001	< 2.70	

Respectfully submitted,



Gregg W. Holman,
 Inorganic Chemistry Department Manager

BW/cg
 < = less than



interpoll

INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

January 4, 1988

PARAMETER: NI, Method SD07
DETECTION LIMIT: 5.94 ug/L
UNITS: ug/L
PREP DATE: 12/28/87
ANALYSIS DATE: 12/28/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW058	12/17/87	5610-06	ANN003	< 5.94	1
SW059	12/17/87	5610-07	ANN004	< 5.94	1
SW060	12/17/87	5610-08	ANN005	< 5.94	1
SW052	12/11/87	5585-02	ANN006	< 5.94	1
SW056	12/11/87	5585-03	ANN007	< 5.94	1
01U127	12/11/87	5586-01	ANN008	< 5.94	1
01U133	12/11/87	5586-02	ANN009	13.0	1
01U133	12/11/87	5586-02D	ANN010	12.5	1
Field Blank	12/11/87	5586-04	ANN011	< 5.94	1
High Spike			ANN002	34.0	
High Spike			ANN013	38.0	
High Spike True Value				35.0	
Low Spike			ANN012	12.0	
Low Spike True Value				12.0	
HQ Blank			ANN001	< 5.94	

Respectfully submitted,

Gregg M. Holman,
Inorganic Chemistry Department Manager

BWH/cg
< = less than

interpoll

INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN . 55112

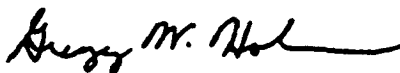
Attention: Paula Connell

December 30, 1987

PARAMETER: AS, Method SD07
DETECTION LIMIT: 4.81 ug/L
UNITS: ug/L
PREP DATE: 12/15/87
ANALYSIS DATE: 12/15/87
ANALYST: BJN
PURCHASE ORDER: 87194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SM052	12/11/87	5585-02	AJZ003	< 4.81	1
SM056	12/11/87	5585-03	AJZ004	< 4.81	1
01U127	12/11/87	5586-01	AJZ005	5.50	1
01U133	12/11/87	5586-02	AJZ006	5.50	1
01U133	12/11/87	5586-02D	AJZ007	< 4.81	1
Field Blank	12/11/87	5586-04	AJZ008	< 4.81	1
High Spike			AJZ002	60.0	
High Spike			AJZ010	59.0	
High Spike True Value				50.0	
Low Spike			AJZ009	7.00	
Low Spike True Value				8.00	
HQ Blank			AJZ001	< 4.81	

Respectfully submitted,



Gregg M. Holman,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

December 30, 1987

PARAMETER: AS, Method SD07
DETECTION LIMIT: 4.81 ug/L
UNITS: ug/L
PREP DATE: 11/17/87
ANALYSIS DATE: 11/17/87
ANALYST: PMM
PURCHASE ORDER: 87194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW034	11/2/87	5416-01	AJV003	< 4.81	1
SW045	11/2/87	5416-03	AJV004	< 4.81	1
SW035	11/2/87	5416-05	AJV005	< 4.81	1
SW039	11/2/87	5416-07	AJV006	< 4.81	1
SW041	11/2/87	5416-09	AJV007	< 4.81	1
SW065	11/2/87	5416-11	AJV008	< 4.81	1
SW029	11/2/87	5416-13	AJV009	< 4.81	1
SW028	11/3/87	5424-02	AJV010	< 4.81	1
SW031	11/3/87	5424-04	AJV011	< 4.81	1
SW030	11/3/87	5424-06	AJV012	< 4.81	1
SW036	11/5/87	5434-02	AJV013	< 4.81	1
SW038	11/5/87	5434-04	AJV014	< 4.81	1
SW037	11/5/87	5434-05	AJV015	< 4.81	1
SW040	11/5/87	5434-08	AJV016	< 4.81	1
03M505	11/9/87	5445-01	AJV017	< 4.81	1
03U007	11/9/87	5445-02	AJV018	6.00	1
03L007	11/9/87	5445-03	AJV019	6.00	1
04U007	11/9/87	5445-04	AJV020	< 4.81	1
03U008	11/9/87	5445-05	AJV021	20.0	1
03U010	11/9/87	5445-06	AJV022	< 4.81	1
03L010	11/9/87	5445-07	AJV023	< 4.81	1
04U012	11/9/87	5445-08	AJV024	< 4.81	1
03L012	11/9/87	5445-09	AJV025	< 4.81	1
03U012	11/9/87	5445-11	AJV026	6.00	1

Interpoll Laboratories
 USATHAMA Laboratory Report
 Federal Cartridge Company
 Page Two

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW032	11/10/87	5450-01	AJV027	< 4.81	1
SW062	11/10/87	5450-03	AJV028	< 4.81	1
SW064	11/10/87	5450-03	AJV029	< 4.81	1
SW063	11/10/87	5450-07	AJV030	< 4.81	1
SW061	11/10/87	5450-09	AJV031	< 4.81	1
03U013	11/10/87	5451-01	AJV032	7.5	1
03M013	11/10/87	5451-02	AJV033	< 4.81	1
03L013	11/10/87	5451-03	AJV034	< 4.81	1
03U017	11/10/87	5451-04	AJV035	< 4.81	1
03M017	11/10/87	5451-05	AJV036	< 4.81	1
03L017	11/10/87	5451-06	AJV037	< 4.81	1
03U076	11/10/87	5451-07	AJV038	< 4.81	1
03U704	11/10/87	5451-08	AJV039	< 4.81	1
03U075	11/10/87	5451-09	AJV040	< 4.81	1
03U023	11/10/87	5451-10	AJV041	< 4.81	1
High Spike			AJV002	51.0	
High Spike			AJV043	55.0	
High Spike True Value				50.0	
Low Spike			AJV042	7.00	
Low Spike True Value				8.00	
MQ Blank			AJV001	< 4.81	

Respectfully submitted,

Bregg M. Holean

Bregg M. Holean,
 Inorganic Chemistry Department Manager

BMH/cg
 < = less than



interpoll

INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

December 30, 1987

PARAMETER: AG, Method SD07
DETECTION LIMIT: 1.93 ug/L
UNITS: ug/L
PREP DATE: 11/19/87
ANALYSIS DATE: 11/19/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SN034	11/2/87	5416-01	AJR003	< 1.93	1
SN045	11/2/87	5416-03	AJR004	< 1.93	1
SN035	11/2/87	5416-05	AJR005	< 1.93	1
SN039	11/2/87	5416-07	AJR006	< 1.93	1
SN041	11/2/87	5416-09	AJR007	< 1.93	1
SN065	11/2/87	5416-11	AJR008	< 1.93	1
SN029	11/2/87	5416-13	AJR009	3.00	1
SN028	11/3/87	5424-02	AJR010	< 1.93	1
SN031	11/3/87	5424-04	AJR011	< 1.93	1
SN030	11/3/87	5424-06	AJR012	2.50	1
SN036	11/5/87	5434-02	AJR013	< 1.93	1
SN038	11/5/87	5434-04	AJR014	< 1.93	1
SN037	11/5/87	5434-05	AJR015	< 1.93	1
SN040	11/5/87	5434-08	AJR016	< 1.93	1
03N505	11/9/87	5445-01	AJR017	< 1.93	1
03U007	11/9/87	5445-02	AJR018	< 1.93	1
03L007	11/9/87	5445-03	AJR019	< 1.93	1
04U007	11/9/87	5445-04	AJR020	< 1.93	1
03U008	11/9/87	5445-05	AJR021	< 1.93	1
03U010	11/9/87	5445-06	AJR022	< 1.93	1
03L010	11/9/87	5445-07	AJR023	< 1.93	1
04U012	11/9/87	5445-08	AJR024	< 1.93	1
03L012	11/9/87	5445-09	AJR025	< 1.93	1
03U012	11/9/87	5445-11	AJR026	2.00	1

Interpoll Laboratories
 USATHAMA Laboratory Report
 Federal Cartridge Company
 Page Two

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SM032	11/10/87	5450-01	AJR027	< 1.93	1
SM062	11/10/87	5450-03	AJR028	< 1.93	1
SM064	11/10/87	5450-05	AJR029	< 1.93	1
SM063	11/10/87	5450-07	AJR030	< 1.93	1
SM061	11/10/87	5450-09	AJR031	2.00	1
03U013	11/10/87	5451-01	AJR032	< 1.93	1
03M013	11/10/87	5451-02	AJR033	< 1.93	1
03L013	11/10/87	5451-03	AJR034	< 1.93	1
03U017	11/10/87	5451-04	AJR035	< 1.93	1
03M017	11/10/87	5451-05	AJR036	< 1.93	1
03L017	11/10/87	5451-06	AJR037	< 1.93	1
03U076	11/10/87	5451-07	AJR038	< 1.93	1
03U704	11/10/87	5451-08	AJR039	< 1.93	1
03U075	11/10/87	5451-09	AJR040	< 1.93	1
03U023	11/10/87	5451-10	AJR041	< 1.93	1
High Spike			AJR002	20.0	
High Spike			AJR043	18.0	
High Spike True Value				20.0	
Low Spike			AJR042	4.00	
Low Spike True Value				4.00	
MQ Blank			AJR001	< 1.93	

Respectfully submitted,

Gregg M. Holman

Gregg M. Holman,
 Inorganic Chemistry Department Manager

GMH/cg
 < = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-8020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

March 11, 1988

PARAMETER: Hardness, as CaCO_3
DETECTION LIMIT: 1 mg/L
UNITS: mg/L
ANALYSIS DATE: 12/10/87
ANALYST: MP
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>
SW036	11/05/87	5434-02	APZ001	93
SW038	11/05/87	5434-04	APZ002	77
SW037	11/05/87	5434-05	APZ003	69
SW040	11/05/87	5434-08	APZ004	73
SW032	11/10/87	5450-01	APZ005	110
SW062	11/10/87	5450-03	APZ006	770
SW064	11/10/87	5450-05	APZ007	150
SW063	11/10/87	5450-07	APZ008	160
SW061	11/10/87	5450-09	APZ009	210
SW034	11/02/87	5416-01	APZ010	120
SW045	11/02/87	5416-03	APZ011	260
SW035	11/02/87	5416-05	APZ012	77
SW039	11/02/87	5416-07	APZ013	73
SW041	11/02/87	5416-09	APZ014	81
SW065	11/02/87	5416-11	APZ015	89
SW029	11/02/87	5416-13	APZ016	460
SW028	11/04/87	5424-02	APZ017	250
SW031	11/04/87	5424-04	APZ018	280
SW030	11/04/87	5424-06	APZ019	260

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager



interpoll

INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

March 11, 1988

PARAMETER: Hardness, as CaCO_3
DETECTION LIMIT: 1 mg/L
UNITS: mg/L
ANALYSIS DATE: 12/28/87
ANALYST: MP
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>
SW039	12/10/87	5578-01	ARF001	70
SW041	12/10/87	5578-02	ARF002	70
SW035	12/10/87	5578-05	ARF003	76
SW045	12/10/87	5578-07	ARF004	160
SW034	12/10/87	5578-09	ARF005	140
SW030	12/10/87	5578-11	ARF006	210
SW031	12/10/87	5578-13	ARF007	210
SW028	12/11/87	5585-01	ARF008	210
SW052	12/11/87	5585-02	ARF009	320
SW056	12/11/87	5585-03	ARF010	180
SW058	12/17/87	5610-06	ARF011	490
SW059	12/17/87	5610-07	ARF012	44
SW060	12/17/87	5610-08	ARF013	280

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

GWH/cg



interpoll

INTERPOLL LABORATORIES
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612-786-6020
FAX: 612-786-7854

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

March 23, 1988

PARAMETER: Hexavalent Chromium
METHOD: #7196
DETECTION LIMIT: 5 ug/L
UNITS: ug/L
ANALYSIS DATE: 11/3/87
ANALYST: BN
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>
SW034	11/02/87	5416-01	ARJ001	< 5
SW045	11/02/87	5416-03	ARJ002	< 5
SW035	11/02/87	5416-05	ARJ003	< 5
SW039	11/02/87	5416-07	ARJ004	< 5
SW041	11/02/87	5416-09	ARJ005	< 5
SW065	11/02/87	5416-11	ARJ006	< 5
SW029	11/02/87	5416-13	ARJ007	< 5
SW028	11/03/87	5424-02	ARJ008	< 5
SW031	11/03/87	5424-04	ARJ009	< 5
SW030	11/03/87	5424-06	ARJ010	< 5
SW036	11/05/87	5434-01	ARJ011	< 5
SW038	11/05/87	5434-04	ARJ012	< 5
SW037	11/05/87	5434-05	ARJ013	< 5
SW040	11/05/87	5434-08	ARJ014	< 5
SW062	11/10/87	5450-03	ARJ015	< 5
SW064	11/10/87	5450-05	ARJ016	< 5
SW063	11/10/87	5450-07	ARJ017	< 5
SW061	11/10/87	5450-09	ARJ018	< 5

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



interpoll

INTERPOLL LABORATORIES
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014-1819
TEL: 612/786-6020
FAX: 612/786-7854

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

April 7, 1988

PARAMETER: Hexavalent Chromium
METHOD: #7196
DETECTION LIMIT: 5 ug/L
UNITS: ug/L
ANALYST: BN
PURCHASE ORDER: #7194-01

Sample ID	Date Collected	Date Analyzed	Interpoll ID	USATHAMA ID	Result
SW034	11/02/87	11/03/87	5416-01	ARJ001	< 5
SW045	11/02/87	11/03/87	5416-03	ARJ002	< 5
SW035	11/02/87	11/03/87	5416-05	ARJ003	< 5
SW039	11/02/87	11/03/87	5416-07	ARJ004	< 5
SW041	11/02/87	11/03/87	5416-09	ARJ005	< 5
SW065	11/02/87	11/03/87	5416-11	ARJ006	< 5
SW029	11/02/87	11/03/87	5416-13	ARJ007	< 5
SW028	11/03/87	11/04/87	5424-02	ARJ008	< 5
SW031	11/03/87	11/04/87	5424-04	ARJ009	< 5
SW030	11/03/87	11/04/87	5424-06	ARJ010	< 5
SW036	11/05/87	11/06/87	5434-01	ARJ011	< 5
SW038	11/05/87	11/06/87	5434-04	ARJ012	< 5
SW037	11/05/87	11/06/87	5434-05	ARJ013	< 5
SW040	11/05/87	11/06/87	5434-08	ARJ014	< 5
SW062	11/10/87	11/11/87	5450-03	ARJ015	< 5
SW064	11/10/87	11/11/87	5450-05	ARJ016	< 5
SW063	11/10/87	11/11/87	5450-07	ARJ017	< 5
SW061	11/10/87	11/11/87	5450-09	ARJ018	< 5

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

GWH/cg
< = less than



interpoll

INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

March 11, 1988

PARAMETER: Hexavalent Chromium
METHOD: #7196
DETECTION LIMIT: 5 ug/L
UNITS: ug/L
ANALYSIS DATE: 12/23/87
ANALYST: BN
PURCHASE ORDER: #7194-01

<u>Sample</u> <u>ID</u>	<u>Date</u> <u>Collected</u>	<u>Interpoll</u> <u>ID</u>	<u>USATHAMA</u> <u>ID</u>	<u>Result</u>
SW052	12/10/87	5585-02	AGA001	< 5
SW056	12/10/87	5585-03	AGA002	< 5

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

February 29, 1988

PARAMETER: MN, Method SD07
DETECTION LIMIT: 1.19 ug/L
UNITS: ug/L
PREP DATE: 2/15/88
ANALYSIS DATE: 2/15/88
ANALYST: PHW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW059	12/17/87	5610-07	APY004	3.9	10
SW060	12/17/87	5610-08	APY005	4.0	10
High Spike			APY002	14.4	
High Spike			APY008	14.2	
High Spike True Value				15.0	
Low Spike			APY007	2.20	
Low Spike True Value				2.00	
HQ Blank			APY001	< 1.19	

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

BWH/cg
< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

January 4, 1988

PARAMETER: PB, Method SD07
DETECTION LIMIT: 2.65 ug/L
UNITS: ug/L
PREP DATE: 12/22/87
ANALYSIS DATE: 12/22/87
ANALYST: PHW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SN058	12/17/87	5610-06	ANQ003	< 2.65	1
SN059	12/17/87	5610-07	ANQ004	< 2.65	1
SN060	12/17/87	5610-08	ANQ005	< 2.65	1
SN052	12/11/87	5585-02	ANQ006	3.50	1
SN056	12/11/87	5585-03	ANQ007	< 2.65	1
01U127	12/11/87	5586-01	ANQ008	< 2.65	1
01U133	12/11/87	5586-02	ANQ009	< 2.65	1
01U133	12/11/87	5586-02D	ANQ010	< 2.65	1
Field Blank	12/11/87	5586-04	ANQ011	< 2.65	1
High Spike			ANQ002	24.5	
High Spike			ANQ013	24.5	
High Spike True Value				25.0	
Low Spike			ANQ012	4.40	
Low Spike True Value				4.00	
HQ Blank			ANQ001	< 2.65	

Respectfully submitted,

Gregg M. Holman,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

February 12, 1988

PARAMETER: MN, Method SD07
DETECTION LIMIT: 1.19 ug/L
UNITS: ug/L
PREP DATE: 12/23/87
ANALYSIS DATE: 12/23/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW058	12/17/87	5610-06	AND003	5.50	1
SW052	12/11/87	5585-02	AND006	5.05	1
SW056	12/11/87	5585-03	AND014	6.5	50
01U127	12/11/87	5586-01	AND008	9.50	1
01U133	12/11/87	5586-02	AND015	10	50
01U133	12/11/87	5586-02D	AND016	12	50
Field Blank	12/11/87	5586-04	AND011	2.45	1
High Spike			AND002	16.5	
High Spike			AND013	16.0	
High Spike True Value				15.0	
Low Spike			AND012	1.90	
Low Spike True Value				2.00	
MQ Blank			AND001	< 1.19	

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

SWH/cg
< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

February 12, 1988

PARAMETER: CR, Method SD07
DETECTION LIMIT: 2.18 ug/L
UNITS: ug/L
PREP DATE: 1/5/88
ANALYSIS DATE: 1/5/88
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW058	12/17/87	5610-06	ADF003	< 2.18	1
SW059	12/17/87	5610-07	ADF004	< 2.18	1
SW060	12/17/87	5610-08	ADF005	< 2.18	1
High Spike			ADF002	16.5	
High Spike			ADF007	16.5	
High Spike True Value				15.0	
Low Spike			ADF006	4.20	
Low Spike True Value				4.00	
MQ Blank			ADF001	< 2.18	

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



interpoll

INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

February 12, 1988

PARAMETER: CD, Method SD07
DETECTION LIMIT: 0.100 ug/L
UNITS: ug/L
PREP DATE: 1/4/88
ANALYSIS DATE: 1/4/88
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW058	12/17/87	5610-06	AQE003	0.260	1
SW059	12/17/87	5610-07	AQE004	0.230	1
SW060	12/17/87	5610-08	AQE005	0.140	1
High Spike			AQE002	1.10	
High Spike			AQE007	1.08	
High Spike True Value				1.00	
Low Spike			AQE006	0.200	
Low Spike True Value				0.200	
HQ Blank			AQE001	< 0.100	

Respectfully submitted,

Gregg M. Holman,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
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Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

February 12, 1988

PARAMETER: AG, Method SD07
DETECTION LIMIT: 1.93 ug/L
UNITS: ug/L
PREP DATE: 1/4/88
ANALYSIS DATE: 1/4/88
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SM058	12/17/87	5610-06	AQD003	< 1.93	1
SM059	12/17/87	5610-07	AQD004	< 1.93	1
SM060	12/17/87	5610-08	AQD005	< 1.93	1
High Spike			AQD002	20.0	
High Spike			AQD007	21.5	
High Spike True Value				20.0	
Low Spike			AQD006	4.20	
Low Spike True Value				4.00	
HQ Blank			AQD001	< 1.93	

Respectfully submitted,

Gregg M. Holman,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



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4500 BALL ROAD N.E.
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Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN. 55112

Attention: Paula Connell

February 12, 1988

PARAMETER: BA, Method SD07
DETECTION LIMIT: 20.0 ug/L
UNITS: ug/L
PREP DATE: 12/30/87
ANALYSIS DATE: 12/30/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW058	12/17/87	5610-06	A0C003	163	1
SW059	12/17/87	5610-07	A0C004	49.0	1
SW060	12/17/87	5610-08	A0C005	132	1
SW052	12/11/87	5585-02	A0C006	145	1
SW056	12/11/87	5585-03	A0C007	148	1
01U127	12/11/87	5586-01	A0C008	101	1
01U133	12/11/87	5586-02	A0C009	24	11
01U133	12/11/87	5586-02D	A0C010	30	11
Field Blank	12/11/87	5586-04	A0C011	< 20.0	1
High Spike			A0C002	158	
High Spike			A0C013	164	
High Spike True Value				150	
Low Spike			A0C012	43.0	
Low Spike True Value				40.0	
MQ Blank			A0C001	< 20.0	

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



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Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN. 55112

Attention: Paula Connell

February 12, 1988

PARAMETER: AS, Method SD07
DETECTION LIMIT: 4.81 ug/L
UNITS: ug/L
PREP DATE: 1/4/88
ANALYSIS DATE: 1/4/88
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW058	12/17/87	5610-06	ADH003	< 4.81	1
SW059	12/17/87	5610-07	ADH004	< 4.81	1
SW060	12/17/87	5610-08	ADH005	5.20	1
High Spike			ADH002	55.0	
High Spike			ADH007	55.0	
High Spike True Value				50.0	
Low Spike			ADH006	7.50	
Low Spike True Value				8.00	
MQ Blank			ADH001	< 4.81	

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



interpoll
INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

February 12, 1988

PARAMETER: SE, Method SD07
DETECTION LIMIT: 3.06 ug/L
UNITS: ug/L
PREP DATE: 1/4/88
ANALYSIS DATE: 1/4/88
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW058	12/17/87	5610-06	A06003	< 3.06	1
SW059	12/17/87	5610-07	A06004	< 3.06	1
SW060	12/17/87	5610-08	A06005	< 3.06	1
SW052	12/11/87	5585-02	A06006	< 3.06	1
SW056	12/11/87	5585-03	A06007	< 3.06	1
01U127	12/11/87	5586-01	A06008	< 3.06	1
01U133	12/11/87	5586-02	A06009	< 3.06	1
01U133	12/11/87	5586-02D	A06010	< 3.06	1
Field Blank	12/11/87	5586-04	A06011	< 3.06	1
High Spike			A06002	31.5	
High Spike			A06013	32.5	
High Spike True Value				30.0	
Low Spike			A06012	6.00	
Low Spike True Value				6.00	
MQ Blank			A06001	< 3.06	

Respectfully submitted,

Gregg M. Holman,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



INTERPOLL INC.
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612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

February 12, 1988

PARAMETER: BE, Method SD07
DETECTION LIMIT: 1.47 ug/L
UNITS: ug/L
PREP DATE: 1/5/88
ANALYSIS DATE: 1/5/88
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW058	12/17/87	5610-06	AOK003	< 1.47	1
SW059	12/17/87	5610-07	AOK004	< 1.47	1
SW060	12/17/87	5610-08	AOK005	< 1.47	1
SW052	12/11/87	5585-02	AOK006	< 1.47	1
SW056	12/11/87	5585-03	AOK007	< 1.47	1
01U127	12/11/87	5586-01	AOK008	< 1.47	1
01U133	12/11/87	5586-02	AOK009	< 1.47	1
01U133	12/11/87	5586-02D	AOK010	< 1.47	1
Field Blank	12/11/87	5586-04	AOK011	< 1.47	1
High Spike			AOK002	9.10	
High Spike			AOK013	9.10	
High Spike True Value				10.0	
Low Spike			AOK012	1.80	
Low Spike True Value				2.00	
HQ Blank			AOK001	< 1.47	

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

BWH/cg
< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
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Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

January 4, 1988

PARAMETER: CU, Method SD07
DETECTION LIMIT: 0.500 ug/L
UNITS: ug/L
PREP DATE: 12/21/87
ANALYSIS DATE: 12/21/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SM058	12/17/87	5610-06	ALP003	3.80	1
SM059	12/17/87	5610-07	ALP004	1.70	1
SM060	12/17/87	5610-08	ALP005	4.55	1
SM052	12/11/87	5585-02	ALP006	5.40	1
SM056	12/11/87	5585-03	ALP007	4.1	10
01U127	12/11/87	5586-01	ALP008	2.00	1
01U133	12/11/87	5586-02	ALP009	5.90	1
01U133	12/11/87	5586-02D	ALP010	6.00	1
Field Blank	12/11/87	5586-04	ALP011	< 0.500	1
High Spike			ALP002	10.5	
High Spike			ALP013	9.90	
High Spike True Value				10.0	
Low Spike			ALP012	2.00	
Low Spike True Value				2.00	
HQ Blank			ALP001	< 0.500	

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

BWH/cg
< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

January 30, 1988

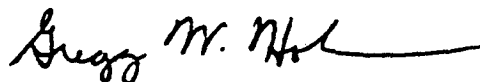
PARAMETER: PB, Method SD07
DETECTION LIMIT: 2.65 ug/L
UNITS: ug/L
PREP DATE: 11/25/87
ANALYSIS DATE: 11/25/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW034	11/2/87	5416-01	ALS003	< 2.65	1
SW045	11/2/87	5416-03	ALS004	< 2.65	1
SW035	11/2/87	5416-05	ALS005	< 2.65	1
SW039	11/2/87	5416-07	ALS006	< 2.65	1
SW041	11/2/87	5416-09	ALS007	< 2.65	1
SW065	11/2/87	5416-11	ALS008	< 2.65	1
SW029	11/2/87	5416-13	ALS009	< 2.65	1
SW028	11/3/87	5424-02	ALS010	6.00	1
SW031	11/3/87	5424-04	ALS011	2.65	1
SW030	11/3/87	5424-06	ALS012	2.65	1
SW036	11/5/87	5434-02	ALS013	< 2.65	1
SW038	11/5/87	5434-04	ALS014	< 2.65	1
SW037	11/5/87	5434-05	ALS015	< 2.65	1
SW040	11/5/87	5434-08	ALS016	< 2.65	1
03M505	11/9/87	5445-01	ALS017	< 2.65	1
03U007	11/9/87	5445-02	ALS018	< 2.65	1
03L007	11/9/87	5445-03	ALS019	< 2.65	1
04U007	11/9/87	5445-04	ALS020	< 2.65	1
03U008	11/9/87	5445-05	ALS021	< 2.65	1
03U010	11/9/87	5445-06	ALS022	2.65	1
03L010	11/9/87	5445-07	ALS023	< 2.65	1
04U012	11/9/87	5445-08	ALS024	< 2.65	1
03L012	11/9/87	5445-09	ALS025	< 2.65	1
03U012	11/9/87	5445-11	ALS026	6.30	1

Interpoll Laboratories
USATHAMA Laboratory Report
Federal Cartridge Company
Page Two

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW032	11/10/87	5450-01	ALS027	< 2.65	1
SW062	11/10/87	5450-03	ALS028	< 2.65	1
SW064	11/10/87	5450-05	ALS029	< 2.65	1
SW063	11/10/87	5450-07	ALS030	< 2.65	1
SW061	11/10/87	5450-09	ALS031	3.50	1
03U013	11/10/87	5451-01	ALS032	< 2.65	1
03M013	11/10/87	5451-02	ALS033	< 2.65	1
03L013	11/10/87	5451-03	ALS034	3.40	1
03U017	11/10/87	5451-04	ALS035	4.50	1
03M017	11/10/87	5451-05	ALS036	< 2.65	1
03L017	11/10/87	5451-06	ALS037	< 2.65	1
03U076	11/10/87	5451-07	ALS038	< 2.65	1
03U704	11/10/87	5451-08	ALS039	< 2.65	1
03U075	11/10/87	5451-09	ALS040	< 2.65	1
03U023	11/10/87	5451-10	ALS041	< 2.65	1
High Spike			ALS002	26.5	
High Spike			ALS043	27.5	
High Spike True Value				25.0	
Low Spike			ALS042	4.20	
Low Spike True Value				4.00	
MQ Blank			ALS001	< 2.65	

Respectfully submitted,



Gregg W. Holman,
Inorganic Chemistry Department Manager

BWH/cg
< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

January 22, 1988

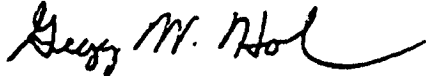
PARAMETER: SB, Method SD07
DETECTION LIMIT: 10.0 ug/L
UNITS: ug/L
PREP DATE: 11/20/87
ANALYSIS DATE: 11/20/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SN034	11/2/87	5416-01	ALU003	< 10.0	1
SN045	11/2/87	5416-03	ALU004	< 10.0	1
SN035	11/2/87	5416-05	ALU005	< 10.0	1
SN039	11/2/87	5416-07	ALU006	< 10.0	1
SN041	11/2/87	5416-09	ALU007	< 10.0	1
SN065	11/2/87	5416-11	ALU008	< 10.0	1
SN029	11/2/87	5416-13	ALU009	< 10.0	1
SN028	11/3/87	5424-02	ALU010	< 10.0	1
SN031	11/3/87	5424-04	ALU011	< 10.0	1
SN030	11/3/87	5424-06	ALU012	< 10.0	1
SN036	11/5/87	5434-02	ALU013	< 10.0	1
SN038	11/5/87	5434-04	ALU014	< 10.0	1
SN037	11/5/87	5434-05	ALU015	< 10.0	1
SN040	11/5/87	5434-08	ALU016	< 10.0	1
03M505	11/9/87	5445-01	ALU017	< 10.0	1
03U007	11/9/87	5445-02	ALU018	< 10.0	1
03L007	11/9/87	5445-03	ALU019	< 10.0	1
04U007	11/9/87	5445-04	ALU020	< 10.0	1
03U008	11/9/87	5445-05	ALU021	< 10.0	1
03U010	11/9/87	5445-06	ALU022	< 10.0	1
03L010	11/9/87	5445-07	ALU023	< 10.0	1
04U012	11/9/87	5445-08	ALU024	< 10.0	1
03L012	11/9/87	5445-09	ALU025	< 10.0	1
03U012	11/9/87	5445-11	ALU026	< 10.0	1

Interpoll Laboratories
 USATHAMA Laboratory Report
 Federal Cartridge Company
 Page Two

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SM032	11/10/87	5450-01	ALU027	< 10.0	1
SM062	11/10/87	5450-03	ALU028	< 10.0	1
SM064	11/10/87	5450-05	ALU029	< 10.0	1
SM063	11/10/87	5450-07	ALU030	< 10.0	1
SM061	11/10/87	5450-09	ALU031	< 10.0	1
03U013	11/10/87	5451-01	ALU032	< 10.0	1
03M013	11/10/87	5451-02	ALU033	< 10.0	1
03L013	11/10/87	5451-03	ALU034	< 10.0	1
03U017	11/10/87	5451-04	ALU035	< 10.0	1
03M017	11/10/87	5451-05	ALU036	< 10.0	1
03L017	11/10/87	5451-06	ALU037	< 10.0	1
03U076	11/10/87	5451-07	ALU038	< 10.0	1
03U704	11/10/87	5451-08	ALU039	< 10.0	1
03U075	11/10/87	5451-09	ALU040	< 10.0	1
03U023	11/10/87	5451-10	ALU041	< 10.0	1
High Spike			ALU002	95.0	
High Spike			ALU043	90.0	
High Spike True Value				100	
Low Spike			ALU042	20.0	
Low Spike True Value				20.0	
MQ Blank			ALU001	< 10.0	

Respectfully submitted,



Gregg M. Holman,
 Inorganic Chemistry Department Manager

GMH/cg
 < = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

December 30, 1987

PARAMETER: BE, Method SD07
DETECTION LIMIT: 1.47 ug/L
UNITS: ug/L
PREP DATE: 11/23/87
ANALYSIS DATE: 11/23/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW034	11/2/87	5416-01	AKI002	< 1.47	1
SW045	11/2/87	5416-03	AKI003	< 1.47	1
SW035	11/2/87	5416-05	AKI004	< 1.47	1
SW039	11/2/87	5416-07	AKI005	< 1.47	1
SW041	11/2/87	5416-09	AKI006	< 1.47	1
SW065	11/2/87	5416-11	AKI007	< 1.47	1
SW029	11/2/87	5416-13	AKI008	< 1.47	1
SW028	11/3/87	5424-02	AKI009	< 1.47	1
SW031	11/3/87	5424-04	AKI010	< 1.47	1
SW030	11/3/87	5424-06	AKI011	< 1.47	1
SW036	11/5/87	5434-02	AKI012	< 1.47	1
SW038	11/5/87	5434-04	AKI013	< 1.47	1
SW037	11/5/87	5434-05	AKI014	< 1.47	1
SW040	11/5/87	5434-08	AKI015	< 1.47	1
03M505	11/9/87	5445-01	AKI016	< 1.47	1
03U007	11/9/87	5445-02	AKI017	< 1.47	1
03L007	11/9/87	5445-03	AKI018	< 1.47	1
04U007	11/9/87	5445-04	AKI019	< 1.47	1
03U008	11/9/87	5445-05	AKI020	< 1.47	1
03U010	11/9/87	5445-06	AKI021	< 1.47	1
03L010	11/9/87	5445-07	AKI022	< 1.47	1
04U012	11/9/87	5445-08	AKI023	< 1.47	1
03L012	11/9/87	5445-09	AKI024	< 1.47	1
03U012	11/9/87	5445-11	AKI025	< 1.47	1

Interpoll Laboratories
 USATHAMA Laboratory Report
 Federal Cartridge Company
 Page Two

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SM032	11/10/87	5450-01	AKI026	< 1.47	1
SM062	11/10/87	5450-03	AKI027	< 1.47	1
SM064	11/10/87	5450-05	AKI028	< 1.47	1
SM063	11/10/87	5450-07	AKI029	< 1.47	1
SM061	11/10/87	5450-09	AKI030	< 1.47	1
03U013	11/10/87	5451-01	AKI031	< 1.47	1
03M013	11/10/87	5451-02	AKI032	< 1.47	1
03L013	11/10/87	5451-03	AKI033	< 1.47	1
03U017	11/10/87	5451-04	AKI034	< 1.47	1
03M017	11/10/87	5451-05	AKI035	< 1.47	1
03L017	11/10/87	5451-06	AKI036	< 1.47	1
03U076	11/10/87	5451-07	AKI037	< 1.47	1
03U704	11/10/87	5451-08	AKI038	< 1.47	1
03U075	11/10/87	5451-09	AKI039	< 1.47	1
03U023	11/10/87	5451-10	AKI040	< 1.47	1
High Spike			AKI043	9.60	
High Spike			AKI042	10.6	
High Spike True Value				10.0	
Low Spike			AKI041	2.20	
Low Spike True Value				2.00	
MQ Blank			AKI001	< 1.47	

Respectfully submitted,

Gregg W. Holman

Gregg W. Holman,
 Inorganic Chemistry Department Manager

BWH/cg
 < = less than



INTERPOLL INC.
 4500 BALL ROAD N.E.
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 612/786-6020

Federal Cartridge Company
 Twin Cities Army Ammunition Plant
 New Brighton, MN 55112

Attention: Paula Connell

LABORATORY REPORT: #5610
 PURCHASE ORDER: #7194-01

January 29, 1988

SAMPLES COLLECTED: December 17, 1987
 SAMPLES RECEIVED: December 17, 1987

METHOD: UG01

Sample Identification:	SW058	SW059	SW060
Laboratory Log Number:	5610-06	5610-07	5610-08
USATHAMA ID Number:	<u>ANK004</u>	<u>ANK005</u>	<u>ANK006</u>

<u>Parameter, ug/L</u>	<u>Analysis</u>				
	<u>Date & Initials</u>	<u>Detect Limit</u>			
	12/21/87				
C2H3CL	NJE	1.5	<	1.5	< 1.5
CH2CL2	NJE	1.8	<	1.8	< 1.8
11DCE	NJE	0.49	<	0.49	< 0.49
11DCLE	NJE	0.72	<	0.72	< 0.72
12DCE	NJE	0.56	<	0.56	< 0.56
CHCL3	NJE	0.41	<	0.41	< 0.41
TCLTFE	NJE	4.5	<	4.5	< 4.5
12DCLE	NJE	0.51	<	0.51	< 0.51
111TCE	NJE	0.81	<	0.81	< 0.81
CCL4	NJE	1.1	<	1.1	< 1.1
12DCLP	NJE	0.62	<	0.62	< 0.62
TRCLE	NJE	1.1	<	1.1	< 5.21
112TCE	NJE	0.99	<	0.99	< 0.99
TCLLE	NJE	0.88	<	0.88	< 0.88
Volume used				5 mL	5 mL
Dilution factor				1	1

Sample Identification:	Field
Laboratory Log Number:	Blank
USATHAMA ID Number:	5610-10
	<u>ANK003</u>

<u>Parameter, ug/L</u>	<u>Analysis</u>			
	<u>Date & Initials</u>	<u>Detect Limit</u>		
	12/21/87			
C2H3CL	MJE	1.5	<	1.5
CH2CL2	MJE	1.8	<	1.8
11DCE	MJE	0.49	<	0.49
11DCLE	MJE	0.72	<	0.72
12DCE	MJE	0.56	<	0.56
CHCL3	MJE	0.41	<	0.41
TCLTFE	MJE	4.5	<	4.5
12DCLE	MJE	0.51	<	0.51
111TCE	MJE	0.81	<	0.81
CCL4	MJE	1.1	<	1.1
12DCLP	MJE	0.62	<	0.62
TRCLE	MJE	1.1	<	1.1
112TCE	MJE	0.99	<	0.99
TCLEE	MJE	0.88	<	0.88
Volume used				5 mL
Dilution factor				1

Sample Identification:	MO Blank	2 CRL QC	2 CRL QC
USATHAMA ID Number:	<u>ANK001</u>	<u>ANK002</u>	True
			<u>Value</u>

<u>Parameter, ug/L</u>	<u>Analysis</u>				
	<u>Date & Initials</u>	<u>Detect Limit</u>			
	12/21/87				
C2H3CL	MJE	1.5	<	1.5	< 1.5
CH2CL2	MJE	1.8	<	1.8	< 1.8
11DCE	MJE	0.49	<	0.49	0.551 0.944
11DCLE	MJE	0.72	<	0.72	< 0.72
12DCE	MJE	0.56	<	0.56	0.764 1.16
CHCL3	MJE	0.41	<	0.41	< 0.41
TCLTFE	MJE	4.5	<	4.5	< 4.5
12DCLE	MJE	0.51	<	0.51	0.589 0.984
111TCE	MJE	0.81	<	0.81	1.25 1.65
CCL4	MJE	1.1	<	1.1	< 1.1
12DCLP	MJE	0.62	<	0.62	< 0.62
TRCLE	MJE	1.1	<	1.1	1.64 2.14
112TCE	MJE	0.99	<	0.99	1.80 1.93
TCLEE	MJE	0.88	<	0.88	1.41 1.75
Volume used				5 mL	5 mL
Dilution factor				1	1

Sample Identification: USATHAMA ID Number:		10 CRL QC <u>ANK007</u>	10 CRL QC <u>ANK008</u>	10 CRL QC True <u>Value</u>
<u>Parameter, ug/L</u>	<u>Analysis Date & Initials</u>	<u>Detect Limit</u>		
	12/21/87			
C2H3CL	MJE	1.5	< 1.5	
CH2CL2	MJE	1.8	2.42	2.66
11DCE	MJE	0.49	4.47	4.32 4.72
11DCLE	MJE	0.72	< 0.72	< 0.72
12DCE	MJE	0.56	5.41	5.37 5.81
CHCL3	MJE	0.41	< 0.41	< 0.41
TCLTFE	MJE	4.5	< 4.5	< 4.5
12DCLE	MJE	0.51	4.39	4.16 4.92
111TCE	MJE	0.81	8.50	7.86 8.27
CCL4	MJE	1.1	< 1.1	< 1.1
12DCLP	MJE	0.62	< 0.62	< 0.62
TRCLE	MJE	1.1	11.3	10.5 10.7
112TCE	MJE	0.99	12.4	11.6 9.66
TCL EE	MJE	0.88	9.05	7.84 8.76
Volume used		5 mL	5 mL	
Dilution factor		1	1	

Note: To obtain correct detection limits for each sample, stated detection limits must be multiplied by the dilution factor.

Respectfully submitted,

Wayne A. Olson

Wayne A. Olson,
 Organic Chemistry Department Manager

MAO/cg
 < = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
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612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

February 12, 1988

PARAMETER: HG, Method SB04
DETECTION LIMIT: 0.7 ug/L
UNITS: ug/L
PREP DATE: 12/18/87
ANALYSIS DATE: 12/19/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW058	12/17/87	5610-06	ALL003	< 0.7	1
SW059	12/17/87	5610-07	ALL004	< 0.7	1
SW060	12/17/87	5610-08	ALL005	< 0.7	1
SW052	12/11/87	5585-02	ALL006	< 0.7	1
SW056	12/11/87	5585-03	ALL007	< 0.7	1
01U127	12/11/87	5586-01	ALL008	< 0.7	1
01U133	12/11/87	5586-02	ALL009	< 0.7	1
01U133	12/11/87	5586-02D	ALL010	< 0.7	1
Field Blank	12/11/87	5586-04	ALL011	< 0.7	1
High Spike			ALL002	7.00	
High Spike			ALL013	6.90	
High Spike True Value				7.00	
Low Spike			ALL012	1.30	
Low Spike True Value				1.40	
HQ Blank			ALL001	< 0.7	

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



INTERPOLL INC.
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612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

December 30, 1987

PARAMETER: HG, Method SB04
DETECTION LIMIT: 0.7 ug/L
UNITS: ug/L
PREP DATE: 11/16/87
ANALYSIS DATE: 11/16/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SM034	11/2/87	5416-01	AKM035	< 0.7	1
SM045	11/2/87	5416-03	AKM036	< 0.7	1
SM035	11/2/87	5416-05	AKM037	< 0.7	1
SM039	11/2/87	5416-07	AKM038	< 0.7	1
SM041	11/2/87	5416-09	AKM039	< 0.7	1
SM065	11/2/87	5416-11	AKM040	< 0.7	1
SM029	11/2/87	5416-13	AKM041	< 0.7	1
SM028	11/3/87	5424-02	AKM003	< 0.7	1
SM031	11/3/87	5424-04	AKM004	< 0.7	1
SM030	11/3/87	5424-06	AKM005	< 0.7	1
SM036	11/5/87	5434-02	AKM006	< 0.7	1
SM038	11/5/87	5434-04	AKM007	< 0.7	1
SM037	11/5/87	5434-05	AKM008	< 0.7	1
SM040	11/5/87	5434-08	AKM009	< 0.7	1
03M505	11/9/87	5445-01	AKM015	< 0.7	1
03U007	11/9/87	5445-02	AKM016	< 0.7	1
03L007	11/9/87	5445-03	AKM017	< 0.7	1
04U007	11/9/87	5445-04	AKM018	< 0.7	1
03U008	11/9/87	5445-05	AKM019	< 0.7	1
03U010	11/9/87	5445-06	AKM020	< 0.7	1
03L010	11/9/87	5445-07	AKM021	< 0.7	1
04U012	11/9/87	5445-08	AKM022	< 0.7	1
03L012	11/9/87	5445-09	AKM023	< 0.7	1
03U012	11/9/87	5445-11	AKM024	< 0.7	1

Interpoll Laboratories
 USATHAMA Laboratory Report
 Federal Cartridge Company
 Page Two

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW032	11/10/87	5450-01	AKW010	< 0.7	1
SW062	11/10/87	5450-03	AKW011	< 0.7	1
SW064	11/10/87	5450-05	AKW012	< 0.7	1
SW063	11/10/87	5450-07	AKW013	< 0.7	1
SW061	11/10/87	5450-09	AKW014	< 0.7	1
03U013	11/10/87	5451-01	AKW025	< 0.7	1
03M013	11/10/87	5451-02	AKW026	< 0.7	1
03L013	11/10/87	5451-03	AKW027	< 0.7	1
03U017	11/10/87	5451-04	AKW028	< 0.7	1
03M017	11/10/87	5451-05	AKW029	< 0.7	1
03L017	11/10/87	5451-06	AKW030	< 0.7	1
03U076	11/10/87	5451-07	AKW031	< 0.7	1
03U704	11/10/87	5451-08	AKW032	< 0.7	1
03U075	11/10/87	5451-09	AKW033	< 0.7	1
03U023	11/10/87	5451-10	AKW034	< 0.7	1
High Spike			AKW002	7.10	
High Spike			AKW043	6.90	
High Spike True Value				7.40	
Low Spike			AKW042	1.40	
Low Spike True Value				1.40	
HQ Blank			AKW001	< 0.7	

Respectfully submitted,

Gregg W. Holman

Gregg W. Holman,
 Inorganic Chemistry Department Manager

GMH/cg
 < = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

January 4, 1988

PARAMETER: Cyanide, Method TY02
DETECTION LIMIT: 8.35 ug/L
UNITS: ug/L
ANALYSIS DATE: 12/21/87
ANALYST: MP
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW058	12/17/87	5610-06	ALB003	< 8.35	1
SW059	12/17/87	5610-07	ALB004	< 8.35	1
SW060	12/17/87	5610-08	ALB005	< 8.35	1
High Spike			ALB006	90.5	
High Spike			ALB007	95.4	
High Spike True Value				100	
Low Spike			ALB002	12.6	
Low Spike True Value				10.0	
MQ Blank			ALB001	< 8.35	

Respectfully submitted,

Gregg W. Holman,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



INTERPOLL INC.
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Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

December 15, 1987

PURCHASE ORDER: #7194-01

PARAMETER: Cyanide, Method TY02
DETECTION LIMIT: 8.35 ug/L
UNITS: ug/L
ANALYSIS DATE: 11/19/87
ANALYST: MP

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SM032	11/10/87	5450-01	AIX003	< 8.35	1
SM062	11/10/87	5450-03	AIX004	< 8.35	1
SM064	11/10/87	5450-05	AIX005	< 8.35	1
SM063	11/10/87	5450-07	AIX006	< 8.35	1
SM061	11/10/87	5450-09	AIX007	< 8.35	1
03U076	11/10/87	5451-07	AIX009	< 8.35	1
03U704	11/10/87	5451-08	AIX010	< 8.35	1
01U050	11/16/87	5473-05	AIX011	< 8.35	1
01U053	11/16/87	5473-07	AIX012	< 8.35	1
01U524	11/17/87	5477-01	AIX013	< 8.35	1
01U526	11/17/87	5477-02	AIX015	10.1	1
01U108	11/17/87	5477-04	AIX016	< 8.35	1
03U015	11/17/87	5477-05	AIX017	< 8.35	1
03U088	11/17/87	5477-10	AIX018	< 8.35	1
High Spike			AIX008	81.3	
High Spike			AIX014	89.4	
High Spike True Value				100	
Low Spike			AIX002	10.1	
Low Spike True Value				10.0	
HQ Blank			AIX001	< 8.35	

Respectfully submitted,

Gregg W. Holan,
Inorganic Chemistry Department Manager

BWH/cg
< = less than



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 New Brighton, MN 55112

Attention: Paula Connell

LABORATORY REPORT: #5578 & #5585
 PURCHASE ORDER: #7194-01

February 29, 1988

SAMPLES COLLECTED: December 10 & 11, 1987
 SAMPLES RECEIVED: December 10 & 11, 1987
 PREP DATE: December 16, 1987

METHOD: UH05

Sample Identification:
 Laboratory Log Number:
 USATHAMA ID Number:

SW039
 5578-01
APB002

SW041
 5578-02
APB003

SW035
 5578-05
APB004

Parameter, ug/L	Analysis				
	Date & Initials	Detect Limit			
	12/16/87				
DBUCLE	JB	0.160	0.616	0.443	0.808
PCB016	JB	0.290	< 0.290	< 0.290	< 0.290
PCB242	JB	0.620	< 0.620	< 0.620	< 0.620
PCB248	JB	0.340	< 0.340	< 0.340	< 0.340
PCB254	JB	0.130	< 0.130	< 0.130	< 0.130
PCB260	JB	0.320	< 0.320	< 0.320	< 0.320
Volume used			200 mL	200 mL	200 mL
Dilution factor			1	1	1

Interpoll Laboratories
 USATHAMA Laboratory Report #5578 & #5585 (continued)
 Federal Cartridge Company
 Page Two

Sample Identification:	SM045	SM034	SM030
Laboratory Log Number:	5578-07	5578-09	5578-11
USATHAMA ID Number:	<u>APB005</u>	<u>APB006</u>	<u>APB007</u>

<u>Parameter, ug/L</u>	Analysis				
	Date & Initials	Detect Limit			
	12/16/87				
DBUCLE	JB	0.160	0.715	0.753	0.673
PCB016	JB	0.290	< 0.290	< 0.290	< 0.290
PCB242	JB	0.620	< 0.620	< 0.620	< 0.620
PCB248	JB	0.340	< 0.340	< 0.340	< 0.340
PCB254	JB	0.130	< 0.130	< 0.130	< 0.130
PCB260	JB	0.320	< 0.320	< 0.320	< 0.320
Volume used			200 mL	200 mL	200 mL
Dilution factor			1	1	1

Sample Identification:	SM031	SM028	SM056
Laboratory Log Number:	5578-13	5585-01	5585-03
USATHAMA ID Number:	<u>APB008</u>	<u>APB009</u>	<u>APB010</u>

<u>Parameter, ug/L</u>	Analysis				
	Date & Initials	Detect Limit			
	12/16/87				
DBUCLE	JB	0.160	0.487	0.461	0.512
PCB016	JB	0.290	< 0.290	< 0.290	< 0.290
PCB242	JB	0.620	< 0.620	< 0.620	< 0.620
PCB248	JB	0.340	< 0.340	< 0.340	< 0.340
PCB254	JB	0.130	< 0.130	< 0.130	< 0.130
PCB260	JB	0.320	< 0.320	< 0.320	< 0.320
Volume used			200 mL	200 mL	200 mL
Dilution factor			1	1	1

Interpoll Laboratories
 USATHAMA Laboratory Report #5578 & #5585 (continued)
 Federal Cartridge Company
 Page Three

Sample Identification:			Method	Low	Low Spike
USATHAMA ID Number:			Blank	Spike	True Value
			<u>APB001</u>	<u>APB011</u>	
Parameter, ug/L	Analysis	Detect			
	Date & Initials	Limit			
	12/16/87				
DBUCLE	JB	0.160	0.551	0.601	0.800
PCB016	JB	0.290	< 0.290	0.320	0.400
PCB242	JB	0.620	< 0.620	< 0.620	< 0.620
PCB248	JB	0.340	< 0.340	< 0.340	< 0.340
PCB254	JB	0.130	< 0.130	< 0.130	< 0.130
PCB260	JB	0.320	< 0.320	0.308	0.400
Volume used			200 mL	200 mL	
Dilution factor			1	1	

Sample Identification:			High	High	High Spike
USATHAMA ID Number:			Spike	Spike	True Value
			<u>APB012</u>	<u>APB013</u>	
Parameter, ug/L	Analysis	Detect			
	Date & Initials	Limit			
	12/16/87				
DBUCLE	JB	0.160	1.11	1.10	1.20
PCB016	JB	0.290	0.518	0.482	0.600
PCB242	JB	0.620	< 0.620	< 0.620	< 0.620
PCB248	JB	0.340	< 0.340	< 0.340	< 0.340
PCB254	JB	0.130	< 0.130	< 0.130	< 0.130
PCB260	JB	0.320	0.518	0.518	0.600
Volume used			200 mL	200 mL	
Dilution factor			1	1	

Note: DBUCLE was added to all field samples and the method blank at a concentration of 0.750 ug/L.

Respectfully submitted,

Wayne A. Olson

Wayne A. Olson,
 Organic Chemistry Department Manager

WAO/cg
 < = less than



INTERPOLL INC.
 4500 BALL ROAD N.E.
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 612/786-6020

Federal Cartridge Company
 Twin Cities Army Ammunition Plant
 New Brighton, MN 55112

Attention: Paula Connell

LABORATORY REPORT: #5434 & #5450
 PURCHASE ORDER: #7194-01

February 29, 1988

SAMPLES COLLECTED: November 5 & 10, 1987
 SAMPLES RECEIVED: November 5 & 10, 1987
 PREP DATE: November 12, 1987

METHOD: UH05

Sample Identification:
 Laboratory Log Number:
 USATHAMA ID Number:

SW036
 5434-02
ANY002

SW038
 5434-04
ANY003

SW037
 5434-05
ANY004

Parameter, ug/L	Analysis				
	Date & Initials	Detect Limit			
	11/18/87				
DBUCLE	JB	0.160	0.541	0.546	0.200
PCB016	JB	0.290	< 0.290	< 0.290	< 0.290
PCB242	JB	0.620	< 0.620	< 0.620	< 0.620
PCB248	JB	0.340	< 0.340	< 0.340	< 0.340
PCB254	JB	0.130	< 0.130	< 0.130	< 0.130
PCB260	JB	0.320	< 0.320	< 0.320	< 0.320
Volume used			200 mL	200 mL	200 mL
Dilution factor			1	1	1

Interpoll Laboratories
 USATHAMA Laboratory Report #5434 & #5450 (continued)
 Federal Cartridge Company
 Page Two

Sample Identification: SW040
 Laboratory Log Number: 5434-08
 USATHAMA ID Number: ANY005

<u>Parameter, ug/L</u>	<u>Analysis</u>		<u>Detect</u>
	<u>Date & Initials</u>	<u>Limit</u>	
	11/18/87		
DBUCLE	JB	0.160	0.187
PCB016	JB	0.290	< 0.290
PCB242	JB	0.620	< 0.620
PCB248	JB	0.340	< 0.340
PCB254	JB	0.130	< 0.130
PCB260	JB	0.320	< 0.320
Volume used	200 mL		
Dilution factor	1		

Sample Identification: SW032 SW064 SW063
 Laboratory Log Number: 5450-01 5450-05 5450-07
 USATHAMA ID Number: ANY006 ANY007 ANY008

<u>Parameter, ug/L</u>	<u>Analysis</u>					
	<u>Date & Initials</u>	<u>Limit</u>				
	11/18/87					
DBUCLE	JB	0.160	0.534	0.214	< 0.160	
PCB016	JB	0.290	< 0.290	< 0.290	< 0.290	< 0.290
PCB242	JB	0.620	< 0.620	< 0.620	< 0.620	< 0.620
PCB248	JB	0.340	< 0.340	< 0.340	< 0.340	< 0.340
PCB254	JB	0.130	< 0.130	< 0.130	< 0.130	< 0.130
PCB260	JB	0.320	< 0.320	< 0.320	< 0.320	< 0.320
Volume used	200 mL		200 mL	200 mL	200 mL	200 mL
Dilution factor	1		1	1	1	1

Interpoll Laboratories
 USATHAMA Laboratory Report #5434 & #5450 (continued)
 Federal Cartridge Company
 Page Three

Sample Identification:			Method	Low	Low Spike
USATHAMA ID Number:			Blank	Spike	True Value
			<u>ANY001</u>	<u>ANY009</u>	
<u>Parameter, ug/L</u>	Analysis				
	<u>Date & Initials</u>	<u>Detect Limit</u>			
	11/18/87				
DBUCLE	JB	0.160	0.767	0.485	0.800
PCB016	JB	0.290	< 0.290	< 0.290	0.400
PCB242	JB	0.620	< 0.620	< 0.620	< 0.620
PCB248	JB	0.340	< 0.340	< 0.340	< 0.340
PCB254	JB	0.130	< 0.130	< 0.130	< 0.130
PCB260	JB	0.320	< 0.320	< 0.320	0.400
Volume used			200 mL	200 mL	
Dilution factor			1	1	

Sample Identification:			High	High	High Spike
USATHAMA ID Number:			Spike	Spike	True Value
			<u>ANY010</u>	<u>ANY011</u>	
<u>Parameter, ug/L</u>	Analysis				
	<u>Date & Initials</u>	<u>Detect Limit</u>			
	11/18/87				
DBUCLE	JB	0.160	1.53	1.58	1.00
PCB016	JB	0.290	0.640	0.783	0.500
PCB242	JB	0.620	< 0.620	< 0.620	< 0.620
PCB248	JB	0.340	< 0.340	< 0.340	< 0.340
PCB254	JB	0.130	< 0.130	< 0.130	< 0.130
PCB260	JB	0.320	0.700	0.750	0.500
Volume used			200 mL	200 mL	
Dilution factor			1	1	

Note: DBUCLE was added to all field samples and the method blank at a concentration of 0.750 ug/L.

Respectfully submitted,

Wayne A. Olson

Wayne A. Olson,
 Organic Chemistry Department Manager

MAO/cg
 < = less than



interpoll

INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

March 11, 1988

PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Alpha, Dissolved pCi/L</u>	<u>Beta, Dissolved pCi/L</u>
SW052	12/11/87	5585-02	AR0001	< 1.6	1.3
SW059	12/17/87	5610-07	ARE001	2.1	2.3

Respectfully submitted,

Richard R. Dahl,
Director of Analytical Services

FRD/cg

< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN. 55112

Attention: Paula Connell

February 12, 1988

PARAMETER: ZN, Method SC03
DETECTION LIMIT: 29.4 ug/L
UNITS: ug/L
PREP DATE: 1/5/88
ANALYSIS DATE: 1/5/88
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW058	12/17/87	5610-06	AQI003	< 29.4	1
SW059	12/17/87	5610-07	AQI004	< 29.4	1
SW060	12/17/87	5610-08	AQI005	< 29.4	1
SW052	12/11/87	5585-02	AQI006	< 29.4	1
SW056	12/11/87	5585-03	AQI007	< 29.4	1
High Spike			AQI002	250	
High Spike			AQI009	250	
High Spike True Value				250	
Low Spike			AQI008	50.0	
Low Spike True Value				50.0	
HQ Blank			AQI001	< 29.4	

Respectfully submitted,

Gregg M. Holman,
Inorganic Chemistry Department Manager

GWH/cg
< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

March 11, 1988

PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Alpha, Dissolved pCi/L</u>	<u>Beta, Dissolved pCi/L</u>
SW062	11/10/87	5450-03	ARA001	< 1.0	4.6
SW061	11/10/87	5450-09	ARA002	2.5	4.0
SW041	11/03/87	5416-09	ARA003	< 1.0	3.5
SW028	11/04/87	5424-02	ARA004	2.1	4.5
SW031	11/04/87	5424-04	ARA005	< 1.0	4.5
SW030	11/04/87	5424-06	ARA006	3.0	1.9

Respectfully submitted,

Richard R. Dahl,
Director of Analytical Services

RRD/cg

< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

January 22, 1988

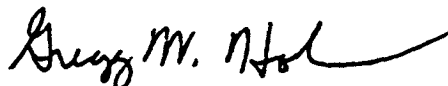
PARAMETER: ZN, Method SC03
DETECTION LIMIT: 29.4 ug/L
UNITS: ug/L
PREP DATE: 11/24/87
ANALYSIS DATE: 11/24/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW034	11/2/87	5416-01	AMS003	< 29.4	1
SW045	11/2/87	5416-03	AMS004	< 29.4	1
SW035	11/2/87	5416-05	AMS005	< 29.4	1
SW039	11/2/87	5416-07	AMS006	< 29.4	1
SW041	11/2/87	5416-09	AMS007	< 29.4	1
SW065	11/2/87	5416-11	AMS008	< 29.4	1
SW029	11/2/87	5416-13	AMS009	< 29.4	1
SW028	11/3/87	5424-02	AMS010	< 29.4	1
SW031	11/3/87	5424-04	AMS011	< 29.4	1
SW030	11/3/87	5424-06	AMS012	< 29.4	1
SW036	11/5/87	5434-02	AMS013	< 29.4	1
SW038	11/5/87	5434-04	AMS014	< 29.4	1
SW037	11/5/87	5434-05	AMS015	< 29.4	1
SW040	11/5/87	5434-08	AMS016	< 29.4	1
03M505	11/9/87	5445-01	AMS017	< 29.4	1
03U007	11/9/87	5445-02	AMS018	< 29.4	1
03L007	11/9/87	5445-03	AMS019	< 29.4	1
04U007	11/9/87	5445-04	AMS020	< 29.4	1
03U008	11/9/87	5445-05	AMS021	< 29.4	1
03U010	11/9/87	5445-06	AMS022	< 29.4	1
03L010	11/9/87	5445-07	AMS023	< 29.4	1
04U012	11/9/87	5445-08	AMS024	< 29.4	1
03L012	11/9/87	5445-09	AMS025	< 29.4	1
03U012	11/9/87	5445-11	AMS026	< 29.4	1

Interpoll Laboratories
USATHAMA Laboratory Report
Federal Cartridge Company
Page Two

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW032	11/10/87	5450-01	AMS027	< 29.4	1
SW062	11/10/87	5450-03	AMS028	< 29.4	1
SW064	11/10/87	5450-05	AMS029	< 29.4	1
SW063	11/10/87	5450-07	AMS030	< 29.4	1
SW061	11/10/87	5450-09	AMS031	< 29.4	1
03U013	11/10/87	5451-01	AMS032	< 29.4	1
03M013	11/10/87	5451-02	AMS033	< 29.4	1
03L013	11/10/87	5451-03	AMS034	< 29.4	1
03U017	11/10/87	5451-04	AMS035	< 29.4	1
03M017	11/10/87	5451-05	AMS036	< 29.4	1
03L017	11/10/87	5451-06	AMS037	< 29.4	1
03U076	11/10/87	5451-07	AMS038	< 29.4	1
03U704	11/10/87	5451-08	AMS039	< 29.4	1
03U075	11/10/87	5451-09	AMS040	< 29.4	1
03U023	11/10/87	5451-10	AMS041	< 29.4	1
High Spike			AMS002	264	
High Spike			AMS043	263	
High Spike True Value				250	
Low Spike			AMS042	50.0	
Low Spike True Value				50.0	
MQ Blank			AMS001	< 29.4	

Respectfully submitted,



Gregg M. Holman,
Inorganic Chemistry Department Manager

GMH/cg
< = less than



interpoll

INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

December 30, 1987

PARAMETER: MN, Method SD07
DETECTION LIMIT: 1.19 ug/L
UNITS: ug/L
PREP DATE: 12/1/87
ANALYSIS DATE: 12/1/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SN034	11/2/87	5416-01	AKU003	10	20
SN045	11/2/87	5416-03	AKU004	2.3	400
SN035	11/2/87	5416-05	AKU005	2.4	20
SN041	11/2/87	5416-09	AKU007	10	20
SN065	11/2/87	5416-11	AKU008	2.6	20
SN029	11/2/87	5416-13	AKU009	4.9	400
SN028	11/3/87	5424-02	AKU010	9.2	20
SN031	11/3/87	5424-04	AKU011	12	20
SN030	11/3/87	5424-06	AKU012	13	20
SN036	11/5/87	5434-02	AKU013	14.0	1
SN038	11/5/87	5434-04	AKU014	13.0	1
SN037	11/5/87	5434-05	AKU015	13.1	1
SN040	11/5/87	5434-08	AKU016	14.0	1
03M505	11/9/87	5445-01	AKU017	11	20
03U007	11/9/87	5445-02	AKU018	16	20
03L007	11/9/87	5445-03	AKU019	19	20
04U007	11/9/87	5445-04	AKU020	20	20
03U008	11/9/87	5445-05	AKU021	1.9	400
03U010	11/9/87	5445-06	AKU022	10	20
03L010	11/9/87	5445-07	AKU023	2.65	1
04U012	11/9/87	5445-08	AKU024	1.3	400
03L012	11/9/87	5445-09	AKU025	2.0	400
03U012	11/9/87	5445-11	AKU026	9.8	20

Interpoll Laboratories
 USATHAMA Laboratory Report
 Federal Cartridge Company
 Page Two

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW032	11/10/87	5450-01	AKU027	2.7	400
SW062	11/10/87	5450-03	AKU028	2.9	400
SW064	11/10/87	5450-05	AKU029	15.0	1
SW063	11/10/87	5450-07	AKU030	15.0	1
SW061	11/10/87	5450-09	AKU031	4.0	20
03U013	11/10/87	5451-01	AKU032	8.0	20
03M013	11/10/87	5451-02	AKU033	20	20
03L013	11/10/87	5451-03	AKU034	2.4	400
03U017	11/10/87	5451-04	AKU035	9.60	1
03M017	11/10/87	5451-05	AKU036	5.50	1
03L017	11/10/87	5451-06	AKU037	18	20
03U076	11/10/87	5451-07	AKU038	5.4	20
03U704	11/10/87	5451-08	AKU039	6.9	20
03U075	11/10/87	5451-09	AKU040	6.40	1
03U023	11/10/87	5451-10	AKU041	12.5	1
High Spike			AKU002	15.9	
High Spike			AKU043	16.0	
High Spike True Value				15.0	
Low Spike			AKU042	2.20	
Low Spike True Value				2.00	
MQ Blank			AKU001	< 1.19	

Respectfully submitted,

Gregg M. Holman

Gregg M. Holman,
 Inorganic Chemistry Department Manager

BWH/cg
 < = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

December 30, 1987

PARAMETER: CU, Method SD07
DETECTION LIMIT: 0.500 ug/L
UNITS: ug/L
PREP DATE: 11/24/87
ANALYSIS DATE: 11/24/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SN034	11/2/87	5416-01	AKS003	1.60	1
SN045	11/2/87	5416-03	AKS004	1.65	1
SN035	11/2/87	5416-05	AKS005	5.85	1
SN039	11/2/87	5416-07	AKS006	4.10	1
SN041	11/2/87	5416-09	AKS007	2.65	1
SN065	11/2/87	5416-11	AKS008	1.45	1
SN029	11/2/87	5416-13	AKS009	1.50	1
SN028	11/3/87	5424-02	AKS010	3.30	1
SN031	11/3/87	5424-04	AKS011	3.40	1
SN030	11/3/87	5424-06	AKS012	3.25	1
SN036	11/5/87	5434-02	AKS013	5.25	1
SN038	11/5/87	5434-04	AKS014	5.10	1
SN037	11/5/87	5434-05	AKS015	5.10	1
SN040	11/5/87	5434-08	AKS016	5.00	1
03N505	11/9/87	5445-01	AKS017	1.25	1
03U007	11/9/87	5445-02	AKS018	1.80	1
03L007	11/9/87	5445-03	AKS019	2.10	1
04U007	11/9/87	5445-04	AKS020	1.70	1
03U008	11/9/87	5445-05	AKS021	1.55	1
03U010	11/9/87	5445-06	AKS022	1.70	1
03L010	11/9/87	5445-07	AKS023	1.10	1
04U012	11/9/87	5445-08	AKS024	1.25	1
03L012	11/9/87	5445-09	AKS025	1.35	1
03U012	11/9/87	5445-11	AKS026	3.60	1

Interpoll Laboratories
 USATHAMA Laboratory Report
 Federal Cartridge Company
 Page Two

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SM032	11/10/87	5450-01	AKS027	6.90	1
SM062	11/10/87	5450-03	AKS028	1.50	1
SM064	11/10/87	5450-05	AKS029	1.10	1
SM063	11/10/87	5450-07	AKS030	1.75	1
SM061	11/10/87	5450-09	AKS031	2.70	1
03U013	11/10/87	5451-01	AKS032	2.55	1
03M013	11/10/87	5451-02	AKS033	1.50	1
03L013	11/10/87	5451-03	AKS034	1.50	1
03U017	11/10/87	5451-04	AKS035	2.45	1
03M017	11/10/87	5451-05	AKS036	2.30	1
03L017	11/10/87	5451-06	AKS037	1.50	1
03U076	11/10/87	5451-07	AKS038	1.25	1
03U704	11/10/87	5451-08	AKS039	1.95	1
03U075	11/10/87	5451-09	AKS040	1.00	1
03U023	11/10/87	5451-10	AKS041	0.800	1
High Spike			AKS002	9.90	
High Spike			AKS043	10.0	
High Spike True Value				10.0	
Low Spike			AKS042	1.90	
Low Spike True Value				2.00	
HQ Blank			AKS001	< 0.500	

Respectfully submitted,

Gregg W. Holman

Gregg W. Holman,
 Inorganic Chemistry Department Manager

GMH/cg
 < = less than



interpoll

INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

January 4, 1988

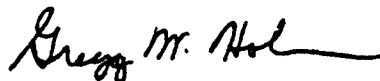
PARAMETER: CR, Method SD07
DETECTION LIMIT: 2.18 ug/L
UNITS: ug/L
PREP DATE: 12/3/87
ANALYSIS DATE: 12/3/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHANA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW034	11/2/87	5416-01	AKB003	< 2.18	1
SW045	11/2/87	5416-03	AKB004	< 2.18	1
SW035	11/2/87	5416-05	AKB005	< 2.18	1
SW039	11/2/87	5416-07	AKB006	< 2.18	1
SW041	11/2/87	5416-09	AKB007	< 2.18	1
SW065	11/2/87	5416-11	AKB008	< 2.18	1
SW029	11/2/87	5416-13	AKB009	< 2.18	1
SW028	11/3/87	5424-02	AKB010	< 2.18	1
SW031	11/3/87	5424-04	AKB011	< 2.18	1
SW030	11/3/87	5424-06	AKB012	2.70	1
SW036	11/5/87	5434-02	AKB013	< 2.18	1
SW038	11/5/87	5434-04	AKB014	< 2.18	1
SW037	11/5/87	5434-05	AKB015	< 2.18	1
SW040	11/5/87	5434-08	AKB016	< 2.18	1
03M505	11/9/87	5445-01	AKB017	< 2.18	1
03U007	11/9/87	5445-02	AKB018	< 2.18	1
03L007	11/9/87	5445-03	AKB019	< 2.18	1
04U007	11/9/87	5445-04	AKB020	< 2.18	1
03U008	11/9/87	5445-05	AKB021	< 2.18	1
03U010	11/9/87	5445-06	AKB022	< 2.18	1
03L010	11/9/87	5445-07	AKB023	< 2.18	1
04U012	11/9/87	5445-08	AKB024	2.30	1
03L012	11/9/87	5445-09	AKB025	< 2.18	1
03U012	11/9/87	5445-11	AKB026	3.45	1

Interpoll Laboratories
USATHAMA Laboratory Report
Federal Cartridge Company
Page Two

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SM032	11/10/87	5450-01	AKQ027	< 2.18	1
SM062	11/10/87	5450-03	AKQ028	< 2.18	1
SM064	11/10/87	5450-05	AKQ029	< 2.18	1
SM063	11/10/87	5450-07	AKQ030	< 2.18	1
SM061	11/10/87	5450-09	AKQ031	< 2.18	1
03U013	11/10/87	5451-01	AKQ032	< 2.18	1
03M013	11/10/87	5451-02	AKQ033	< 2.18	1
03L013	11/10/87	5451-03	AKQ034	< 2.18	1
03U017	11/10/87	5451-04	AKQ035	3.15	1
03M017	11/10/87	5451-05	AKQ036	2.60	1
03L017	11/10/87	5451-06	AKQ037	< 2.18	1
03U076	11/10/87	5451-07	AKQ038	< 2.18	1
03U704	11/10/87	5451-08	AKQ039	< 2.18	1
03U075	11/10/87	5451-09	AKQ040	< 2.18	1
03U023	11/10/87	5451-10	AKQ041	< 2.18	1
High Spike			AKQ002	15.0	
High Spike			AKQ043	15.5	
High Spike True Value				15.0	
Low Spike			AKQ042	4.15	
Low Spike True Value				4.00	
MQ Blank			AKQ001	< 2.18	

Respectfully submitted,



Gregg W. Holman,
Inorganic Chemistry Department Manager

BWH/cg

< = less than



interpoll

INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

December 30, 1987

PARAMETER: CD, Method SD07
DETECTION LIMIT: 0.1 ug/L
UNITS: ug/L
PREP DATE: 11/27/87
ANALYSIS DATE: 11/27/87
ANALYST: PMW
PURCHASE ORDER: 87194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW034	11/2/87	5416-01	AKN003	0.410	1
SW045	11/2/87	5416-03	AKN004	0.600	1
SW035	11/2/87	5416-05	AKN005	0.110	1
SW039	11/2/87	5416-07	AKN006	< 0.1	1
SW041	11/2/87	5416-09	AKN007	0.100	1
SW065	11/2/87	5416-11	AKN008	< 0.1	1
SW029	11/2/87	5416-13	AKN009	< 0.1	1
SW028	11/3/87	5424-02	AKN010	< 0.1	1
SW031	11/3/87	5424-04	AKN011	< 0.1	1
SW030	11/3/87	5424-06	AKN012	1.00	1
SW036	11/3/87	5434-02	AKN013	< 0.1	1
SW038	11/3/87	5434-04	AKN014	< 0.1	1
SW037	11/3/87	5434-05	AKN015	< 0.1	1
SW040	11/3/87	5434-08	AKN016	< 0.1	1
03M505	11/9/87	5445-01	AKN017	< 0.1	1
03U007	11/9/87	5445-02	AKN018	< 0.1	1
03L007	11/9/87	5445-03	AKN019	< 0.1	1
04U007	11/9/87	5445-04	AKN020	< 0.1	1
03U008	11/9/87	5445-05	AKN021	< 0.1	1
03U010	11/9/87	5445-06	AKN022	< 0.1	1
03L010	11/9/87	5445-07	AKN023	< 0.1	1
04U012	11/9/87	5445-08	AKN024	< 0.1	1
03L012	11/9/87	5445-09	AKN025	< 0.1	1
03U012	11/9/87	5445-11	AKN026	< 0.1	1

Interpoll Laboratories
 USATHAMA Laboratory Report
 Federal Cartridge Company
 Page Two

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW032	11/10/87	5450-01	AKM027	< 0.1	1
SW062	11/10/87	5450-03	AKM028	< 0.1	1
SW064	11/10/87	5450-05	AKM029	< 0.1	1
SW063	11/10/87	5450-07	AKM030	< 0.1	1
SW061	11/10/87	5450-09	AKM031	< 0.1	1
03U013	11/10/87	5451-01	AKM032	< 0.1	1
03M013	11/10/87	5451-02	AKM033	< 0.1	1
03L013	11/10/87	5451-03	AKM034	< 0.1	1
03U017	11/10/87	5451-04	AKM035	< 0.1	1
03M017	11/10/87	5451-05	AKM036	0.100	1
03L017	11/10/87	5451-06	AKM037	< 0.1	1
03U076	11/10/87	5451-07	AKM038	< 0.1	1
03U704	11/10/87	5451-08	AKM039	0.150	1
03U075	11/10/87	5451-09	AKM040	< 0.1	1
03U023	11/10/87	5451-10	AKM041	< 0.1	1
High Spike			AKM001	0.950	
High Spike			AKM043	0.910	
High Spike True Value				1.00	
Low Spike			AKM042	0.190	
Low Spike True Value				0.200	
HQ Blank			AKM002	< 0.1	

Respectfully submitted,

Gregg M. Holman

Gregg M. Holman,
 Inorganic Chemistry Department Manager

GMH/cg

< = less than



INTERPOLL INC.
4500 BALL ROAD N.E.
CIRCLE PINES, MINNESOTA 55014
612/786-6020

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Attention: Paula Connell

January 4, 1988

PARAMETER: SE, Method SD07
DETECTION LIMIT: 3.06 ug/L
UNITS: ug/L
PREP DATE: 11/18/87
ANALYSIS DATE: 11/18/87
ANALYST: PMW
PURCHASE ORDER: #7194-01

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SM034	11/2/87	5416-01	AMB003	< 3.06	1
SM045	11/2/87	5416-03	AMB004	< 3.06	1
SM033	11/2/87	5416-05	AMB005	< 3.06	1
SM039	11/2/87	5416-07	AMB006	< 3.06	1
SM041	11/2/87	5416-09	AMB007	< 3.06	1
SM065	11/2/87	5416-11	AMB008	< 3.06	1
SM029	11/2/87	5416-13	AMB009	< 3.06	1
SM028	11/3/87	5424-02	AMB010	< 3.06	1
SM031	11/3/87	5424-04	AMB011	< 3.06	1
SM030	11/3/87	5424-06	AMB012	< 3.06	1
SM036	11/5/87	5434-02	AMB013	< 3.06	1
SM038	11/5/87	5434-04	AMB014	< 3.06	1
SM037	11/5/87	5434-05	AMB015	< 3.06	1
SM040	11/5/87	5434-08	AMB016	< 3.06	1
03M505	11/9/87	5445-01	AMB017	< 3.06	1
03U007	11/9/87	5445-02	AMB018	5.00	1
03L007	11/9/87	5445-03	AMB019	< 3.06	1
04U007	11/9/87	5445-04	AMB020	< 3.06	1
03U008	11/9/87	5445-05	AMB021	< 3.06	1
03U010	11/9/87	5445-06	AMB022	< 3.06	1
03L010	11/9/87	5445-07	AMB023	< 3.06	1
04U012	11/9/87	5445-08	AMB024	< 3.06	1
03L012	11/9/87	5445-09	AMB025	< 3.06	1
03U012	11/9/87	5445-11	AMB026	< 3.06	1

Interpoll Laboratories
 USATHAMA Laboratory Report
 Federal Cartridge Company
 Page Two

<u>Sample ID</u>	<u>Date Collected</u>	<u>Interpoll ID</u>	<u>USATHAMA ID</u>	<u>Result</u>	<u>Dilution Factor</u>
SW032	11/10/87	5450-01	AMB027	< 3.06	1
SW062	11/10/87	5450-03	AMB028	< 3.06	1
SW064	11/10/87	5450-05	AMB029	< 3.06	1
SW063	11/10/87	5450-07	AMB030	< 3.06	1
SW061	11/10/87	5450-09	AMB031	< 3.06	1
03U013	11/10/87	5451-01	AMB032	< 3.06	1
03M013	11/10/87	5451-02	AMB033	< 3.06	1
03L013	11/10/87	5451-03	AMB034	< 3.06	1
03U017	11/10/87	5451-04	AMB035	< 3.06	1
03M017	11/10/87	5451-05	AMB036	< 3.06	1
03L017	11/10/87	5451-06	AMB037	< 3.06	1
03U076	11/10/87	5451-07	AMB038	< 3.06	1
03U704	11/10/87	5451-08	AMB039	< 3.06	1
03U075	11/10/87	5451-09	AMB040	< 3.06	1
03U023	11/10/87	5451-10	AMB041	< 3.06	1
High Spike			AMB002	32.0	
High Spike			AMB043	36.0	
High Spike True Value				30.0	
Low Spike			AMB042	6.00	
Low Spike True Value				6.00	
MQ Blank			AMB001	< 3.06	

Respectfully submitted,

Gregg W. Holman

Gregg W. Holman,
 Inorganic Chemistry Department Manager

GMH/cg
 < = less than

February 05, 1988

Ms. Beverly Erickson
Federal Cartridge Corporation
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

RE: January, 1988 NPDES Sampling

Dear Ms. Erickson:

Enclosed please find a copy of our report of laboratory analysis for the samples collected January 22, 1988. Samples could only be collected from NPDES sites 20200 (Site C) and 20400 (Site E) because the remainder of the locations were frozen.

We were unable to measure the flow at Site 20400 because we could not locate a key to unlock the gate leading to the weir. The personnel we have contacted for the key during past sampling events are no longer employed at Federal Cartridge. We then contacted the guard but despite contacting several other personnel we were unsuccessful in locating a key.

The measured flow at location 20200 was 8,900 gallons per day from the east and 13,100 gallons per day from the west. This equals a total daily discharge of 22,000 gallons.

If you have any questions regarding this report, please do not hesitate to contact us.

Sincerely,

Steven R. Stoffer

Steven R. Stoffer
Environmental Technician

Donald P. Duffy

Donald P. Duffy, P.E.
Director, Engineering and Field Services

cc: Leanne Hammerbeck



REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa

Federal Cartridge Corporation
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

February 05, 1988
PACE Project Number: 880122523

Attn: Ms. Beverly Erickson

Monthly NPDES, January, 1988

Date Sample(s) Collected: 01/22/88

Date Sample(s) Received: 01/22/88

PACE Sample Number: . 014830 014840 014850

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>Field Blank</u>	<u>DI Blank</u>	<u>NPDES 20200</u>
pH (Field)		0.1	4.8	4.8	7.5
Chloride	mg/L	1	ND	ND	40
Dissolved Oxygen (Field)	mg/l	0.1	6.7	6.7	10.6
Oil and Grease	mg/L	1	ND	ND	ND
Phosphorus, Ortho	mg/L	0.02	ND	ND	ND
Phosphorus, Total	mg/L	0.05	ND	ND	ND
Solids, Total Suspended	mg/L	1	ND	ND	2
Discharge Volume	mgd		-	-	0.022

ND Not detected at or above the MDL.
MDL Method Detection Limit

Ms. Beverly Erickson
Page 2

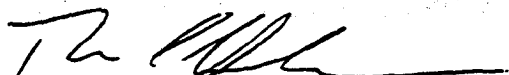
February 05, 1988
PACE Project Number: 880122523

PACE Sample Number: 014860

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>NPDES</u> <u>20400</u>
pH (Field)			7.4
Chloride	mg/L	1	57
Dissolved Oxygen (Field)	mg/l	0.1	10.6
Oil and Grease	mg/L	1	ND
Phosphorus, Ortho	mg/L	0.02	ND
Phosphorus, Total	mg/L	0.05	ND
Solids, Total Suspended	mg/L	1	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

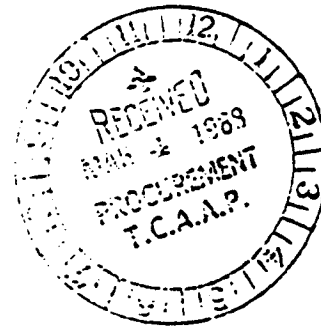
The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my direct supervision.



Thomas L. Halverson
Inorganic Chemistry Manager

February 29, 1988

Ms. Beverly Erickson
Federal Cartridge Corporation
Twin Cities Army Ammunition Plant
New Brighton, MN 55112



RE: February NPDES Sampling

Dear Ms. Erickson:

Enclosed please find our report of laboratory analysis for the samples collected February 10, 1988. These samples were collected at the Twin Cities Army Ammunition plant to meet the February NPDES requirements.

We were able to collect samples from only NPDES sites 20200 and 20400. The other four sites were frozen. Therefore, we were unable to sample these locations.

The pH, dissolved oxygen and discharge volumes were measured at the time of sample collection. The results of the pH and dissolved oxygen measurements are shown on the enclosed laboratory report. Please note that the dissolved oxygen and pH for the deionized water blank and the field blank samples were measured in the laboratory rather than in the field or at the time of sample collection.

The measured discharge volume at location 20200 was 17,800 gallons per day (8,900 gallons from both the east and west locations). The discharge volume at location 20400 was 24,600 gallons on the sampling day.

If you have any questions regarding this report, please do not hesitate to contact us.

Sincerely,

A handwritten signature in cursive script that reads "Steven R. Stoffer".

Steven R. Stoffer
Environmental Engineer

A handwritten signature in cursive script that reads "Donald P. Duffy".

Donald P. Duffy, P.E.
Director, Engineering and Field Services

Enclosures

cc: Leann Hammerbeck



REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa

Federal Cartridge Corporation
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

February 29, 1988
PACE Project Number: 880210509

Attn: Ms. Beverly Erickson

February NPDES Grabs

Date Sample(s) Collected: 02/10/88
Date Sample(s) Received: 02/10/88

PACE Sample Number: 033150 033160 033170

Table with 6 columns: Parameter, Units, MDL, D.I. Blank, Field Blank, NPDES 20200. Rows include Chloride, Dissolved Oxygen (Field), Oil and Grease, Oxygen, Dissolved Phosphorus, Ortho, Phosphorus, Total, Solids, Total Suspended, pH, and pH (Field).

ND Not detected at or above the MDL.
MDL Method Detection Limit

Ms. Beverly Erickson
Page 2

February 29, 1988
PACE Project Number: 880210509

PACE Sample Number: 033180

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>NPDES 20400</u>
Chloride	mg/L	1	58
Dissolved Oxygen (Field)	mg/l	0.1	12.0
Oil and Grease	mg/L	1	ND
Phosphorus, Ortho	mg/L	0.02	0.02
Phosphorus, Total	mg/L	0.05	0.08
Solids, Total Suspended	mg/L	1	ND
pH		0.1	8.1
pH (Field)		0.1	7.7

MDL Method Detection Limit
ND Not detected at or above the MDL.

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my direct supervision.



Thomas L. Halverson
Inorganic Chemistry Manager

April 12, 1988

Ms. Beverly Erickson
Federal Cartridge Corporation
Building 105
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

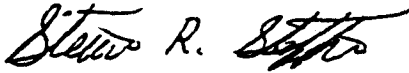
RE: March, 1988; NPDES Monitoring

Dear Ms. Erickson:

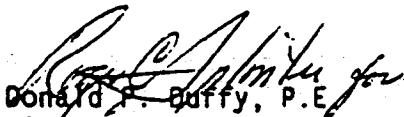
Enclosed please find a copy of our report of laboratory analysis for samples collected March 10, 1988. These samples are for the March NPDES and storm sewer requirements.

Enclosed is an interim laboratory report which does not contain the radioactivity data. When the radioactivity data is available we will issue a completed report.

Sincerely,



Steven R. Stoffer
Engineering Technician



Donald P. Duffy, P.E.
Director, Consulting Services Division

Enclosures

cc: Leann Hammerbeck



REPORT OF LABORATORY ANALYSIS

Offices:
 Minneapolis, Minnesota
 Tampa, Florida
 Coralville, Iowa

Federal Cartridge Corporation
 Twin Cities Army Ammunition Plant
 New Brighton, MN 55112

April 12, 1988
 PACE Project Number: 880310516

Attn: Ms. Beverly Erickson

March '88 NPDES

Date Sample(s) Collected: 03/10/88
 Date Sample(s) Received: 03/10/88, 03/11/88

PACE Sample Number: .

055880 055890 055900
 DI Field
 Water Blank Site A

Parameter	Units	MDL	Water	Blank	Site A
Biochemical Oxygen Demand	mg/L	6	ND	ND	ND
Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	ND	ND	ND
Chloride	mg/L	1	ND	ND	86
Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col/100 ml	1	ND	ND	37
Copper	mg/L	0.01	ND	ND	ND
Cyanide, Total	mg/L	0.01	ND	ND	ND
Dissolved Oxygen (Field)	mg/L	0.1	2.7	2.7	14.0
Nickel	mg/L	0.05	ND	ND	ND
Nitrogen, Ammonia	mg/L	0.1	ND	ND	ND
Oil and Grease	mg/L	1	ND	ND	3
Phosphorus, Ortho	mg/L	0.02	ND	ND	0.04
Phosphorus, Total	mg/L	0.05	0.07	ND	0.08
Solids, Total Suspended	mg/L	1	ND	ND	ND
Total Organic Carbon	mg/L	0.5	1.2	ND	9.4
Zinc	mg/L	0.01	ND	ND	0.03
pH		0.1	7.9	7.0	8.0
Methylene chloride	ug/L	3.0	ND	ND	ND
1,1-Dichloroethylene	ug/L	0.3	ND	ND	ND
1,1-Dichloroethane	ug/L	0.2	ND	ND	ND
1,1,1-Trichloroethane	ug/L	0.5	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.5	ND	ND	ND

ND Not detected at or above the MDL.
 MDL Method Detection Limit

Ms. Beverly Erickson
Page 2

April 12, 1988
PACE Project Number: 880310516

PACE Sample Number: <u>Parameter</u>	<u>Units</u>	055910 <u>MDL</u>	055920 <u>Site B</u>	055930 <u>Site C</u>	<u>Site D</u>
Biochemical Oxygen Demand	mg/L	6	16	ND	ND
Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	73	ND	ND
Chloride	mg/L	1	40	34	34
Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col/100 ml	1	4	ND	ND
Copper	mg/L	0.01	ND	ND	ND
Cyanide, Total	mg/L	0.01	ND	ND	ND
Dissolved Oxygen (Field)	mg/L	0.1	12.2	12.9	13.6
Nickel	mg/L	0.05	ND	ND	ND
Nitrogen, Ammonia	mg/L	0.1	2.1	ND	ND
Oil and Grease	mg/L	1	2	2	3
Phosphorus, Ortho	mg/L	0.02	0.04	ND	ND
Phosphorus, Total	mg/L	0.05	0.14	ND	ND
Solids, Total Suspended	mg/L	1	7	ND	ND
Total Organic Carbon	mg/L	0.5	27	2.4	7.8
Zinc	mg/L	0.01	ND	0.02	ND
pH	0.1	7.8	8.4	8.5	
Methylene chloride	ug/L	3.0	ND	ND	ND
1,1-Dichloroethylene	ug/L	0.3	ND	ND	ND
1,1-Dichloroethane	ug/L	0.2	ND	ND	ND
1,1,1-Trichloroethane	ug/L	0.5	0.9	ND	ND
1,1,2-Trichloroethylene	ug/L	0.5	ND	6.6	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 3

April 12, 1988
PACE Project Number: 880310516

PACE Sample Number: Parameter	Units	MDL	055940 Site E	055950 Site F	055960 Site G
Biochemical Oxygen Demand	mg/L	6	ND	16	6
Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	ND	73	58
Chloride	mg/L	1	50	44	28
Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col/100 ml	1	11	2	ND
Copper	mg/L	0.01	ND	ND	ND
Cyanide, Total	mg/L	0.01	ND	ND	ND
Dissolved Oxygen (Field)	mg/L	0.1	12.2	12.3	1.2
Nickel	mg/L	0.05	ND	ND	ND
Nitrogen, Ammonia	mg/L	0.1	0.1	2.0	0.2
Oil and Grease	mg/L	1	1	ND	ND
Phosphorus, Ortho	mg/L	0.02	ND	ND	0.04
Phosphorus, Total	mg/L	0.05	0.05	0.14	ND
Solids, Total Suspended	mg/L	1	ND	5	ND
Total Organic Carbon	mg/L	0.5	7.1	24	13
Zinc	mg/L	0.01	ND	ND	ND
pH		0.1	7.9	7.8	6.9
Methylene chloride	ug/L	3.0	ND	ND	ND
1,1-Dichloroethylene	ug/L	0.3	ND	ND	ND
1,1-Dichloroethane	ug/L	0.2	ND	ND	ND
1,1,1-Trichloroethane	ug/L	0.5	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.5	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

Ms. Beverly Erickson
Page 4

April 12, 1988
PACE Project Number: 880310516

PACE Sample Number: <u>Parameter</u>	<u>Units</u>	<u>MDL</u>	055970 <u>Site H</u>	055980 <u>Site I</u>	055990 <u>Site J</u>
Biochemical Oxygen Demand	mg/L	6	29	15	ND
Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	93	73	ND
Chloride	mg/L	1	38	51	28
Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col/100 ml	1	1	2	28
Copper	mg/L	0.01	ND	ND	ND
Cyanide, Total	mg/L	0.01	ND	ND	ND
Dissolved Oxygen (Field)	mg/L	0.1	13.8	11.9	13.6
Nickel	mg/L	0.05	ND	ND	ND
Nitrogen, Ammonia	mg/L	0.1	3.0	1.9	0.1
Oil and Grease	mg/L	1	ND	ND	ND
Phosphorus, Ortho	mg/L	0.02	ND	0.04	0.04
Phosphorus, Total	mg/L	0.05	0.15	0.14	0.11
Solids, Total Suspended	mg/L	1	10	4	ND
Total Organic Carbon	mg/L	0.5	30	21	11
Zinc	mg/L	0.01	ND	ND	ND
pH		0.1	7.7	7.8	7.9
Methylene chloride	ug/L	3.0	ND	ND	ND
1,1-Dichloroethylene	ug/L	0.3	ND	ND	ND
1,1-Dichloroethane	ug/L	0.2	ND	ND	ND
1,1,1-Trichloroethane	ug/L	0.5	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.5	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 5

April 12, 1988
PACE Project Number: 880310516

The data contained in this report were obtained using EPA or other approved methodologies. All analysis were performed by me or under my direct supervision.



Thomas L. Halverson
Inorganic Chemistry Manager



William H. Scruton
Organic Chemistry Manager

1710 Douglas Drive North □ Minneapolis, MN 55422 □ Phone (612) 544-5543 □ FAX (612) 544-3974

April 25, 1988

Ms. Beverly Erickson
Federal Cartridge Corporation
Building 105
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

RE: March, 1988; NPDES Monitoring

Dear Ms. Erickson:

Enclosed is the completed report of laboratory analysis for samples collected March 10, 1988. This report is completed and should take the place of the interim report submitted to you on April 2, 1988. The interim report did not include the radioactivity data which is included in this report.

The samples were collected from the monthly NPDES locations to meet March 1988 requirements as well as the quarterly locations for the first quarter of 1988. The pH, dissolved oxygen and discharge volumes were measured at the time of sample collection. The pH and dissolved oxygen readings are included in the report of laboratory analysis. The estimated discharge volumes were as follows:

<u>Monitoring Location</u>	<u>Twenty-Four Hour Discharge Volume (Gallons)</u>
A 20500	5,700
B 20700	15,120,000
C 20200	20,300
D 20300	1,600
E 20400	36,000
F 20800	16,548,000
G 20100	1,368,000
H 20900	10,340,000
I 21700	3,540,000
J 21100	458,000

PACE Laboratories, Inc.

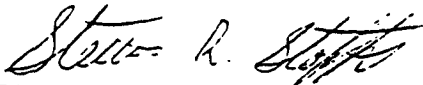
April 25, 1988

- 2 -

Ms. Beverly Erickson
Federal Cartridge Corporation

If you have any questions regarding this report, please do not
hesitate to contact us.

Sincerely,



Steven R. Stoffer
Engineering Technician



Donald P. Duffy, P.E.
Director, Consulting Services Division

SRS:DPD/jb



REPORT OF LABORATORY ANALYSIS

Offices:
 Minneapolis, Minnesota
 Tampa, Florida
 Coralville, Iowa

Federal Cartridge Corporation
 Twin Cities Army Ammunition Plant
 New Brighton, MN 55112

April 25, 1988
 PACE Project Number: 880310516

Attn: Ms. Beverly Erickson

March, 1988 NPDES

Date Sample(s) Collected: 03/10/88
 Date Sample(s) Received: 03/10/88, 03/11/88

PACE Sample Number:

Parameter	Units	MDL	055880 DI Water	055890 Field Blank	055900 Site A
✓ Biochemical Oxygen Demand	mg/L	6	ND✓	ND✓	ND✓
✓ Cadmium	mg/L	0.01	ND✓	ND✓	ND✓
Chemical Oxygen Demand	mg/L	50	ND	ND	ND
✓ Chloride	mg/L	1	ND✓	ND✓	86✓
✓ Chromium	mg/L	0.05	ND✓	ND✓	ND✓
Coliform, Fecal	col/100 ml	1	ND	ND	37
✓ Copper	mg/L	0.01	ND✓	ND✓	ND✓
✓ Cyanide, Total	mg/L	0.01	ND✓	ND✓	ND✓
✓ Dissolved Oxygen (Field)	mg/L	0.1	2.7✓	2.7✓	14.0✓
✓ Nickel	mg/L	0.05	ND	ND✓	ND✓
✓ Nitrogen, Ammonia	mg/L	0.1	ND✓	ND✓	ND✓
✓ Oil and Grease	mg/L	1	ND✓	ND✓	3✓
✓ Phosphorus, Ortho	mg/L	0.02	ND✓	ND✓	0.04✓
✓ Phosphorus, Total	mg/L	0.05	0.07✓	ND✓	0.08✓
✓ Solids, Total Suspended	mg/L	1	ND✓	ND✓	ND✓
✓ Total Organic Carbon	mg/L	0.5	1.2✓	ND✓	9.4✓
✓ Zinc	mg/L	0.01	ND✓	ND✓	0.03✓
✓ pH		0.1	7.9✓	7.0✓	8.0✓
✓ Methylene chloride	ug/L	3.0	ND✓	ND✓	ND✓
✓ 1,1-Dichloroethylene	ug/L	0.3	ND✓	ND✓	ND✓
✓ 1,1-Dichloroethane	ug/L	0.2	ND✓	ND✓	ND✓
✓ 1,1,1-Trichloroethane	ug/L	0.5	ND✓	ND✓	ND✓
1,1,2-Trichloroethylene	ug/L	0.5	ND	ND	ND
✓ Gross Alpha	pci/L		<0.8	-	<0.7
✓ Gross Beta	pci/L		<2.4	-	5.9±1.5
Manganese 54	pci/L		<0.9	-	<1.5
✓ Cobalt 60	pci/L		<1.1	-	<1.5
✓ Cesium 134	pci/L		<0.8	-	<1.6
✓ Cesium 137	pci/L		<1.0	-	<1.6

ND Not detected at or above the MDL.
 MDL Method Detection Limit

Ms. Beverly Erickson
Page 2

April 25, 1988
PACE Project Number: 880310516

PACE Sample Number: Parameter	Units	055910 MDL	055920 Site B	055930 Site C	Site D
✓ Biochemical Oxygen Demand	mg/L	6	✓16	ND✓	ND✓
✓ Cadmium	mg/L	0.01	ND	ND✓	ND✓
Chemical Oxygen Demand	mg/L	50	73	ND	ND
✓ Chloride	mg/L	1	✓40	✓34	✓34
✓ Chromium	mg/L	0.05	✓ND	ND✓	ND✓
Coliform, Fecal	col/100 ml	1	4	ND	ND
✓ Copper	mg/L	0.01	✓ND	ND✓	ND✓
✓ Cyanide, Total	mg/L	0.01	✓ND	ND✓	ND✓
✓ Dissolved Oxygen (Field)	mg/L	0.1	✓12.25	12.9✓	13.6✓
✓ Nickel	mg/L	0.05	✓ND	ND✓	ND✓
✓ Nitrogen, Ammonia	mg/L	0.1	✓2.1	✓ND	✓ND
✓ Oil and Grease	mg/L	1	✓2	✓2	3✓
✓ Phosphorus, Ortho	mg/L	0.02	✓0.04	✓ND	✓ND
✓ Phosphorus, Total	mg/L	0.05	✓0.14	✓ND	✓ND
✓ Solids, Total Suspended	mg/L	1	✓7	✓ND	✓ND
✓ Total Organic Carbon	mg/L	0.5	✓27	2.4	✓7.8
✓ Zinc	mg/L	0.01	✓ND	✓0.02	✓ND
✓ pH		0.1	7.8✓	8.4✓	8.5✓
✓ Methylene chloride	ug/L	3.0	✓ND	✓ND	ND✓
✓ 1,1-Dichloroethylene	ug/L	0.3	✓ND	✓ND	ND✓
✓ 1,1-Dichloroethane	ug/L	0.2	✓ND	✓ND	✓ND
✓ 1,1,1-Trichloroethane	ug/L	0.5	✓0.9	✓ND	✓ND
1,1,2-Trichloroethylene	ug/L	0.5	ND	6.6	ND
✓ Gross Alpha	pci/L		✓<1.9	-	✓<0.7
✓ Gross Beta	pci/L		✓4.7±2.0	-	✓1.5
Manganese 54	pci/L		<1.3	-	<1.3
✓ Cobalt 60	pci/L		✓<1.4	-	✓<1.4
✓ Cesium 134	pci/L		✓<1.4	-	✓<1.4
✓ Cesium 137	pci/L		✓<1.4	-	✓<1.5

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 3

April 25, 1988
PACE Project Number: 880310516

PACE Sample Number: Parameter	Units	MDL	055940 Site E	055950 Site F	055960 Site G
✓ Biochemical Oxygen Demand	mg/L	6	ND	16	6
✓ Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	ND	73	58
✓ Chloride	mg/L	1	50	44	28
✓ Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col/100 ml	1	11	2	ND
✓ Copper	mg/L	0.01	ND	ND	ND
✓ Cyanide, Total	mg/L	0.01	ND	ND	ND
✓ Dissolved Oxygen (Field)	mg/L	0.1	12.2	12.3	12.2
✓ Nickel	mg/L	0.05	ND	ND	ND
✓ Nitrogen, Ammonia	mg/L	0.1	0.1	2.0	0.2
✓ Oil and Grease	mg/L	1	1	ND	ND
✓ Phosphorus, Ortho	mg/L	0.02	ND	ND	0.04
✓ Phosphorus, Total	mg/L	0.05	0.05	0.14	ND
✓ Solids, Total Suspended	mg/L	1	ND	5	ND
✓ Total Organic Carbon	mg/L	0.5	7.1	24	13
✓ Zinc	mg/L	0.01	ND	ND	ND
✓ pH		0.1	7.9	7.8	6.9
✓ Methylene chloride	ug/L	3.0	ND	ND	ND
✓ 1,1-Dichloroethylene	ug/L	0.3	ND	ND	ND
✓ 1,1-Dichloroethane	ug/L	0.2	ND	ND	ND
✓ 1,1,1-Trichloroethane	ug/L	0.5	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.5	ND	ND	ND
✓ Gross Alpha	pci/L	-	-	<1.4	1.3
✓ Gross Beta	pci/L	-	-	6.4±2.2	22.9±3.4
Manganese 54	pci/L	-	-	<1.4	3.3
✓ Cobalt 60	pci/L	-	-	<1.7	3.4
✓ Cesium 134	pci/L	-	-	1.5	3.2
✓ Cesium 137	pci/L	-	-	1.8	3.4

ND Not detected at or above the MDL.
MDL Method Detection Limit

Ms. Beverly Erickson
Page 4

April 25, 1988
PACE Project Number: 880310516

PACE Sample Number: Parameter	Units	MDL	055970 Site H	055980 Site I	055990 Site J
✓Biochemical Oxygen Demand	mg/L	6	29	✓15	ND✓
✓Cadmium	mg/L	0.01	ND	✓ND	✓ND
Chemical Oxygen Demand	mg/L	50	93	73	ND
✓Chloride	mg/L	1	38	✓51	✓28
✓Chromium	mg/L	0.05	ND✓	ND✓	✓ND
Coliform, Fecal	col/100 ml	1	1	2	28
✓Copper	mg/L	0.01	ND✓	ND✓	ND✓
✓Cyanide, Total	mg/L	0.01	ND✓	ND✓	ND✓
✓Dissolved Oxygen (Field)	mg/L	0.1	✓13.8	11.9✓	13.6✓
✓Nickel	mg/L	0.05	✓ND	✓ND	✓ND
✓Nitrogen, Ammonia	mg/L	0.1	✓3.0	✓1.9	✓0.1
✓Oil and Grease	mg/L	1	✓ND	✓ND	✓ND
✓Phosphorus, Ortho	mg/L	0.02	✓ND	✓0.04	✓0.04
✓Phosphorus, Total	mg/L	0.05	✓0.15	✓0.14	✓0.11
✓Solids, Total Suspended	mg/L	1	✓10	✓4	✓ND
✓Total Organic Carbon	mg/L	0.5	✓30	✓21	✓11
✓Zinc	mg/L	0.01	✓ND	✓ND	✓ND
✓pH		0.1	7.7✓	7.8✓	7.9✓
✓Methylene chloride	ug/L	3.0	✓ND	✓ND	✓ND
✓1,1-Dichloroethylene	ug/L	0.3	✓ND	✓ND	✓ND
✓1,1-Dichloroethane	ug/L	0.2	✓ND	✓ND	✓ND
✓1,1,1-Trichloroethane	ug/L	0.5	✓ND	✓ND	✓ND
1,1,2-Trichloroethylene	ug/L	0.5	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 5

April 25, 1988
PACE Project Number: 880310516

The data contained in this report were obtained using EPA or other approved methodologies. All analysis were performed by me or under my direct supervision.



Thomas L. Halverson
Inorganic Chemistry Manager



William H. Scruton
Organic Chemistry Manager

May 18, 1988

Ms. Beverly Erickson
Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Dear Ms. Erickson:

Enclosed please find a copy of our report of laboratory analyses for samples collected April 15, 1988. The samples were collected from NPDES sites around the Twin Cities Army Ammunition plant by PACE Laboratories, Inc. to meet April, 1988 requirements.

The dissolved oxygen, pH and discharge volumes were measured at each site. The dissolved oxygen and pH results are shown on the enclosed laboratory report. The daily discharge volume at each site was as follows:

<u>Location</u>	<u>Discharge Volume (GPD)</u>
NPDES Site 20500	2,300
NPDES Site 20200	13,300
NPDES Site 20300	4,300
NPDES Site 20400	28,800
Rice Creek Out (Site F)	40,900,000
NPDES Site 20100	490,000

If you have any questions regarding this report, please do not hesitate to contact us.

Sincerely,



Steven R. Stoffer
Environmental Technician



Donald P. Duffy, P.E.
Director, Consulting Services Division

SRS:DPD/jb

cc: Leanne Hammerbeck, Federal Cartridge Company



REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

May 18, 1988
PACE Project Number: 880415523

Attn: Ms. Beverly Erickson

Date Sample(s) Collected: 04/15/88
Date Sample(s) Received: 04/15/88

PACE Sample Number: 089250 089260 089270

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>DI Blank</u>	<u>Field Blank</u>	<u>NPOES Site 20500</u>
Chloride	mg/L	1	ND	ND	550
Dissolved Oxygen (Field)	mg/L	0.1	8.3	8.3	11.0
Oil and Grease	mg/L	1	3	ND	2
Phosphorus, Ortho	mg/L	0.02	ND	ND	ND
Phosphorus, Total	mg/L	0.05	ND	ND	0.05
Solids, Total Suspended	mg/L	1	2	ND	2
pH (Field)	units	0.1	8.5	8.5	7.4

ND Not detected at or above the MDL.
MDL Method Detection Limit

Ms. Beverly Erickson
Page 2

May 18, 1988
PACE Project Number: 880415523

PACE Sample Number:

089280	089290	089300
NPDES	NPDES	NPDES
Site	Site	Site
20200	20300	20400

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>20200</u>	<u>20300</u>	<u>20400</u>
Chloride	mg/L	1	29	52	58
Dissolved Oxygen (Field)	mg/L	0.1	10.1	11.6	11.0
Oil and Grease	mg/L	1	5	8	3
Phosphorus, Ortho	mg/L	0.02	ND	ND	ND
Phosphorus, Total	mg/L	0.05	0.05	ND	0.05
Solids, Total Suspended	mg/L	1	7	ND	2
pH (Field)	units	0.1	8.2	8.3	7.8

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 3

May 18, 1988
PACE Project Number: 880415523

PACE Sample Number:

089310 089320
Site F NPDES
Rice Creek Site
Out 20100

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>Out</u>	<u>20100</u>
Chloride	mg/L	1	23	33
Dissolved Oxygen (Field)	mg/L	0.1	10.6	8.9
Oil and Grease	mg/L	1	1	2
Phosphorus, Ortho	mg/L	0.02	ND	ND
Phosphorus, Total	mg/L	0.05	0.10	ND
Solids, Total Suspended	mg/L	1	13	4
pH (Field)	units	0.1	8.7	7.5

MDL Method Detection Limit
ND Not detected at or above the MDL.

The data contained in this report were obtained using EPA or other approved methodologies. All analysis were performed by me or under my direct supervision.

Peggy Gaskill for

Thomas L. Halverson
Inorganic Chemistry Manager

1710 Douglas Drive North Minneapolis, MN 55422 612-644-6643

PROJECT LOCATION				NAME OF CLIENT				PROJECT TELEPHONE NO.				PROJECT NUMBER					
ITEM NO.	SAMPLE NO.	TIME	NO. OF CONTAINERS	GENERAL	METALS	NITROGEN	CYANIDE	VOLATILES	OTG	SAMPLE DESCRIPTION	TRANSFER NO. & CHECK						
											1	2	3	4	5	6	7
1		1155 1200	3	1		1			1	D.I. Blank	✓						
2		1200 1200	3	1		1			1	Field Blank	✓						
3		1200 1155	3	1		1			1	Site G	✓						
4		1210	3	1		1			1	Site C	✓						
5		1220	3	1		1			1	Site D	✓						
6		1305	7	1		1			1	Site A	✓						
7		1320	3	1		1			1	Site E	✓						
8		1325	3	1		1			1	Site F	✓						

PERSON RESPONSIBLE FOR SAMPLE COLLECTION <i>Richard A Smith</i>		AFFILIATION <i>Pace Labs</i>		TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME
DATE <i>4/15/88</i>	TIME <i>1325</i>			1	1-8	<i>R Pace</i>	<i>MYL</i>	<i>4-15-88</i>	
PURPOSE OF ANALYSIS (use back of front sheet if needed)				2					
				3					
				4					
				5					
				6					
				7					
				8					

ORIGINAL

1710 Douglas Drive North □ Minneapolis, MN 55422 □ Phone (612) 544-5543 □ FAX (612) 544-3974

May 31, 1988

Ms. Beverly Erickson
Federal Cartridge Corporation
Twin Cities Army Ammunition Plant
Building 105
New Brighton, MN 55112

Re: Storm Sewer pH Monitoring

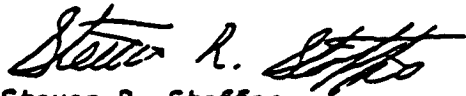
Dear Ms. Erickson:

Enclosed please find a copy of the recording pH meter strip charts obtained from storm water discharge sites around the Twin Cities Army Ammunition Plant from May 10-18, 1988. The recording pH meters were installed at each location for a twenty-four hour period. At the conclusion of each twenty-four hour period, the pH meters were calibrated and installed at a new location.

Site M did not contain enough water to submerge the probe on the pH meter. Therefore, we were unable to obtain a record of the pH at this location.

If you have any questions regarding these strip charts, please do not hesitate to contact me.

Sincerely,



Steven R. Stoffer
Engineering Technician

SRS/jb

cc: Leann Hammerbeck - Federal Cartridge Corporation

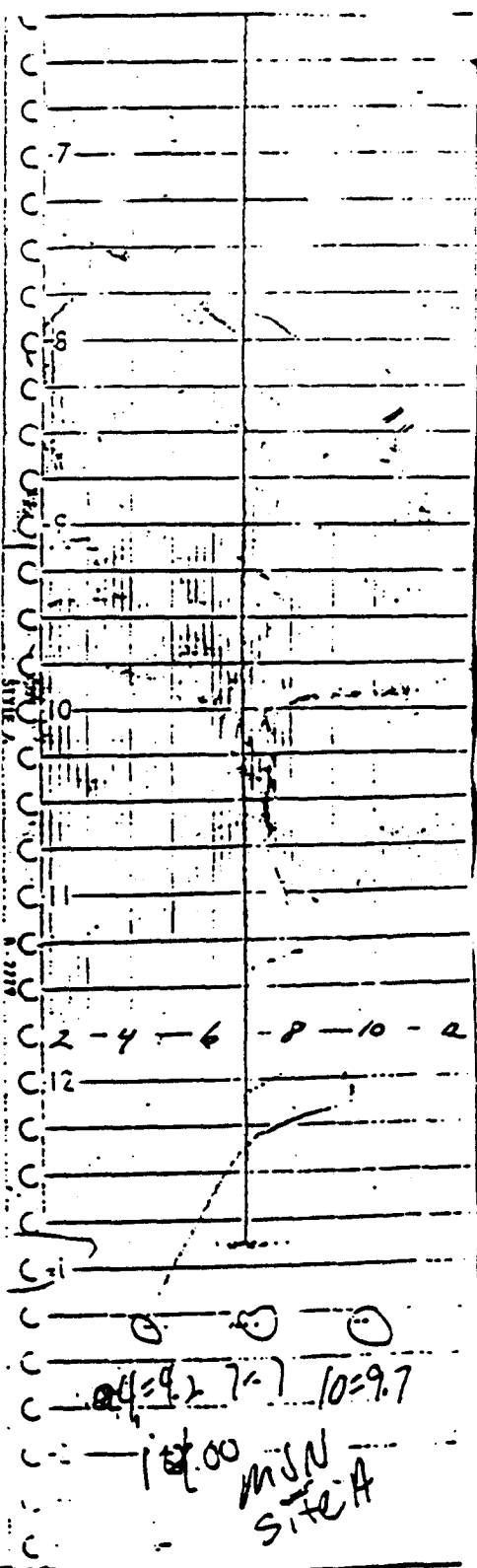
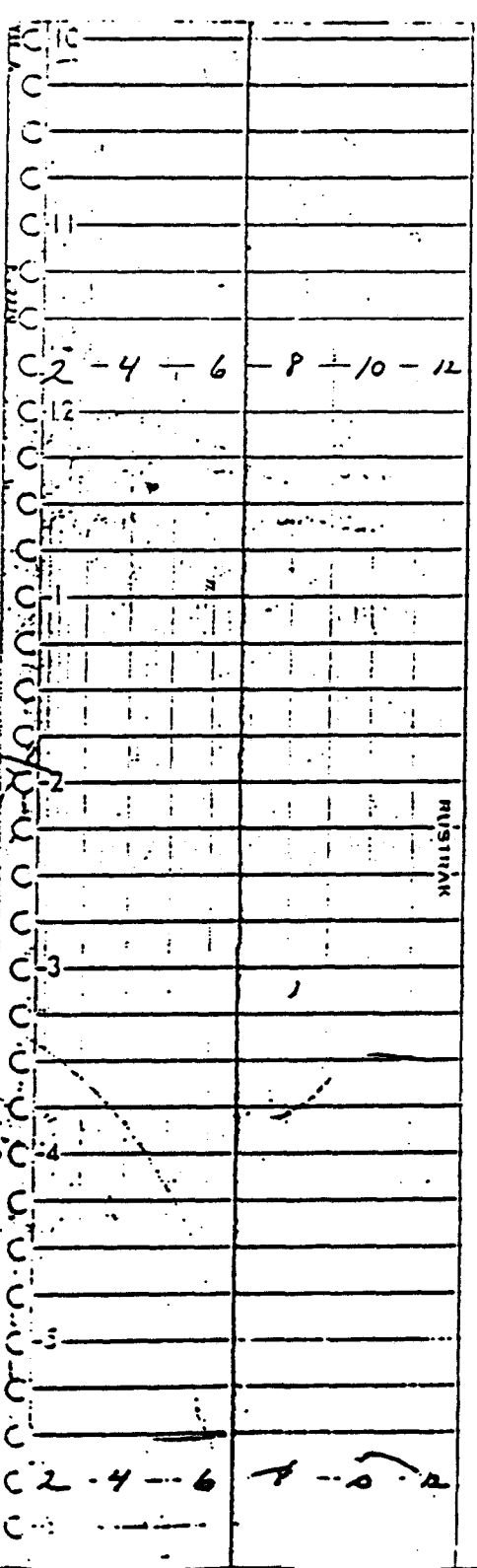
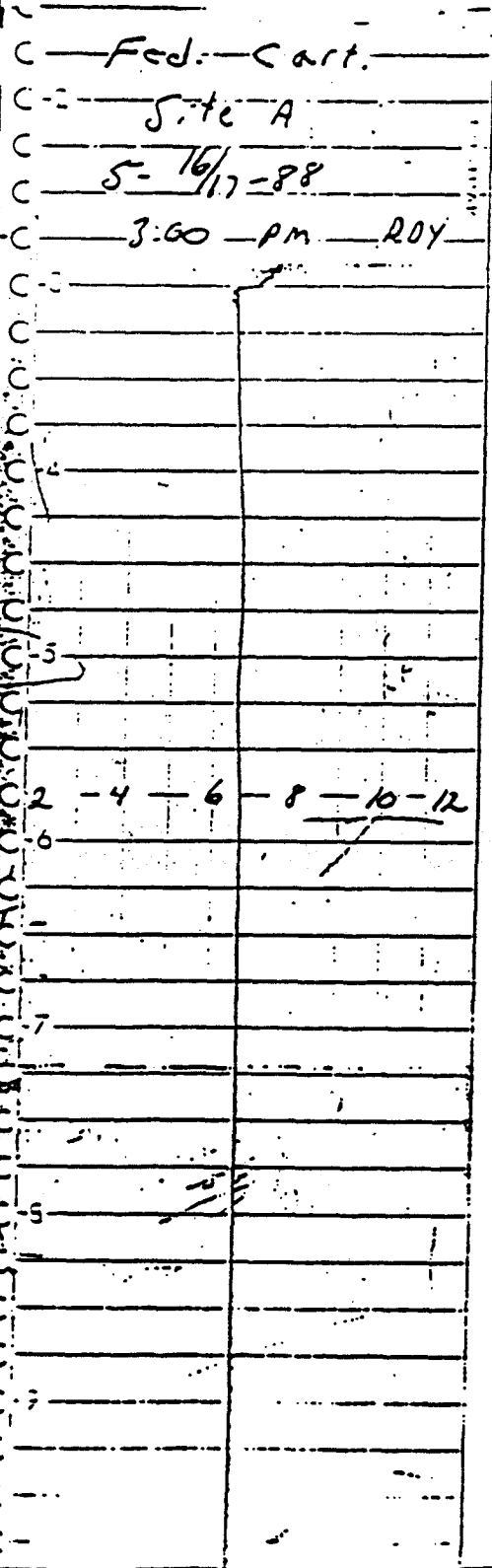
Enclosures

PACE

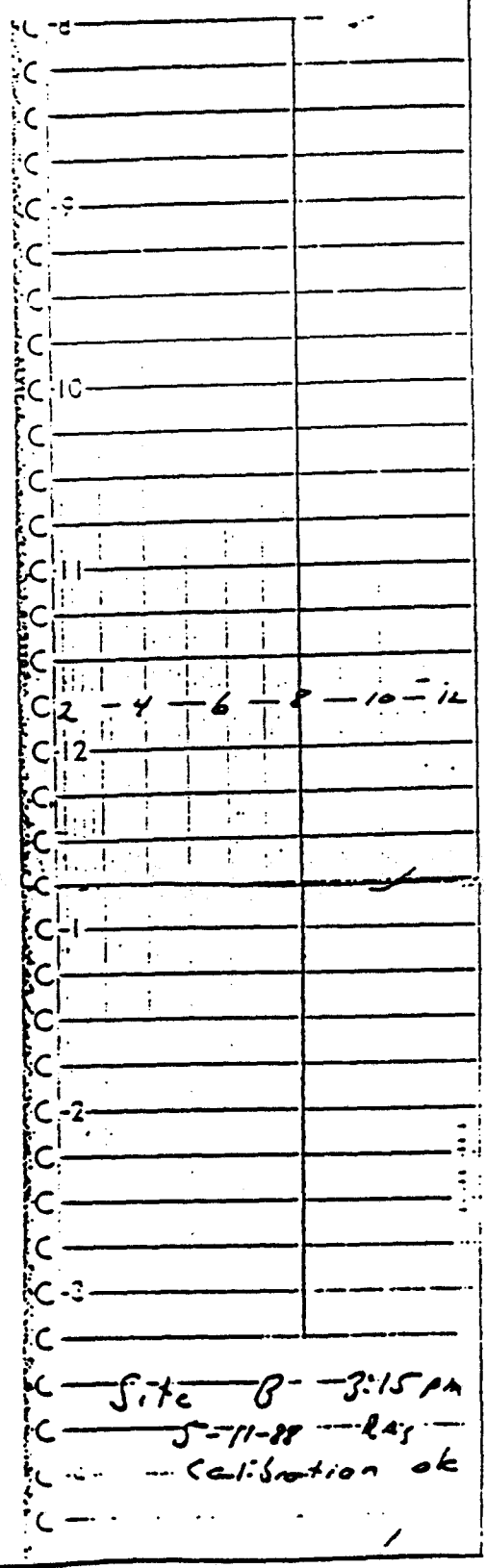
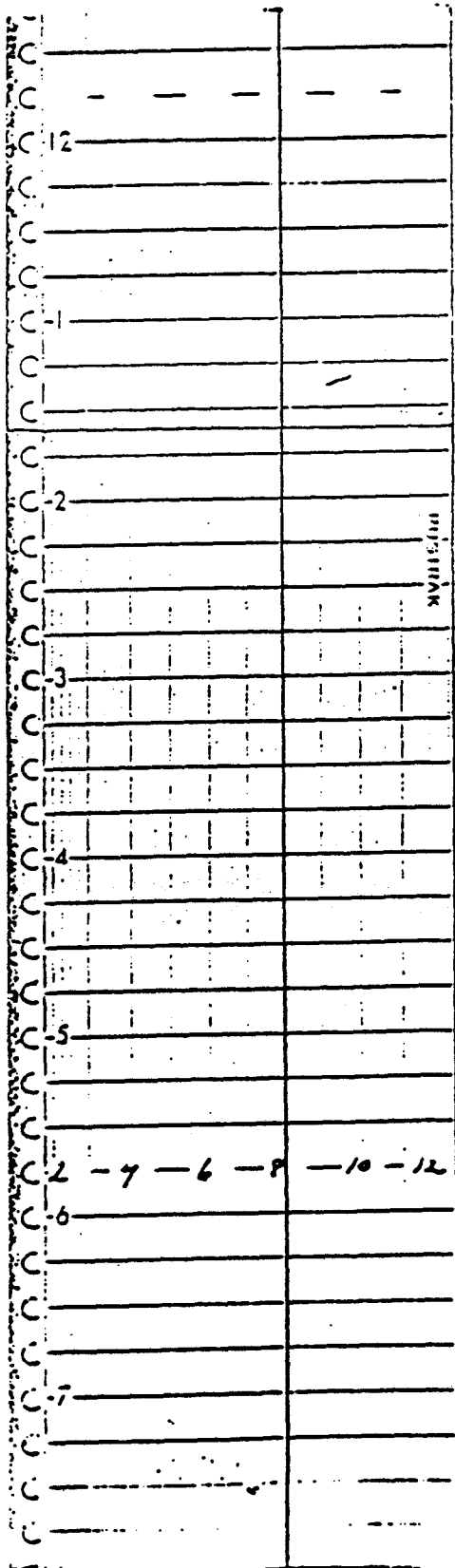
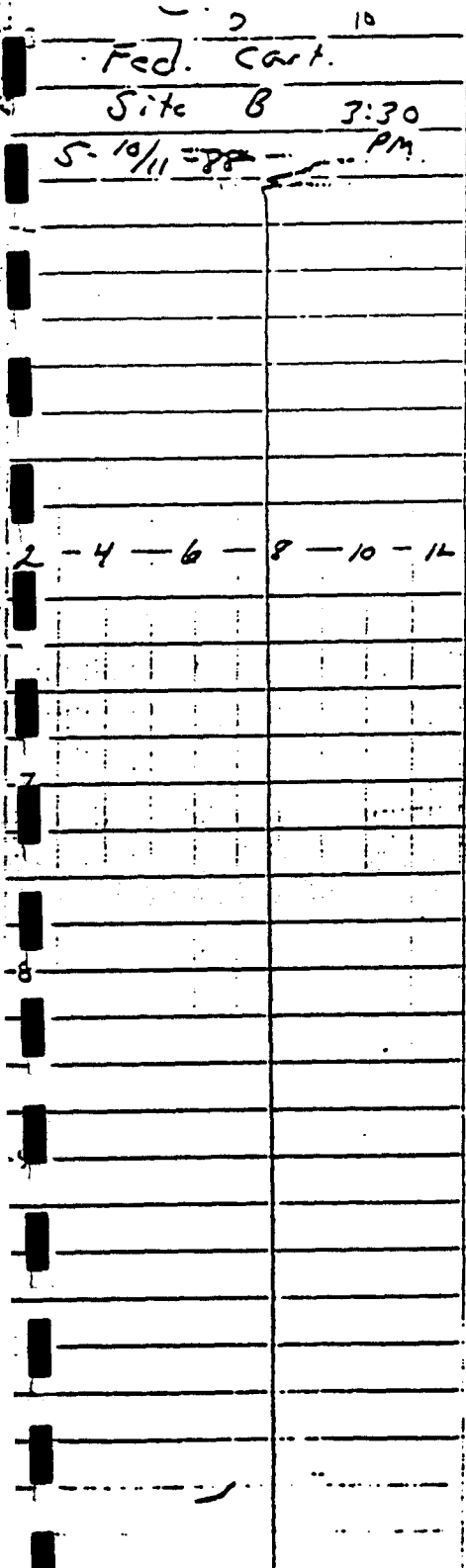
laboratories, inc.

Federal Cartridge
Recording pH Meter
Strip Chart
Site "A"
May 15/16, 1988

NPDES
20500

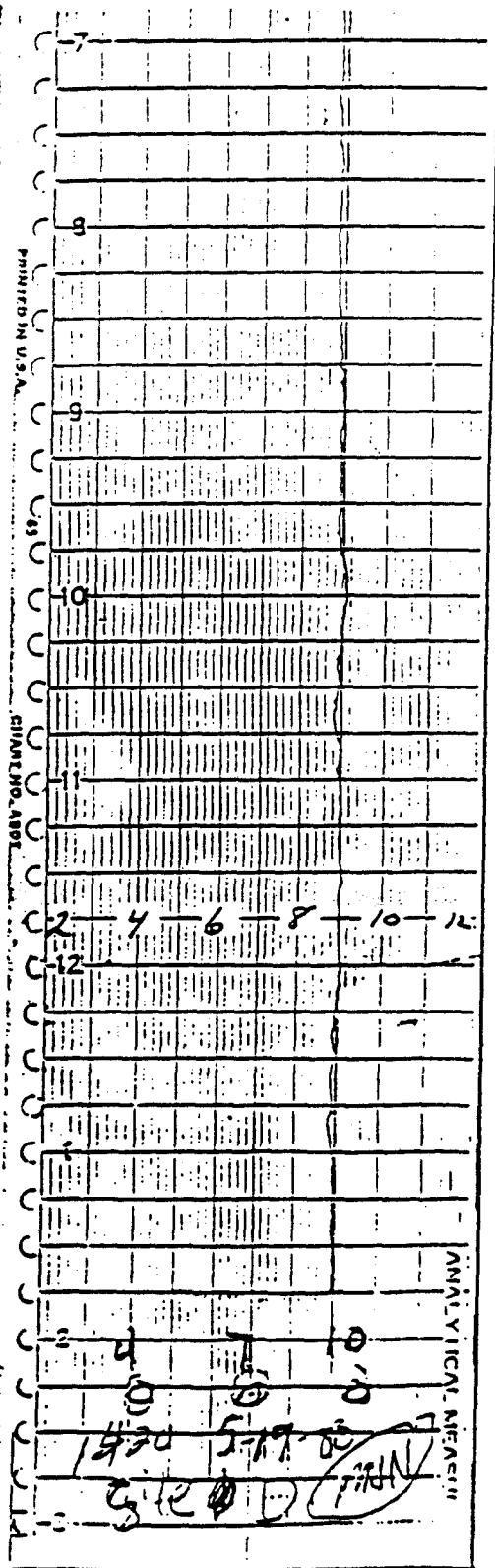
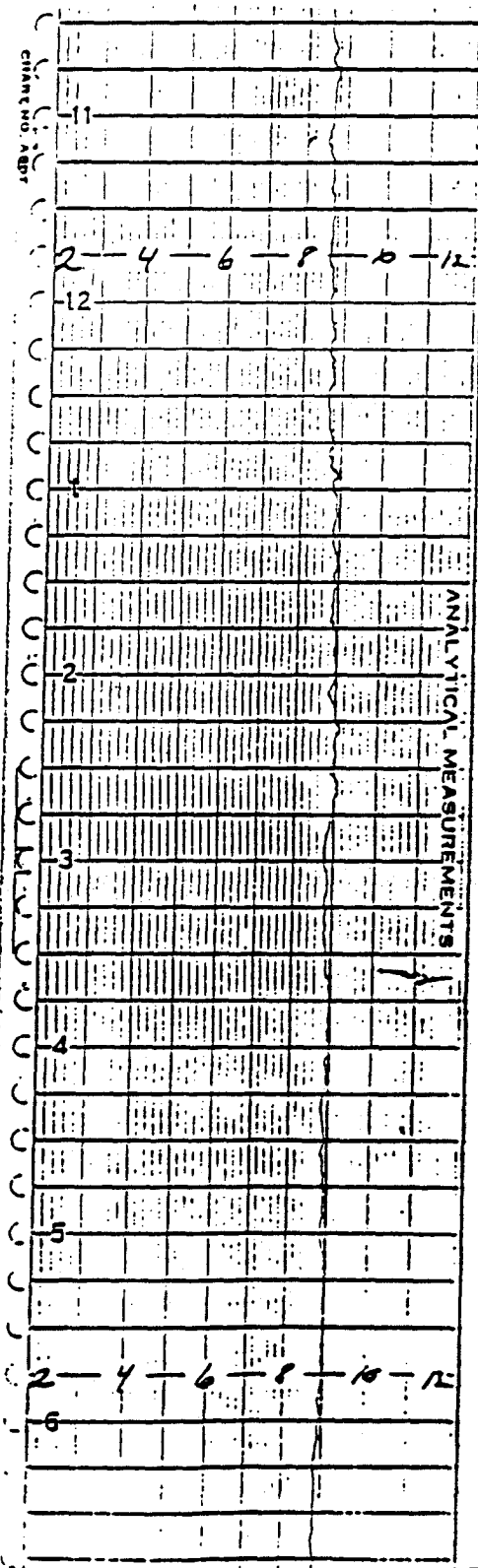
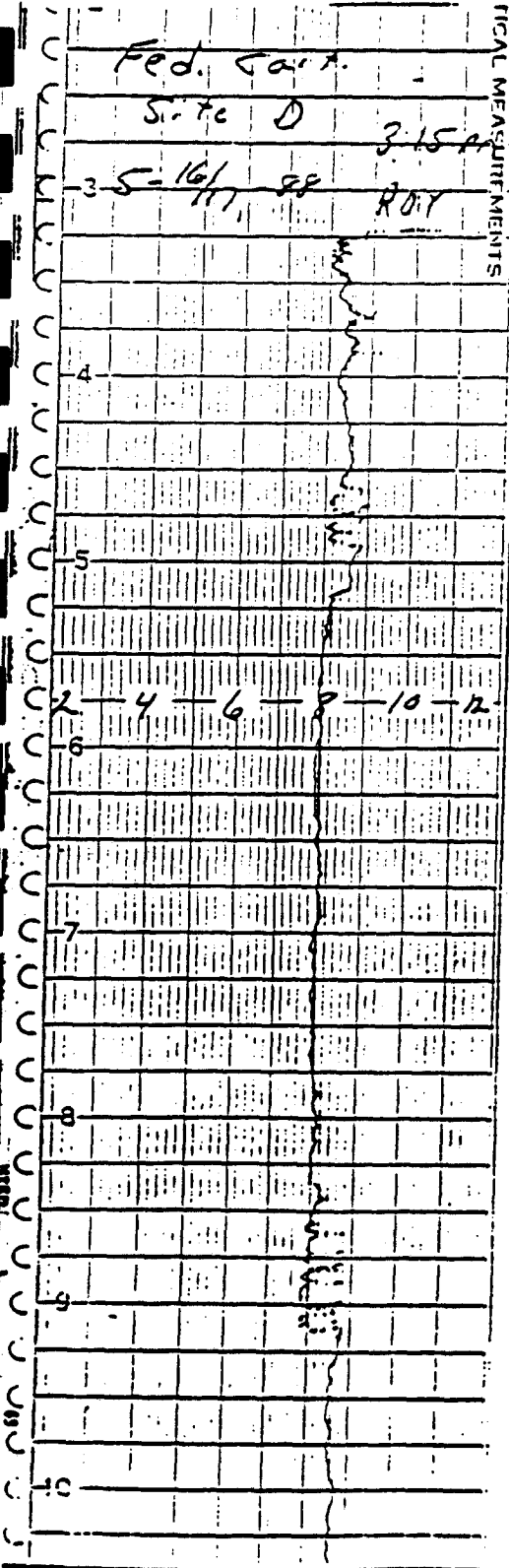


Federal Cartridge
Recording pH Meter
Strip Chart
Site "8"
May 10/11, 1988



Federal Cartridge
Recording pH Meter
Strip Chart
Site "D"
May 16/17, 1988

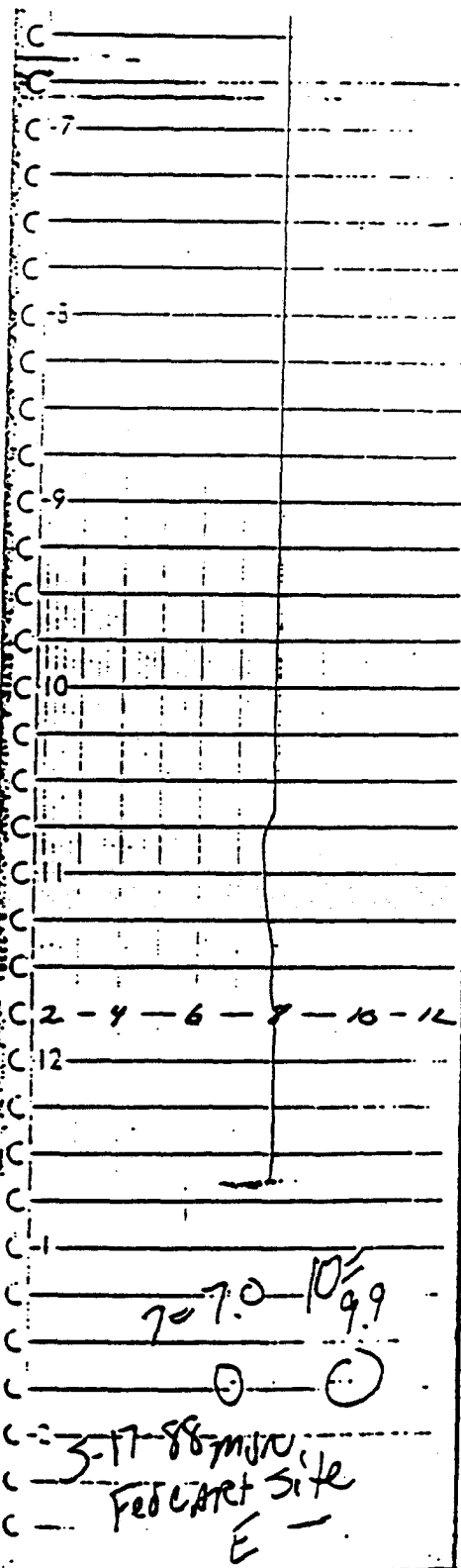
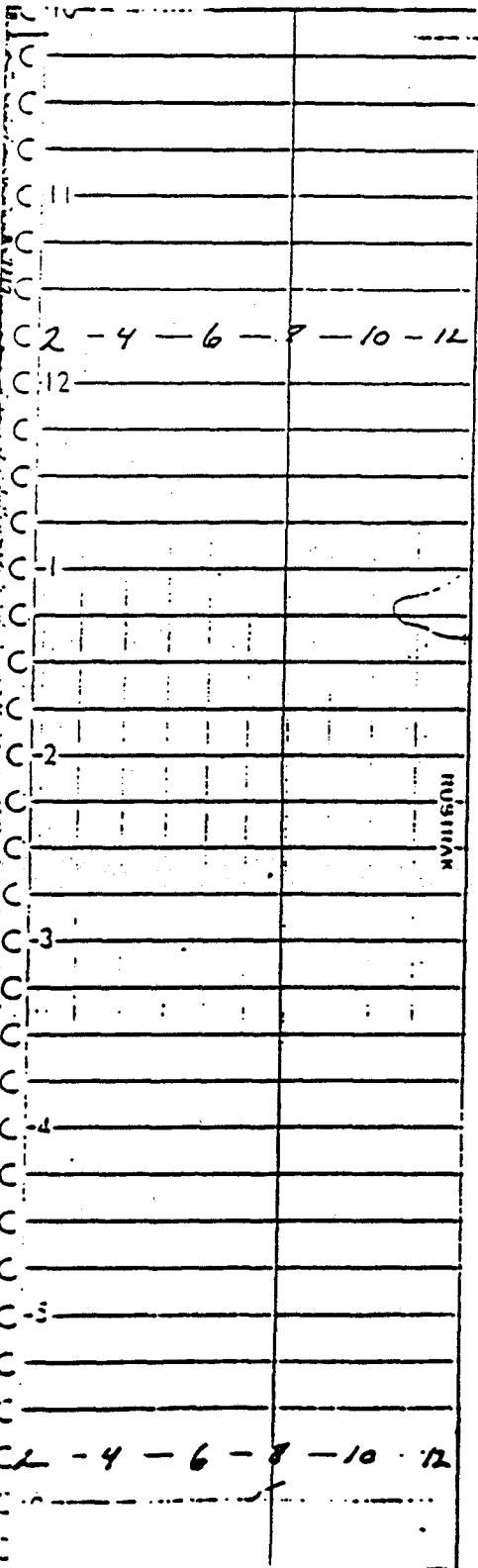
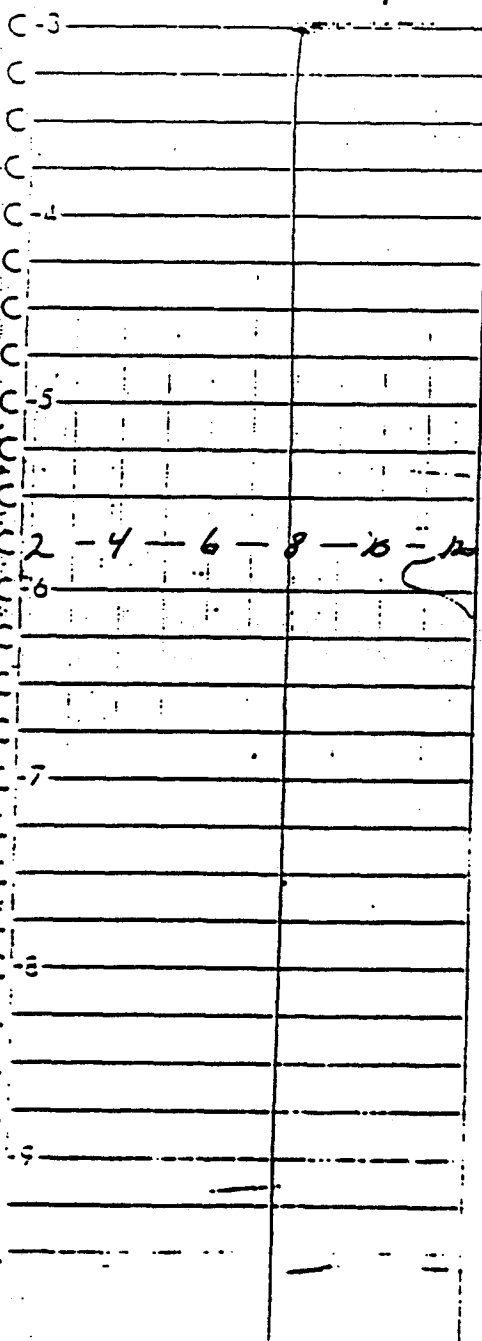
NPDES
20300



Federal Cartridge
Recording pH Meter
Strip Chart
Site "E"
May 16/17, 1988

NPDES
20400

C- Fed. Cart.
C- Site E
C- 5-16/17-88 3:00 PM
C- ROY



707.0 10/99
3-17-88 min
Fed Cart Site
E

Federal Cartridge
Recording pH Meter
Strip Chart
Site "F"
May 12/13, 1988

PHYSICAL MEASUREMENTS

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

ANALYTICAL MEASUREMENTS

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

ANALYTICAL MEASUREMENTS

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

Federal Cartridge
Site F
5-12/13-88 3:15
ROY

2-4-6-8-10-12

2-4-6-8-10-12

2-4-6-8-10-12

2-4-6-8-10-12

2-4-6-8-10-12

5/13/88
Site F
calibrated ok
3:20

NPDES
20100

REMEMBER!

Federal Cartridge
Site G
5-11-88 ROY
4:00 PM

2-4-6-8-10-12

3

4

5

6

7

8

9

10

11

ANALYTICAL MEASUREMENTS

2-4-6-8-10-12

12

2

3

4

5

2-4-6-8-10-12

6

7

PRINTED IN U.S.A.

CHART NO. A807

ANALYTICAL MEASUREMENTS

2-4-6-8-10-12

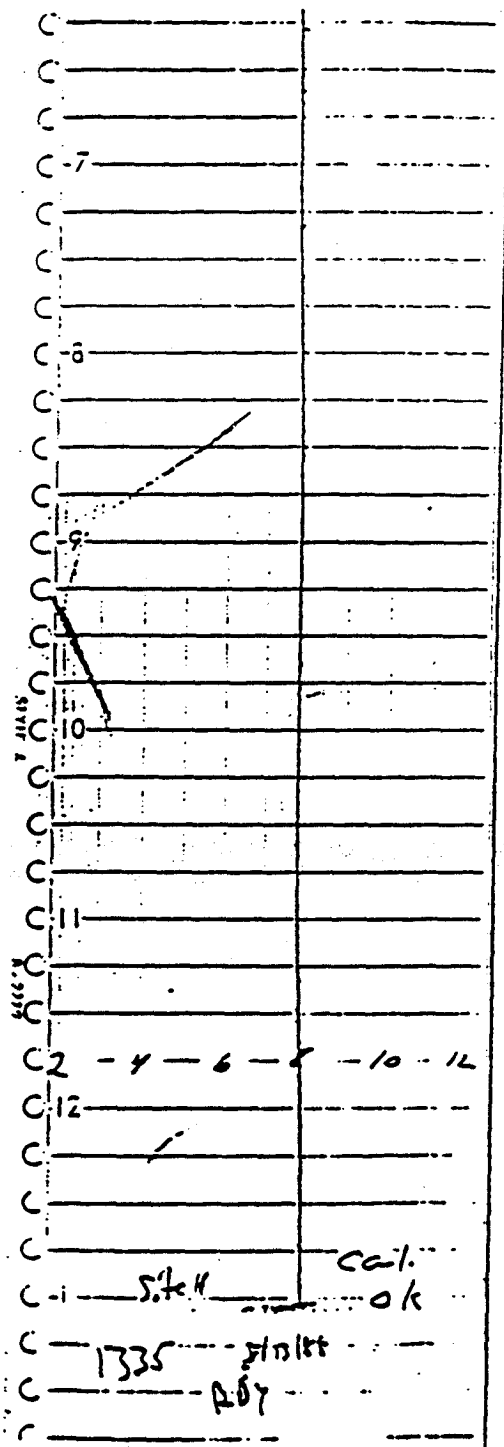
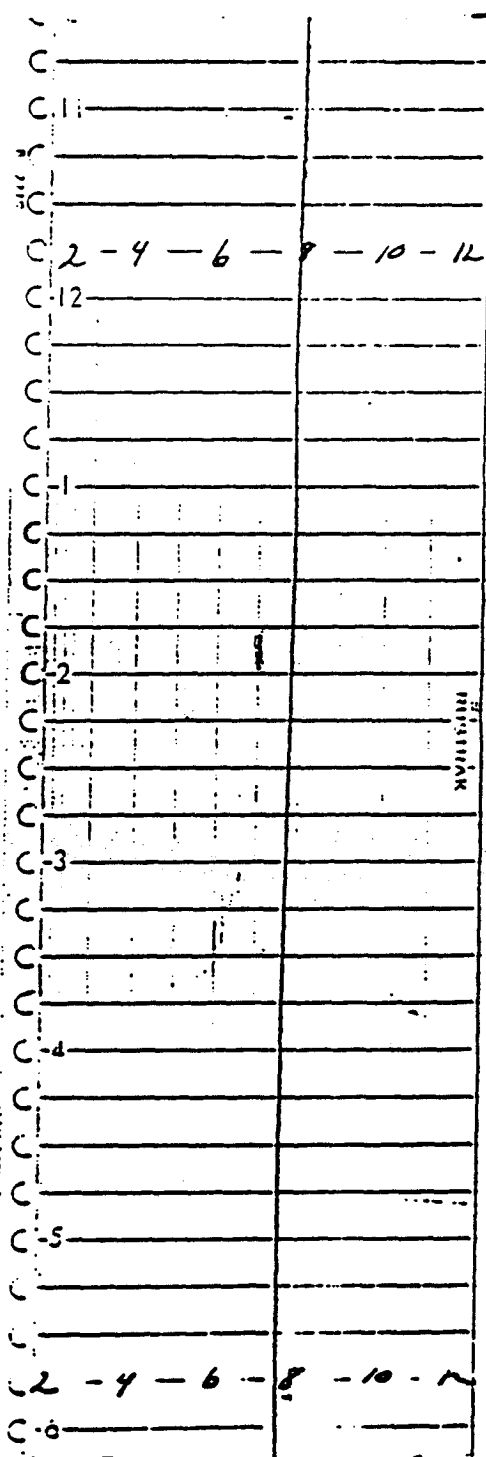
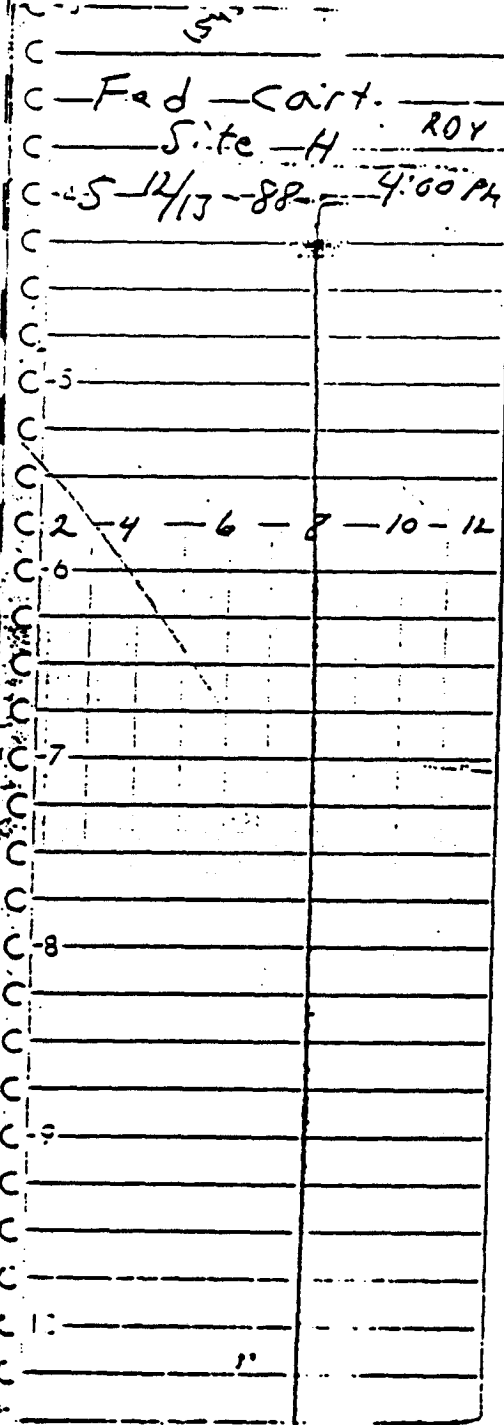
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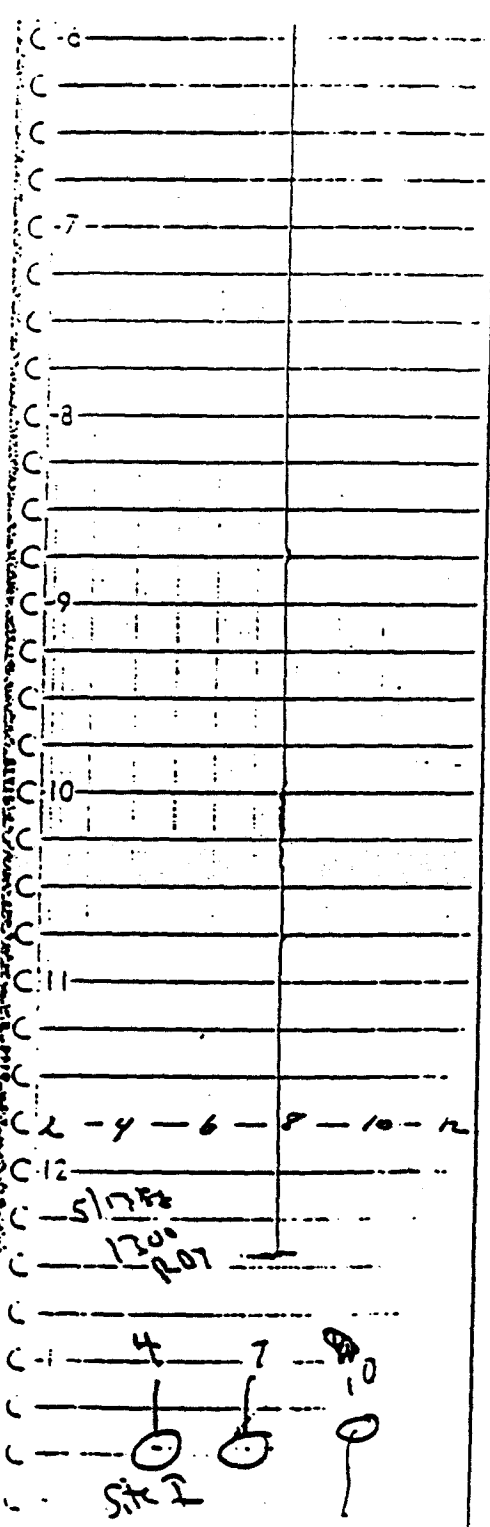
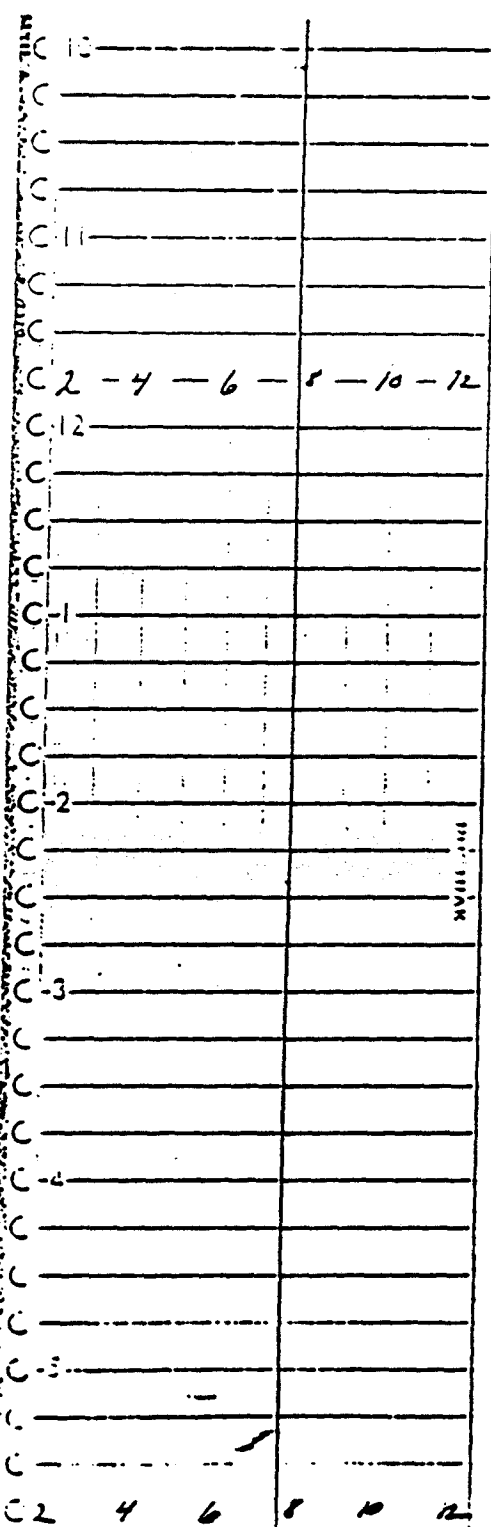
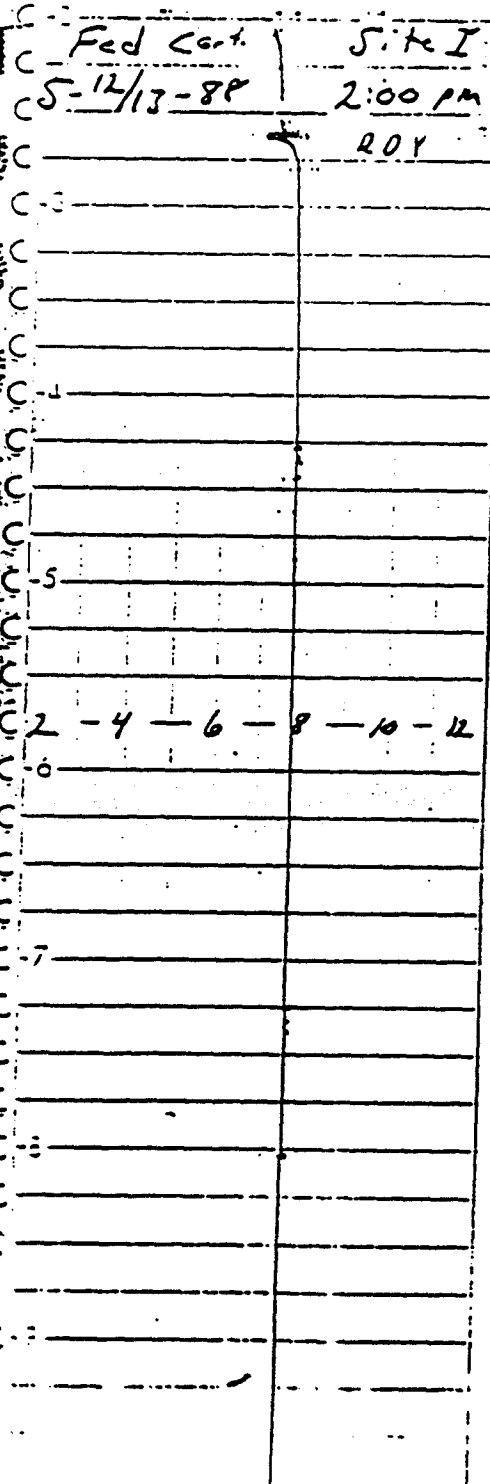
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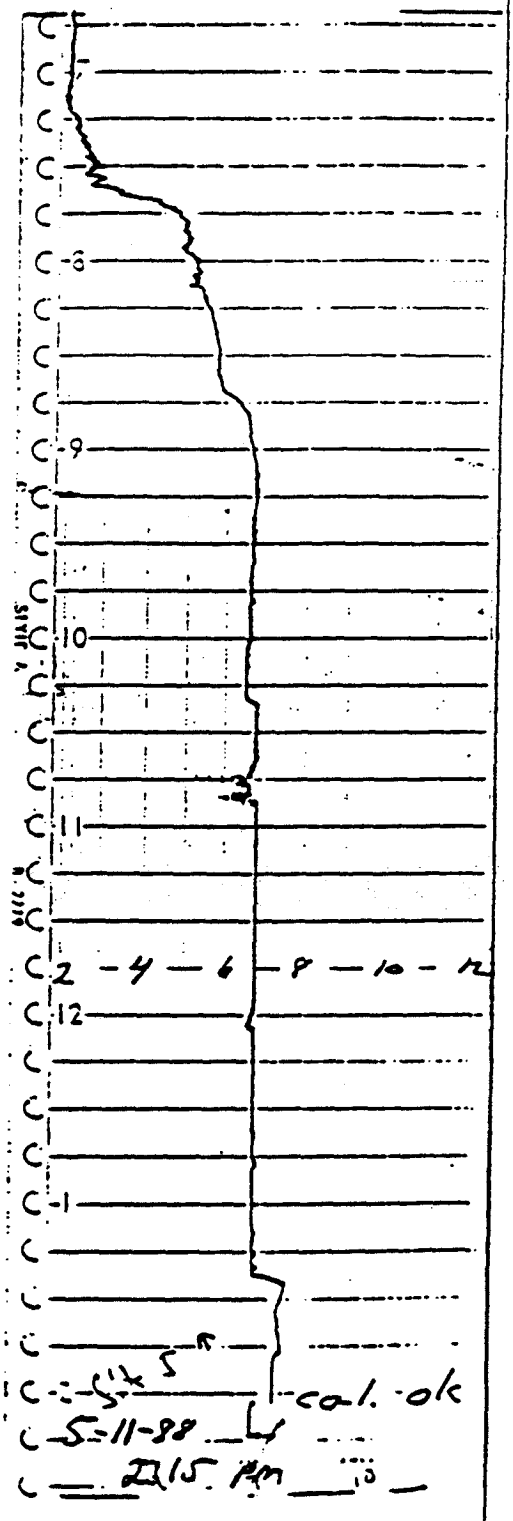
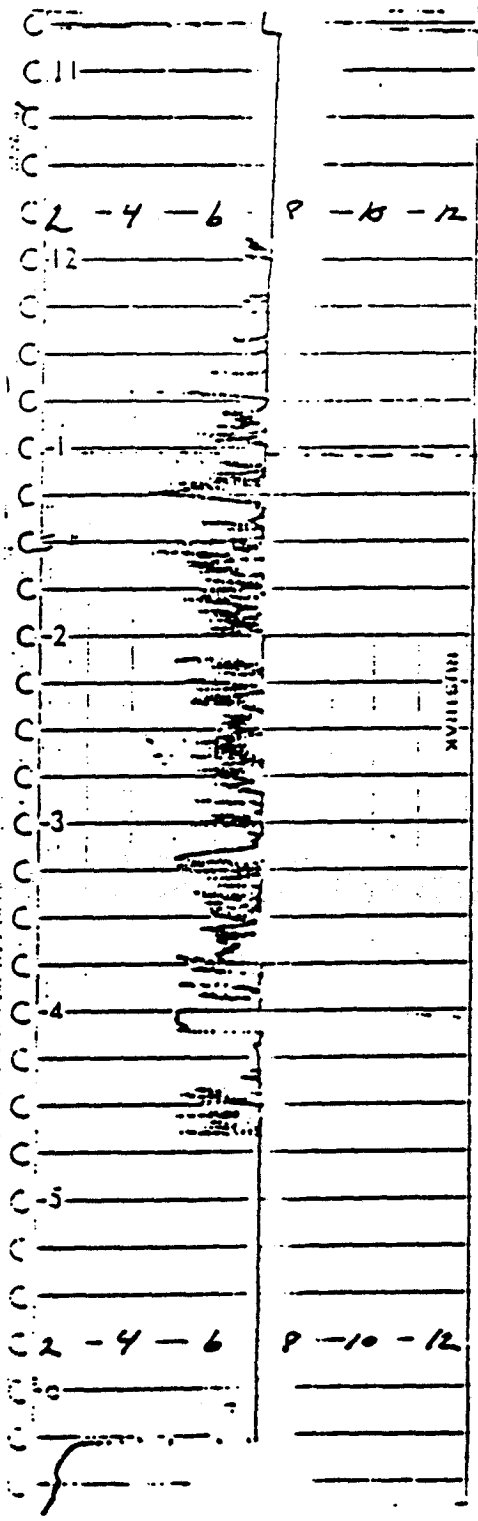
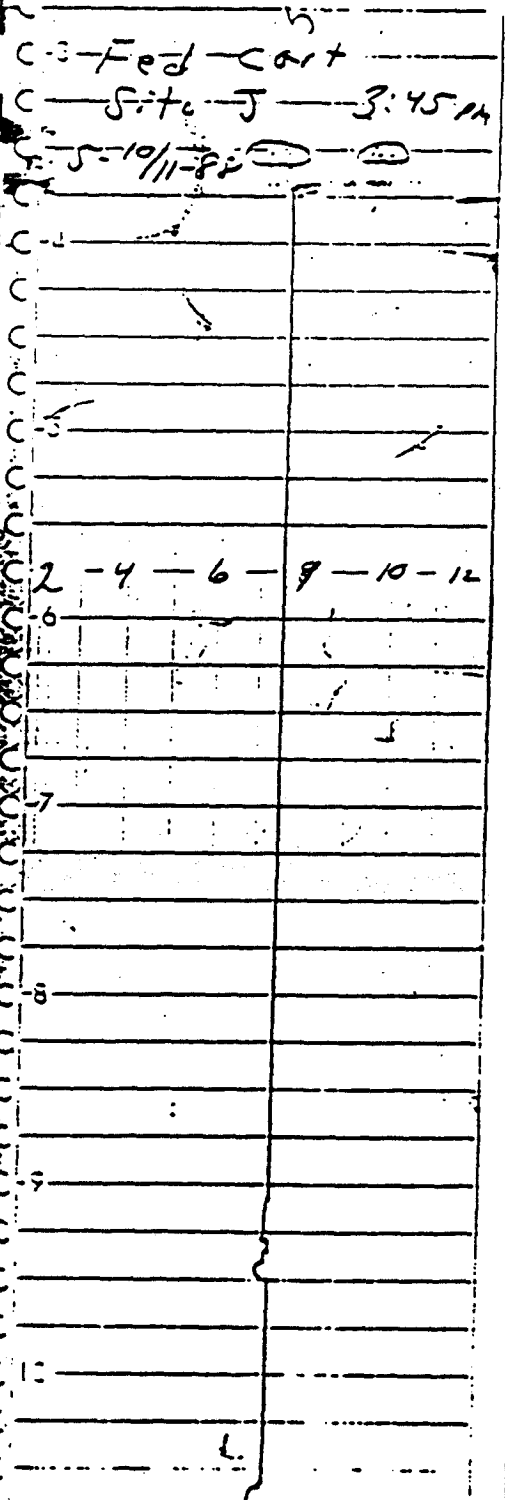
3

Calibration
ok
5-12-88 RYS
Site G

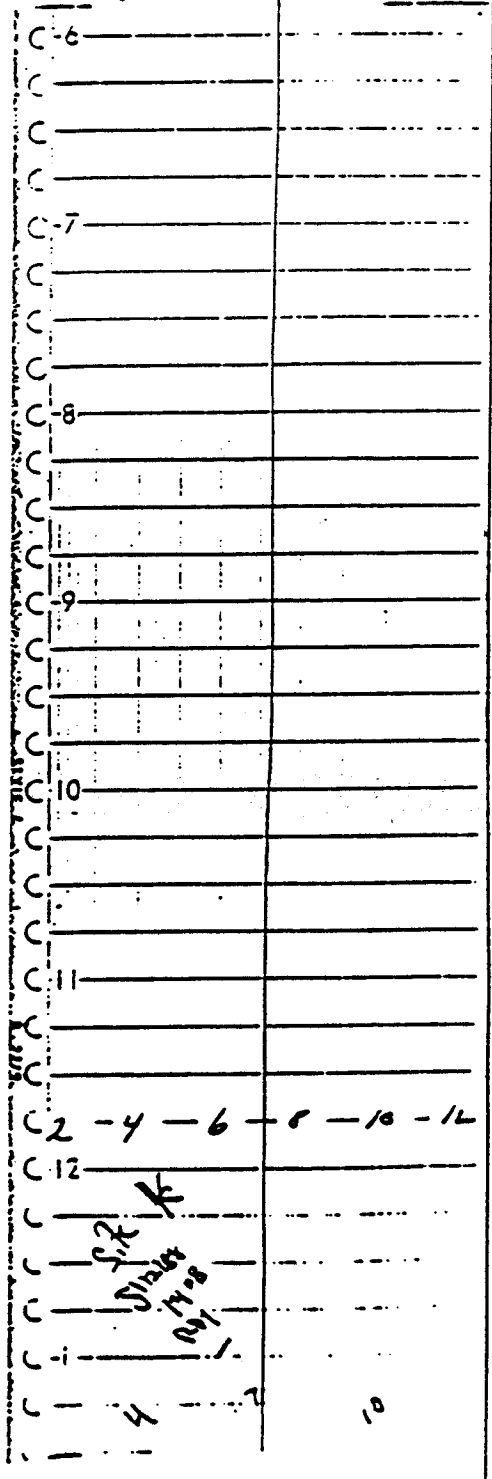
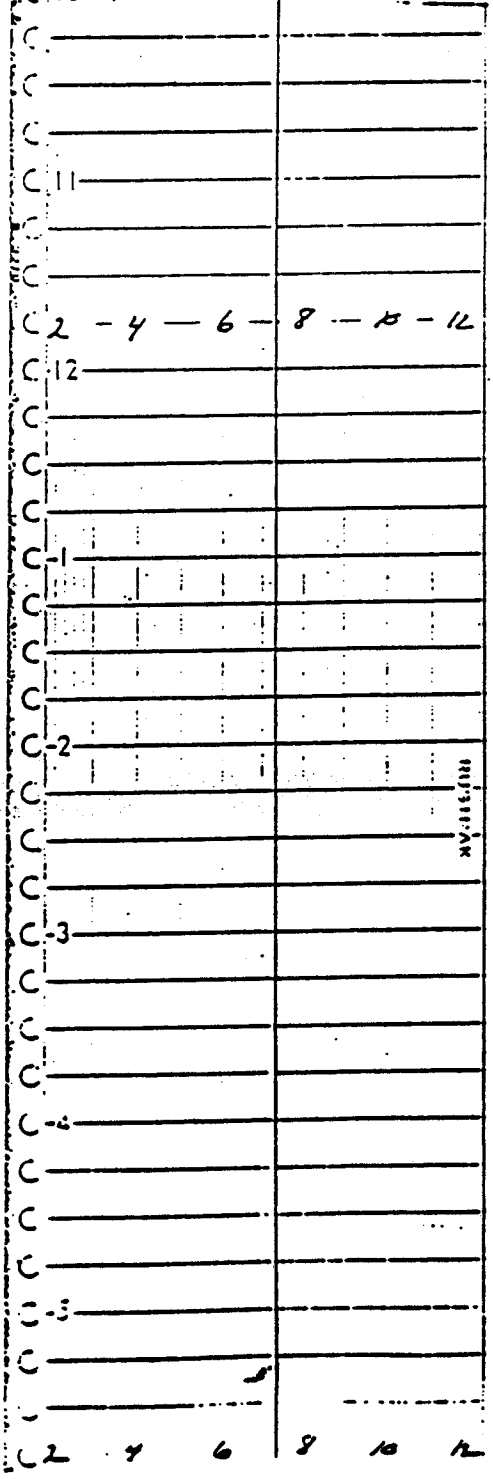
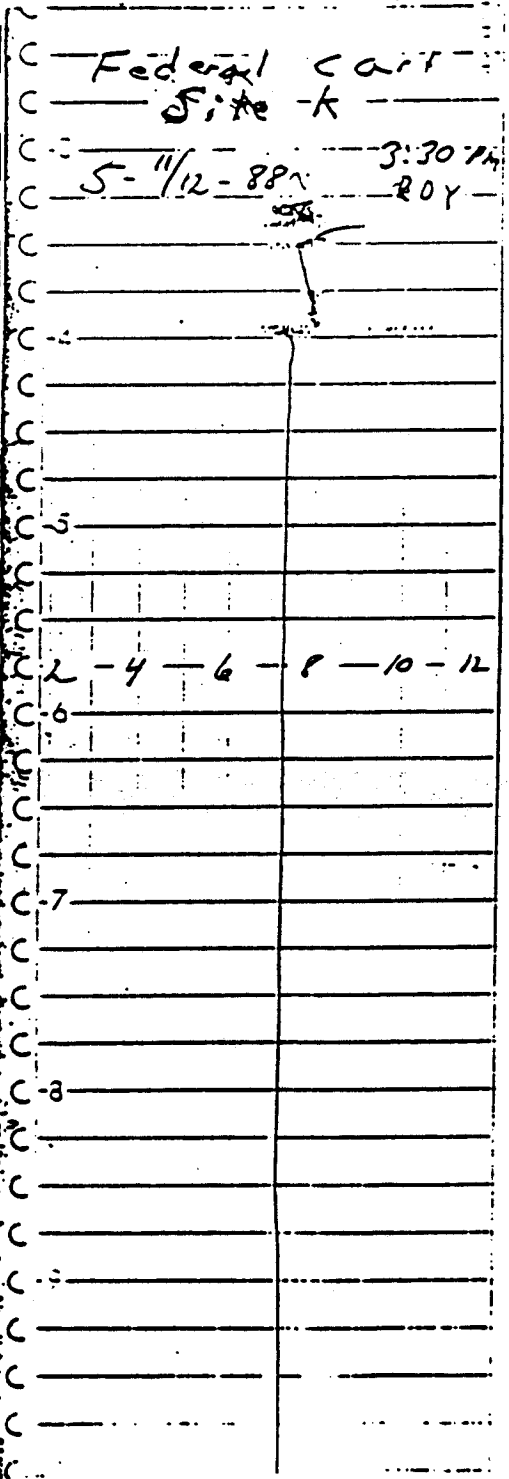
Federal Cartridge
Recording pH Meter
Strip Chart
Site "H"
May 12/13, 1988

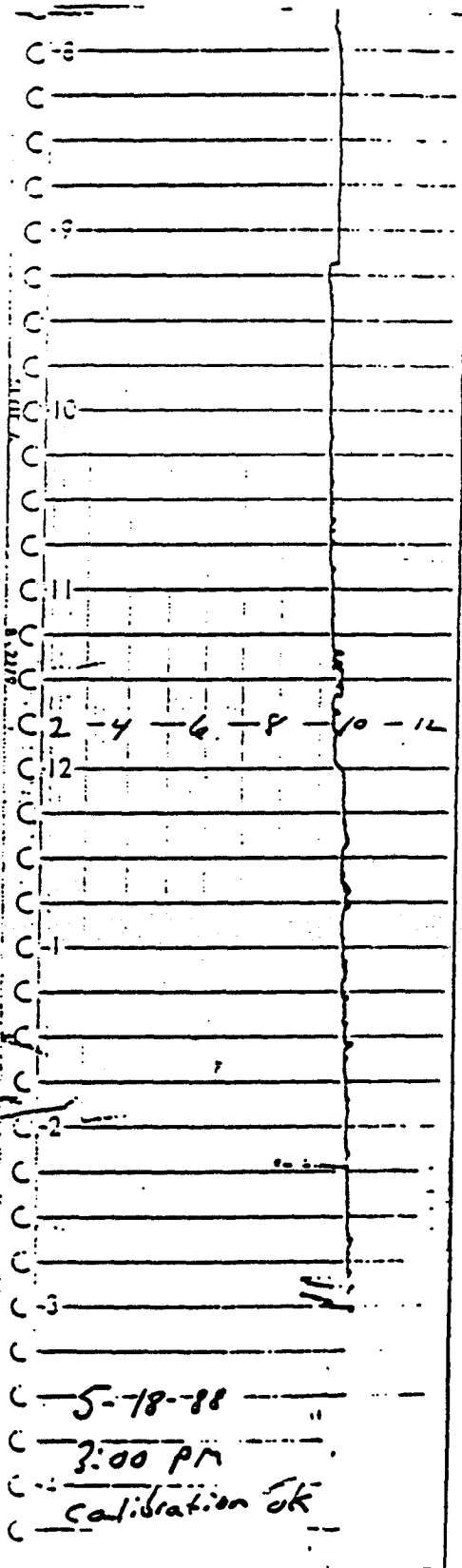
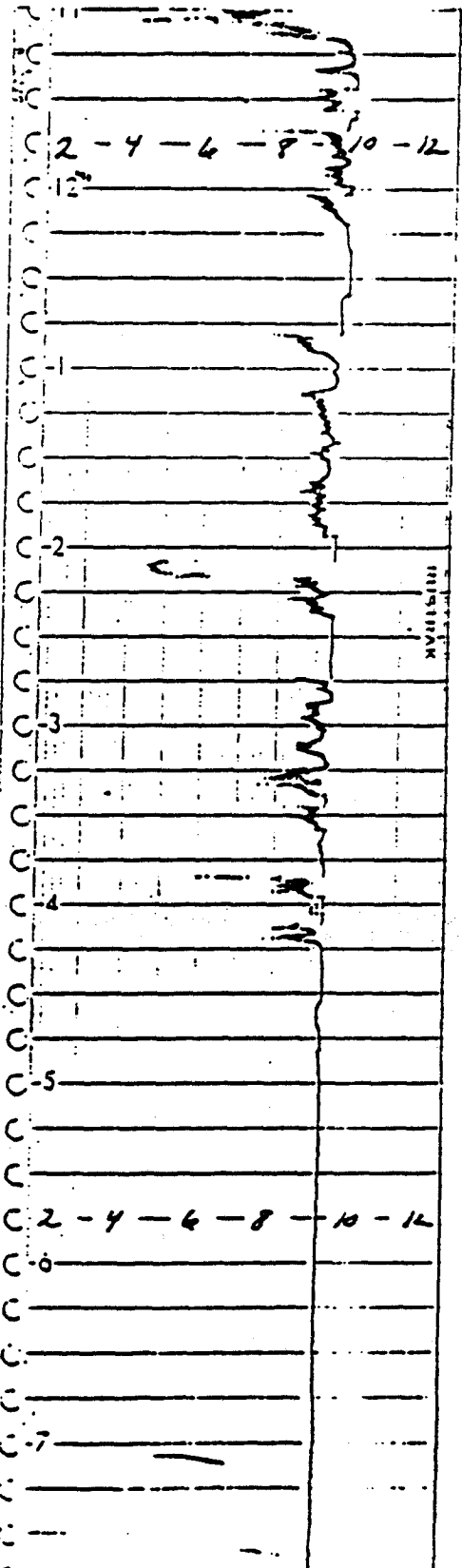
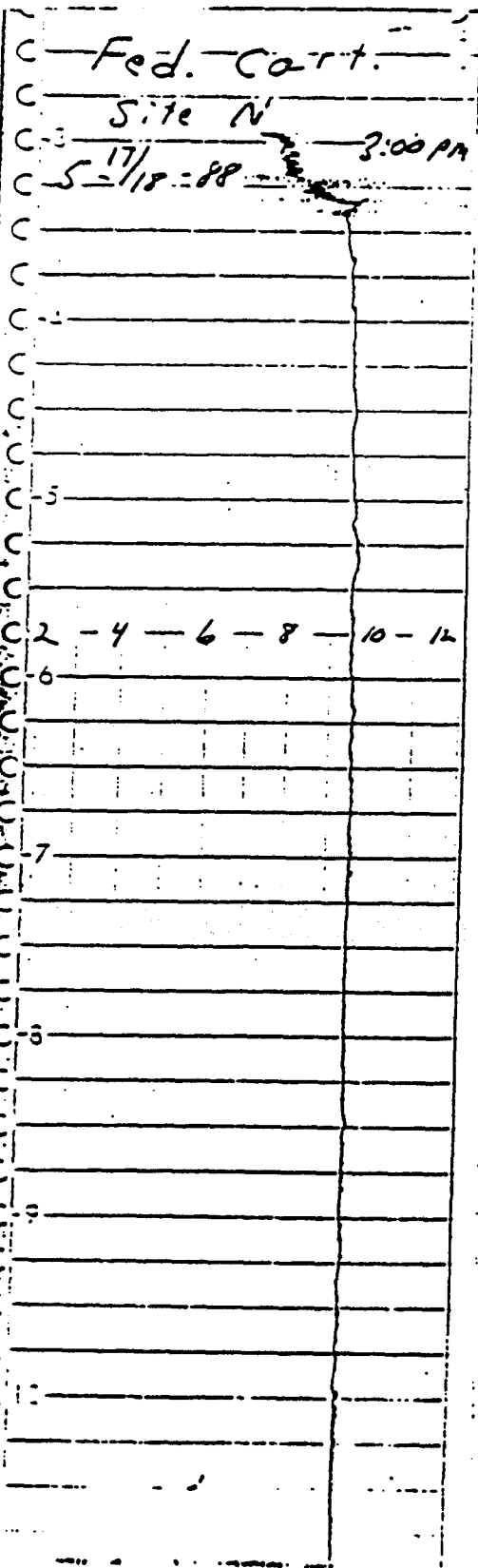






Federal Cartridge
Recording pH Meter
Strip Chart
Site "K"
May 11/12, 1988





Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

July 19, 1988
PACE Project Number: 880512516

Attn: Ms. Beverly Erickson

May NPDES

Date Sample(s) Collected: 05/12/88
Date Sample(s) Received: 05/12/88

PACE Sample Number: <u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>123310 Site F</u>	<u>123320 Site H</u>	<u>123330 Site I</u>
Biochemical Oxygen Demand	mg/L	6	8	10	8
Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	ND	ND	ND
Chloride	mg/L	1	25	22	28
Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col/100 ml	1	30	40	30
Copper	mg/L	0.01	ND	ND	ND
Cyanide, Total	mg/L	0.01	ND	ND	ND
Lead	mg/L	0.1	ND	ND	ND
Mercury	ug/L	0.2	ND	ND	ND
Nickel	mg/L	0.05	ND	ND	ND
Nitrogen, Ammonia	mg/L	0.1	ND	ND	1.0
Oil and Grease	mg/L	1	1	20	2
Oxygen, Dissolved	mg/L	0.1	10	11	10
Phosphorus, Ortho	mg/L	0.02	ND	ND	ND
Phosphorus, Total	mg/L	0.05	0.17	0.12	0.12
Silver	mg/L	0.04	ND	ND	ND
Solids, Total Suspended	mg/L	1	24	20	12
Total Organic Carbon	mg/L	0.5	18	18	18
Zinc	mg/L	0.10	ND	ND	0.14
pH (Field)	units	0.1	7.6	8.3	7.4
Chloromethane	ug/L	1.0	ND	ND	ND
Bromomethane	ug/L	1.5	ND	ND	ND
Dichlorodifluoromethane	ug/L	1.5	ND	ND	ND
Vinyl chloride	ug/L	1.5	ND	ND	ND
Chloroethane	ug/L	1.0	ND	ND	ND
Methylene chloride	ug/L	1.0	ND	ND	ND
Trichlorofluoromethane	ug/L	0.4	ND	0.5	ND

DRAFT

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
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July 19, 1988
PACE Project Number: 880512516

PACE Sample Number: Parameter	Units	MDL	123310 Site F	123320 Site H	123330 Site I
1,1-Dichloroethylene	ug/L	0.3	ND	ND	ND
1,1-Dichloroethane	ug/L	0.2	ND	ND	ND
trans-1,2-Dichloroethylene	ug/L	0.3	ND	ND	ND
Chloroform	ug/L	0.5	ND	ND	ND
1,2-Dichloroethane	ug/L	0.2	ND	ND	ND
1,1,1-Trichloroethane	ug/L	0.5	ND	ND	ND
Carbon tetrachloride	ug/L	0.3	ND	ND	ND
Bromodichloromethane	ug/L	0.2	ND	ND	ND
1,2-Dichloropropane	ug/L	0.2	ND	ND	ND
cis-1,3-Dichloro-1-propene	ug/L	0.5	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.5	ND	ND	ND
Dibromochloromethane	ug/L	1.0	ND	ND	ND
1,1,2-Trichloroethane	ug/L	1.0	ND	ND	ND
trans-1,3-Dichloro-1-propene	ug/L	0.3	ND	ND	ND
2-Chloroethylvinyl ether	ug/L	5.0	ND	ND	ND
Bromoform	ug/L	0.2	ND	ND	ND
1,1,2,2-Tetrachloroethane	ug/L	1.0	ND	ND	ND
1,1,2,2-Tetrachloroethylene	ug/L	1.0	ND	ND	ND
Chlorobenzene	ug/L	1.0	ND	ND	ND
1,3-Dichlorobenzene	ug/L	4.0	ND	ND	ND
1,2-Dichlorobenzene	ug/L	4.0	ND	ND	ND
1,4-Dichlorobenzene	ug/L	4.0	ND	ND	ND

DRAFT

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
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July 19, 1988
PACE Project Number: 880512516

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my direct supervision.

Thomas L. Halverson
Inorganic Chemistry Manager

William H. Scruton
Organic Chemistry Manager

DRAFT

July 19, 1988

Ms. Beverly Erickson
Federal Cartridge Company
Twin Cities Army Ammunition Plant
Building 105
New Brighton, MN 55112

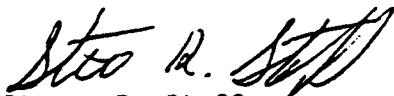
RE: May 1988 Storm Sewer Monitoring

Dear Ms. Erickson:

Enclosed are two reports of laboratory analysis. The first is a completed report for the samples collected May 11, 1988. The second report is an incompleated report for the samples collected May 12, 1988. The radioactivity data has not yet been completed by our subcontracting laboratory. As soon as this data is available a final report will be submitted.

If I can be of any further assistance, please contact me.

Sincerely,



Steven R. Stoffer
Engineering Technician

SRS/jb

Enclosures

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

July 19, 1988
PACE Project Number: 880511515

Attn: Ms. Beverly Erickson

May NPDES

Date Sample(s) Collected: 05/11/88
Date Sample(s) Received: 05/11/88

PACE Sample Number: 122320 122330 122340

Parameter	Units	MDL	DI Blank	Field Blank	Site A
Biochemical Oxygen Demand	mg/L	6	ND	ND	ND
Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	ND	ND	ND
Chloride	mg/L	1	ND	ND	310
Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col / 100 ml	1	ND	ND	900
Copper	mg/L	0.01	ND	ND	ND
Cyanide, Total	mg/L	0.01	ND	ND	ND
Lead	mg/L	0.1	ND	ND	ND
Mercury	ug/L	0.2	ND	ND	ND
Nickel	mg/L	0.05	ND	ND	ND
Nitrogen, Ammonia	mg/L	0.1	ND	ND	0.2
Oil and Grease	mg/L	1	3	ND	2
Oxygen, Dissolved	mg/L	0.1	10	10	11
Phosphorus, Ortho	mg/L	0.02	ND	ND	ND
Phosphorus, Total	mg/L	0.05	ND	0.06	0.07
Silver	mg/L	0.04	ND	ND	ND
Solids, Total Suspended	mg/L	1	ND	ND	1
Total Organic Carbon	mg/L	0.5	ND	ND	5.4
Zinc	mg/L	0.01	ND	ND	0.06
pH (Field)	units	0.1	7.8	7.8	7.4
Chloromethane	ug/L	1.0	ND	ND	ND
Bromomethane	ug/L	1.5	ND	ND	ND
Dichlorodifluoromethane	ug/L	1.5	ND	ND	4.0
Vinyl chloride	ug/L	1.5	ND	ND	4.0
Chloroethane	ug/L	1.0	ND	ND	ND
Methylene chloride	ug/L	1.0	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 2

July 19, 1988
PACE Project Number: 880511515

PACE Sample Number:		122320	122330	122340
Parameter	Units	MDL	Field Blank	Site A
Trichlorofluoromethane	ug/L	0.4	ND	ND
1,1-Dichloroethylene	ug/L	0.3	ND	ND
1,1-Dichloroethane	ug/L	0.2	ND	ND
trans-1,2-Dichloroethylene	ug/L	0.3	ND	ND
Chloroform	ug/L	0.5	1.3	1.2
1,2-Dichloroethane	ug/L	0.2	ND	ND
1,1,1-Trichloroethane	ug/L	0.5	ND	ND
Carbon tetrachloride	ug/L	0.3	ND	ND
Bromodichloromethane	ug/L	0.2	ND	ND
1,2-Dichloropropane	ug/L	0.2	ND	ND
cis-1,3-Dichloro-1-propene	ug/L	0.5	ND	ND
1,1,2-Trichloroethylene	ug/L	0.5	ND	ND
Dibromochloromethane	ug/L	1.0	ND	ND
1,1,2-Trichloroethane	ug/L	1.0	ND	ND
trans-1,3-Dichloro-1-propene	ug/L	0.3	ND	ND
2-Chloroethylvinyl ether	ug/L	5.0	ND	ND
Bromoform	ug/L	1.0	ND	ND
1,1,2,2-Tetrachloroethane	ug/L	1.0	ND	ND
1,1,2,2-Tetrachloroethylene	ug/L	1.0	ND	ND
Chlorobenzene	ug/L	1.0	ND	ND
1,3-Dichlorobenzene	ug/L	4.0	ND	ND
1,2-Dichlorobenzene	ug/L	4.0	ND	ND
1,4-Dichlorobenzene	ug/L	4.0	ND	ND
Gross Alpha	pci/L	0.4±0.3	0.4±0.3	2.0±1.7
Gross Beta	pci/L	<1.0	<0.9	6.5±1.4
Manganese 54	pci/L	<4.1	<4.2	<2.4
Cobalt 60	pci/L	<4.0	<4.5	<2.3
Cesium 134	pci/L	<3.8	<3.8	<1.8
Cesium 137	pci/L	<4.1	<5.0	<2.9

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
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July 19, 1988
PACE Project Number: 880511515

PACE Sample Number: Parameter	Units	MDL	122350 Site B	122360 Site C	122370 Site D
Biochemical Oxygen Demand	mg/L	6	13	ND	ND
Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	ND	210	ND
Chloride	mg/L	1	24	89	59
Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col/100 ml	1	50	49	32
Copper	mg/L	0.01	ND	0.01	ND
Cyanide, Total	mg/L	0.01	ND	ND	0.01
Lead	mg/L	0.1	ND	ND	ND
Mercury	ug/L	0.2	ND	ND	ND
Nickel	mg/L	0.05	ND	ND	ND
Nitrogen, Ammonia	mg/L	0.1	0.1	0.1	ND
Oil and Grease	mg/L	1	6	2	ND
Oxygen, Dissolved	mg/L	0.1	11	12	12
Phosphorus, Ortho	mg/L	0.02	ND	ND	ND
Phosphorus, Total	mg/L	0.05	0.11	0.19	0.07
Silver	mg/L	0.04	ND	ND	ND
Solids, Total Suspended	mg/L	1	14	ND	ND
Total Organic Carbon	mg/L	0.5	19	2.3	3.3
Zinc	mg/L	0.01	ND	0.01	0.01
pH (Field)	units	0.1	7.3	7.8	7.8
Chloromethane	ug/L	1.0	ND	ND	ND
Bromomethane	ug/L	1.5	ND	ND	ND
Dichlorodifluoromethane	ug/L	1.5	ND	ND	ND
Vinyl chloride	ug/L	1.5	ND	ND	ND
Chloroethane	ug/L	1.0	ND	ND	ND
Methylene chloride	ug/L	1.0	ND	ND	ND
Trichlorofluoromethane	ug/L	0.4	ND	ND	ND
1,1-Dichloroethylene	ug/L	0.3	ND	ND	ND
1,1-Dichloroethane	ug/L	0.2	ND	ND	ND
trans-1,2-Dichloroethylene	ug/L	0.3	ND	1.2	ND
Chloroform	ug/L	0.5	ND	ND	ND
1,2-Dichloroethane	ug/L	0.2	ND	ND	ND

DRAFT

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
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July 19, 1988
PACE Project Number: 880511515

PACE Sample Number: <u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>122350 Site B</u>	<u>122360 Site C</u>	<u>122370 Site D</u>
1,1,1-Trichloroethane	ug/L	0.5	ND	ND	ND
Carbon tetrachloride	ug/L	0.3	ND	ND	ND
Bromodichloromethane	ug/L	0.2	ND	ND	ND
1,2-Dichloropropane	ug/L	0.2	ND	ND	ND
cis-1,3-Dichloro-1-propene	ug/L	0.5	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.5	ND	16	ND
Dibromochloromethane	ug/L	1.0	ND	ND	ND
1,1,2-Trichloroethane	ug/L	1.0	ND	ND	ND
trans-1,3-Dichloro-1-propene	ug/L	0.3	ND	ND	ND
2-Chloroethylvinyl ether	ug/L	5.0	ND	ND	ND
Bromoform	ug/L	1.0	ND	ND	ND
1,1,2,2-Tetrachloroethane	ug/L	1.0	ND	ND	ND
1,1,2,2-Tetrachloroethylene	ug/L	1.0	ND	ND	ND
Chlorobenzene	ug/L	1.0	ND	ND	ND
1,3-Dichlorobenzene	ug/L	4.0	ND	ND	ND
1,2-Dichlorobenzene	ug/L	4.0	ND	ND	ND
1,4-Dichlorobenzene	ug/L	4.0	ND	ND	ND
Gross Alpha	pci/L		<0.8	<1.3	1.7±1.2
Gross Beta	pci/L		4.5±1.2	5.4±1.3	3.5±1.2
Manganese 54	pci/L		<4.6	<5.2	<4.2
Cobalt 60	pci/L		<4.3	<4.4	<4.6
Cesium 134	pci/L		<3.7	<4.5	<4.2
Cesium 137	pci/L		<4.5	<5.5	<4.6

DRAFT

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
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July 19, 1988
PACE Project Number: 880511515

PACE Sample Number: <u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>122380 Site E</u>	<u>122390 Site G</u>	<u>122400 Site J</u>
Biochemical Oxygen Demand	mg/L	6	ND	20	9
Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	ND	82	ND
Chloride	mg/L	1	48	30	57
Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col/100 ml	1	22	43	5
Copper	mg/L	0.01	ND	ND	ND
Cyanide, Total	mg/L	0.01	ND	ND	ND
Lead	mg/L	0.1	ND	ND	ND
Mercury	ug/L	0.2	ND	ND	ND
Nickel	mg/L	0.05	ND	ND	ND
Nitrogen, Ammonia	mg/L	0.1	0.1	0.1	0.1
Oil and Grease	mg/L	1	ND	ND	3
Oxygen, Dissolved	mg/L	0.1	11	11	11
Phosphorus, Ortho	mg/L	0.02	ND	ND	ND
Phosphorus, Total	mg/L	0.05	0.37	0.19	0.06
Silver	mg/L	0.04	ND	ND	ND
Solids, Total Suspended	mg/L	1	ND	2	ND
Total Organic Carbon	mg/L	0.5	14	6.0	12
Zinc	mg/L	0.01	0.01	ND	ND
pH (Field)	units	0.1	7.5	7.8	7.5
Chloromethane	ug/L	1.0	ND	ND	ND
Bromomethane	ug/L	1.5	ND	ND	ND
Dichlorodifluoromethane	ug/L	1.5	ND	ND	ND
Vinyl chloride	ug/L	1.5	ND	ND	ND
Chloroethane	ug/L	1.0	ND	ND	ND
Methylene chloride	ug/L	1.0	ND	ND	ND
Trichlorofluoromethane	ug/L	0.4	ND	0.5	ND
1,1-Dichloroethylene	ug/L	0.3	ND	ND	ND
1,1-Dichloroethane	ug/L	0.2	ND	ND	ND
trans-1,2-Dichloroethylene	ug/L	0.3	ND	ND	ND
Chloroform	ug/L	0.5	ND	ND	ND
1,2-Dichloroethane	ug/L	0.2	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
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July 19, 1988
PACE Project Number: 880511515

PACE Sample Number: Parameter	Units	MDL	122380 Site E	122390 Site G	122400 Site J
1,1,1-Trichloroethane	ug/L	0.5	ND	ND	ND
Carbon tetrachloride	ug/L	0.3	ND	ND	ND
Bromodichloromethane	ug/L	0.2	ND	ND	ND
1,2-Dichloropropane	ug/L	0.2	ND	ND	ND
cis-1,3-Dichloro-1-propene	ug/L	0.5	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.5	ND	ND	ND
Dibromochloromethane	ug/L	1.0	ND	ND	ND
1,1,2-Trichloroethane	ug/L	1.0	ND	ND	ND
trans-1,3-Dichloro-1-propene	ug/L	0.3	ND	ND	ND
2-Chloroethylvinyl ether	ug/L	5.0	ND	ND	ND
Bromoform	ug/L	1.0	ND	ND	ND
1,1,2,2-Tetrachloroethane	ug/L	1.0	ND	ND	ND
1,1,2,2-Tetrachloroethylene	ug/L	1.0	ND	ND	ND
Chlorobenzene	ug/L	1.0	ND	ND	ND
1,3-Dichlorobenzene	ug/L	4.0	ND	ND	ND
1,2-Dichlorobenzene	ug/L	4.0	ND	ND	ND
1,4-Dichlorobenzene	ug/L	4.0	ND	ND	ND
Gross Alpha	pci/L		1.6±1.0	<0.8	<1.5
Gross Beta	pci/L		3.5±1.0	6.5±1.2	4.9±1.3
Manganese 54	pci/L		<3.5	<3.5	<4.0
Cobalt 60	pci/L		<4.4	<4.3	<5.3
Cesium 134	pci/L		<3.8	<3.8	<4.3
Cesium 137	pci/L		<4.0	<3.9	<5.0

DRAFT

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
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July 19, 1988
PACE Project Number: 880511515

PACE Sample Number: <u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>122410 Site K</u>	<u>122420 Site L</u>	<u>122430 Site M</u>
Biochemical Oxygen Demand	mg/L	6	ND	ND	8
Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	ND	88	53
Chloride	mg/L	1	62	91	12
Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col/100 ml	1	24	26	20000
Copper	mg/L	0.01	ND	ND	ND
Cyanide, Total	mg/L	0.01	ND	ND	ND
Lead	mg/L	0.1	ND	ND	ND
Mercury	ug/L	0.2	ND	ND	ND
Nickel	mg/L	0.05	ND	ND	ND
Nitrogen, Ammonia	mg/L	0.1	ND	ND	0.1
Oil and Grease	mg/L	1	3	ND	ND
Oxygen, Dissolved	mg/L	0.1	11	10	10
Phosphorus, Ortho	mg/L	0.02	ND	ND	ND
Phosphorus, Total	mg/L	0.05	0.14	0.12	0.12
Silver	mg/L	0.04	ND	ND	ND
Solids, Total Suspended	mg/L	ND	ND	2	19
Total Organic Carbon	mg/L	0.5	21	13	9.2
Zinc	mg/L	0.01	0.02	0.04	0.04
pH (Field)	units	0.1	7.2	8.0	7.8
Chloromethane	ug/L	1.0	ND	ND	ND
Bromomethane	ug/L	1.5	ND	ND	ND
Dichlorodifluoromethane	ug/L	1.5	ND	ND	ND
Vinyl chloride	ug/L	1.5	ND	ND	ND
Chloroethane	ug/L	1.0	ND	ND	ND
Methylene chloride	ug/L	1.0	ND	ND	ND
Trichlorofluoromethane	ug/L	0.4	ND	0.4	ND
1,1-Dichloroethylene	ug/L	0.3	ND	ND	ND
1,1-Dichloroethane	ug/L	0.2	ND	ND	ND
trans-1,2-Dichloroethylene	ug/L	0.3	ND	ND	ND
Chloroform	ug/L	0.5	ND	ND	ND
1,2-Dichloroethane	ug/L	0.2	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
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July 19, 1988
PACE Project Number: 880511515

PACE Sample Number: Parameter	Units	MDL	122410 Site K	122420 Site L	122430 Site M
1,1,1-Trichloroethane	ug/L	0.5	ND	ND	ND
Carbon tetrachloride	ug/L	0.3	ND	ND	ND
Bromodichloromethane	ug/L	0.2	ND	ND	ND
1,2-Dichloropropane	ug/L	0.2	ND	ND	ND
cis-1,3-Dichloro-1-propene	ug/L	0.5	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.5	ND	ND	ND
Dibromochloromethane	ug/L	1.0	ND	ND	ND
1,1,2-Trichloroethane	ug/L	1.0	ND	ND	ND
trans-1,3-Dichloro-1-propene	ug/L	0.3	ND	ND	ND
2-Chloroethylvinyl ether	ug/L	5.0	ND	ND	ND
Bromoform	ug/L	1.0	ND	ND	ND
1,1,2,2-Tetrachloroethane	ug/L	1.0	ND	ND	ND
1,1,2,2-Tetrachloroethylene	ug/L	1.0	ND	ND	ND
Chlorobenzene	ug/L	1.0	ND	ND	ND
1,3-Dichlorobenzene	ug/L	4.0	ND	ND	ND
1,2-Dichlorobenzene	ug/L	4.0	ND	ND	ND
1,4-Dichlorobenzene	ug/L	4.0	ND	ND	ND
Gross Alpha	pci/L		<1.3	1.0±0.9	<1.2
Gross Beta	pci/L		3.5±1.2	3.7±1.0	2.4±1.2
Manganese 54	pci/L		<4.8	<3.2	<2.3
Cobalt 60	pci/L		<6.2	<3.7	<3.1
Cesium 134	pci/L		<4.9	<3.3	<3.0
Cesium 137	pci/L		<4.8	<3.6	<3.1

DRAFT

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
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July 19, 1988
PACE Project Number: 880511515

PACE Sample Number:			122440
<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>Site N</u>
Biochemical Oxygen Demand	mg/L	6	6
Cadmium	mg/L	0.01	ND
Chemical Oxygen Demand	mg/L	50	88
Chloride	mg/L	1	64
Chromium	mg/L	0.05	ND
Coliform, Fecal	col/100 ml	10	ND
Copper	mg/L	0.01	ND
Cyanide, Total	mg/L	0.01	ND
Lead	mg/L	0.1	ND
Mercury	ug/L	0.2	ND
Nickel	mg/L	0.05	ND
Nitrogen, Ammonia	mg/L	0.1	ND
Oil and Grease	mg/L	1	ND
Oxygen, Dissolved	mg/L	0.1	10
Phosphorus, Ortho	mg/L	0.02	0.12
Phosphorus, Total	mg/L	0.05	0.43
Silver	mg/L	0.04	ND
Solids, Total Suspended	mg/L	1	26
Total Organic Carbon	mg/L	0.5	13
Zinc	mg/L	0.01	0.04
pH (Field)	units		7.7
Chloromethane	ug/L	1.0	ND
Bromomethane	ug/L	1.5	ND
Dichlorodifluoromethane	ug/L	1.5	ND
Vinyl chloride	ug/L	1.5	ND
Chloroethane	ug/L	1.0	ND
Methylene chloride	ug/L	1.0	ND
Trichlorofluoromethane	ug/L	0.4	ND
1,1-Dichloroethylene	ug/L	0.3	ND
1,1-Dichloroethane	ug/L	0.2	ND
trans-1,2-Dichloroethylene	ug/L	0.3	ND
Chloroform	ug/L	0.5	ND
1,2-Dichloroethane	ug/L	0.2	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 10

July 19, 1988
PACE Project Number: 880511515

PACE Sample Number: <u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>122440 Site N</u>
1,1,1-Trichloroethane	ug/L	0.5	ND
Carbon tetrachloride	ug/L	0.3	ND
Bromodichloromethane	ug/L	0.2	ND
1,2-Dichloropropane	ug/L	0.2	ND
cis-1,3-Dichloro-1-propene	ug/L	0.5	ND
1,1,2-Trichloroethylene	ug/L	0.5	ND
Dibromochloromethane	ug/L	1.0	ND
1,1,2-Trichloroethane	ug/L	1.0	ND
trans-1,3-Dichloro-1-propene	ug/L	0.3	ND
2-Chloroethylvinyl ether	ug/L	5.0	ND
Bromoform	ug/L	1.0	ND
1,1,2,2-Tetrachloroethane	ug/L	1.0	ND
1,1,2,2-Tetrachloroethylene	ug/L	1.0	ND
Chlorobenzene	ug/L	1.0	ND
1,3-Dichlorobenzene	ug/L	4.0	ND
1,2-Dichlorobenzene	ug/L	4.0	ND
1,4-Dichlorobenzene	ug/L	4.0	ND
Gross Alpha	pci/L		1.4±0.9
Gross Beta	pci/L		4.0±1.2
Manganese 54	pci/L		<3.6
Cobalt 60	pci/L		<3.4
Cesium 134	pci/L		<3.4
Cesium 137	pci/L		<4.0

DRAFT

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 11

July 19, 1988
PACE Project Number: 880511515

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my direct supervision.

Thomas L. Halverson
Inorganic Chemistry Manager

DRAFT

William H. Scruton
Organic Chemistry Manager

1710 Douglas Drive North □ Minneapolis, MN 55422 □ Phone (612) 544-5543 □ FAX (612) 544-3974

July 12, 1988

Ms. Beverly Erickson
 Federal Cartridge Company
 Twin City Army Ammunition Plant
 New Brighton, MN 55112

RE: June, 1988 NPDES Monitoring
 PACE Project Nos. 880620.516 and 880621.513

Dear Ms. Erickson:

Enclosed please find two reports of laboratory analyses for samples collected June 20 and June 21, 1988. The samples were collected from the NPDES sites located around the Twin Cities Army Ammunition Plant.

Based on a telephone conversation with Ms. LeeAnn Hammerbeck of Federal Cartridge, we understand more than 0.5 inches of rain was received on Sunday, June 19, 1988. Therefore, the samples were collected on June 20, 1988, approximately twelve hours after the rain and June 21, 1988, approximately thirty-six hours after the rain.

At the time of sample collection, the pH, dissolved oxygen and discharge volumes were measured. The pH and dissolved oxygen values are on the laboratory report. The measured discharge volumes for each sampling event were as follows:

<u>Sampling Location</u>	<u>June 20, Twenty-four Hour Discharge Volume (Gallons)</u>	<u>June 21, Twenty-four Hour Discharge Volume (Gallons)</u>
NPDES 20500	580	580
NPDES 20200	20,200	49,500
NPDES 20300	5,700	5,700
NPDES 20400	11,500	11,500
NPDES 20100	316,800	359,000
Site F (Rice Creek Out)	2,880,000	3,823,000

PACE Laboratories, Inc.


July 12, 1988

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Ms. Beverly Erickson
Federal Cartridge Company
Twin City Army Ammunition Plant

If you have any questions regarding this report, please do not
hesitate to contact us.

Sincerely,



Steven R. Stoffer
Engineering Technician



Donald P. Duffy, P.E.
Director, Consulting Services Division

SRS:DPD/jb

Enclosure

cc: LeeAnn Hammerbeck, Federal Cartridge Company

Federal Cartridge Company
Twin City Army Ammunition Plant
New Brighton, MN 55112

July 08, 1988
PACE Project Number: 880621513

Attn: Ms. Beverly Erickson

Date Sample(s) Collected: 06/21/88
Date Sample(s) Received: 06/21/88

PACE Sample Number:

162550	162560	162570
June 21	June 21	June 21
Field	Deionized	NPDES Site
Blank	Water	20500

Parameter	Units	MDL	162550	162560	162570
Chloride	mg/L	1	ND	ND	350
Dissolved Oxygen (Field)	mg/L	0.1	3.1	3.1	6.2
Oil and Grease	mg/L	1	ND	ND	ND
Phosphorus, Ortho	mg/L	0.02	ND	ND	0.11
Phosphorus, Total	mg/L	0.05	0.06	0.07	0.15
Solids, Total Suspended	mg/L	1	ND	ND	2
pH (Field)	units	0.1	8.0	8.0	7.6

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 2

July 08, 1988
PACE Project Number: 880621513

PACE Sample Number:

	162580	162590	162600
	June 21	June 21	June 21
	NPDES Site	NPDES Site	NPDES Site
	20200	20300	20400

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	162580	162590	162600
Chloride	mg/L	1	6	32	57
Dissolved Oxygen (Field)	mg/L	0.1	9.3	8.3	7.4
Oil and Grease	mg/L	1	11	9	4
Phosphorus, Ortho	mg/L	0.02	0.06	0.04	0.02
Phosphorus, Total	mg/L	0.05	0.14	0.10	0.12
Solids, Total Suspended	mg/L	1	38	ND	1
pH (Field)	units	0.1	8.3	8.5	7.8

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 3

July 08, 1988
PACE Project Number: 880621513

PACE Sample Number:

162610 162620

June 21


NPDES Site

20100

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>June 21 Site F</u>	<u>20100</u>
Chloride	mg/L	1	82	21
Dissolved Oxygen (Field)	mg/L	0.1	7.2	0.4
Oil and Grease	mg/L	1	3	10
Phosphorus, Ortho	mg/L	0.02	0.1	0.04
Phosphorus, Total	mg/L	0.05	0.24	0.15
Solids, Total Suspended	mg/L	1	11	170
pH (Field)	units	0.1	8.3	7.5

MDL Method Detection Limit

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my direct supervision.


Thomas L. Halverson
Inorganic Chemistry Manager

1710 Douglas Drive North □ Minneapolis, MN 55422 □ Phone (612) 544-5543 □ FAX (612) 544-3974

September 29, 1988

Ms. Beverly Erickson
Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Dear Ms. Erickson:

Enclosed please find a copy of our report of laboratory analyses for samples collected July 13, 1988. The samples were collected from NPDES sites around the Twin Cities Army Ammunition plant by PACE Laboratories, Inc. to meet July, 1988 requirements.

It should be noted that at NPDES Site 20100 there was no water, so no samples were taken and the flow is reported as zero. The dissolved oxygen, pH and discharge volumes were measured at each site. The dissolved oxygen and pH results are shown on the enclosed laboratory report. The daily discharge volume at each site was as follows:

<u>Location</u>	<u>Discharge Volume (GPD)</u>
NPDES Site 20500	5,100
NPDES Site 20200	12,700
NPDES Site 20300	1,400
NPDES Site 20400	24,500
Rice Creek Out (Site F)	309,700
NPDES Site 20100	0

An error was made at the time the July samples were checked in, which caused the delay in getting your report out to you. This error also caused the total phosphorous analysis to be missed. We apologize for any inconvenience this may have caused.

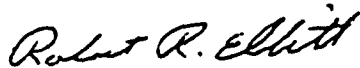
Ms. Beverly Erickson
September 29, 1988
Page 2

If you have any questions regarding this report, please do not
hesitate to contact us.

Sincerely,



Richard A. Smith
Environmental Technician



Robert R. Elliott
Field Services Manager

RAS:REE/kw

Enclosure

cc: Bridgette Manderfeld, Federal Cartridge Company



REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

September 16, 1988
PACE Project Number: 880713511

Attn: Ms. Beverly Erickson

July Grab

Date Sample(s) Collected: 07/13/88
Date Sample(s) Received: 07/13/88

PACE Sample Number:

Table with 6 columns: Parameter, Units, MDL, 188370 Dionized Water Blank, 188380 Field Blank, 188390 NPDES 20500. Rows include Chloride, Dissolved Oxygen (Field), Oil and Grease, Phosphorus, Ortho Solids, Total Suspended, and pH (Field).

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 2

September 16, 1988
PACE Project Number: 880713511

PACE Sample Number:

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	188400	188420	188430
			NPDES 20200	NPDES 20300	NPDES 20400
Chloride	mg/L	1	58	31	25
Dissolved Oxygen (Field)	mg/L	0.1	9.6	7.1	7.6
Oil and Grease	mg/L	1	ND	3	2
Phosphorus, Ortho	mg/L	0.02	0.10	0.04	0.04
Solids, Total Suspended	mg/L	1	ND	ND	9
pH (Field)	units	0.1	8.1	7.8	7.3

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 3

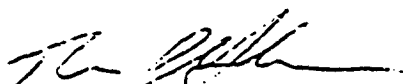
September 16, 1988
PACE Project Number: 880713511

PACE Sample Number: 188440

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>Site F</u>
Chloride	mg/L	1	259
Dissolved Oxygen (Field)	mg/L	0.1	5.8
Oil and Grease	mg/L	1	3
Phosphorus, Ortho	mg/L	0.02	0.02
Solids, Total Suspended	mg/L	1	28
pH (Field)	units	0.1	7.6

MDL Method Detection Limit

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my direct supervision.


Thomas L. Halverson
Inorganic Chemistry Manager

1710 Douglas Drive North • Minneapolis, MN 55422 • Phone (612) 544-5543 • FAX (612) 544-3974

September 29, 1988

Ms. Beverly Erickson
Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Dear Ms. Erickson:

Enclosed please find a copy of our report of laboratory analyses for samples collected August 29, 1988. The samples were collected from NPDES sites around the Twin Cities Army Ammunition plant by PACE Laboratories, Inc. to meet August 1988 requirements.

Also included in this report is the PCB results for all sites except G, K, L and M which were dry. This is normally done in May but the samples were not analyzed so it was done with the August sampling as discussed with Bruce Wenzel.

This report is complete with the exception of the Gama Scan, Gross Alpha and Gross Beta results which will be forwarded to you as soon as they become available.

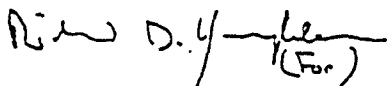
Please note the daily discharge volumes listed below. Sites B, 20100, H and J were stagnant and reported as zero flow.

<u>Location</u>	<u>Discharge Volume (GPD)</u>
NPDES Site 20500	520
Site B	0
NPDES Site 20200	11,300
NPDES Site 20300	3,900
NPDES Site 20400	16,500
Rice Creek Out (Site F)	1,074,700
NPDES Site 20100	0
Site H	0
Site I	1,535,700
Site J	0

Ms. Beverly Erickson
September 29, 1988
Page 2

If you have any questions regarding this report, please do not
hesitate to contact us.

Sincerely,

 (Enc.)

Richard A. Smith
Environmental Technician



Robert R. Elliott
Field Services Manager

RAS:REE/kw

Enclosure

cc: Bridgette Manderfeld, Federal Cartridge Company



REPORT OF LABORATORY ANALYSIS

Offices:
 Minneapolis, Minnesota
 Tampa, Florida
 Coralville, Iowa
 Novato, California

Federal Cartridge Company
 Twin Cities Army Ammunition Plant
 New Brighton, MN 55112

September 29, 1988
 PACE Project Number: 880829600

Attn: Ms. Beverly Erickson

Date Sample(s) Collected: 08/29/88
 Date Sample(s) Received: 08/29/88, 08/30/88

PACE Sample Number:			300310 Site A 20500	300320 Site B	300330 Site C 20200
Parameter	Units	MDL			
1,1,1-Trichloroethane	ug/L	0.50	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.50	ND	ND	12
1,1-Dichloroethane	ug/L	0.20	ND	ND	ND
1,1-Dichloroethylene	ug/L	0.30	ND	ND	ND
Biochemical Oxygen Demand	mg/L	6	13	ND	ND
Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	ND	ND	ND
Chloride	mg/L	1	140	110	93
Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col/100 ml	10	2200	50	ND
Copper	mg/L	0.01	ND	ND	ND
Cyanide, Total	mg/L	0.01	ND	ND	ND
Dissolved Oxygen (Field)	mg/L	0.1	8.9	10.6	10.8
Gamma Scan			*	*	-
Gross Alpha	pCi/L		*	*	-
Gross Beta	pCi/L		*	*	-
Methylene chloride	ug/L	3.0	ND	ND	ND
Nickel	mg/L	0.05	ND	ND	ND
Nitrogen, Ammonia	mg/L	0.1	0.1	0.2	0.3
Oil and Grease	mg/L	1	ND	ND	ND
Phosphorus, Ortho	mg/L	0.02	0.05	0.02	ND
Phosphorus, Total	mg/L	0.05	0.12	0.07	0.07
Solids, Total Suspended	mg/L	1	20	1	ND
Temperature (Field)	Degrees C	0.5	17.0	18.0	19.0
Total Organic Carbon	mg/L	0.5	6.5	13	10
Zinc	mg/L	0.01	0.02	ND	ND
pH (Field)	units	0.1	7.8	7.6	8.3

MDL Method Detection Limit
 ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 2

September 29, 1988
PACE Project Number: 880829600

PACE Sample Number:

Parameter	Units	MDL	300310	300320	300330
			Site A 20500	Site B	Site C 20200
PCB-1016	ug/L	0.1	ND	ND	ND
PCB-1221	ug/L	0.1	ND	ND	ND
PCB-1232	ug/L	0.1	ND	ND	ND
PCB-1242	ug/L	0.1	ND	ND	ND
PCB-1248	ug/L	0.1	ND	ND	ND
PCB-1254	ug/L	0.1	ND	ND	ND
PCB-1260	ug/L	0.1	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 3

September 29, 1988
PACE Project Number: 880829600

Parameter	Units	MDL	300340 Site D 20300	300350 Site E 20400	300360 Site F
1,1,1-Trichloroethane	ug/L	0.50	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.50	ND	ND	ND
1,1-Dichloroethane	ug/L	0.20	ND	ND	ND
1,1-Dichloroethylene	ug/L	0.30	ND	ND	ND
Biochemical Oxygen Demand	mg/L	6	ND	ND	ND
Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	ND	ND	ND
Chloride	mg/L	1	64	58	180
Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col/100 ml	10	ND	ND	100
Copper	mg/L	0.01	ND	ND	ND
Cyanide, Total	mg/L	0.01	ND	ND	ND
Dissolved Oxygen (Field)	mg/L	0.1	8.7	8.8	9.00
Gamma Scan			*	-	*
Gross Alpha	pCi/L		*	-	*
Gross Beta	pCi/L		*	-	*
Methylene chloride	ug/L	3.0	ND	ND	ND
Nickel	mg/L	0.05	ND	ND	ND
Nitrogen, Ammonia	mg/L	0.1	0.1	0.2	0.2
Oil and Grease	mg/L	1	ND	ND	ND
Phosphorus, Ortho	mg/L	0.02	ND	ND	0.03
Phosphorus, Total	mg/L	0.05	ND	ND	0.10
Solids, Total Suspended	mg/L	1	9	ND	38
Temperature (Field)	Degrees C	0.5	17.0	16.0	20.0
Total Organic Carbon	mg/L	0.5	6.6	9.3	11
Zinc	mg/L	0.01	ND	ND	0.01
pH (Field)	units	0.1	8.2	7.9	7.6
PCB-1016	ug/L	0.1	ND	ND	ND
PCB-1221	ug/L	0.1	ND	ND	ND
PCB-1232	ug/L	0.1	ND	ND	ND
PCB-1242	ug/L	0.1	ND	ND	ND
PCB-1248	ug/L	0.1	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 4

September 29, 1988
PACE Project Number: 880829600

PACE Sample Number:

			300340	300350	300360
			Site D	Site E	
<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>20300</u>	<u>20400</u>	<u>Site F</u>
PCB-1254	ug/L	0.1	ND	ND	ND
PCB-1260	ug/L	0.1	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 5

September 29, 1988
PACE Project Number: 880829600

PACE Sample Number:		300370	300380	300390	
Parameter	Units	MDL	Site 4	Site 1	Field Water
1,1,1-Trichloroethane	ug/L	0.50	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.50	ND	ND	ND
1,1-Dichloroethane	ug/L	0.20	ND	ND	ND
1,1-Dichloroethylene	ug/L	0.30	ND	ND	ND
Biochemical Oxygen Demand	mg/L	6	ND	30	ND
Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	ND	100	ND
Chloride	mg/L	1	21	91	ND
Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col/100 ml	10	50	1800	ND
Copper	mg/L	0.01	ND	ND	ND
Cyanide, Total	mg/L	0.01	ND	ND	ND
Dissolved Oxygen (Field)	mg/L	0.1	15.0	12.0	3.1
Methylene chloride	ug/L	3.0	ND	ND	ND
Nickel	mg/L	0.05	ND	ND	ND
Nitrogen, Ammonia	mg/L	0.1	ND	0.1	ND
Oil and Grease	mg/L	1	ND	ND	ND
Phosphorus, Ortho	mg/L	0.02	ND	0.08	ND
Phosphorus, Total	mg/L	0.05	0.05	0.19	ND
Solids, Total Suspended	mg/L	1	2	29	ND
Temperature (Field)	Degrees C	0.5	18.0	20.0	18.0
Total Organic Carbon	mg/L	0.5	9.9	31	1.2
Zinc	mg/L	0.01	ND	0.02	ND
pH (Field)	units	0.1	8.3	8.8	7.8
PCB-1016	ug/L	0.1	ND	ND	ND
PCB-1221	ug/L	0.1	ND	ND	ND
PCB-1232	ug/L	0.1	ND	ND	ND
PCB-1242	ug/L	0.1	ND	ND	ND
PCB-1248	ug/L	0.1	ND	ND	ND
PCB-1254	ug/L	0.1	ND	ND	ND
PCB-1260	ug/L	0.1	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 6

September 29, 1988
PACE Project Number: 880829600

PACE Sample Number:			300400	300410	300460
			DI		
<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>Water</u>	<u>Site 1</u>	<u>Site N</u>
1,1,1-Trichloroethane	ug/L	0.50	ND	ND	-
1,1,2-Trichloroethylene	ug/L	0.50	ND	ND	-
1,1-Dichloroethane	ug/L	0.20	ND	ND	-
1,1-Dichloroethylene	ug/L	0.30	ND	ND	-
Biochemical Oxygen Demand	mg/L	6	ND	ND	-
Cadmium	mg/L	0.01	ND	ND	-
Chemical Oxygen Demand	mg/L	50	ND	ND	-
Chloride	mg/L	1	ND	45	-
Chromium	mg/L	0.05	ND	ND	-
Coliform, Fecal	col/100 ml	10	ND	ND	-
Copper	mg/L	0.01	ND	ND	-
Cyanide, Total	mg/L	0.01	ND	ND	-
Dissolved Oxygen (Field)	mg/L	0.1	1.9	6.9	-
Gamma Scan			*	-	-
Gross Alpha	pCi/L		*	-	-
Gross Beta	pCi/L		*	-	-
Methylene chloride	ug/L	3.0	ND	ND	-
Nickel	mg/L	0.05	ND	ND	-
Nitrogen, Ammonia	mg/L	0.1	ND	0.1	-
Oil and Grease	mg/L	1	ND	ND	-
Phosphorus, Ortho	mg/L	0.02	ND	ND	-
Phosphorus, Total	mg/L	0.05	ND	ND	-
Solids, Total Suspended	mg/L	1	ND	5	-
Temperature (Field)	Degrees C	0.5	20.0	15.0	-
Total Organic Carbon	mg/L	0.5	2.9	11	-
Zinc	mg/L	0.01	ND	ND	-
pH (Field)	units	0.1	7.9	8.3	-
PCB-1016	ug/L	0.1	ND	ND	ND
PCB-1221	ug/L	0.1	ND	ND	ND
PCB-1232	ug/L	0.1	ND	ND	ND
PCB-1242	ug/L	0.1	ND	ND	ND
PCB-1248	ug/L	0.1	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 7

September 29, 1988
PACE Project Number: 880829600

PACE Sample Number:

300400 300410 300460

Parameter

Units

MDL

DI
Water

Site J

Site N

PCB-1254
PCB-1260

ug/L
ug/L

0.1
0.1


ND
ND


ND
ND

ND
ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my direct supervision.


Thomas L. Halverson
Inorganic Chemistry Manager


Sandra A. McDonald
Supervisor

1710 Douglas Drive North Minneapolis, MN 55422 612-644-6643

PROJECT LOCATION: _____ NAME OF CLIENT: **Fed CART** PROJECT TELEPHONE NO.: _____ PROJECT NUMBER: **880829.600**
~~880829~~

ITEM NO.	SAMPLE NO.	TIME	NO OF CONTAINERS	GENERAL	METALS	NITROGEN	CYANIDE	VOLATILES	SULFIDE	GL	SAMPLE DESCRIPTION	TRANSFER NO. & CHECK						
												1	2	3	4	5	6	7
1		1145	11	1	1	1	1	3	3	1	Site J	/						
2		3:50	1							1	Site N	/						
3		9:30	11	1	1	1	1	3	3	1	Field water	/						
4		9:30	12	1	1	1	1	3	3	1	DI WATER	/						
5																		
6																		
7																		
8																		

PERSON RESPONSIBLE FOR SAMPLE COLLECTION		AFFILIATION		TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME
Michael J Nelson		PACE							
DATE	TIME	PURPOSE OF ANALYSIS (use back of front sheet if needed)							
8-29-88	6:00								
ORIGINAL									

laboratories, inc.

CHAIN-OF-CUSTODY RECORD

NO. 9887

1710 Douglas Drive North Minneapolis, MN 55422 812-644-6643

PROJECT LOCATION				NAME OF CLIENT							PROJECT TELEPHONE NO.			PROJECT NUMBER					
				Fed Cartridge										880829.600					
ITEM NO.	SAMPLE NO.	TIME	NO. OF CONTAINERS	GENERAL	METALS	NITROGEN	CYANIDE	VOLATILES	WK, OC	DE, FL	RA	SAMPLE DESCRIPTION	TRANSFER NO. & CHECK						
													1	2	3	4	5	6	7
1		2:15	12	1	1	1	1	3	4	1		20500 (Site A)	/						
2		3:00	12	1	1	1	1	3	4	1		Site B	/						
3		1:00	11	1	1	1	1	3	4			20200 (Site C)	/						
4		12:15	12	1	1	1	1	3	4	1		20300 (Site D)	/						
5		1:15	11	1	1	1	1	3	4			20400 (Site E)	/						
6		10:50	12	1	1	1	1	3	4	1		Site F	/						
7		4:30	11	1	1	1	1	3	4			Site 11 H	/						
8		5:15	11	1	1	1	1	3	4			Site I	/						
PERSON RESPONSIBLE FOR SAMPLE COLLECTION				AFFILIATION							TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME			
Michael J Nelson				B. PALE							1	1-8	Michael J Nelson	[Signature]	8/30/88	9:10			
DATE		TIME																	
8-29-88		6:00																	
PURPOSE OF ANALYSIS (use back of front sheet if needed)																			
ORIGINAL																			

October 17, 1988

Ms. Beverly Erickson
Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Dear Ms. Erickson:

Enclosed please find a copy of our report of laboratory analyses for samples collected August 29, 1988. The samples were collected from NPDES sites around the Twin Cities Army Ammunition plant by PACE Laboratories, Inc. to meet August 1988 requirements.

This is the final report which contains all laboratory analyses including the Gama Scan, Gross Alpha and Gross Beta results. It should take the place of the report received on September 29, 1988.

If you have any questions regarding this report, please do not hesitate to contact us.

Sincerely,

Robert R. Elliott (FOL)

Richard A. Smith
Environmental Technician

Robert R. Elliott

Robert R. Elliott
Field Services Manager

Enclosures

cc: Bridgett Manderfeld, Federal Cartridge Company



REPORT OF LABORATORY ANALYSIS

Offices:
 Minneapolis, Minnesota
 Tampa, Florida
 Coralville, Iowa
 Novato, California

Federal Cartridge Company
 Twin Cities Army Ammunition Plant
 New Brighton, MN 55112

October 17, 1988
 PACE Project Number: 880829600

Attn: Ms. Beverly Erickson

Date Sample(s) Collected: 08/29/88
 Date Sample(s) Received: 08/29/88, 08/30/88

PACE Sample Number:			300310 Site A	300320 Site B	300330 Site C
Parameter	Units	MDL	20500		20200
1,1,1-Trichloroethane	ug/L	0.50	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.50	ND	ND	12
1,1-Dichloroethane	ug/L	0.20	ND	ND	ND
1,1-Dichloroethylene	ug/L	0.30	ND	ND	ND
Biochemical Oxygen Demand	mg/L	6	13	ND	ND
Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	ND	ND	ND
Chloride	mg/L	1	140	110	93
Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col/100 ml	10	2200	50	ND
Copper	mg/L	0.01	ND	ND	ND
Cyanide, Total	mg/L	0.01	ND	ND	ND
Dissolved Oxygen (Field)	mg/L	0.1	8.9	10.6	10.8
Methylene chloride	ug/L	3.0	ND	ND	ND
Nickel	mg/L	0.05	ND	ND	ND
Nitrogen, Ammonia	mg/L	0.1	0.1	0.2	0.3
Oil and Grease	mg/L	1	ND	ND	ND
Phosphorus, Ortho	mg/L	0.02	0.05	0.02	ND
Phosphorus, Total	mg/L	0.05	0.12	0.07	0.07
Solids, Total Suspended	mg/L	1	20	1	ND
Temperature (Field)	Degrees C	0.5	17.0	18.0	19.0
Total Organic Carbon	mg/L	0.5	6.5	13	10
Zinc	mg/L	0.01	0.02	ND	ND
pH (Field)	units	0.1	7.8	7.6	8.3
PCB-1016	ug/L	0.1	ND	ND	ND
PCB-1221	ug/L	0.1	ND	ND	ND
PCB-1232	ug/L	0.1	ND	ND	ND

MDL Method Detection Limit
 ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 2

October 17, 1988
PACE Project Number: 880829600

PACE Sample Number:		300310	300320	300330	
Parameter	Units	MDL	Site A	Site B	Site C
		20500	20500	20200	20200
PCB-1242	ug/L	0.1	ND	ND	ND
PCB-1248	ug/L	0.1	ND	ND	ND
PCB-1254	ug/L	0.1	ND	ND	ND
PCB-1260	ug/L	0.1	ND	ND	ND
Gross Alpha	pCi/L		LT 0.9	LT 0.8	-
Gross Beta	pCi/L		2.6±0.9	2.8±0.9	-
Manganese 54	pCi/L		LT 3.8	LT 3.4	-
Cobalt 60	pCi/L		LT 4.0	LT 4.7	-
Cesium 134	pCi/L		LT 4.2	LT 4.5	-
Cesium 137	pCi/L		LT 4.4	LT 3.8	-

MDL Method Detection Limit
 ND Not detected at or above the MDL.
 LT Less than.

Ms. Beverly Erickson
Page 3

October 17, 1988
PACE Project Number: 880829600

PACE Sample Number:			300340	300350	300360
Parameter	Units	MDL	Site D 20300	Site E 20400	Site F
1,1,1-Trichloroethane	ug/L	0.50	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.50	ND	ND	ND
1,1-Dichloroethane	ug/L	0.20	ND	ND	ND
1,1-Dichloroethylene	ug/L	0.30	ND	ND	ND
Biochemical Oxygen Demand	mg/L	6	ND	ND	ND
Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	ND	ND	ND
Chloride	mg/L	1	64	58	180
Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col/100 ml	10	ND	ND	100
Copper	mg/L	0.01	ND	ND	ND
Cyanide, Total	mg/L	0.01	ND	ND	ND
Dissolved Oxygen (Field)	mg/L	0.1	8.7	8.8	9.00
Methylene chloride	ug/L	3.0	ND	ND	ND
Nickel	mg/L	0.05	ND	ND	ND
Nitrogen, Ammonia	mg/L	0.1	0.1	0.2	0.2
Oil and Grease	mg/L	1	ND	ND	ND
Phosphorus, Ortho	mg/L	0.02	ND	ND	0.03
Phosphorus, Total	mg/L	0.05	ND	ND	0.10
Solids, Total Suspended	mg/L	1	9	ND	38
Temperature (Field)	Degrees C	0.5	17.0	16.0	20.0
Total Organic Carbon	mg/L	0.5	6.6	9.3	11
Zinc	mg/L	0.01	ND	ND	0.01
pH (Field)	units	0.1	8.2	7.9	7.6
PCB-1016	ug/L	0.1	ND	ND	ND
PCB-1221	ug/L	0.1	ND	ND	ND
PCB-1232	ug/L	0.1	ND	ND	ND
PCB-1242	ug/L	0.1	ND	ND	ND
PCB-1248	ug/L	0.1	ND	ND	ND
PCB-1254	ug/L	0.1	ND	ND	ND
PCB-1260	ug/L	0.1	ND	ND	ND

MDL Method Detection Limit
 ND Not detected at or above the MDL.
 LT Less than.

Ms. Beverly Erickson
Page 4

October 17, 1988
PACE Project Number: 880829600

PACE Sample Number:		300340	300350	300360
Parameter	Units	Site D	Site E	Site F
		MDL	MDL	
		20300	20400	
Gross Alpha	pCi/L	LT 0.8	-	1.1±0.9
Gross Beta	pCi/L	2.2±0.9	-	2.9±1.0
Manganese 54	pCi/L	LT 3.9	-	LT 3.8
Cobalt 60	pCi/L	LT 4.8	-	LT 4.1
Cesium 134	pCi/L	LT 3.9	-	LT 4.1
Cesium 137	pCi/L	LT 3.4	-	LT 4.5

MDL Method Detection Limit
LT Less than.

Ms. Beverly Erickson
Page 5

October 17, 1988
PACE Project Number: 880829600

PACE Sample Number:			300370	300380	300390
Parameter	Units	MDL	Site H	Site I	Field Water
1,1,1-Trichloroethane	ug/L	0.50	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.50	ND	ND	ND
1,1-Dichloroethane	ug/L	0.20	ND	ND	ND
1,1-Dichloroethylene	ug/L	0.30	ND	ND	ND
Biochemical Oxygen Demand	mg/L	6	ND	30	ND
Cadmium	mg/L	0.01	ND	ND	ND
Chemical Oxygen Demand	mg/L	50	ND	100	ND
Chloride	mg/L	1	21	91	ND
Chromium	mg/L	0.05	ND	ND	ND
Coliform, Fecal	col/100 ml	10	50	1800	ND
Copper	mg/L	0.01	ND	ND	ND
Cyanide, Total	mg/L	0.01	ND	ND	ND
Dissolved Oxygen (Field)	mg/L	0.1	15.0	12.0	3.1
Methylene chloride	ug/L	3.0	ND	ND	ND
Nickel	mg/L	0.05	ND	ND	ND
Nitrogen, Ammonia	mg/L	0.1	ND	0.1	ND
Oil and Grease	mg/L	1	ND	ND	ND
Phosphorus, Ortho	mg/L	0.02	ND	0.08	ND
Phosphorus, Total	mg/L	0.05	0.05	0.19	ND
Solids, Total Suspended	mg/L	1	2	29	ND
Temperature (Field)	Degrees C	0.5	18.0	20.0	18.0
Total Organic Carbon	mg/L	0.5	9.9	31	1.2
Zinc	mg/L	0.01	ND	0.02	ND
pH (Field)	units	0.1	8.3	8.8	7.8
PCB-1016	ug/L	0.1	ND	ND	ND
PCB-1221	ug/L	0.1	ND	ND	ND
PCB-1232	ug/L	0.1	ND	ND	ND
PCB-1242	ug/L	0.1	ND	ND	ND
PCB-1248	ug/L	0.1	ND	ND	ND
PCB-1254	ug/L	0.1	ND	ND	ND
PCB-1260	ug/L	0.1	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 6

October 17, 1988
PACE Project Number: 880829600

PACE Sample Number:			300400	300410	300460
<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>DI Water</u>	<u>Site J</u>	<u>Site N</u>
1,1,1-Trichloroethane	ug/L	0.50	ND	ND	-
1,1,2-Trichloroethylene	ug/L	0.50	ND	ND	-
1,1-Dichloroethane	ug/L	0.20	ND	ND	-
1,1-Dichloroethylene	ug/L	0.30	ND	ND	-
Biochemical Oxygen Demand	mg/L	6	ND	ND	-
Cadmium	mg/L	0.01	ND	ND	-
Chemical Oxygen Demand	mg/L	50	ND	ND	-
Chloride	mg/L	1	ND	45	-
Chromium	mg/L	0.05	ND	ND	-
Coliform, Fecal	col/100 ml	10	ND	ND	-
Copper	mg/L	0.01	ND	ND	-
Cyanide, Total	mg/L	0.01	ND	ND	-
Dissolved Oxygen (Field)	mg/L	0.1	1.9	6.9	-
Methylene chloride	ug/L	3.0	ND	ND	-
Nickel	mg/L	0.05	ND	ND	-
Nitrogen, Ammonia	mg/L	0.1	ND	0.1	-
Oil and Grease	mg/L	1	ND	ND	-
Phosphorus, Ortho	mg/L	0.02	ND	ND	-
Phosphorus, Total	mg/L	0.05	ND	ND	-
Solids, Total Suspended	mg/L	1	ND	5	-
Temperature (Field)	Degrees C	0.5	20.0	15.0	-
Total Organic Carbon	mg/L	0.5	2.9	11	-
Zinc	mg/L	0.01	ND	ND	-
pH (Field)	units	0.1	7.9	8.3	-
PCB-1016	ug/L	0.1	ND	ND	ND
PCB-1221	ug/L	0.1	ND	ND	ND
PCB-1232	ug/L	0.1	ND	ND	ND
PCB-1242	ug/L	0.1	ND	ND	ND
PCB-1248	ug/L	0.1	ND	ND	ND
PCB-1254	ug/L	0.1	ND	ND	ND
PCB-1260	ug/L	0.1	ND	ND	ND
Gross Alpha	pCi/L		0.5±0.3	-	-

MDL Method Detection Limit
 ND Not detected at or above the MDL.
 LT Less than.

Ms. Beverly Erickson
Page 7

October 17, 1988
PACE Project Number: 880829600

PACE Sample Number:		300400	300410	300460	
Parameter	Units	MDL	Water	Site J	Site N
Gross Beta	pCi/L	LT 0.8	-	-	-
Manganese 54	pCi/L	LT 4.0	-	-	-
Cobalt 60	pCi/L	LT 4.5	-	-	-
Cesium 134	pCi/L	LT 4.4	-	-	-
Cesium 137	pCi/L	LT 4.6	-	-	-

MDL Method Detection Limit
LT Less than.

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my direct supervision.

Peggy F. Gaskill for

Thomas L. Halverson
Inorganic Chemistry Manager

Susan D. Max

Susan D. Max
Assistant Director of Analytical Services

1710 Douglas Drive North Minneapolis, MN 55422 612-544-5543

PROJECT LOCATION	NAME OF CLIENT	PROJECT TELEPHONE NO.	PROJECT NUMBER
	Fed CARtridge		880829.600

ITEM NO.	SAMPLE NO.	TIME	NO. OF CONTAINERS	GENERAL	METALS	NITROGEN	CYANIDE	VOLATILES	W/S, OC	O/S, G/L	RA	SAMPLE DESCRIPTION	TRANSFER NO. & CHECK							
													1	2	3	4	5	6	7	
1		2:15	12	1	1	1	1	3	4	1		20500 (Site A)	/							
2		3:00	12	1	1	1	1	3	4	1		Site B	/							
3		1:00	11	1	1	1	1	3	4			20200 (Site C)	/							
4		12:15	12	1	1	1	1	3	4	1		20300 (Site D)	/							
5		1:15	11	1	1	1	1	3	4			20400 (Site E)	/							
6		10:50	12	1	1	1	1	3	4	1		Site F	/							
7		4:30	11	1	1	1	1	3	4			Site 11 H	/							
8		5:15	11	1	1	1	1	3	4			Site I	/							

PERSON RESPONSIBLE FOR SAMPLE COLLECTION	AFFILIATION	TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME
Michael J Nelson	B. PACE	1	1-8	Michael J Nelson	MJN	8/20/88	9:00
DATE	TIME	2					
8-29-88	6:00 6:00	3					
PURPOSE OF ANALYSIS (use back of front sheet if needed)		4					
		5					
		6					
		7					

ORIGINAL

3
4
5
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1710 Douglas Drive North Minneapolis, MN 55422 612-544-5543

PROJECT LOCATION: NAME OF CLIENT: PROJECT TELEPHONE NO.: PROJECT NUMBER: **880829.600**

Fed CART

ITEM NO.	SAMPLE NO.	TIME	NO. OF CONTAINERS	GENERAL	METALS	NITROGEN	CYANIDE	VOLATILES	WV% OC	GL	SAMPLE DESCRIPTION	TRANSFER NO. & CHECK						
												1	2	3	4	5	6	7
1		1145	11	1	1	1	1	3	3	1	Site J	/						
2		3:50	1							1	Site N	/						
3		9:30	11	1	1	1	1	3	3	1	Field water	/						
4		9:30	12	1	1	1	1	3	3	1	DI WATER	/						
5																		
6																		
7																		
8																		

PERSON RESPONSIBLE FOR SAMPLE COLLECTION		AFFILIATION		TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME
Michael J Nelson		PAC		1	1-4	Michael J Nelson	MJC	8/20/88	9:00
DATE	TIME			2					
8-29-88	6:00			3					
PURPOSE OF ANALYSIS (use back of front sheet if needed)				4					
				5					
				6					
				7					

ORIGINAL

November 04, 1988

Ms. Beverly Erickson
Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Dear Ms. Erickson:

Enclosed please find a copy of our report of laboratory analyses for samples collected October 19, 1988. The samples were collected from NPDES sites around the Twin Cities Army Ammunition plant by PACE Laboratories, Inc. to meet October, 1988 requirements.

The dissolved oxygen, pH and discharge volumes were measured at each site. The dissolved oxygen and pH results are shown on the enclosed laboratory report. The daily discharge volume at each site was as follows:

<u>Location</u>	<u>Discharge Volume (GPD)</u>
Point A 20500	*
Point C 20200	10,800
Point D 20300	2,100
Point E 20400	14,100
Point F 20800	518,400
Point G 20100	Dry
Point P 21600	No Flow

*Less than 0.01 head, did not sample

If you have any questions regarding this report, please do not hesitate to contact us.

Sincerely,



Richard A. Smith
Environmental Technician



Robert R. Elliott
Field Services Manager

RAS:RRE/jb

cc: Bridgette Manderfeld, Federal Cartridge Company

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

October 28, 1988
PACE Project Number: 881019600

Attn: Ms. Beverly Erickson

October NPDES

Date Sample(s) Collected: 10/19/88
Date Sample(s) Received: 10/19/88

PACE Sample Number: .

Parameter	Units	MDL	382480	382490	382500
			Field Blank	DI Blank	Point C 20200
pH (Field)	units	0.1	8.1	8.1	8.1
Dissolved Oxygen (Field)	mg/L	0.1	9.6	9.6	10.6
Solids, Total Suspended	mg/L	1	ND	ND	ND
Oil and Grease	mg/L	2	ND	ND	ND
Chloride	mg/L	1	ND	ND	550
Phosphorus, Total	ug/L	9.36	ND	ND	120
Phosphorus, Ortho	ug/L	10	12.6 ✓	10.7 ✓	42.4

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 2

October 28, 1988
PACE Project Number: 881019600

PACE Sample Number:

Parameter	Units	MDL	382510	382520	382530
			Point D	Point E	Point F
			20300	20400	20800
pH (Field)	units	0.1	8.2	7.8	7.5
Dissolved Oxygen (Field)	mg/L	0.1	10.2	10.0	11.8
Solids, Total Suspended	mg/L	1	ND	ND	3
Oil and Grease	mg/L	2	ND	ND	ND
Chloride	mg/L	1	57	110	920
Phosphorus, Total	ug/L	9.36	30.6	40.0	40.1
Phosphorus, Ortho	ug/L	10	15.1	27.0	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 3

October 28, 1988
PACE Project Number: 881019600

PACE Sample Number:

382540
Point P
21600

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>21600</u>
pH (Field)	units	0.1	7.6
Dissolved Oxygen (Field)	mg/L	0.1	9.0
Solids, Total Suspended	mg/L	1	52
Oil and Grease	mg/L	2	ND
Chloride	mg/L	1	22
Phosphorus, Total	ug/L	9.36	90.9
Phosphorus, Ortho	ug/L	10	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my direct supervision.


Thomas L. Halverson
Inorganic Chemistry Manager

1710 Douglas Drive North Minneapolis, MN 55422 612-544-5543

PROJECT LOCATION TLAAI	NAME OF CLIENT Federal Cartridge Inc	PROJECT TELEPHONE NO.	PROJECT NUMBER 88/019-600
----------------------------------	--	-----------------------	-------------------------------------

ITEM NO.	SAMPLE NO.	TIME	NO. OF CONTAINERS	GENERAL	METALS	NITROGEN	CYANIDE	VOLATILES	OK	SAMPLE DESCRIPTION	TRANSFER NO. & CHECK						
											1	2	3	4	5	6	7
1		1000	2	1		1			1	FIELD DE	-						
2		1000	2	1		1			1	DE 17400	-						
3		1125	2	1		1			1	Site P	-						
4		1150	2	1		1			1	Site C	-						
5		1205	2	1		1			1	Site D	-						
6		1220	2	1		1			1	Site E	-						
7		1205	2	1		1			1	Site F	-						
8																	

PERSON RESPONSIBLE FOR SAMPLE COLLECTION Dan Youngblom		AFFILIATION PACE		TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME
DATE 10/19/88	TIME 1450	1	1-7	D. Youngblom	MJC	0-19-88			
PURPOSE OF ANALYSIS (use back of front sheet if needed)				2					
				3					
				4					
				5					
				6					
ORIGINAL				7					

1710 Douglas Drive North □ Minneapolis, MN 55422 □ Phone (612) 544-5543 □ FAX (612) 544-3974

December 9, 1988

Ms. Beverly Erickson
Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Dear Ms. Erickson:

Enclosed please find a copy of our report of laboratory analyses for samples collected November 10, 1988. The samples were collected from NPDES sites around the Twin Cities Army Ammunition plant by PACE Laboratories, Inc. to meet November, 1988 requirements.

The dissolved oxygen, pH and discharge volumes were measured at each site. The dissolved oxygen and pH results are shown on the enclosed laboratory report. The daily discharge volume at each site as follow:

<u>Location</u>	<u>Discharging Volume (GPD)</u>
Point A 20500	520
Point B 20700	2,154,200
Point C 20200	6,500
Point D 20300	2,100
Point E 20400	19,300
Point F 20800	2,423,520
Point G 20100	No Flow
Point H 20900	915,800
Point I 21000	5,848,800
Point J 21100	22,200
Point K 21200	No Flow
Point L 21300	No Flow
Point M 21400	No Flow
Point P 21600	No Flow

PACE Laboratories, Inc.

December 9, 1988

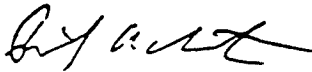
-2-

Ms. Beverly Erickson
Federal Cartridge Company

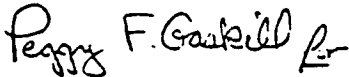
This report contains all the laboratory analyses with the exception of the Gama Scan, Gross Alpha and Gross Beta Results. These will be forwarded to as soon as they are available.

If you have any questions regarding this report, please do not hesitate to contact us.

Sincerely,



Richard A. Smith
Environmental Technician



Robert A. Elliott
Manager, Field Services

cc: Bridgette Manderfeld, Federal Cartridge Company



REPORT OF LABORATORY ANALYSIS

Offices:
 Minneapolis, Minnesota
 Tampa, Florida
 Coralville, Iowa
 Novato, California

Federal Cartridge Company
 Twin Cities Army Ammunition Plant
 New Brighton, MN 55112

December 09, 1988
 PACE Project Number: 881104602

Attn: Ms. Beverly Erickson

NPDES Nov. 88

Date Sample(s) Collected: 11/10/88
 Date Sample(s) Received: 11/10/88

PACE Sample Number:

Parameter	Units	MDL	406470 20500	406480 20700	406490 20200
pH (Field)	units	0.1	7.6	7.5	8.3
Dissolved Oxygen (Field)	mg/L	0.1	10.9	10.0	10.6
Total Organic Carbon	mg/L	0.5	430	450	41
Solids, Total Suspended	mg/L	1	ND	4	ND
Oil and Grease	mg/L	1	ND	9	9
Chloride	mg/L	1	370	48	89
Chemical Oxygen Demand	mg/L	50	ND	ND	ND
Biochemical Oxygen Demand	mg/L	6	ND	7	7
Coliform, Fecal	col/100 ml	10	400	140	40
Nitrogen, Ammonia	mg/L	0.1	0.1	ND	ND
Chromium	ug/L	2.50	ND	ND	ND
Cadmium	ug/L	0.370	ND	ND	ND
Copper	ug/L	1.56	1.80	ND	ND
Nickel	ug/L	5.32	ND	ND	ND
Cyanide, total	ug/L	8.17	ND	ND	11.4
Zinc	ug/L	25.0	32.1	ND	ND
Phosphorus, total	ug/L	9.36	69.1	91.0	42.4
Phosphorus, ortho	ug/L	10.3	41.4	ND	22.4
Methylene chloride	ug/L	3.20	ND	ND	ND
1,1-Dichloroethylene	ug/L	1.00	ND	ND	ND
1,1-Dichloroethane	ug/L	0.780	ND	ND	ND
1,1,1-Trichloroethane	ug/L	1.00	ND	ND	ND
Trichloroethylene	ug/L	0.500	ND	ND	3.73

MDL Method Detection Limit
 ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 2

December 09, 1988
PACE Project Number: 881104602

PACE Sample Number: <u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>406500</u> <u>20300</u>	<u>406510</u> <u>20400</u>	<u>406520</u> <u>20800</u>
pH (Field)	units	0.1	8.3	7.9	7.6
Dissolved Oxygen (Field)	mg/L	0.1	10.8	10.2	9.4
Total Organic Carbon	mg/L	0.5	480	35	310
Solids, Total Suspended	mg/L	1	ND	ND	4
Oil and Grease	mg/L	1	5	27	ND
Chloride	mg/L	1	60	54	71
Chemical Oxygen Demand	mg/L	50	ND	ND	ND
Biochemical Oxygen Demand	mg/L	6	ND	ND	6
Coliform, Fecal	col/100 ml	10	ND	ND	20
Nitrogen, Ammonia	mg/L	0.1	ND	0.2	ND
Chromium	ug/L	2.50	ND	ND	ND
Cadmium	ug/L	0.370	ND	ND	ND
Copper	ug/L	1.56	ND	ND	ND
Nickel	ug/L	5.32	ND	ND	ND
Cyanide, total	ug/L	8.17	38.5	ND	ND
Zinc	ug/L	25.0	ND	ND	ND
Phosphorus, total	ug/L	9.36	30.1	43.8	63.7
Phosphorus, ortho	ug/L	10.3	27.4	22.1	29.2
Methylene chloride	ug/L	3.20	ND	ND	ND
1,1-Dichloroethylene	ug/L	1.00	ND	ND	ND
1,1-Dichloroethane	ug/L	0.780	ND	ND	ND
1,1,1-Trichloroethane	ug/L	1.00	ND	ND	ND
Trichloroethylene	ug/L	0.500	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 3

December 09, 1988
PACE Project Number: 881104602

PACE Sample Number: <u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>406530</u> <u>20100</u>	<u>406540</u> <u>20900</u>	<u>406550</u> <u>21000</u>
pH (Field)	units	0.1	7.3	7.8	7.9
Dissolved Oxygen (Field)	mg/L	0.1	5.0	11.4	11.2
Total Organic Carbon	mg/L	0.5	360	450	12
Solids, Total Suspended	mg/L	1	32	1	8
Oil and Grease	mg/L	1	ND	ND	ND
Chloride	mg/L	1	38	30	90
Chemical Oxygen Demand	mg/L	50	58	ND	ND
Biochemical Oxygen Demand	mg/L	6	7	7	7
Coliform, Fecal	col/100 ml	10	300	10	ND
Nitrogen, Ammonia	mg/L	0.1	0.5	ND	0.1
Chromium	ug/L	2.50	ND	ND	ND
Cadmium	ug/L	0.370	ND	ND	ND
Copper	ug/L	1.56	3.55	ND	ND
Nickel	ug/L	5.32	ND	ND	ND
Cyanide, total	ug/L	8.17	ND	25.0	ND
Zinc	ug/L	25.0	207	ND	ND
Phosphorus, total	ug/L	66	130	160	140
Phosphorus, ortho	ug/L	10.3	52.0	110	ND
Methylene chloride	ug/L	3.20	ND	ND	ND
1,1-Dichloroethylene	ug/L	1.00	ND	ND	ND
1,1-Dichloroethane	ug/L	0.780	ND	ND	ND
1,1,1-Trichloroethane	ug/L	1.00	ND	ND	ND
Trichloroethylene	ug/L	0.500	ND	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 4

December 09, 1988
PACE Project Number: 881104602

PACE Sample Number: <u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>406560</u> <u>21100</u>	<u>406570</u> <u>21600</u>	<u>406580</u> <u>DI Blank</u>
Dissolved Oxygen (Field)	mg/L	0.1	-	13.3	-
pH (Field)	units	0.1	7.8	7.9	5.5
Dissolved Oxygen (Field)	mg/L	0.1	11.0	-	7.6
Total Organic Carbon	mg/L	0.5	630	-	33
Chloride	mg/L	1	-	30	-
Oil and Grease	mg/L	1	-	4	-
Phosphorus,ortho	ug/L	10.3	-	15.0	-
Phosphorus,total	ug/L	9.36	-	38.1	-
Solids, Total Suspended	mg/L	1	ND	5	ND
Oil and Grease	mg/L	1	ND	-	ND
Chloride	mg/L	1	54	-	ND
Chemical Oxygen Demand	mg/L	50	ND	-	ND
Biochemical Oxygen Demand	mg/L	6	ND	-	6
Coliform, Fecal	col/100 ml	10	ND	-	ND
Nitrogen, Ammonia	mg/L	0.1	ND	-	ND
Chromium	ug/L	2.50	ND	-	ND
Cadmium	ug/L	0.370	ND	-	ND
Copper	ug/L	1.56	ND	-	ND
Nickel	ug/L	5.32	ND	-	ND
Cyanide, total	ug/L	8.17	8.66	-	11.4
Zinc	ug/L	25.0	ND	-	ND
Phosphorus,total	ug/L	9.36	18.0	-	ND
Phosphorus,ortho	ug/L	10.3	12.0	-	ND
Methylene chloride	ug/L	3.20	ND	-	ND
1,1-Dichloroethylene	ug/L	1.00	ND	-	ND
1,1-Dichloroethane	ug/L	0.780	ND	-	ND
1,1,1-Trichloroethane	ug/L	1.00	ND	-	ND
Trichloroethylene	ug/L	0.500	ND	-	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 5

December 09, 1988
PACE Project Number: 881104602

PACE Sample Number:

406590

Field

Blank

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>Blank</u>
pH (Field)	units	0.1	5.5
Dissolved Oxygen (Field)	mg/L	0.1	7.6
Total Organic Carbon	mg/L	0.5	50
Solids, Total Suspended	mg/L	1	ND
Oil and Grease	mg/L	1	ND
Chloride	mg/L	1	ND
Chemical Oxygen Demand	mg/L	50	ND
Biochemical Oxygen Demand	mg/L	6	ND
Coliform, Fecal	col/100 ml	10	ND
Nitrogen, Ammonia	mg/L	0.1	0.1
Chromium	ug/L	2.50	ND
Cadmium	ug/L	0.370	ND
Copper	ug/L	1.56	ND
Nickel	ug/L	5.32	ND
Cyanide, total	ug/L	8.17	ND
Zinc	ug/L	25.0	ND
Phosphorus, total	ug/L	9.36	ND
Phosphorus, ortho	ug/L	10.3	ND
Methylene chloride	ug/L	3.20	ND
1,1-Dichloroethylene	ug/L	1.00	ND
1,1-Dichloroethane	ug/L	0.780	ND
1,1,1-Trichloroethane	ug/L	1.00	ND
Trichloroethylene	ug/L	0.500	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

1710 Douglas Drive North Minneapolis, MN 55422 612-544-5543

PROJECT LOCATION				NAME OF CLIENT								PROJECT TELEPHONE NO.			PROJECT NUMBER				
TCAA1				Fed Car											881104-602 603				
ITEM NO.	SAMPLE NO.	TIME	NO. OF CONTAINERS	GENERAL	METALS	NITROGEN	CYANIDE	VOLATILES	K ₂ SO ₄	OTC	PA	SAMPLE DESCRIPTION	TRANSFER NO. & CHECK						
													1	2	3	4	5	6	7
1		0870	12	1	1	2	1	4	1	1	1	DF Blank	/						
2		0830	11	1	1	2	1	4	1	1		Field DF	/						
3		625	12	1	1	2	1	4	1	1	1	Point D	/						
4		647	11	1	1	2	1	4	1	1		Point C	/						
5		1110	11	1	1	2	1	4	1	1		Point J	/						
6		1100	12	1	1	2	1	4	1	1	1	Point B	/						
7		1205	12	1	1	2	1	4	1	1	1	Point G	/						
8		1230	11	1	1	2	1	4	1	1	1	Point K	/						

PERSON RESPONSIBLE FOR SAMPLE COLLECTION		AFFILIATION		TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME
Rick Youngblom		PACE		1	18	<i>[Signature]</i>	MJC	11-10-88	
DATE	TIME			2					
11/10/88	1215			3					
PURPOSE OF ANALYSIS (use back of front sheet if needed)				4					
				5					
				6					
				7					

ORIGINAL

1710 Douglas Drive North □ Minneapolis, MN 55422 □ Phone (612) 544-5543 □ FAX (612) 544-3974

December 16, 1988

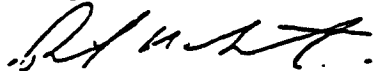
Ms. Beverly Erickson
Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Dear Ms. Erickson:

Enclosed you will find the results for the Gamm Scan, Gross Alpha and Gross Beta analysis of the NPDES samples collected on November 10, 1988. This report is an addition to the report sent to you on December 9, 1988.

If you have any questions regarding this report, please do not hesitate to contact us.

Sincerely,



Richard A. Smith
Environmental Technician



Robert R. Elliott
Manager, Field Services

cc: Bridgette Manderfeld, Federal Cartridge Company



REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

December 22, 1988
PACE Project Number: 881104603

Attn: Ms. Beverly Erickson

NPOES Nov. 88 Rad.

Date Sample(s) Collected: 11/10/88
Date Sample(s) Received: 11/10/88

PACE Sample Number: .

Parameter	Units	MDL	406600	406610	406620
			20500	20700	20300
Gamma Scan	pCi/L		ND	ND	ND
Gross Alpha	pCi/L		60.0±21.8	3.4±5.6	0.0±6.5
Gross Beta	pCi/L		49.5±19.3	1.0±4.7	0.0±8.2

MDL Method Detection Limit
ND Not detected at or above the MDL.

Ms. Beverly Erickson
Page 2

December 22, 1988
PACE Project Number: 881104603

PACE Sample Number: Parameter	Units	MDL	406630 20800	406640 20100	406650 DI Blank
Gamma Scan	pCi/L		ND	ND	ND
Gross Alpha	pCi/L		1.5±5.0	4.3±6.5	0.7±1.7
Gross Beta	pCi/L		2.9±7.7	7.8±5.5	0.0±3.2

MDL Method Detection Limit
ND Not detected at or above the MDL.

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my direct supervision.

Thomas L. Halverson for

Thomas L. Halverson
Inorganic Chemistry Manager



REPORT OF LABORATORY ANALYSIS

Offices
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California

January 03, 1989

Ms. Beverly Erickson
Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

Dear Ms. Erickson:

Enclosed please find a copy of our report of laboratory analyses for samples collected December 5, 1988. The samples were collected from NPDES sites around the Twin Cities Army Ammunition plant by PACE Laboratories, Inc. to meet December, 1988 requirements.

The dissolved oxygen, pH and discharge volumes were measured at each site. The dissolved oxygen and pH results are shown on the enclosed laboratory report. The daily discharge volume at each site as follows:

<u>Location</u>	<u>Discharge Volume (GPD)</u>
Point A 20500	8,100
Point C 20200	25,100
Point D 20300	5,100
Point E 20400	79,700
Point F 20800	2,584,800
Point G 20100	Frozen
Point P 21600	6,400

If you have any questions concerning this report, please do not hesitate to contact us.

Sincerely,

Richard A. Smith
Environmental Technician

Robert R. Elliott
Manager, Field Services

RAS:RRE/tjt

cc: Bridgette Manderfeld, Federal Cartridge Company



REPORT OF LABORATORY ANALYSIS

Offices
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

January 03, 1989
PACE Project Number: 881205605

Attn: Ms. Beverly Erickson

NPDES Dec. 88

Date Sample(s) Collected: 12/05/88
Date Sample(s) Received: 12/06/88

PACE Sample Number:

Parameter	Units	MDL	432180	432190	432200
			Point A 20500	Point C 20200	Point D 20300
pH (Field)	units	0.1	7.7	8.3	8.3
Dissolved Oxygen (Field)	mg/L	0.1	11.3	11.6	11.2
Solids, Total Suspended	mg/L	1	2	4	ND
Oil and Grease	mg/L	1	ND	ND	ND
Chloride	mg/L	1	260	74	60
Phosphorus, Total	ug/L	9.36	92.6	250	64.2
Phosphorus, Ortho	ug/L	10.3	17.0	130	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.



REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coraville, Iowa
Novato, California

Ms. Beverly Erickson
Page 2

January 03, 1989
PACE Project Number: 881205605

PACE Sample Number:

Parameter	Units	MDL	432210	432220	432230
			Point E	Point F	Point P
			20400	20800	21600
pH (Field)	units	0.1	7.8	7.8	7.4
Dissolved Oxygen (Field)	mg/L	0.1	9.9	10.8	11.0
Solids, Total Suspended	mg/L	1	2	ND	24
Oil and Grease	mg/L	1	ND	22	6
Chloride	mg/L	1	42	77	190
Phosphorus, Total	ug/L	9.36	45.1	63.7	26.2
Phosphorus, Ortho	ug/L	10.3	23.4	38.1	10.8

MDL Method Detection Limit
ND Not detected at or above the MDL.



REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa
Novato, California

Ms. Beverly Erickson
Page 3


January 03, 1989
PACE Project Number: 881205605

PACE Sample Number: 432240 432250

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>Field Water</u>	<u>DI Water</u>
pH (Field)	units	0.1	7.3	7.3
Dissolved Oxygen (Field)	mg/L	0.1	10.0	3.0
Solids, Total Suspended	mg/L	1	ND	ND
Oil and Grease	mg/L	1	ND	ND
Chloride	mg/L	1	ND	ND
Phosphorus, Total	ug/L	9.36	ND	ND
Phosphorus, Ortho	ug/L	10.3	ND	ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

The data contained in this report were obtained using EPA or other approved methodologies. All analyses were performed by me or under my direct supervision.


Thomas L. Halverson
Inorganic Chemistry Manager

1710 Douglas Drive North Minneapolis, MN 55422 612-544-5543

PROJECT LOCATION: _____ NAME OF CLIENT: **Federal Cartridge** PROJECT TELEPHONE NO.: _____ PROJECT NUMBER: _____

ITEM NO	SAMPLE ID	TIME	NO. OF CONTAINERS	GENERAL	METALS	NITROGEN	CYANIDE	VOLATILES	OG	SAMPLE DESCRIPTION	TRANSFER NO. & CHECK						
											1	2	3	4	5	6	7
1		1450	3	1		1			1	Point A 20500	/						
2		1400	3	1		1			1	Point C 20200	/						
3		1345	3	1		1			1	Point D 20300	/						
4		1510	3	1		1			1	Point E 20400	/						
5		1310	3	1		1			1	Point F 20800	/						
6		1430	3	1		1			1	Point P 21600	/						
7			3	1		1			1	Field Water	/						
8			3	1		1			1	DI Water	/						

PERSON RESPONSIBLE FOR SAMPLE COLLECTION		AFFILIATION		TRANSFER NUMBER	ITEM NUMBER	TRANSFERS RELINQUISHED BY	ACCEPTED BY	DATE	TIME
Michael J Nelson		PACE		1	1-8	Michael J Nelson			
DATE	TIME			2					
12-5-88				3					
PURPOSE OF ANALYSIS (use back of front sheet if none)				4					
				5					
				6					
				7					

ORIGINAL



REPORT OF LABORATORY ANALYSIS

Offices:
Minneapolis, Minnesota
Tampa, Florida
Coralville, Iowa

Federal Cartridge Company
Twin Cities Army Ammunition Plant
New Brighton, MN 55112

June 16, 1988
PACE Project Number: 880406559

Attn: Ms. Paula Connell

Date Sample(s) Collected: 04/12/88
Date Sample(s) Received: 04/12/88

PACE Sample Number:

811500 811510 811520
AMV001 AMV002 AMV003
SW030 SW059 SW031

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>SW030</u>	<u>SW059</u>	<u>SW031</u>
Hardness, Total	mg/L	1	155	280	155

MDL Method Detection Limit

Ms. Paula Connell
Page 2

June 16, 1988
PACE Project Number: 880406559

PACE Sample Number:

Parameter

Units

MDL

811530

AMV004

SW032

811540

AMV005

SW062

811550

AMV006

SW033

Hardness, Total

mg/L

1

324

689

543

MDL Method Detection Limit

Ms. Paula Connell
Page 3

June 16, 1988
PACE Project Number: 880406559

PACE Sample Number:

Parameter

Units

MDL

811560

AMV007

SH052

811570

AMV008

SH056

811580

AMV009

SH035

Hardness, Total

mg/L

1

320

94.5

73.4

MDL Method Detection Limit

Ms. Paula Connell
Page 4

June 16, 1988
PACE Project Number: 880406559

PACE Sample Number:

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>811590 AMV010 SH034</u>	<u>811600 AMV011 SH042</u>	<u>811610 AMV012 SH029</u>
Hardness, Total	mg/L	1	131	54.3	398

MDL Method Detection Limit

Ms. Paula Connell
Page 2

June 20, 1988
PACE Project Number: 880406557

PACE Sample Number:

Parameter	Units	MDL	810230	810240	810250
			AMP004 SW031	AMP005 SW032	AMP006 SW062
Gross Alpha	pci/L		<0.6	<1.2	<2.4
Gross Beta	pci/L		3.7±1.2	7.0±1.5	4.6±1.5

MDL Method Detection Limit

Ms. Paula Connell
Page 27

June 16, 1988
PACE Project Number: 880406552

PACE Sample Number:

803480 803490 803500

ALY010 ALY011 ALY012

Parameter

Units

MDL

011108

011527

SW030

Arsenic

ug/L

6.01

ND

ND

ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

Ms. Paula Connell
Page 28

June 16, 1988
PACE Project Number: 880406552

PACE Sample Number:

803510	803520	803530
ALY013	ALY014	ALY015
SW059	SW031	SW032

Parameter

Units

MDL

Arsenic

ug/L

6.01

ND

ND

ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

Ms. Paula Connell
Page 29

June 16, 1988
PACE Project Number: 880406552

PACE Sample Number:

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>803540 ALY016 SW062</u>	<u>803550 ALY017 SW033</u>	<u>803560 ALY018 SW052</u>
Arsenic	ug/L	6.01	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

Ms. Paula Connell
Page 30

June 16, 1988
PACE Project Number: 880406552

PACE Sample Number:

Parameter

Units

MDL

803570

ALY019

SW056

803580

ALY020

SW035

803590

ALY021

SW034

Arsenic

ug/L

6.01

ND

ND

ND

ND
MDL

Not detected at or above the MDL.
Method Detection Limit

Ms. Paula Connell
Page 31

June 16, 1988
PACE Project Number: 880406552

PACE Sample Number:

803600	803610	803620
ALY022	ALY023	ALY001
SW042	SW029	METHOD BLK

Parameter

Units

MDL

Arsenic

ug/L

6.01

ND

ND

ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406552

PACE Sample Number:

Parameter

Units

MDL

804770
ANB004
0111527

804780
ANB005
SH030

804790
ANB006
SH059

Barium

ug/L

9.10

420

69.3

141

MDL Method Detection Limit

Ms. Paula Connell
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June 16, 1988
PACE Project Number: 880406552

PACE Sample Number:

804800 804810 804820
ANB007 ANB008 ANB009

Parameter

Units

MDL

SW031

SW032

SW062

Barium

ug/L

9.10

67.1

117

330

MDL Method Detection Limit

Ms. Paula Connell
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June 16, 1988
PACE Project Number: 880406552

PACE Sample Number:

804830 804840 804850
ANB010 ANB011 ANB012

Parameter

Units

MDL

SW033

SW052

SW056

Barium

ug/L

9.10

120

83.9

36.3

MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406552

PACE Sample Number:

Parameter

Units

MDL

804860
ANB013
SW035

804870
ANB014
SW034

804880
ANB015
SW042

Barium

ug/L

9.10

39.6

67.8

48.0

MDL

Method Detection Limit

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June 16, 1988
PACE Project Number: 880406552

PACE Sample Number:

Parameter

Units

MDL

804890
ANB016
SW029

804900
ANB001
METHOD BLK

804910
LOW SPIKE
TRUE VALUE

Barium

ug/L

9.10

169

ND

20.0

MDL
ND

Method Detection Limit
Not detected at or above the MDL.

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June 16, 1988
PACE Project Number: 880406559

PACE Sample Number:

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>811620 AMW001 SW030</u>	<u>811630 AMW002 SW059</u>	<u>811640 AMW003 SW031</u>
Chromium, Hexavalent	ug/L	5.18	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406559

PACE Sample Number:

Parameter

Units

MDL

811650
AMW004
SH032

811660
AMW005
SH062

811670
AMW006
SH033

Chromium, Hexavalent

ug/L

5.18

ND

ND

ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406559

PACE Sample Number:

811680	811690	811700
AMW07	AMW08	AMW09
SW052	SW056	SW035

Parameter

Units

MDL

SW052

SW056

SW035

Chromium, Hexavalent

ug/L

5.18

ND

ND

ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406559

PACE Sample Number:		811710	811720	811730
<u>Parameter</u>	<u>Units</u>	<u>AMW010</u>	<u>AMW011</u>	<u>AMW012</u>
		<u>SH034</u>	<u>SH042</u>	<u>SH029</u>
Chromium, Hexavalent	ug/L	5.18	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406560

PACE Sample Number:

807130	807140	807150
AMS004	AMS005	AMS006
<u>SW031</u>	<u>SW032</u>	<u>SW062</u>

Parameter

Units

MDL

Chromium

ug/L

2.50

ND

ND

ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406560

PACE Sample Number: -

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>807160 AMS007 SW033</u>	<u>807170 AMS008 SW052</u>	<u>807180 AMS009 SW056</u>
Chromium	ug/L	2.50	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406560

PACE Sample Number:			807190	807200	807210
<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>AMS010</u>	<u>AMS011</u>	<u>AMS012</u>
			<u>SH035</u>	<u>SH034</u>	<u>SH042</u>
Chromium	ug/L	2.50	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406560

PACE Sample Number:

	807220	807230	807240		
<u>Parameter</u>	<u>AMS013</u>	<u>AMS001</u>	<u>LOW SPIKE</u>		
	<u>MDL</u>	<u>SW029</u>	<u>METHOD BLK</u>	<u>TRUE VALUE</u>	
Chromium	ug/L	2.50	ND	ND	5.00

ND Not detected at or above the MDL.
MDL Method Detection Limit



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June 16, 1988

PACE Project Number: 880406560

PACE Sample Number:

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>805880 AMA016 0111108</u>	<u>805890 AMA017 0111527</u>	<u>805900 AMA018 SH030</u>
Cadmium	ug/L	0.37	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

EE
Laboratories, Inc.

REPORT OF LABORATORY ANALYSIS

Offices:
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June 16, 1988
PACE Project Number: 880406560

PACE Sample Number:

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>805910 AMA019 SW059</u>	<u>805920 AMA003 METHOD BLK</u>	<u>805930 LOW SPIKE TRUE VALUE</u>
Cadmium	ug/L	0.37	ND	ND	0.500

ND Not detected at or above the MDL.
MDL Method Detection Limit

CE
Laboratories, Inc.

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Offices:
Minneapolis, Minnesota
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June 16, 1988
PACE Project Number: 880406560

PACE Sample Number:

Parameter

Cadmium

Units

ug/L

MDL

0.37

805970

AMA020

HIGH SPIKE

2.43

805980

AMR004

SW031

ND

805990

AMR005

SW032

ND

MDL
ND

Method Detection Limit
Not detected at or above the MDL.

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June 16, 1988
PACE Project Number: 880406560

PACE Sample Number:

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>806000 AMR006 SW062</u>	<u>806010 AMR007 SW033</u>	<u>806020 AMR008 SW052</u>
Cadmium	ug/L	0.37	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

REPORT OF LABORATORY ANALYSIS

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June 16, 1988
PACE Project Number: 880406560

PACE Sample Number:

Parameter	Units	MDL	806030	806040	806050
			AMR009	AMR010	AMR011
			SW056	SW035	SW034
Cadmium	ug/L	0.37	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

REPORT OF LABORATORY ANALYSIS

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June 16, 1988
PACE Project Number: 880406560

PACE Sample Number:

Parameter

Cadmium

<u>Units</u>	<u>MDL</u>	806060 AMR012 SW042	806070 AMR013 SW029	806080 AMR003 METHOD BLK
ug/L	0.37	0.529	ND	ND

MDL
ND

Method Detection Limit
Not detected at or above the MDL.

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June 17, 1988
PACE Project Number: 880406554

PACE Sample Number:

Parameter

Units

MDL

810780

AMN016

011125

810790

AMN017

011108

810800

AMN018

SW031

Cyanide, Total

ug/L

8.17

ND

ND

ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 17, 1988
PACE Project Number: 880406554

PACE Sample Number:		810810	810820	810830	
<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>AMN019</u>	<u>AMN001</u>	<u>LOW SPIKE</u>
			<u>SW032</u>	<u>METHOD BLK</u>	<u>TRUE VALUE</u>
Cyanide, Total	ug/L	8.17	ND	ND	10.0

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406561

PACE Sample Number:

Parameter

Units

MDL

809390
AMD017
01U527

809400
AMD018
SW030

809410
AMD019
SW059

Lead

ug/L

1.26

ND

ND

ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406561

PACE Sample Number:

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	809480 AMU004 SW031	809490 AMU005 SW032	809500 AMU006 SW062
Lead	ug/L	1.26	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406561

PACE Sample Number:

Parameter

Units

MDL

809510

AMU007

SW033

809520

AMU008

SW052

809530

AMU009

SW056

Lead

ug/L

1.26

ND

ND

ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406561

PACE Sample Number:

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>809540 AMU010 SW035</u>	<u>809550 AMU011 SW034</u>	<u>809560 AMU012 SW042</u>
Lead	ug/L	1.26	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406561

PACE Sample Number:

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	809570 AMU013 SW029	809580 AMU001 METHOD BLK	809590 LOW SPIKE TRUE VALUE
Lead	ug/L	1.26	ND	ND	4.00

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406553

PACE Sample Number:

809880	809890	809900
AM0007	AM0008	AM0009
SW031	SW032	SW062

Parameter

Units

MDL

Mercury

ug/L

0.74

ND

ND

ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406553

PACE Sample Number:

Parameter

Units

MDL

809910
AM0010
SW033

809920
AM0011
SW052

809930
AM0012
SW035

Mercury

ug/L

0.74

ND

ND

ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406553

PACE Sample Number:

809940	809950	809960
AM0013	AM0001	LOW SPIKE
SW042	METHOD BLK	TRUE VALUE

Parameter

Units

MDL

Mercury

ug/L

0.74

ND

ND

1.50

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406561

PACE Sample Number:		808180	808190	808200
<u>Parameter</u>	<u>Units</u>	<u>AMC017</u>	<u>AMC018</u>	<u>AMC019</u>
Nickel	ug/L	0111108	0111527	SW030
		5.32	6.12	ND
				ND

MDL Method Detection Limit
ND Not detected at or above the MDL.

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June 16, 1988
PACE Project Number: 880406561

PACE Sample Number:

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	808210 AMC020 SW059	808220 AMC006 METHOD BLK	808230 LOW SPIKE TRUE VALUE
Nickel	ug/L	5.32	ND	ND	10.0

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406561

PACE Sample Number:

808270	808280	808290
AMC009	AMT004	AMT005
<u>MDL</u>	<u>HIGH SPIKE</u>	<u>SW031</u>
		<u>SW032</u>

Parameter

Units

MDL

HIGH SPIKE

SW031

SW032

Nickel

ug/L

5.32

43.6

ND

ND

MDL

Method Detection Limit

ND

Not detected at or above the MDL.

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June 16, 1988
PACE Project Number: 880406561

PACE Sample Number:

808300	808310	808320
AMT006	AMT007	AMT008
SW062	SW033	SW052

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>SW062</u>	<u>SW033</u>	<u>SW052</u>
Nickel	ug/L	5.32	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406561

PACE Sample Number:

808330 808340 808350
AMT009 AMT010 AMT011
SW056 SW035 SW034

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>			
Nickel	ug/L	5.32	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406561

PACE Sample Number:

	808360	808370	808380
	AMT012	AMT013	AMT001
	SW042	SW029	METHOD BLK

Parameter

Units

MDL

Nickel

ug/L

5.32

ND

ND

ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406558

PACE Sample Number:

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	<u>FIELD BLK</u>	<u>SW030</u>	<u>SW059</u>
Zinc	ug/L	25.0	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406558

PACE Sample Number:

811160	811170	811180
ALJ010	ALJ011	ALJ012
SW031	SW032	SW062

Parameter

Units

MDL

Zinc

ug/L

25.0

ND

ND

47.7

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 16, 1988
PACE Project Number: 880406558

PACE Sample Number:

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	811190 ALJ013 SH034	811200 ALJ001 METHOD BLK	811210 LOW SPIKE TRUE VALUE
Zinc	ug/L	25.0	ND	ND	50.0

ND Not detected at or above the MDL.
MDL Method Detection Limit



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PACE Project Number: 880406551

PACE Sample Number:			800840	800850	800860
			AMI007	AMI008	AMI001
Parameter	Units	MDL	SW059	SW031	METHOD BLK
Vinyl chloride	ug/L	1.9	ND	ND	ND
1,1-Dichloroethylene	ug/L	1.0	ND	ND	ND
1,2-Dichloroethylene (total)	ug/L	0.5	ND	ND	ND
Chloroform	ug/L	0.72	ND	ND	ND
1,2-Dichloroethane	ug/L	0.5	ND	ND	ND
1,1,1-Trichloroethane	ug/L	1.0	ND	ND	ND
1,2-Dichloropropane	ug/L	1.0	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.5	4.90	ND	ND
1,1,2-Trichloroethane	ug/L	1.0	ND	ND	ND
1,1,2,2-Tetrachloroethylene	ug/L	1.0	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 20, 1988
PACE Project Number: 880406551

PACE Sample Number:

Parameter

Units

MDL

800900
AMI010

800910
AMI011

800920
AMX002
SW032

HIGH SPIKE

HIGH SPIKE

<u>Parameter</u>	<u>Units</u>	<u>MDL</u>	800900 AMI010 <u>HIGH SPIKE</u>	800910 AMI011 <u>HIGH SPIKE</u>	800920 AMX002 SW032
Vinyl chloride	ug/L	1.9	ND	ND	ND
1,1-Dichloroethylene	ug/L	1.0	17.0	17.1	ND
1,2-Dichloroethylene (total)	ug/L	0.5	5.74	5.47	ND
Chloroform	ug/L	0.72	ND	ND	ND
1,2-Dichloroethane	ug/L	0.5	4.46	4.35	ND
1,1,1-Trichloroethane	ug/L	1.0	14.6	10.3	ND
1,2-Dichloropropane	ug/L	1.0	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.5	5.27	4.80	ND
1,1,2-Trichloroethane	ug/L	1.0	10.0	9.82	ND
1,1,2,2-Tetrachloroethylene	ug/L	1.0	9.00	8.91	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 20, 1988
PACE Project Number: 880406551

PACE Sample Number:

Parameter	Units	MDL	800930	800940	800950
			AMX003 SW033	AMX004 SW052	AMX005 SW056
Vinyl chloride	ug/L	1.9	ND	ND	ND
1,1-Dichloroethylene	ug/L	1.0	ND	ND	ND
1,2-Dichloroethylene (total)	ug/L	0.5	ND	ND	ND
Chloroform	ug/L	0.72	ND	ND	ND
1,2-Dichloroethane	ug/L	0.5	ND	ND	ND
1,1,1-Trichloroethane	ug/L	1.0	ND	ND	ND
1,2-Dichloropropane	ug/L	1.0	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.5	ND	ND	ND
1,1,2-Trichloroethane	ug/L	1.0	ND	ND	ND
1,1,2,2-Tetrachloroethylene	ug/L	1.0	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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June 20, 1988
PACE Project Number: 880406551

PACE Sample Number:

Parameter	Units	MDL	800960	800970	800980
			AMX006 SW035	AMX007 SW034	AMX001 METHOD BLK
Vinyl chloride	ug/L	1.9	ND	ND	ND
1,1-Dichloroethylene	ug/L	1.0	ND	ND	ND
1,2-Dichloroethylene (total)	ug/L	0.5	ND	ND	ND
Chloroform	ug/L	0.72	ND	ND	ND
1,2-Dichloroethane	ug/L	0.5	ND	ND	ND
1,1,1-Trichloroethane	ug/L	1.0	1.82	ND	ND
1,2-Dichloropropane	ug/L	1.0	ND	ND	ND
1,1,2-Trichloroethylene	ug/L	0.5	ND	ND	ND
1,1,2-Trichloroethane	ug/L	1.0	ND	ND	ND
1,1,2,2-Tetrachloroethylene	ug/L	1.0	ND	ND	ND

ND Not detected at or above the MDL.
MDL Method Detection Limit

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USATHAMA - TCAAP - QUART.

Q 19

ECT

SITE: SW029 DATE

ANALYTE	BOOLEAN	RESULT	UNITS	LOT NUMBER	METHOD NUMBER	DILUTION FACTOR	ANALYSIS DATE
=====	=====	=====	=====	=====	=====	=====	=====
HARD		290	MG/L	ARK	99	1	09/13/88
AS	LT	6.01	UG/L	AOZ	SD08	1	09/21/88
BA		93.3	UG/L	APL	SD08	1	09/17/88
CD	LT	0.370	UG/L	APV	SD08	1	09/06/88
CR	LT	2.50	UG/L	AQC	SD08	1	09/17/88
NI	LT	5.32	UG/L	AQJ	SD08	1	09/13/88
PB	LT	1.26	UG/L	AQQ	SD08	1	09/07/88
CRHEX	LT	5.18	UG/L	ARL	SD08	1	08/30/88
111TCE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
112TCE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
11DCE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
12DCE	LT	0.500	UG/L	AOK	UG03	1	09/08/88
12DCLE	LT	0.500	UG/L	AOK	UG03	1	09/08/88
12DCLP	LT	1.00	UG/L	AOK	UG03	1	09/08/88
C2H3CL	LT	1.90	UG/L	AOK	UG03	1	09/08/88
CHCL3	LT	0.720	UG/L	AOK	UG03	1	09/08/88
TCLEE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
TRCLE	LT	0.500	UG/L	AOK	UG03	1	09/08/88

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USATHAMA - TCAAP - QUARTER 19 MONITORING PROJECT

SITE: SW030 DATE COLLECTED: 08/29/88

ANALYTE =====	BOOLEAN =====	RESULT =====	UNITS =====	LOT NUMBER =====	METHOD NUMBER =====	DILUTION FACTOR =====	ANALYSIS DATE =====
HARD		310	MG/L	ARK	99	1	09/13/88
ZN	LT	25.0	UG/L	ARF	SC04	1	09/09/88
AS	LT	6.01	UG/L	AOZ	SD08	1	09/21/88
BA		155	UG/L	APM	SD08	1	09/17/88
CD	LT	0.370	UG/L	APV	SD08	1	09/06/88
CR	LT	2.50	UG/L	AQC	SD08	1	09/17/88
NI	LT	5.32	UG/L	AQJ	SD08	1	09/13/88
PB	LT	1.26	UG/L	AQQ	SD08	1	09/07/88
CRHEX	LT	5.18	UG/L	ARL	SD08	1	08/30/88
111TCE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
112TCE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
11DCE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
12DCE	LT	0.500	UG/L	AOK	UG03	1	09/08/88
12DCLE	LT	0.500	UG/L	AOK	UG03	1	09/08/88
12DCLP	LT	1.00	UG/L	AOK	UG03	1	09/08/88
C2H3CL	LT	1.90	UG/L	AOK	UG03	1	09/08/88
CHCL3	LT	0.720	UG/L	AOK	UG03	1	09/08/88
TCLEE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
TRCLE	LT	0.500	UG/L	AOK	UG03	1	09/08/88

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USATHAMA - TCAAP - QUARTER 19 MONITORING PROJECT

SITE: SW031 DATE COLLECTED: 08/29/88

ANALYTE =====	BOOLEAN =====	RESULT =====	UNITS =====	LOT NUMBER =====	METHOD NUMBER =====	DILUTION FACTOR =====	ANALYSIS DATE =====
ALPHAG	ND	1.00	PC/L	ARC	99	1	10/06/88
BETAG		2.70	PC/L	ARC	99	1	10/06/88
HARD		310	MG/L	ARK	99	1	09/13/88
HG	LT	0.740	UG/L	AQU	SB07	1	09/09/88
ZN	LT	25.0	UG/L	ARF	SC04	1	09/09/88
AS	LT	6.01	UG/L	AOZ	SD08	1	09/21/88
BA		120	UG/L	APM	SD08	1	09/17/88
CD	LT	0.370	UG/L	APV	SD08	1	09/06/88
CR	LT	2.50	UG/L	AQC	SD08	1	09/17/88
NI	LT	5.32	UG/L	AQJ	SD08	1	09/13/88
PB	LT	1.26	UG/L	AQQ	SD08	1	09/07/88
CRHEX	LT	5.18	UG/L	ARL	SD08	1	08/30/88
CYN	LT	8.17	UG/L	AQZ	TY03	1	09/06/88
111TCE	LT	1.00	UG/L	AOK	UG03	1	09/07/88
112TCE	LT	1.00	UG/L	AOK	UG03	1	09/07/88
11DCE	LT	1.00	UG/L	AOK	UG03	1	09/07/88
12DCE	LT	0.500	UG/L	AOK	UG03	1	09/07/88
12DCLE	LT	0.500	UG/L	AOK	UG03	1	09/07/88
12DCLP	LT	1.00	UG/L	AOK	UG03	1	09/07/88
C2H3CL	LT	1.90	UG/L	AOK	UG03	1	09/07/88
CHCL3	LT	0.720	UG/L	AOK	UG03	1	09/07/88
TCLEE	LT	1.00	UG/L	AOK	UG03	1	09/07/88
TRCLE	LT	0.500	UG/L	AOK	UG03	1	09/07/88

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USATHAMA - TCAAP - QUARTER 19 MONITORING PROJECT

SITE: SW032 DATE COLLECTED: 08/29/88

ANALYTE =====	BOOLEAN =====	RESULT =====	UNITS =====	LOT NUMBER =====	METHOD NUMBER =====	DILUTION FACTOR =====	ANALYSIS DATE =====
ALPHAG		14.0	PC/L	ARC	99	1	10/06/88
BETAG		110	PC/L	ARC	99	1	10/06/88
CO60	ND	5.20	PC/L	ARC	99	1	10/06/88
CS134	ND	5.20	PC/L	ARC	99	1	10/06/88
CS137	ND	4.60	PC/L	ARC	99	1	10/06/88
MN54	ND	4.00	PC/L	ARC	99	1	10/06/88
U234		0.300	PC/L	ARC	99	1	10/06/88
U238		0.110	PC/L	ARC	99	1	10/06/88
HARD		59	MG/L	ARK	99	1	09/13/88
HG	LT	0.740	UG/L	AQU	SB07	1	09/09/88
ZN	LT	25.0	UG/L	ARF	SC04	1	09/09/88
AS	LT	6.01	UG/L	AOZ	SD08	1	09/21/88
BA		172	UG/L	APM	SD08	1	09/17/88
CD	LT	0.370	UG/L	APV	SD08	1	09/06/88
CR	LT	2.50	UG/L	AQC	SD08	1	09/17/88
NI	LT	5.32	UG/L	AQJ	SD08	1	09/13/88
PB		3.83	UG/L	AQQ	SD08	1	09/07/88
CRHEX	LT	5.18	UG/L	ARL	SD08	1	08/30/88
CYN	LT	8.17	UG/L	AQZ	TY03	1	09/06/88
111TCE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
112TCE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
11DCE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
12DCE	LT	0.500	UG/L	AOK	UG03	1	09/08/88
12DCLF	LT	0.500	UG/L	AOK	UG03	1	09/08/88
12DCLP	LT	1.00	UG/L	AOK	UG03	1	09/08/88
C2H3CL	LT	1.90	UG/L	AOK	UG03	1	09/08/88
CHCL3	LT	0.720	UG/L	AOK	UG03	1	09/08/88
TCLEE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
TRCLE	LT	0.500	UG/L	AOK	UG03	1	09/08/88

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USATHAMA - TCAAP - QUARTER 19 MONITORING PROJECT

SITE: SW035 DATE COLLECTED: 08/29/88

ANALYTE =====	BOOLEAN =====	RESULT =====	UNITS =====	LOT NUMBER =====	METHOD NUMBER =====	DILUTION FACTOR =====	ANALYSIS DATE =====
HARD		58	MG/L	ARK	99	1	09/13/88
HG	LT	0.740	UG/L	AQU	SB07	1	09/09/88
AS	LT	6.01	UG/L	AOZ	SD08	1	09/21/88
BA		30.6	UG/L	APM	SD08	1	09/17/88
CD	LT	0.370	UG/L	APV	SD08	1	09/06/88
CR	LT	2.50	UG/L	AQC	SD08	1	09/17/88
NI	LT	5.32	UG/L	AQJ	SD08	1	09/13/88
PB	LT	1.26	UG/L	AQQ	SD08	1	09/07/88
CRHEX	LT	5.18	UG/L	ARL	SD08	1	08/30/88
111TCE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
112TCE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
11DCE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
12DCE	LT	0.500	UG/L	AOK	UG03	1	09/08/88
12DCLE	LT	0.500	UG/L	AOK	UG03	1	09/08/88
12DCLP	LT	1.00	UG/L	AOK	UG03	1	09/08/88
C2H3CL	LT	1.90	UG/L	AOK	UG03	1	09/08/88
CHCL3	LT	0.720	UG/L	AOK	UG03	1	09/08/88
TCLEE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
TRCLE	LT	0.500	UG/L	AOK	UG03	1	09/08/88

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USATHAMA - TCAAP - QUARTER 19 MONITORING PROJECT

SITE: SW059 DATE COLLECTED: 08/29/88

ANALYTE =====	BOOLEAN =====	RESULT =====	UNITS =====	LOT NUMBER =====	METHOD NUMBER =====	DILUTION FACTOR =====	ANALYSIS DATE =====
HARD		290	MG/L	ARK	99	1	09/13/88
ZN	LT	25.0	UG/L	ARF	SC04	1	09/09/88
AS	LT	6.01	UG/L	AOZ	SD08	1	09/21/88
BA		140	UG/L	APM	SD08	2	09/17/88
CD	LT	0.370	UG/L	APV	SD08	1	09/06/88
CR	LT	2.50	UG/L	AQC	SD08	1	09/17/88
NI	LT	5.32	UG/L	AQJ	SD08	1	09/13/88
PB	LT	1.26	UG/L	AQQ	SD08	1	09/07/88
CRHEX	LT	5.18	UG/L	ARL	SD08	1	08/30/88
111TCE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
112TCE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
11DCE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
12DCE		5.06	UG/L	AOK	UG03	1	09/08/88
12DCLE	LT	0.500	UG/L	AOK	UG03	1	09/08/88
12DCLP	LT	1.00	UG/L	AOK	UG03	1	09/08/88
C2H3CL	LT	1.90	UG/L	AOK	UG03	1	09/08/88
CHCL3	LT	0.720	UG/L	AOK	UG03	1	09/08/88
TCLEE	LT	1.00	UG/L	AOK	UG03	1	09/08/88
TRCLE		11.9	UG/L	AOK	UG03	1	09/08/88

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USATHAMA - TCAAP - QUARTER 19 MONITORING PROJECT

SITE: SW062 DATE COLLECTED: 08/29/88

ANALYTE =====	BOOLEAN =====	RESULT =====	UNITS =====	LOT NUMBER =====	METHOD NUMBER =====	DILUTION FACTOR =====	ANALYSIS DATE =====
ALPHAG		1.00	PC/L	ARC	99	1	10/06/88
BETAG		2.10	PC/L	ARC	99	1	10/06/88
HARD		150	MG/L	ARK	99	1	09/13/88
HG	LT	0.740	UG/L	AQU	SB07	1	09/09/88
ZN	LT	25.0	UG/L	ARF	SC04	1	09/09/88
AS	LT	6.01	UG/L	AOZ	SD08	1	09/21/88
BA		51.5	UG/L	APM	SD08	1	09/17/88
CD	LT	0.370	UG/L	APV	SD08	1	09/06/88
CR	LT	2.50	UG/L	AQC	SD08	1	09/17/88
NI	LT	5.32	UG/L	AQJ	SD08	1	09/13/88
PB	LT	1.26	UG/L	AQQ	SD08	1	09/07/88
CRHEX	LT	5.18	UG/L	ARL	SD08	1	08/30/88
111TCE	LT	1.00	UG/L	AOK	UG03	1	09/07/88
112TCE	LT	1.00	UG/L	AOK	UG03	1	09/07/88
11DCE	LT	1.00	UG/L	AOK	UG03	1	09/07/88
12DCE	LT	0.500	UG/L	AOK	UG03	1	09/07/88
12DCLE	LT	0.500	UG/L	AOK	UG03	1	09/07/88
12DCLP	LT	1.00	UG/L	AOK	UG03	1	09/07/88
C2H3CL	LT	1.90	UG/L	AOK	UG03	1	09/07/88
CHCL3	LT	0.720	UG/L	AOK	UG03	1	09/07/88
TCLEE	LT	1.00	UG/L	AOK	UG03	1	09/07/88
TRCLE	LT	0.500	UG/L	AOK	UG03	1	09/07/88

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USATHAMA - TCAAP - QUARTER 20 MONITORING PROJECT

SITE: SW032 DATE COLLECTED: 11/22/88

ANALYTE =====	BOOLEAN =====	RESULT =====	UNITS =====	LOT NUMBER =====	METHOD NUMBER =====	DILUTION FACTOR =====	ANALYSIS DATE =====
ALPHAG	ND	2.00	pC/L	BAD	99	1	12/21/88
BETAG		7.00	pC/L	BAD	99	1	12/21/88
HARD		230	mg/L	BAF	00	1	12/05/88
HG	LT	0.740	ug/L	BAQ	SB07	1	12/22/88
ZN	LT	25.0	ug/L	BAE	SC04	1	11/23/88
AS	LT	6.01	ug/L	AZN	SD08	1	12/12/88
BA		97.4	ug/L	AZQ	SD08	1	12/19/88
CD		0.388	ug/L	AZR	SD08	1	12/08/88
CR	LT	2.50	ug/L	AZT	SD08	1	11/28/88
NI	LT	5.32	ug/L	AZV	SD08	1	12/14/88
PB	LT	1.26	ug/L	AZX	SD08	1	11/29/88
CRHEX	LT	5.18	ug/L	BAG	SY01	1	11/23/88
CYN	LT	8.17	ug/L	BAH	TY03	1	12/05/88
111TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
112TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
11DCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
12DCE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLP	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
C2H3CL	LT	1.90	ug/L	BAJ	UG03	1	12/04/88
CHCL3	LT	0.720	ug/L	BAJ	UG03	1	12/04/88
TCLEE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
TRCLE		0.849	ug/L	BAJ	UG03	1	12/04/88

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USATHAMA - TCAAP - QUARTER 20 MONITORING PROJECT

SITE: SW062 DATE COLLECTED: 11/22/88

ANALYTE =====	BOOLEAN =====	RESULT =====	UNITS =====	LOT NUMBER =====	METHOD NUMBER =====	DILUTION FACTOR =====	ANALYSIS DATE =====
ALPHAG	ND	2.00	pC/L	BAD	99	1	12/21/88
BETAG		7.00	pC/L	BAD	99	1	12/21/88
HARD		530	mg/L	BAF	00	1	12/05/88
HG	LT	0.740	ug/L	BAQ	SB07	1	12/22/88
ZN		28.1	ug/L	BAE	SC04	1	11/23/88
AS	LT	6.01	ug/L	AZN	SD08	1	12/12/88
BA		82.6	ug/L	AZQ	SD08	1	12/19/88
CD	LT	0.370	ug/L	AZR	SD08	1	12/08/88
CR	LT	2.50	ug/L	AZT	SD08	1	11/28/88
NI		5.66	ug/L	AZV	SD08	1	12/14/88
PB	LT	1.26	ug/L	AZX	SD08	1	11/29/88
CRHEX	LT	5.18	ug/L	BAG	SY01	1	11/23/88
111TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
112TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
11DCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
12DCE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLP	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
C2H3CL	LT	1.90	ug/L	BAJ	UG03	1	12/04/88
CHCL3	LT	0.720	ug/L	BAJ	UG03	1	12/04/88
TCLEE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
TRCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88

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USATHAMA - TCAAP - QUARTER 20 MONITORING PROJECT

SITE: SW033 DATE COLLECTED: 11/22/88

ANALYTE =====	BOOLEAN =====	RESULT =====	UNITS =====	LOT NUMBER =====	METHOD NUMBER =====	DILUTION FACTOR =====	ANALYSIS DATE =====
ALPHAG	ND	2.00	pC/L	BAD	99	1	12/21/88
BETAG		14.0	pC/L	BAD	99	1	12/21/88
HARD		460	mg/L	BAF	00	1	12/05/88
HG	LT	0.740	ug/L	BAQ	SB07	1	12/22/88
AS	LT	6.01	ug/L	AZN	SD08	1	12/12/88
BA		38.3	ug/L	AZQ	SD08	1	12/19/88
CD	LT	0.370	ug/L	AZR	SD08	1	12/08/88
CR	LT	2.50	ug/L	AZT	SD08	1	11/28/88
NI	LT	5.32	ug/L	AZV	SD08	1	12/14/88
PB	LT	1.26	ug/L	AZX	SD08	1	11/29/88
CRHEX	LT	5.18	ug/L	BAG	SY01	1	11/23/88
111TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
112TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
11DCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
12DCE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLP	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
C2H3CL	LT	1.90	ug/L	BAJ	UG03	1	12/04/88
CHCL3	LT	0.720	ug/L	BAJ	UG03	1	12/04/88
TCLEE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
TRCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88

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USATHAMA - TCAAP - QUARTER 20 MONITORING PROJECT

SITE: SW035 / SW035 DUPLICATE DATE COLLECTED: 11/22/88

ANALYTE =====	BOOLEAN =====	RESULT =====	UNITS =====	LOT NUMBER =====	METHOD NUMBER =====	DILUTION FACTOR =====	ANALYSIS DATE =====
HARD		150	mg/L	BAF	00	1	12/05/88
HARD		130	mg/L	BAF	00	1	12/05/88
HG	LT	0.740	ug/L	BAQ	SB07	1	12/22/88
HG	LT	0.740	ug/L	BAQ	SB07	1	12/22/88
AS	LT	6.01	ug/L	AZO	SD08	1	12/01/88
AS	LT	6.01	ug/L	AZO	SD08	1	12/01/88
BA		68.0	ug/L	BAK	SD08	1	12/16/88
BA		56.4	ug/L	BAK	SD08	1	12/16/88
CD		0.449	ug/L	AZR	SD08	1	12/08/88
CD	LT	0.370	ug/L	AZR	SD08	1	12/08/88
CR	LT	2.50	ug/L	AZT	SD08	1	11/28/88
CR	LT	2.50	ug/L	AZT	SD08	1	11/28/88
NI	LT	5.32	ug/L	AZV	SD08	1	12/14/88
NI	LT	5.32	ug/L	AZV	SD08	1	12/14/88
PB	LT	1.26	ug/L	AZY	SD08	1	12/14/88
PB	LT	1.26	ug/L	AZY	SD08	1	12/14/88
CRHEX	LT	5.18	ug/L	BAG	SY01	1	11/23/88
CRHEX	LT	5.18	ug/L	BAG	SY01	1	11/23/88
111TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
111TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
112TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
112TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
11DCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
11DCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
12DCE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLP	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
12DCLP	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
C2H3CL	LT	1.90	ug/L	BAJ	UG03	1	12/04/88
C2H3CL	LT	1.90	ug/L	BAJ	UG03	1	12/04/88
CHCL3	LT	0.720	ug/L	BAJ	UG03	1	12/04/88
CHCL3	LT	0.720	ug/L	BAJ	UG03	1	12/04/88
TCLEE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
TCLEE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
TRCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
TRCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88

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USATHAMA - TCAAP - QUARTER 20 MONITORING PROJECT

SITE: SW034 DATE COLLECTED: 11/22/88

ANALYTE	BOOLEAN	RESULT	UNITS	LOT NUMBER	METHOD NUMBER	DILUTION FACTOR	ANALYSIS DATE
=====	=====	=====	=====	=====	=====	=====	=====
HARD		180	mg/L	BAF	00	1	12/05/88
ZN		26.8	ug/L	BAE	SC04	1	11/23/88
AS	LT	6.01	ug/L	AZN	SD08	1	12/12/88
BA		57.1	ug/L	BAK	SD08	1	12/16/88
CD	LT	0.370	ug/L	AZR	SD08	1	12/08/88
CR	LT	2.50	ug/L	AZT	SD08	1	11/28/88
NI	LT	5.32	ug/L	AZV	SD08	1	12/14/88
PB	LT	1.26	ug/L	AZX	SD08	1	11/29/88
CRHEX	LT	5.18	ug/L	BAG	SY01	1	11/23/88
111TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
112TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
11DCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
12DCE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLP	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
C2H3CL	LT	1.90	ug/L	BAJ	UG03	1	12/04/88
CHCL3	LT	0.720	ug/L	BAJ	UG03	1	12/04/88
TCLEE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
TRCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88

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USATHAMA - TCAAP - QUARTER 20 MONITORING PROJECT

SITE: SW056 / SW056 DUPLICATE DATE COLLECTED: 11/22/88

ANALYTE =====	BOOLEAN =====	RESULT =====	UNITS =====	LOT NUMBER =====	METHOD NUMBER =====	DILUTION FACTOR =====	ANALYSIS DATE =====
HARD		1100	mg/L	BAF	00	1	12/05/88
AS	LT	6.01	ug/L	AZO	SD08	1	12/01/88
BA		160	ug/L	AZQ	SD08	2	12/19/88
CD		0.658	ug/L	AZR	SD08	1	12/08/88
CR	LT	2.50	ug/L	AZT	SD08	1	11/28/88
NI	LT	5.32	ug/L	AZV	SD08	1	12/14/88
PB	LT	1.26	ug/L	AZY	SD08	1	12/14/88
CRHEX	LT	5.18	ug/L	BAG	SY01	1	11/23/88
111TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
111TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
112TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
112TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
11DCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
11DCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
12DCE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLP	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
12DCLP	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
C2H3CL	LT	1.90	ug/L	BAJ	UG03	1	12/04/88
C2H3CL	LT	1.90	ug/L	BAJ	UG03	1	12/04/88
CHCL3	LT	0.720	ug/L	BAJ	UG03	1	12/04/88
CHCL3	LT	0.720	ug/L	BAJ	UG03	1	12/04/88
TCLEE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
TCLEE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
TRCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
TRCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88

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SITE: SW052 DATE COLLECTED: 11/22/88

ANALYTE =====	BOOLEAN =====	RESULT =====	UNITS =====	LOT NUMBER =====	METHOD NUMBER =====	DILUTION FACTOR =====	ANALYSIS DATE =====
HARD		450	mg/L	BAF	00	1	12/05/88
HG	LT	0.740	ug/L	BAQ	SB07	1	12/22/88
AS	LT	6.01	ug/L	AZO	SD08	1	12/01/88
BA		160	ug/L	AZQ	SD08	2	12/19/88
CD	LT	0.370	ug/L	AZS	SD08	1	12/13/88
CR	LT	2.50	ug/L	AZU	SD08	1	12/07/88
NI	LT	5.32	ug/L	AZW	SD08	1	12/14/88
PB	LT	1.26	ug/L	AZY	SD08	1	12/14/88
CRHEX	LT	5.18	ug/L	BAG	SY01	1	11/23/88
111TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
112TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
11DCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
12DCE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLP	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
C2H3CL	LT	1.90	ug/L	BAJ	UG03	1	12/04/88
CHCL3	LT	0.720	ug/L	BAJ	UG03	1	12/04/88
TCLEE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
TRCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88

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SITE: SW029 DATE COLLECTED: 11/22/88

ANALYTE	BOOLEAN	RESULT	UNITS	LOT NUMBER	METHOD NUMBER	DILUTION FACTOR	ANALYSIS DATE
=====	=====	=====	=====	=====	=====	=====	=====
HARD		3400	mg/L	BAF	00	1	12/05/88
AS	LT	6.01	ug/L	AZO	SD08	1	12/01/88
BA		420	ug/L	AZQ	SD08	10	12/19/88
CD	LT	0.370	ug/L	AZS	SD08	1	12/13/88
CR		5.17	ug/L	AZU	SD08	1	12/07/88
NI	LT	5.32	ug/L	AZW	SD08	1	12/14/88
PB	LT	1.26	ug/L	AZY	SD08	1	12/14/88
CRHEX	LT	5.18	ug/L	BAG	SY01	1	11/23/88
111TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
112TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
11DCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
12DCE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLP	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
C2H3CL	LT	1.90	ug/L	BAJ	UG03	1	12/04/88
CHCL3	LT	0.720	ug/L	BAJ	UG03	1	12/04/88
TCLEE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
TRCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88

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SITE: SW031 DATE COLLECTED: 11/22/88

ANALYTE =====	BOOLEAN =====	RESULT =====	UNITS =====	LOT NUMBER =====	METHOD NUMBER =====	DILUTION FACTOR =====	ANALYSIS DATE =====
ALPHAG	ND	2.00	pC/L	BAD	99	1	12/21/88
BETAG		7.00	pC/L	BAD	99	1	12/21/88
HARD		240	mg/L	BAF	00	1	12/05/88
HG	LT	0.740	ug/L	BAQ	SB07	1	12/22/88
ZN	LT	25.0	ug/L	BAE	SC04	1	11/23/88
AS	LT	6.01	ug/L	AZO	SD08	1	12/01/88
BA		92.0	ug/L	BAK	SD08	1	12/16/88
CD	LT	0.370	ug/L	AZS	SD08	1	12/13/88
CR	LT	2.50	ug/L	AZU	SD08	1	12/07/88
NI	LT	5.32	ug/L	AZW	SD08	1	12/14/88
PB	LT	1.26	ug/L	AZY	SD08	1	12/14/88
CRHEX	LT	5.18	ug/L	BAG	SY01	1	11/23/88
CYN	LT	8.17	ug/L	BAH	TY03	1	12/05/88
111TCE	LT	1.00	ug/L	BAL	UG03	1	12/05/88
112TCE	LT	1.00	ug/L	BAL	UG03	1	12/05/88
11DCE	LT	1.00	ug/L	BAL	UG03	1	12/05/88
12DCE		1.57	ug/L	BAL	UG03	1	12/05/88
12DCLE	LT	0.500	ug/L	BAL	UG03	1	12/05/88
12DCLP	LT	1.00	ug/L	BAL	UG03	1	12/05/88
C2H3CL	LT	1.90	ug/L	BAL	UG03	1	12/05/88
CHCL3	LT	0.720	ug/L	BAL	UG03	1	12/05/88
TCLEE	LT	1.00	ug/L	BAL	UG03	1	12/05/88
TRCLE	LT	0.500	ug/L	BAL	UG03	1	12/05/88

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SITE: SW059 DATE COLLECTED: 11/22/88

ANALYTE =====	BOOLEAN =====	RESULT =====	UNITS =====	LOT NUMBER =====	METHOD NUMBER =====	DILUTION FACTOR =====	ANALYSIS DATE =====
HARD		290	mg/L	BAF	00	1	12/05/88
ZN	LT	25.0	ug/L	BAE	SC04	1	11/23/88
AS	LT	6.01	ug/L	AZO	SD08	1	12/01/88
BA		156	ug/L	BAK	SD08	1	12/16/88
CD	LT	0.370	ug/L	AZS	SD08	1	12/13/88
CR		4.14	ug/L	AZU	SD08	1	12/07/88
NI	LT	5.32	ug/L	AZW	SD08	1	12/14/88
PB	LT	1.26	ug/L	AZY	SD08	1	12/14/88
CRHEX	LT	5.18	ug/L	BAG	SY01	1	11/23/88
111TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
112TCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
11DCE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
12DCE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLE	LT	0.500	ug/L	BAJ	UG03	1	12/04/88
12DCLP	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
C2H3CL	LT	1.90	ug/L	BAJ	UG03	1	12/04/88
CHCL3	LT	0.720	ug/L	BAJ	UG03	1	12/04/88
TCLEE	LT	1.00	ug/L	BAJ	UG03	1	12/04/88
TRCLE		1.13	ug/L	BAJ	UG03	1	12/04/88

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SITE: SW030 DATE COLLECTED: 11/22/88

ANALYTE	BOOLEAN	RESULT	UNITS	LOT NUMBER	METHOD NUMBER	DILUTION FACTOR	ANALYSIS DATE
=====	=====	=====	=====	=====	=====	=====	=====
HARD		340	mg/L	BAF	00	1	12/05/88
ZN	LT	25.0	ug/L	BAE	SC04	1	11/23/88
AS	LT	6.01	ug/L	AZO	SD08	1	12/01/88
BA		170	ug/L	AZQ	SD08	2	12/19/88
CD	LT	0.370	ug/L	AZS	SD08	1	12/13/88
CR	LT	2.50	ug/L	AZU	SD08	1	12/07/88
NI	LT	5.32	ug/L	AZW	SD08	1	12/14/88
PB	LT	1.26	ug/L	AZY	SD08	1	12/14/88
CRHEX	LT	5.18	ug/L	BAG	SY01	1	11/23/88
111TCE	LT	1.00	ug/L	BAL	UG03	1	12/05/88
112TCE	LT	1.00	ug/L	BAL	UG03	1	12/05/88
11DCE	LT	1.00	ug/L	BAL	UG03	1	12/05/88
12DCE	LT	0.500	ug/L	BAL	UG03	1	12/05/88
12DCLE	LT	0.500	ug/L	BAL	UG03	1	12/05/88
12DCLP	LT	1.00	ug/L	BAL	UG03	1	12/05/88
C2H3CL	LT	1.90	ug/L	BAL	UG03	1	12/05/88
CHCL3	LT	0.720	ug/L	BAL	UG03	1	12/05/88
TCLEE	LT	1.00	ug/L	BAL	UG03	1	12/05/88
TRCLE		1.54	ug/L	BAL	UG03	1	12/05/88