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**Groundwater Investigation Report  
Addendum 1 - 2<sup>nd</sup> Quarter Sampling Results  
Site 1 - Former Mixed Waste Burial Pits  
United States Department of Agriculture (USDA)  
National Animal Disease Center (NADC)**

**Ames, Iowa**



**United States Department of Agriculture**

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**CABRERA SERVICES**  
RADIOLOGICAL • ENVIRONMENTAL • REMEDIATION

**Contract No. DAAA09-02-D-0024/017**

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**NMSS/RGNI MATERIALS-002**

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## ACRONYMS AND ABBREVIATIONS

<b>AFSC</b>	Army Field Support Command	<b>µg/L</b>	micrograms per liter
<b>AMSL</b>	above mean sea level	<b>NADC</b>	USDA National Animal Disease Center
<b>ANL</b>	Argonne National Laboratory		
<b>bgs</b>	below ground surface	<b>Ni-63</b>	Nickel-63
<b>CABRERA</b>	Cabrera Services, Inc.	<b>NRC</b>	Nuclear Regulatory Commission
<b>DO</b>	dissolved oxygen	<b>ORD</b>	Oxidation-reduction potential
<b>DQOs</b>	data quality objectives	<b>PA</b>	preliminary assessment
<b>EE/CA</b>	engineering evaluation/cost analysis	<b>PRG</b>	preliminary remediation goal
<b>ESE</b>	Environmental Science and Engineering, Inc.	<b>Site 1</b>	former mixed waster burial site (CERCLA designation)
<b>ft</b>	feet	<b>USDA</b>	U.S. Department of Agriculture
<b>H-3</b>	tritium (Hydrogen-3)	<b>USEPA</b>	U.S. Environmental Protection Agency
<b>MCL</b>	maximum contaminant level	<b>VOC</b>	volatile organic compound

## EXECUTIVE SUMMARY

Cabrera Services, Inc. (CABRERA) has been contracted by the U.S. Army Field Support Command (AFSC) under Contract No. DAAA09-02-D-0024/DO17 to develop and implement a groundwater investigation for the United States Department of Agriculture (USDA) National Animal Disease Center (NADC) former mixed waste burial site (Site 1) in Ames, Iowa. This sampling effort is being conducted to supplement existing groundwater analytical data for the purpose of refining the conceptual site model and assessing the nature and extent of impacted groundwater at the site in support of regulatory closure of the former burial site.

This report is presented as an addendum to the July 2004 Groundwater Investigation Report, which documented the installation and development of six (6) new monitoring wells, and the initial (i.e., baseline) groundwater sampling event that included both the existing and newly installed monitoring wells. This addendum documents the second quarterly sampling event completed in September 2004. This groundwater investigation report addendum provides additional data to support the 2004 monitoring program, which has been approved by U.S. Environmental Protection Agency (USEPA) Region VII and conducted in accordance with the approved work plan (CABRERA, 2004a). The third groundwater-sampling event under this program will be conducted in December 2004, and the results will be summarized in a subsequent addendum report.

On September 1, 2004, the groundwater flow beneath Site 1 was relatively flat over the western portion of the site, with a slight gradient to the south. In the eastern portion of the site, groundwater flow was generally to the southwest, with an approximate 1.7% gradient. The presence of surface water on the north side of Road A may be affecting a shift in the groundwater flow, counteracting the northward component of flow that was observed during the May 2004 sampling event and facilitating southward migration of contaminants.

None of the previously identified in soil radionuclides of potential concern were identified above background levels during the September 2004 sampling event. This corroborates the findings from the initial July 2004 sampling event.

1,4-dioxane was detected in all eleven wells at concentrations ranging from 6.3 µg/l to 2,000 µg/l. Results from the eleven wells are all greater than the USEPA advisory level of 3 µg/l for 1,4-dioxane, and results from ten of the wells are greater than the State of Iowa groundwater standard of 15 µg/l. No drinking water standards for 1,4-dioxane have been established by USEPA or the State of Iowa. The distribution and relative concentrations of 1,4-dioxane during this sampling round do not differ significantly from the July sampling event.

One monitoring well, MW-12, also contained low concentrations of the following compounds: benzene, chlorobenzene, ethylbenzene, isophorone, n-propylbenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, total xylenes, diesel range organics, and ammonia. Concentrations of all detected compounds were well below their respective USEPA maximum contaminant levels (MCLs) for drinking water.

Trace concentrations of acetone and toluene were detected in two wells each, and trace concentrations of methylene chloride were detected in ten of the wells. However, all concentrations were well below their respective USEPA MCLs for drinking water and, due to the presence of these compounds in the blank samples, are likely representative of laboratory contamination.

Based on the results from two quarterly sampling events, there is no evidence that any of the radionuclides identified in the waste material in the former burial site have impacted groundwater in the vicinity of Site 1. As a result, it is recommended that USDA resubmit their request to Nuclear Regulatory Commission (NRC) for closure of Site 1.

Further investigation to delineate the horizontal and vertical extent of the 1,4-dioxane contamination is being implemented for Site 1. This investigation could proceed under the continuing review of USEPA Region VII and Iowa Dept. of Health. Based on the results of this delineation, additional permanent wells, both upgradient and downgradient, will be installed and included in the well monitoring network for additional groundwater monitoring events.

## 1 INTRODUCTION

Cabrera Services, Inc. (CABRERA) has been contracted by the U.S. Army Field Support Command (AFSC) under Contract No. DAAA09-02-D-0024/DO17 to implement a groundwater investigation for the United States Department of Agriculture (USDA) National Animal Disease Center (NADC) former mixed waste burial site (Site 1) in Ames, Iowa. This investigation is being conducted to supplement existing groundwater analytical data for the purpose of assessing the nature and extent of potentially impacted groundwater at the site. A baseline groundwater investigation report (CABRERA, 2004b) was submitted in July 2004 documenting the results of an initial groundwater sampling round.

The purpose of this groundwater investigation program is to determine if radionuclides of potential concern (ROPs) and chemicals of potential concern (COPCs) buried within the former waste pits at Site 1 (Figure 1-1) have leached into groundwater and are adversely impacting the environment. Refer to the initial Groundwater Investigation Report (CABRERA, 2004b) for a detailed discussion of the Data Quality Objectives (DQOs), Site background information and baseline investigation results. This addendum report presents the results of a second quarterly groundwater sampling event conducted in September 2004, in accordance with the approved project work plan (CABRERA 2004a). The site layout, including locations of all wells included in this monitoring event, is depicted in Figure 1-2.



Figure 1-1 Site Vicinity Map



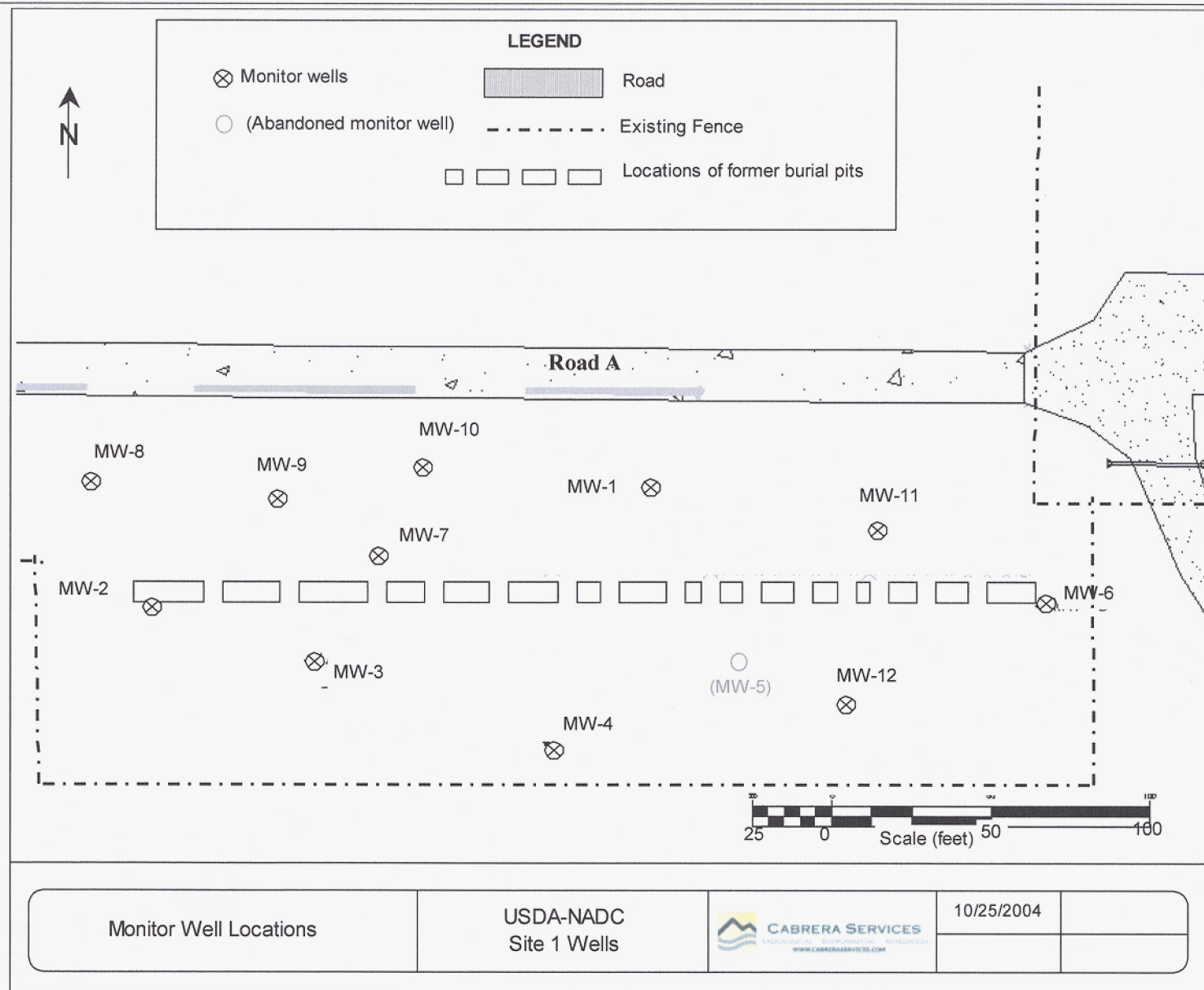


Figure 1-2: Site 1 Monitoring Well Locations

## 2 GROUNDWATER INVESTIGATION FIELD METHOD

Field activities described in this report addendum apply to the second quarterly sampling of all eleven monitoring wells in the groundwater-monitoring network.

### 2.1 Soil Boring/Monitoring Well Installation

No new soil borings or monitoring wells have been installed since those discussed in the *Groundwater Investigation Report* (CABRERA, 2004b).

### 2.2 Well Development

None of the wells sampled during the second quarterly sampling event required redevelopment.

### 2.3 Groundwater Sampling Procedures

Groundwater elevations were measured in all viable monitoring wells as feet (ft) below the measuring point elevation (top of inner casing) to the nearest 0.01-ft. (Note: MW-5 has been abandoned, so it has been omitted from the groundwater sampling program). CABRERA also measured the total depth of the wells and provided comment on the overall condition of the monitoring wells. Based on previous observations, it was determined that the wells did not need to be inspected for a phase separate layer, although a photoionization detector was used to detect airborne volatile organic compounds (VOCs) in the well headspace prior to sampling.

Groundwater samples were obtained from the monitoring wells during the period of September 1 through 2, 2004. This second round of sampling of the entire eleven-well network serves as a comparison to the baseline conditions established in May 2004.

The monitoring wells were purged using low-flow purging methodology to obtain ambient, representative groundwater samples. Low-flow purging was accomplished using a peristaltic pump in accordance with procedures presented in the Work Plan (CABRERA, 2004a). Purge water was collected and stored in drums onsite to await characterization and final disposition.

While each well was being purged, field parameters were monitored at the wellhead at 5- to 10-minute intervals using a flow-through cell. The water-quality stabilization parameters

temperature, pH, oxidation-reduction potential (ORP), dissolved oxygen (DO), and turbidity were measured during purging and recorded on groundwater sampling field data sheets. The purge water was pumped through an in-line flow-through cell containing measurement sensors to monitor the first four stabilization indicator parameters, and a small sample was collected from the flow-through cell discharge tube for turbidity measurement. Completed field data records for each well are included in Appendix A.

Groundwater samples were collected immediately after purging, using a peristaltic pump. The samples were obtained in the following order.

- VOCs
- Semivolatile Organic Compounds (SVOCs)
- Radiological Constituents

The groundwater samples were identified using the well numbers specified in Table 2-1. Sample identification also included sampler initials and the date and time of collection. All samples were appropriately preserved and shipped under chain-of-custody to the STL Laboratory facility in Arvada, Colorado.

#### **2.4 Location/Elevation Survey**

The horizontal and vertical coordinates of all eleven wells in the monitoring network, as measured in May 2004 (CABRERA, 2004), are provided in Table 2-1. These coordinates correspond to the well locations indicated previously in Figure 1-2.

Table 2-1 Monitoring Well Coordinates

Well ID	Northing (ft)	Easting (ft)	Top-of-Casing Elevation (ft AMSL)
MW-1	5130.21	6297.68	995.99
MW-2	5097.51	6141.61	996.27
MW-3	5081.53	6191.04	996.16
MW-4	5055.25	6266.67	996.46
MW-5 *	5079.15	6326.98	n/a *
MW-6	5098.16	6421.86	998.07
MW-7	5110.3	6212.1	995.39
MW-8	5133.0	6122.1	995.43
MW-9	5126.7	6180.1	994.82
MW-10	5135.5	6225.6	996.06
MW-11	5117.7	6368.6	996.65
MW-12	5068.5	6358.6	996.68

ft = feet

AMSL = above mean seal level

\* Well MW-5 has been abandoned.

Note: Existing survey plan for MW-1 through -6: extrapolated data for MW-6 through -12

### **3 GROUNDWATER MONITORING AND SAMPLING RESULTS**

#### **3.1 Soil Boring Data**

No new soil boring data was generated during the second quarterly sampling event.

#### **3.2 Groundwater Elevation Data**

Groundwater elevations were gauged in all eleven existing wells on September 1, 2004, prior to sampling. The depth to ground water varied from 6.73 to 8.42 ft below top-of-casing (or approximately four ft below ground surface [bgs]). A map of the groundwater piezometric surface, as measured in September 2004, is presented in Figure 3-1. The piezometric surface indicates that groundwater flow during the September 2004 sampling event was generally to the southwest in the eastern portion of Site 1, with a gradient of approximately 1:60 (1.7%). In the western portion of the site, the groundwater flow gradient flattens to approximately 1:500 (0.2%), with flow direction to the south-southwest.

#### **3.3 Groundwater Quality Data**

Groundwater samples were collected from all of the existing wells during the period of September 1 through 2, 2004. The wells were sampled using the USEPA low-flow sampling protocol. All samples were analyzed for VOCs, SVOCs, and three ROPCs (Tritium, or Hydrogen-3 [H-3], Nickel-63 [Ni-63], and Carbon-14 [C-14]) by the STL Laboratory. Results for compounds detected in MW-01 through MW-12 are summarized in Table 3-1. Additional compounds that were detected only in MW-12 are presented in Table 3-2. Complete laboratory results for the September 2004 sampling event are included in this report as Appendix B.

The reported activity concentrations presented in Table 3-1 for the three analyzed radionuclides (H-3, Ni-63 and C-14) were below background for all eleven wells. These results are consistent with previously collected data, including data from the May 2004 sampling event, as documented in the initial Groundwater Investigation Report (CABRERA, 2004b).

As part of the evaluation of groundwater at the former burial site, organic chemical compounds commonly associated with radioisotope waste were also included in the sampling program. In

order to analyze groundwater samples for the scintillation cocktail components PPO and POPOP, the Method 8270C analysis library for SVOCs was expanded. None of the standard report Method 8270C analytes were detected, nor were PPO or POPOP. However, the presence of 1,4-dioxane, which was originally detected during the baseline-sampling event (CABRERA, 2004b), was confirmed through the modified Method 8270C analyses. This compound was observed to be present in concentrations ranging from 6.3 micrograms per liter ( $\mu\text{g/l}$ ) at MW-08 to 2,000  $\mu\text{g/l}$  at MW-07. An isoconcentration contour map of 1,4-dioxane concentrations for this sampling event is presented in Figure 3-2.

During sampling, the purge water from one monitoring well (MW-12) exhibited a strong odor and appeared to be the color of weak tea. In addition, a slight sheen was noted on the surface of the initial purge volume from this well. Analytical results indicate that MW-12 contains low concentrations of the following compounds: benzene, chlorobenzene, ethylbenzene, isophorone, n-propylbenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and total xylenes (Table 3-2). Based on field observations during sampling, additional volume was collected from this well and submitted for analysis of diesel range organics and ammonia. Results confirmed the presence of both (Table 3-2). Concentrations of all detected compounds were well below their respective USEPA maximum contaminant levels (MCLs) for drinking water.

As indicated in Table 3-1, trace concentrations of acetone and toluene were detected in two wells each, and trace concentrations of methylene chloride were detected in ten of the wells. However, all concentrations are well below their respective USEPA MCLs for drinking water. In addition, acetone and toluene were present in the trip blank, and methylene chloride was present in the associated laboratory blanks, suggesting that the presence of these compounds may be the result of laboratory handling rather than actual well contamination. The laboratory data summary reports (Appendix B) corroborate this conclusion.

Table 3-1 Summary of Analytes Detected in Groundwater (MW-01 through MW-12)

		Acetone <sup>1</sup>	1,4-Dioxane	Methylene Chloride	Toluene <sup>2</sup>	Tritium	Nickel-63	Carbon-14
Analytical Method		SW846 8260B	SW846 8270C	SW846 8260B	SW846 8260B	EPA 906.0(m)	DOE STL-RC-0055	EERF C-01-1
Units		µg/L	µg/L	µg/L	µg/L	pCi/L	pCi/L	pCi/L
USEPA MCL <sup>3</sup>		n/a	n/a	5	1,000	20,000	50	2,000
Detection Limit		2.5	2 to 60	0.21	0.15	290 to 300	21 to 29 <sup>4</sup>	12 to 16
Well ID	Sample Date							
MW-01	9/2/04	ND	120	0.63 J, B	0.21 J	-170 U	-11 U	-4 U
MW-02	9/1/04	ND	30	0.76 J, B	ND	5.4 U	-15 U	17.5 J
MW-03	9/1/04	ND	47	0.54 J, B	ND	30 U	4 U	1.2 U
MW-04	9/1/04	ND	57	0.63 J, B	ND	5 U	13	-3.6 U
MW-06	9/1/04	ND	29	0.59 J, B	ND	-50 U	0.05 U	3.1 U
MW-07	9/2/04	ND	2,000	ND	ND	240 U	-13 U	18.9 J
MW-08	9/1/04	ND	6.3 J	0.9 J, B	ND	70 U	-16 U	11.9 U
MW-09	9/2/04	2.7 J	330	0.69 J, B	ND	200 U	-8 U	5 U
MW-10	9/2/04	4.5 J	810	0.59 J, B	ND	230 U	-8 U	6.8 U
MW-11	9/2/04	ND	1,100	0.64 J, B	ND	-140 U	-0.7 U	3.7 U
MW-12	9/1/04	ND	35	0.70 J, B	0.20 J	-80 U	14	5.6 U

USEPA MCL = Maximum contaminant level for drinking water established by the U. S. Environmental Protection Agency.

ND = Analyte was not detected above the detection limit.

J = Analyte was detected above the detection limit but below the reporting limit.

U = Reported result is below the detection limit.

Notes:

1. Acetone was detected in the trip blank at a concentration of 6.6 µg/L with a "J" qualifier.
2. Toluene was detected in the trip blank at a concentration of 0.21 µg/L with a "J" qualifier.
3. MCLs do not exist for acetone or 1,4-dioxane, although other regulatory agencies have established limits. USEPA has established an advisory limit for 1,4-dioxane recommending a drinking water limit of 3 µg/l. The State of Iowa has established a groundwater standard of 15 µg/L.
4. The laboratory detection limit was above the project-specific detection limit of 5 pCi/L, so all results are reported here. Total propagated uncertainties for Ni-63 were ±0.29 to 59 pCi/L.

Table 3-2 Additional Compounds Detected in MW-12

	Benzene	Chloro- benzene	Ethyl- benzene	Iso- phorone	n-Propyl- benzene	1,2,4- Trimethyl- benzene	1,3,5- Trimethyl- benzene	Xylenes, Total	Diesel Range Organics	Ammonia, as N
<b>Analytical Method</b>	SW846 8260B	SW846 8260B	SW846 8260B	SW846 8270C	SW846 8260B	SW846 8260B	SW846 8260B	SW846 8260B	SW846 8015B	MCAWW 350.1
<b>Units</b>	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L
<b>USEPA MCL</b>	5	100	700	5	n/a	n/a	n/a	10,000	n/a	n/a
<b>Detection Limit</b>	0.17	0.13	0.12	0.9 to 27	0.17	0.15	0.16	0.41	0.043	2.9
<b>Well ID</b>	<b>Sample Date</b>									
MW-12	9/1/04	0.20 J	1.5	0.69 J	1.2 J	0.53 J	2.3	1.1	4.2	1.1
										72 Q

USEPA MCL = Maximum contaminant level for drinking water established by the U. S. Environmental Protection Agency.

J = Analyte was detected above the detection limit but below the reporting limit.

Q = Elevated reporting limit due to high analyte levels.



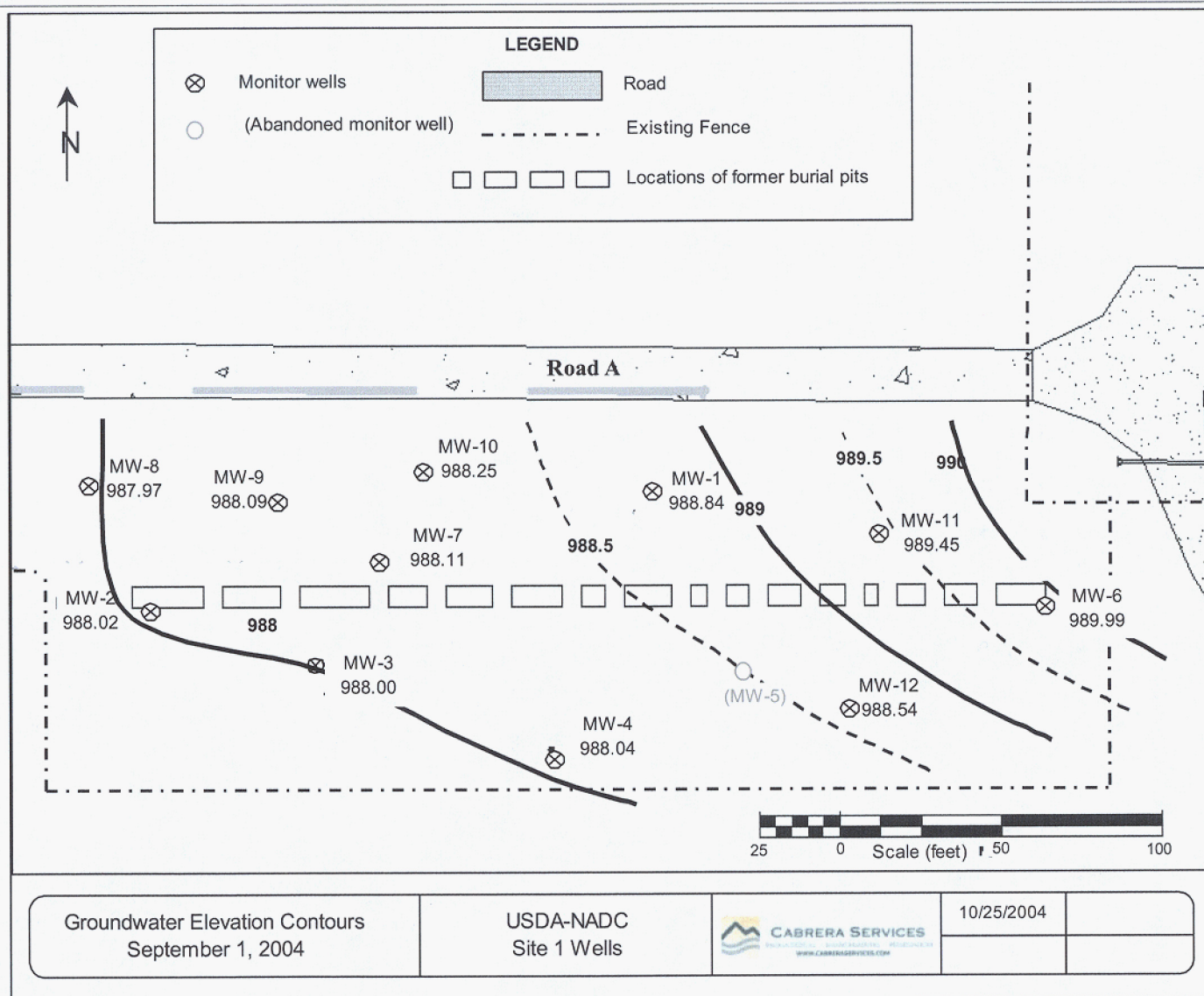


Figure 3-1 Groundwater Elevation Contours - September 1, 2004

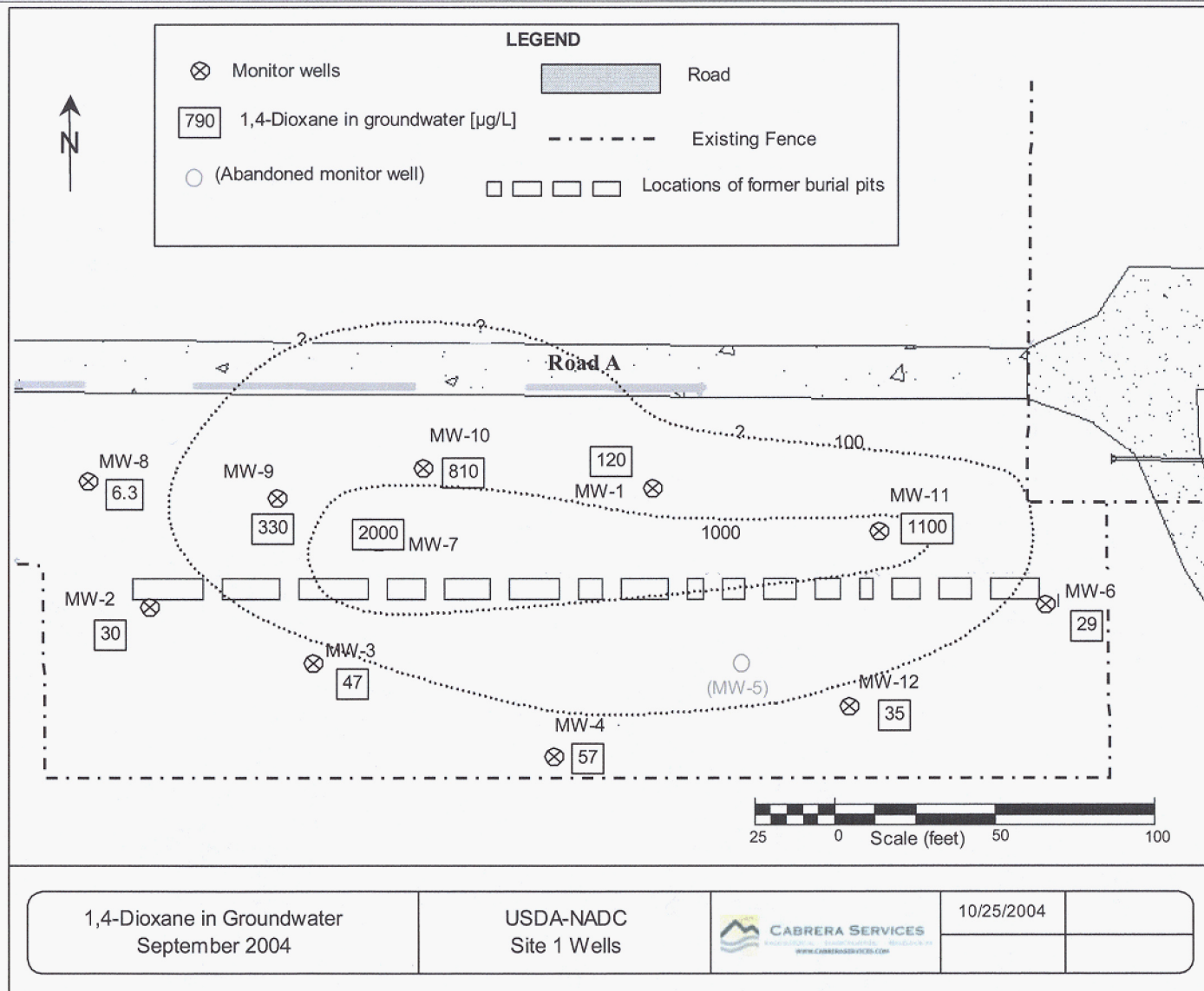


Figure 3-2 1,4-Dioxane in Groundwater - September 2004

## 4 SUMMARY OF FINDINGS AND CONCLUSIONS

The following summarizes the findings of the current groundwater investigation and presents conclusions and recommendations based on these results.

### 4.1 Findings

On September 1, 2004, the groundwater flow beneath Site 1 was relatively flat over the western portion of the site, with a slight gradient to the south. In the eastern portion of the site, groundwater flow was generally to the southwest, with an approximate 1.7% gradient. The presence of surface water in the drainage swale on the north side of Road A may be influencing flow locally.

None of the previously identified ROPCs in soil were detected above background concentrations in groundwater samples collected from the Site 1 monitoring wells during the September 2004 sampling event. These results are consistent with previously collected data, including data from the May 2004 sampling event.

Concentrations of VOCs were reported either as non-detects or below reporting limits in all wells except MW-12. The concentrations of VOCs reported for MW-12, although above reporting limits for some compounds, are all well below their respective MCLs for drinking water. These results are consistent with the May 2004 data.

The SVOC analyses indicate the presence of 1,4-dioxane in all eleven monitoring wells. Concentrations ranging from 6.3 µg/l to 2,000 µg/l were reported for the September 2004 sampling event. Similar concentrations were reported for the May 2004 sampling event, with concentrations ranging from less than 2 µg/l to 1,900 µg/l.

The distribution of 1,4-dioxane shown in Figure 3-2 indicates minor changes from that observed in May 2004. The September 2004 data indicate that the 1,000-µg/l contour encompasses a slightly larger area than it did in May. However, the 100-µg/l contour appears to be relatively unchanged, and there is still uncertainty as to the precise location of this contour due to the lack

of control points on the north side of the site. Follow-on investigation is planned to further delineate the horizontal and vertical extent of the 1,4-dioxane.

#### 4.2 Regulatory Considerations

The State of Iowa has set a groundwater standard of 15 µg/l for 1,4-dioxane. Currently, ten of the eleven wells at this site exceed this standard.

There is no Federal drinking water standard (i.e., MCL) for 1,4-dioxane, although there is a USEPA health advisory level of 3 µg/l. In addition, various states have established their own drinking water standards, as summarized below:

California:	3 µg/l	Massachusetts:	50 µg/l
Florida:	5 µg/l	Michigan:	85 µg/l
Maine:	70 µg/l	North Carolina:	7 µg/l

USEPA Region 9 has established a preliminary remediation goal (PRG) of 6.1 µg/L for 1,4-dioxane in drinking water (USEPA, 2002). All eleven wells at the site exceed this concentration. The PRG is a risk-based concentration intended for use by risk assessors in conducting initial screening level evaluations. This value represents the concentration at which an individual who uses this water as a primary drinking water source over an entire lifetime would experience a one-in-a-million (i.e.,  $1 \times 10^{-6}$ ) risk of developing cancer. Since the groundwater beneath Site 1 is not currently used as a drinking water source, there is no complete exposure pathway, so no population is currently at risk. However, the drinking water PRGs are frequently used by regulatory agencies to gauge the potential human health risks posed by groundwater contaminants for which there are no applicable MCLs.

#### 4.3 Conclusions and Recommendations

No radionuclides were detected above background levels in any of the eleven monitoring wells at Site 1 during either of the 2004 sampling events. This supports previous groundwater sampling results and post-soil removal analyses, confirming that the source materials have been removed and there has been no significant impact to groundwater resulting from radioactive compounds that may have been included in the buried materials. Therefore, it is recommended that

monitoring for radionuclides at Site 1 be discontinued after the third quarterly sampling event and that the USDA proceed with a request for termination of its Nuclear Regulatory Commission (NRC) license.

The lateral extent of the aqueous 1,4-dioxane contamination has been identified to the south at the approximate 50- $\mu\text{g/l}$  contour interval and to the north at the approximate 1,000  $\mu\text{g/l}$  contour interval. Further horizontal delineation of contaminant distribution is planned in both upgradient and downgradient directions, and vertical delineation is planned near the location of highest observed contaminant concentration. It is recommended that SVOCs, in particular 1,4-dioxane, continue to be monitored in all eleven wells and any new wells installed in the vicinity of this site.

With respect to VOCs, there were no significant detections during either of the 2004 sampling events for wells MW-1 through MW-11. Well MW-12, however, exhibited low concentrations of several organic compounds. Because these constituents were not detected during the first quarterly monitoring event, it is recommended that a decision on whether to continue monitoring for VOCs at Site 1 be deferred until after the third quarter monitoring results are evaluated.

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## **APPENDIX A**

### **GROUNDWATER SAMPLING FIELD DATA SHEETS - SEPTEMBER 2004 SAMPLING EVENT**

# **MONITOR WELL STATIC WATER LEVEL FORM**

PROJECT NAME: USDA-NA DC

DATE: 09/01/04

WATER LEVEL INDICATOR ID # 16820

FIELD BOOK # N/A

LOCATION: AMES, IA

PAGE # 01 OF 01

Monitor Well Number	Total Well Depth	Well Screen Length	Measuring Point Elev.	Time	Depth to Static Water Level	Sounding	Explosimeter Reading (above background)	PID Reading (above background)
MW-1	16.60				7.15			0.00
MW-2	16.11				8.25			0.00
MW-3	16.53				8.16			0.00
MW-4	16.09				8.42			0.00
MW-6	16.25				8.08			0.00
MW-7	17.35				7.28			3.29
MW-8	17.46				7.46			0.70
MW-9	16.87				6.73			0.00
MW-10	17.17				7.81			3.10
MW-11	17.50				7.20			2.11
MW-12	17.31				8.14			0.00
					Started 0700			
					ended 0900			

Note: Total well depth to be measured at time of gauging.

INP on Comments: DISTILLED DEION WATER FROM PREMIUM WATERS, INC  
CHIPPewa Falls, WI 54729 ? Call 1-800-842-7886.  
PICD # 072004 0726, EXP 072005 W

Sampler MARK WINTERS

Observer Barb Duletsky



PROJECT	USDA NADC, Site 1 - Former Waste Burial Plts, Ames, IA		JOB NUMBER	03-3040.17, Task 2		DATE	4-2-04		
MONITORING WELL ID	MW - 01		ACTIVITY TIME	START	0930	END	1230	BOTTLE TIME	1100
FIELD SAMPLE ID	02 - MW - 01		QC SAMPLES COLLECTED	DUP		ASSOCIATED TRIP BLANK	NA		

WELL DATA      DIAMETER      2 IN

DEPTH OF WELL (D) 16.61 FT (BTOC)

INITIAL DEPTH TO WATER (DTW) 7.25 FT (BTOC)

HEIGHT OF WATER COLUMN (D - DTW) 9.36 FT

VOLUME OF WATER COLUMN (M) 1.5 GAL

- FOR 2-IN. DIAM.,  $V = 0.16 \times (D - DTW)$

- FOR 4-IN. DIAM.,  $V = 0.65 \times (D - DTW)$

MINIMUM PURGE VOLUME 0.04 GAL

- $PV = 1.5 \times \text{Volume of pump and hose}$

$$= 0.00255 \times 16.61 = .04$$

**WATER LEVEL DATA (POST SAMPLE COLLECTION)**

FINAL DEPTH TO WATER (FDTW) 9.78 FT (BTOC)

DRAWDOWN DEPTH (FDTW - DTW) 2.53 FT

DRAWDOWN VOLUME (DV) *0.4048* GAL

- FOR 2-IN. DIAM., DV = 0.16 (FDTW - DTW)

- FOR 4-IN. DIAM.,  $DV = 0.65$  (FDTW - DTW)

RATIO OF DRAWDOWN VOLUME  
TO TOTAL VOLUME (DV / V) 0.17

Note: BTOC = Below Top of Casing

## EQUIPMENT ID NUMBERS

BLADDER PUMP 218

PERISTALTIC PUMP Geaumo 375

SUBMERSIBLE PUMP *21A*

BAILER *N/A*

FIELD MONITORING YSI 557 MFS

FIELD MONITORING 1-1-350 NW  
INSTRUMENTATION #1003

FIELD INSTRUMENTATION 8/19/04

CALIBRATION DATE # 237

Turb meter Hoch 2100P

### PURGE DATA

[illegible]

## SAMPLE ANALYSES

LE ANALYSES			BOTTLE TYPE/ VOLUME REQUIRED	SAMPLE COLLECTED
PARAMETER	METHOD NUMBER	PRESERVATION METHOD		
VOCs	8280B	HCl, 4°C	3 @ 40-mL	<input checked="" type="checkbox"/>
SVOCs (incl PPO/POPOP)	Mod. 8270B	4°C	2 @ 1 L amber glass	<input checked="" type="checkbox"/>
Carbon-14 (C-14)	LSC	HNO <sub>3</sub>	2 @ 500 mL amber glass \	<input checked="" type="checkbox"/>
Nickel-63 (Ni-63)	LSC	HNO <sub>3</sub>	2 @ 500 mL amber glass /	<input checked="" type="checkbox"/>
Tritium (H-3)	LSC	4°C	2 @ 250 mL amber glass	<input checked="" type="checkbox"/>

## NOTES

9.78 DTW @ 1200 HRS  
END SAMPLING

**SAMPLED BY:**

RECEIVED BY:

**FIELD DATA RECORD**  
**GROUNDWATER SAMPLING**

[illegible]



## FIELD DATA RECORD

### GROUNDWATER SAMPLING

[illegible]



# FIELD DATA RECORD

## GROUNDWATER SAMPLING

PROJECT

USDA NADC, Site 1 - Former Waste Burial Pits, Ames, IA

JOB NUMBER

03-3040.17, Task 2

DATE

09/01/04

MONITORING WELL ID

MW - 08

ACTIVITY TIME

START 1600 END 1730

BOTTLE TIME

16:55

FIELD SAMPLE ID

02 - MW - 08

QC SAMPLES COLLECTED

NONE

ASSOCIATED TRIP BLANK

NA

WELL DATA

DIAMETER 2 IN

DEPTH OF WELL (D) 16.48 FT (BTOW)

INITIAL DEPTH TO WATER (DTW) 8.07 FT (BTOW)

HEIGHT OF WATER COLUMN (D - DTW) 8.41 FT

VOLUME OF WATER COLUMN (V) 1.345 GAL

- FOR 2-IN. DIAM., V = 0.16 x (D - DTW)

- FOR 4-IN. DIAM., V = 0.65 x (D - DTW)

MINIMUM PURGE VOLUME 0.007 GAL

- PV = 1.5 x Volume of pump and hose

0.04

= 0.00255 x 16.09 = 0.04

WATER LEVEL DATA (POST SAMPLE COLLECTION)

FINAL DEPTH TO WATER (FDTW) 8.51 FT (BTOW)

DRAWDOWN DEPTH (FDTW - DTW) 0.44 FT

DRAWDOWN VOLUME (DV) 0.0704 GAL

- FOR 2-IN. DIAM., DV = 0.16 (FDTW - DTW)

- FOR 4-IN. DIAM., DV = 0.65 (FDTW - DTW)

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME (DV / V) 0.0704 / 1.345 = 0.052

Note: BTOW = Below Top of Casing

EQUIPMENT ID NUMBERS

BLADDER PUMP N/A

PERISTALTIC PUMP 375

SUBMERSIBLE PUMP N/A

BAILER N/A

FIELD MONITORING INSTRUMENTATION 1003

FIELD INSTRUMENTATION CALIBRATION DATE 8/10/04

PURGE DATA

TIME	DTW (ft BTOW)	PURGE RATE (lpm)	TEMP (deg C)	CONDUCTIVITY (mS/cm)	pH	DISSOLVED OXYGEN (mg/l)	TURBIDITY (NTU)	OX-RED POTENTIAL (mV)	Other	COMMENTS
1615	8.07	0.240	18.83	1.210	7.13	15.48	1.60	33.27		
1620	8.38	0.240	19.16	1.221	7.00	3.16	8.55	24.10		
1625	8.44	0.230	18.32	1.027	6.77	2.21	5.37	15.20		* SHADY FLOW THROUGH CELL FROM SUN EXPOSURE FOR BETTER WATER TEMPERATURE.
1630	8.51	0.230	18.15	1.087	6.94	1.65	4.95	1.60		
1635	8.51	0.230	18.21	1.223	6.96	1.55	3.64	1.60		
1640	8.51	0.230	18.21	1.223	6.92	1.52	4.06	1.60		
1645	8.51	0.230	17.99	1.024	6.92	1.50	3.85	2.00		
1650	8.51	0.230	18.07	1.025	6.93	1.42	3.67	2.10		
1655	8.51	0.230	17.90	1.228	6.91	1.43	3.33	2.10		

SAMPLE ANALYSES

PARAMETER	METHOD NUMBER	PRESERVATION METHOD	BOTTLE TYPE/ VOLUME REQUIRED	SAMPLE COLLECTED
VOCs	8260B	HCl, 4°C	3 @ 40-mL	<input checked="" type="checkbox"/>
SVOCs (incl PPO/POPOP)	Mod. 8270B	4°C	2 @ 1 L amber glass	<input checked="" type="checkbox"/>
Carbon-14 (C-14)	LSC	HNO <sub>3</sub>	2 @ 500 mL amber glass	<input checked="" type="checkbox"/>
Nickel-63 (NI-63)	LSC	HNO <sub>3</sub>	2 @ 500 mL amber glass	<input checked="" type="checkbox"/>
Tritium (H-3)	LSC	4°C	2 @ 250 mL amber glass	<input checked="" type="checkbox"/>

NOTES

KEEP WATER INTER FACE 600 FROM #775

\* SHADY FLOW THROUGH CELL FROM SUN EXPOSURE FOR BETTER WATER TEMPERATURE.

SAMPLED BY:

RECEIVED BY:

Mark Winters

Paul Duletsky



# FIELD DATA RECORD GROUNDWATER SAMPLING

[illegible]

PROJECT	USDA NADC, Site 1 - Former Waste Burial Pits, Ames, IA		JOB NUMBER	03-3040.17, Task 2		DATE	09/02/04		
MONITORING WELL ID	MW - 09		ACTIVITY TIME	START	0945	END	1130	BOTTLE TIME	1025
FIELD SAMPLE ID	02 - MW - 09		QC SAMPLES COLLECTED	MS, MSD		ASSOCIATED TRIP BLANK	NA		

WELL DATA		DIAMETER		2 IN		WATER LEVEL DATA (POST SAMPLE COLLECTION)		EQUIPMENT ID NUMBERS	
DEPTH OF WELL (D)	17.60 FT (BTOW)		FINAL DEPTH TO WATER (FDTW)	7.69 FT (BTOW)		BLADDER PUMP	N/A		
INITIAL DEPTH TO WATER (DTW)	6.95 FT (BTOW)		DRAWDOWN DEPTH (FDTW - DTW)	0.74 FT		PERISTALTIC PUMP	611		
HEIGHT OF WATER COLUMN (D - DTW)	10.65 FT		DRAWDOWN VOLUME (DV)	0.1184 GAL		SUBMERSIBLE PUMP	N/A		
VOLUME OF WATER COLUMN (V)	1.704 GAL		- FOR 2-IN. DIAM., DV = 0.18 (FDTW - DTW)			BAILER	N/A		
- FOR 2-IN. DIAM., V = 0.18 x (D - DTW)			- FOR 4-IN. DIAM., DV = 0.65 (FDTW - DTW)			FIELD MONITORING	539		
- FOR 4-IN. DIAM., V = 0.65 x (D - DTW)			RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME (DV / V)	0.069		INSTRUMENTATION			
MINIMUM PURGE VOLUME	0.0561 GAL					FIELD INSTRUMENTATION	8/19/04		
- PV = 1.5 x Volume of pump and hose						CALIBRATION DATE			

Note: BTOW = Below Top of Casing  
 18" ID USING PV = 1.30 FT x 7.48 = 9.764 FT

[illegible]

SAMPLE ANALYSES		METHOD NUMBER	PRESERVATION METHOD	BOTTLE TYPE/ VOLUME REQUIRED	SAMPLE COLLECTED
VOCs	8260B	HCl, 4°C	3 @ 40-mL	<input checked="" type="checkbox"/>	
SVOCs (incl PPO/POPOP)	Mod. 8270B	4°C	2 @ 1 L amber glass	<input checked="" type="checkbox"/>	
Carbon-14 (C-14)	LSC	HNO <sub>3</sub>	2 @ 500 mL amber glass \	<input checked="" type="checkbox"/>	
Nickel-63 (NI-63)	LSC	HNO <sub>3</sub>	2 @ 500 mL amber glass /	<input checked="" type="checkbox"/>	
Tritium (H-3)	LSC	4°C	2 @ 250 mL amber glass	<input checked="" type="checkbox"/>	

NOTES TURBIDIMETER ARCH 2100P SERIAL # 280 FROM 600 MCH  
INTER FACE PROBE WORK  
SERIAL # 725  
NPS SAMPLE TIME: 7:20 (M) 1025  
SAMPLED BY: MARK WATERS  
RECEIVED BY: Barb Duletsky

MSD Sample TIME: 1026

NOTE: VOO'S ALL TAKEN  
AT 1025 <sup>THATS FOR</sup> MW-9, MS & MS1



**CABRERA SERVICES**  
RADIOLOGICAL • ENVIRONMENTAL • REMEDIATION

**FIELD DATA RECORD**  
**GROUNDWATER SAMPLING**

[illegible]



# CABRERA SERVICES

RADIOLOGICAL • ENVIRONMENTAL • REMEDIATION

## FIELD DATA RECORD GROUNDWATER SAMPLING

PROJECT USDA NADC, Site 1 - Former Waste Burial Pits, Ames, IA JOB NUMBER 03-3040.17, Task 2 DATE 09/02/04  
 MONITORING WELL ID MW - 11 ACTIVITY TIME START 1220 END 1715 BOTTLE TIME 1645  
 FIELD SAMPLE ID 02 - MW - 11 QC SAMPLES COLLECTED none ASSOCIATED TRIP BLANK NA

WELL DATA DIAMETER 2 IN

DEPTH OF WELL (D) 17.25 FT (BTOW)

INITIAL DEPTH TO WATER (DTW) 7.28 FT (BTOW)

HEIGHT OF WATER COLUMN (D - DTW) 9.97 FT

VOLUME OF WATER COLUMN (V) 1.6 GAL

- FOR 2-IN. DIAM.,  $V = 0.16 \times (D - DTW)$

- FOR 4-IN. DIAM.,  $V = 0.65 \times (D - DTW)$

MINIMUM PURGE VOLUME 0.007 GAL

-  $PV = 1.5 \times \text{Volume of pump and hose}$

$0.00255 \times 17.25 = 0.04$

WATER LEVEL DATA (POST SAMPLE COLLECTION)

FINAL DEPTH TO WATER (FDTW) 16.20 FT (BTOW)

DRAWDOWN DEPTH (FDTW - DTW) 8.92 FT

DRAWDOWN VOLUME (DV) 1.4272 GAL

- FOR 2-IN. DIAM.,  $DV = 0.16 (FDTW - DTW)$

- FOR 4-IN. DIAM.,  $DV = 0.65 (FDTW - DTW)$

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME (DV/V) 0.872

$1.600$

Note: BTOW = Below Top of Casing

EQUIPMENT ID NUMBERS

BLADDER PUMP N/A

PERISTALTIC PUMP Geopump 375

SUBMERSIBLE PUMP N/A

BAILER N/A

FIELD MONITORING INSTRUMENTATION YSI 556 MPS

#1003

FIELD INSTRUMENTATION 6/19/04

CALIBRATION DATE #237

TURB METER - HACH 2100 P

### PURGE DATA

TIME	DTW (ft btoc)	PURGE RATE (lpm)	TEMP (deg C)	CONDUCTIVITY (mS/cm)	pH	DISSOLVED OXYGEN (mg/l)	TURBIDITY (NTU)	OX-RED POTENT (mV)	Other	COMMENTS
1220	7.28	0.20	17.82	1.925	6.71	11.27	15.90	65.1		
1225	7.73	0.20	17.91	1.924	6.73	10.31	10.50	62.31		NSI BATTERY PROBLEMS
1230	8.02	0.20	17.99	1.924	6.75	9.07	10.91	50.11		REPLACED BATS
1235	8.43	0.20	17.99	1.924	6.77	8.10	10.90	40.00		
1240	9.00	0.20	18.31	1.926	6.80	6.37	9.00	37.23		
1245	9.55	0.20	18.60	1.929	6.81	2.15	8.64	19.90		
1250	9.76	0.20	17.35	1.997	6.67	1.45	35.30	14.03		
1255	10.37	0.20	18.10	1.941	6.19	1.10	13.00	21.90		
1310	10.85	0.20	18.18	1.899	6.76	1.68	5.97	11.6		Tried to shade-flow cell
1320	11.48	0.20	17.14	1.875	6.70	1.08	19.1	-90.0		ORP Changing rapidly
1330	12.17	0.20	16.03	1.968	6.54	0.83	14.3	-65.8		
1335	12.57	0.20	16.35	1.912	6.61	1.10	6.15	-64.1		
1340	13.02	0.20	16.27	1.922	6.62	1.02	24.3	-49.3		
1345	13.48	0.20	16.09	1.982	6.61	0.68	19.0	-31.8		Water getting cloudy
1352	14.12	STOPPED								RECHARGE BEFORE SAMPLING
1646	13.12	0.20	18.90	2.802	7.16	3.16	128	-106.3		IRON PRECIP.
1643	13.71	0.20	16.25	2.009	6.86	1.95	140	-100.0		SAMPLE

### SAMPLE ANALYSES

PARAMETER

METHOD NUMBER

PRESERVATION METHOD

BOTTLE TYPE/  
VOLUME REQUIRED

SAMPLE COLLECTED

VOCs

8280B

HCl, 4°C

3 @ 40-mL

☒

SVOCs (incl PPO/POPOP)

Mod. 8270B

4°C

2 @ 1 L amber glass

☒

Carbon-14 (C-14)

LSC

HNO<sub>3</sub>

2 @ 500 mL amber glass

☒

Nickel-63 (NI-63)

LSC

HNO<sub>3</sub>

2 @ 500 mL amber glass

☒

Tritium (H-3)

LSC

4°C

2 @ 250 mL amber glass

☒

NOTES \* REPLACED BATS ON YSI 556 MPS UNIT

\* IRON PRECIPITATION CAUSING  
HIGH TURBID READINGS...

SAMPLED BY:

MARK L. WINTER

RECEIVED BY:

Garb D. D. D.

## FIELD DATA RECORD

### GROUNDWATER SAMPLING

PROJECT

USDA NADC, Site 1 - Former Waste Burial Pits, Ames, IA

JOB NUMBER

03-3040.17, Task 2

DATE

9-1-04

MONITORING WELL ID

MW - 12

ACTIVITY TIME

START 1600 END 1800

BOTTLE TIME

1705

FIELD SAMPLE ID

02 - MW - 12

QC SAMPLES COLLECTED

NONE

ASSOCIATED TRIP BLANK

NA

WELL DATA

DIAMETER 2 IN

DEPTH OF WELL (D) 17.31 FT (BTOW)

INITIAL DEPTH TO WATER (DTW) 8.61 FT (BTOW)

HEIGHT OF WATER COLUMN (D - DTW) 8.70 FT

VOLUME OF WATER COLUMN (V) 1.4 GAL

- FOR 2-IN. DIAM., V = 0.16 x (D - DTW)

- FOR 4-IN. DIAM., V = 0.65 x (D - DTW)

MINIMUM PURGE VOLUME 0.007 GAL

- PV = 1.5 x Volume of pump and hose

0.00255 x 17.31 = 0.04

WATER LEVEL DATA (POST SAMPLE COLLECTION)

FINAL DEPTH TO WATER (FDTW) 13.59 FT (BTOW)

DRAWDOWN DEPTH (FDTW - DTW) 4.98 FT

DRAWDOWN VOLUME (DV) 7.168 GAL

- FOR 2-IN. DIAM., DV = 0.16 (FDTW - DTW)

- FOR 4-IN. DIAM., DV = 0.65 (FDTW - DTW)

RATIO OF DRAWDOWN VOLUME TO TOTAL VOLUME (DV / V) 0.565

Note: BTOW = Below Top of Casing

EQUIPMENT ID NUMBERS

BLADDER PUMP N/A

PERISTALTIC PUMP Geopump 61

SUBMERSIBLE PUMP N/A

BAILER N/A

FIELD MONITORING INSTRUMENTATION YSI 55B mps #539

FIELD INSTRUMENTATION CALIBRATION DATE 8/19/04

Turb Meter - HACH 2100P #237

PURGE DATA

TIME	DTW (ft btoc)	PURGE RATE (lpm)	TEMP (deg C)	CONDUCTIVITY (mS/cm)	pH	DISSOLVED OXYGEN (mg/l)	TURBIDITY (NTU)	OX-RED POTENT (mV)	Other	COMMENTS
1610	8.78	0.2	16.22	4.785	6.82	1.89	3.85	-161.3		
1616	9.36	0.2	16.20	4.800	6.80	1.15	4.13	-157.5		
1622	9.88	0.2	16.43	4.885	6.83	0.47	2.97	-154.0		
1628	10.43	0.2	16.38	4.931	6.82	0.28	2.19	-150.9		
1635	11.18	0.15	16.72	4.947	6.81	0.19	1.89	-161.7		
1645	11.45	0.15	16.88	4.846	6.78	0.18	1.44	-162.3		
1652	11.89	0.15	17.22	4.771	6.77	0.19	1.71	-159.1		Pump Stopped. Restart.
1659	12.33									Started sampling due to drawdown.

SAMPLE ANALYSES

PARAMETER	METHOD NUMBER	PRESERVATION METHOD	BOTTLE TYPE/ VOLUME REQUIRED	SAMPLE COLLECTED
VOCs	8280B	HCl, 4°C	3 @ 40-mL	<input checked="" type="checkbox"/>
SVOCs (incl PPO/POPOP)	Mod. 8270B	4°C	2 @ 1 L amber glass	<input checked="" type="checkbox"/>
Carbon-14 (C-14)	LSC	HNO <sub>3</sub>	2 @ 500 mL amber glass	<input checked="" type="checkbox"/>
Nickel-63 (Ni-63)	LSC	HNO <sub>3</sub>	2 @ 500 mL amber glass	<input checked="" type="checkbox"/>
Tritium (H-3)	LSC	4°C	2 @ 250 mL amber glass	<input checked="" type="checkbox"/>

NOTES

Water is brownish yellow, some sheen, organic odor. Unable to get good meniscus on the VOA samples due to foaming.

SAMPLED BY:

Barb Dulitsky

RECEIVED BY:

John A. Dutton

**APPENDIX B**

**LABORATORY ANALYTICAL REPORTS -  
SEPTEMBER 2004 SAMPLING EVENT**

**(ENCLOSED ON CD)**