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From Science to Solutions

March 27, 2009

Ms. Yolande Norman
U.S. Nuclear Regulatory Commission (NRC)
Mailstop T-8 F-5
Washington, DC 20555-0001

Dear Ms. Norman:

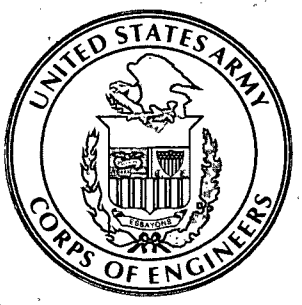
In accordance with the U.S. Army Jefferson Proving Ground License SUB-1435 requirements, and at the U.S. Army's request, Science Applications International Corporation (SAIC) is submitting six hard copies and 4 electronic copies on compact disk-read only memory (CD-ROM) of the Radiation Monitoring Report for License SUB-1435 Jefferson Proving Ground, Summary of Results for the October 2008 Environmental Sampling Event.

Please contact Mr. Paul Cloud at (410) 436-2381, e-mail address: paul.d.cloud@us.army.mil or the undersigned at (703) 375-2074, e-mail address: skibinskij@saic.com if you have any questions.

Sincerely,

Joseph N. Skibinski

cc: Paul Cloud
Brooks Evens
SAIC Central Records Project File (transmittal memo only)



U.S. Army
Corps of
Engineers

RADIATION MONITORING REPORT FOR LICENSE SUB-1435 JEFFERSON PROVING GROUND

Summary of Results for October 2008 Sampling Event

FINAL

Submitted to:

U.S. Department of Army
Installation Support Management Agency
Aberdeen Proving Ground, Maryland

Prepared by:

Science Applications International Corporation
Reston, Virginia

March 2009

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LIST OF ACRONYMS AND ABBREVIATIONS

µg/L	Micrograms per Liter
ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
DQO	Data Quality Objective
DU	Depleted Uranium
ERM	Environmental Radiation Monitoring
ERMP	Environmental Radiation Monitoring Program
I.D.	Identification
JPG	Jefferson Proving Ground
LCL	Lower Control Limit
mS/cm	MilliSiemens per Centimeter
NRC	Nuclear Regulatory Commission
pCi/g	PicoCuries per Gram
pCi/L	PicoCuries per Liter
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
SAIC	Science Applications International Corporation
SOP	Standard Operating Procedure
UCL	Upper Control Limit

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1. INTRODUCTION

Environmental monitoring activities are being conducted at Jefferson Proving Ground (JPG), Madison, Indiana, to ensure that depleted uranium (DU), present within the DU Impact Area as a result of the Army's past DU testing program, does not pose a threat to human health and the environment through inadvertent or unanticipated release or migration. The Environmental Radiation Monitoring Program (ERMP), described in the standard operating procedure (SOP) in Appendix A (CHPPM 2000), is designed to meet the requirements of applicable Federal and state regulations, including Nuclear Regulatory Commission (NRC) regulations and requirements under Radioactive Materials License SUB-1435 (NRC 1988).

The overall goals of JPG's ERMP are to provide:

- A historical and current perspective of DU levels in various media
- A timely indication of the magnitude and extent of any DU release or migration from past operations.

This report summarizes the methodology, results, and conclusions of the October 2008 sampling event, which is the second of two planned sampling events in 2008 for this biannual program. The sampling requirements and approach are presented in Section 2. The results of the multimedia sampling event are presented and discussed in Section 3. Historical data from the ERMP are discussed in Section 4. Conclusions and recommendations are summarized in Section 5. References cited are identified in Section 6. The appendices of this report include the SOP (Appendix A), field logbook (Appendix B), and data validation summary (Appendix C). All tables and figures are presented at the end of their respective sections.

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2. SAMPLING REQUIREMENTS AND APPROACH

The ERMP (U.S. Army 2000) specifies the U.S. Army Center for Health Promotion and Preventive Medicine's (CHPPM's) protocol for the collection and analysis of 11 groundwater, 8 surface water, 8 sediment, and 4 soil samples (with appropriate duplicates) in the DU Impact Area. The plan has been approved by the NRC and is described in an SOP, which is provided in Appendix A. Science Applications International Corporation (SAIC) executes the plan and reports the findings in an effort to fulfill the Army's responsibilities for monitoring under NRC Radioactive Material License SUB-1435.

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3. RESULTS

An SAIC field crew prepared for and conducted sampling at JPG concurrent with other characterization sampling efforts in October 2008. Appendix B contains a copy of the field logbook, which documents environmental monitoring report field activities during the sampling effort.

No unusual or abnormal conditions (e.g., soil or water discoloration, odd odors, or elevated radiation levels) were observed during the sampling effort with the possible exception of the lack of flowing water in Big Creek and Middle Fork Creek.

The sample locations for the groundwater, surface water, sediment, and soil samples are depicted in Figure 3-1. Sections 3.1 through 3.4 summarize the sampling results for each medium, respectively. The results of the data validation are presented in Appendix C. All data were determined to meet data quality objectives (DQOs) and criteria presented in the SOP (as provided in Appendix A).

3.1 GROUNDWATER

The concentrations of total dissolved uranium in groundwater at the 11 monitoring wells plus 1 duplicate sample are presented in Table 3-1. Water quality parameter measurements are presented in Table 3-2. (Water quality measurements were not obtained for MW09 as the very limited quantity of water available and the need for characterization and environmental samples precluded the ability to purge the well.) Total uranium concentrations of the October 2008 groundwater samples ranged from 0.11 picocuries per liter (pCi/L) to 4.25 pCi/L with an average concentration of 1.63.

In addition to the individual isotopic concentrations, Table 3-1 presents the U-238/U-234 ratios for each sample, which ranged from 0.18 ± 0.12 to 5.99 ± 0.75. A U-238/U-234 ratio of 3 or less is representative of natural uranium, whereas higher ratios are potentially indicative of DU (U.S. Army 2002). For the purposes of this report, samples with U-238/ U-234 ratios in excess of 3 are investigated further to validate if the sample is representative of DU or natural uranium. Given that location MW01 exhibited a U-238/U-234 ratio of 5.99 ± 0.75, it was subjected to additional investigation consisting of:

- Review of analytical data, which indicated that the U-234 concentration was low and was reflected as an "approximate concentration"
- Evaluation of two characterization samples (consisting of unfiltered/unpreserved and filtered/preserved samples) from the same well, which exhibited DU ratios of less than 3
- Review of logbook entries, which indicated that the well was purged to dryness and thus may have inadvertently introduced sediments into the sample.

All other groundwater samples had U-238/U-234 ratios in the range of 0.18 ± 0.12 to 1.62 ± 0.17. Based on the U-238/U-234 ratios, groundwater location MW01 exhibited evidence of the presence of DU.

3.2 SURFACE WATER

The concentrations of total dissolved uranium in surface water at seven sampling locations plus one duplicate sample are presented in Table 3-3. (A surface water sample was not able to be obtained from location SWS-03 as the stream was dry at that location.) Water quality parameter measurements are presented in Table 3-4. Total uranium concentrations ranged from 0.04 to 6.91 pCi/L, with an average concentration of 1.14 pCi/L. The U-238/U-234 ratio for locations SWS05 and SWS08 were 7.02 ± 1.38 and 3.58 ± 0.18, respectively. As a result of having a U-238/U-234 ratio exceeding 3, location SWS05 and SWS08 were subjected to additional investigation that included review of results of characterization sampling and radiological surveys that were ongoing concurrent with environmental monitoring activities. Investigation included:

- Review of the sample data, which reflected the fact that the U-234 concentration for location SWS08 was an "approximate concentration."
- Review of field logbooks and associated information to assess basis for elevated concentration. Logbook and sample log sheets indicated that Big Creek was not flowing at the time of sample collection; thus, suspended DU may have contributed to the elevated ratios in SW05 and SW08.
- Review of sediment samples collected adjacent to and downstream from SW05 and SW08, which reflected ratios of less than 3.
- Comparison of results to naturally occurring U-234/U-238 ratios. (The U-234 to U-238 ratio in natural uranium has been found to vary considerably due to preferential leaching of U-234 resulting from radiation damage of crystal lattice upon alpha decay of U-238, oxidation of insoluble tetravalent U-234 to soluble hexavalent U-234, and alpha recoil of Th-234 (and its U-234 daughter) into soluble phase. Migration of leached U-234 produces the variability. U-234/U-238 activity ratios in water vary from 0.5 to 40 (Fujikawa et al. 2000).)

The U-238/U-234 ratio for each of the other samples was in the range of 0.24 ± 0.047 to 2.06 ± 0.16. Based on the U-238/U-234 ratios, surface water at locations SWS05 and SWS08 exhibited evidence of the presence of DU.

3.3 SEDIMENT

The concentrations of total uranium in sediment at eight sampling locations plus one duplicate sample are presented in Table 3-5. Sediment samples were collected at the same locations as surface water samples, as shown in Figure 3-1. Total uranium concentrations ranged from 0.22 to 1.89 picocuries per gram (pCi/g), with an average concentration of 1.04 pCi/g. The U-238/U-234 ratio for the samples ranged from 0.89 ± 0.12 to 1.71 ± 0.13.

As indicated by the relatively low total uranium results and the U-238/U-234 ratios, there is no evidence of the presence of DU in the sediment samples.

3.4 SOIL

The concentrations of total uranium in surface soil at four surface soil sample locations plus one duplicate sample are presented in Table 3-6. Total uranium concentrations ranged from 0.36 to 1.62 with an average concentration of 1.26 pCi/g. The U-238/U-234 ratios ranged from 0.87 ± 0.26 to 1.42 ± 0.08.

As indicated by the relatively low total uranium results and the U-238/U-234 ratios, there is no evidence of the presence of DU in the surface soil samples.

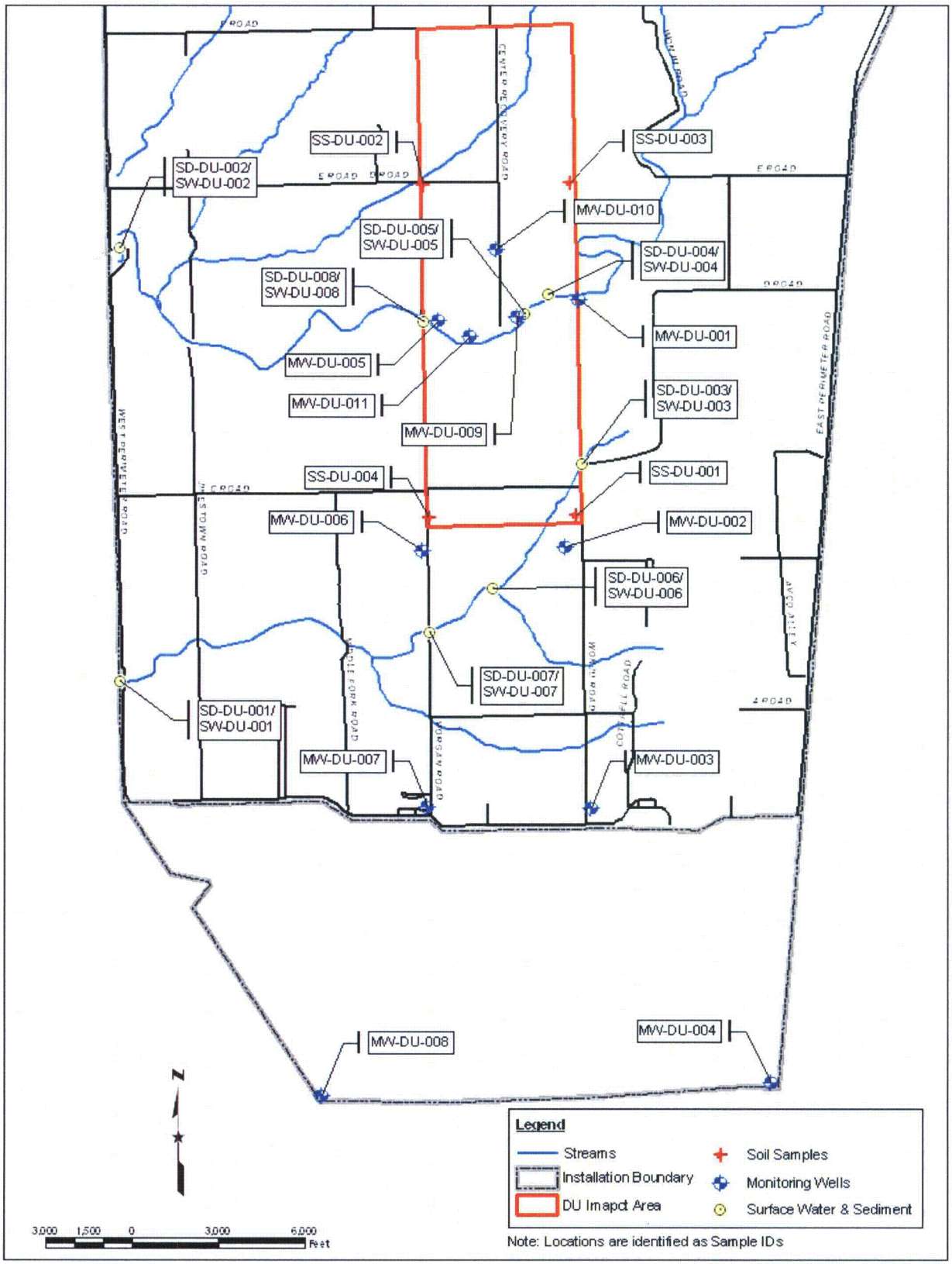

Figure 3-1. Sampling Locations for the JPG ERM Program

Table 3-1. Uranium in Groundwater
Jefferson Proving Ground, Madison, Indiana

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/L)
MW01	MW-DU-001	U-234	0.182 J
MW01	MW-DU-001	U-235	0.012 U
MW01	MW-DU-001	U-238	1.09
		Total Uranium	**1.28**
		U-238/U-234 Ratio[b]	5.99
MW02	MW-DU-002	U-234	2.71
MW02	MW-DU-002	U-235	0.025 U
MW02	MW-DU-002	U-238	1.21
		Total Uranium	**3.95**
		U-238/U-234 Ratio[b]	0.45
MW03	MW-DU-003	U-234	0.652
MW03	MW-DU-003	U-235	-0.005 U
MW03	MW-DU-003	U-238	0.246
		Total Uranium	**0.89**
		U-238/U-234 Ratio[b]	0.38
MW03D	MW-DU-003D	U-234	0.631
MW03D	MW-DU-003D	U-235	0.037 J
MW03D	MW-DU-003D	U-238	0.359
		Total Uranium	**1.03**
		U-238/U-234 Ratio[b]	0.57
MW04	MW-DU-004	U-234	1.28
MW04	MW-DU-004	U-235	0.092 J
MW04	MW-DU-004	U-238	1.01
		Total Uranium	**2.38**
		U-238/U-234 Ratio[b]	0.79
MW05	MW-DU-005	U-234	0.047 J
MW05	MW-DU-005	U-235	0.000 U
MW05	MW-DU-005	U-238	0.065 J
		Total Uranium	**0.11**
		U-238/U-234 Ratio[b]	1.38
MW06	MW-DU-006	U-234	2.18
MW06	MW-DU-006	U-235	0.099 J
MW06	MW-DU-006	U-238	1.97
		Total Uranium	**4.25**
		U-238/U-234 Ratio[b]	0.90
MW07	MW-DU-007	U-234	0.573
MW07	MW-DU-007	U-235	0.019 U
MW07	MW-DU-007	U-238	0.222
		Total Uranium	**0.81**
		U-238/U-234 Ratio[b]	0.39
MW08	MW-DU-008	U-234	0.215
MW08	MW-DU-008	U-235	0.033 J
MW08	MW-DU-008	U-238	0.348
		Total Uranium	**0.60**
		U-238/U-234 Ratio[b]	1.62

Table 3-1. Uranium in Groundwater
Jefferson Proving Ground, Madison, Indiana (Continued)

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/L)
MW09	MW-DU-009	U-234	0.986
MW09	MW-DU-009	U-235	-0.010 U
MW09	MW-DU-009	U-238	0.226
		Total Uranium	**1.20**
		U-238/U-234 Ratio[b]	0.23
MW010	MW-DU-010	U-234	1.94
MW010	MW-DU-010	U-235	0.050 J
MW010	MW-DU-010	U-238	0.751
		Total Uranium	**2.74**
		U-238/U-234 Ratio[b]	0.39
MW011	MW-DU-011	U-234	0.247
MW011	MW-DU-011	U-235	0.011 U
MW011	MW-DU-011	U-238	0.045 J
		Total Uranium	**0.30**
		U-238/U-234 Ratio[b]	0.18

[a] Represents sample designation developed in previous sampling programs.
[b] Unitless.
J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.
ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.
U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

Table 3-2. Groundwater Water Quality Parameters and Exposure Readings
Jefferson Proving Ground, Madison, Indiana

JPG Sample Designation[a]	Sample I.D.	pH	Temp (°C)	Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Rad (µR/hr)
MW01	MW-DU-001	7.21	18.7	[b]	6.75	6
MW02	MW-DU-002	6.50	16.6	0.750	0.04	5
MW03	MW-DU-003	6.19	15.2	0.750	0.00	5
MW04	MW-DU-004	6.27	18.6	0.825	0.00	5.5
MW05	MW-DU-005	6.85	15.4	14.2	0.00	5
MW06	MW-DU-006	6.08	14.3	0.90	6.23	5
MW07	MW-DU-007	6.43	15.1	0.933	0.00	6
MW08	MW-DU-008	6.71	13.0	0.722	0.87	6
MW09[c]	MW-DU-009					5
MW10	MW-DU-0010	6.84	13.0	0.787	0.57	5
MW11	MW-DU-0011	6.73	15.8	6.11	1.29	6

[a] Represents sample designation developed in previous sampling programs.
[b] Above Horiba reading range.
[c] Data not collected as well could was not purged due to the limited volume of water available. Instead, the limited volume of water was collected with Hydrasleeve to meet higher priority characterization and environmental sampling needs.

Table 3-3. Uranium in Surface Water
Jefferson Proving Ground, Madison, Indiana

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/g)
SWS01	SW-DU-001	U-234	0.121 J
SWS01	SW-DU-001	U-235	0.020 U
SWS01	SW-DU-001	U-238	0.130 J
		Total Uranium	**0.27**
		U-238/U-234 Ratio[b]	1.07
SWS02	SW-DU-002	U-234	0.132 J
SWS02	SW-DU-002	U-235	-0.005 U
SWS02	SW-DU-002	U-238	0.162 J
		Total Uranium	**0.29**
		U-238/U-234 Ratio[b]	1.23
SWS02D	SW-DU-002D	U-234	0.092 J
SWS02D	SW-DU-002D	U-235	0.026 U
SWS02D	SW-DU-002D	U-238	0.170 J
		Total Uranium	**0.29**
		U-238/U-234 Ratio[b]	1.85
SWS04	SW-DU-004	U-234	0.154
SWS04	SW-DU-004	U-235	0.014 U
SWS04	SW-DU-004	U-238	0.318
		Total Uranium	**0.49**
		U-238/U-234 Ratio[b]	2.06
SWS05	SW-DU-005	U-234	0.848
SWS05	SW-DU-005	U-235	0.105 J
SWS05	SW-DU-005	U-238	5.96
		Total Uranium	**6.91**
		U-238/U-234 Ratio[b]	7.02
SWS06	SW-DU-006	U-234	0.041 J
SWS06	SW-DU-006	U-235	-0.010 U
SWS06	SW-DU-006	U-238	0.010 U
		Total Uranium	**0.04**
		U-238/U-234 Ratio[b]	ND
SWS07	SW-DU-007	U-234	0.135 J
SWS07	SW-DU-007	U-235	0.000 U
SWS07	SW-DU-007	U-238	0.114 J
		Total Uranium	**0.25**
		U-238/U-234 Ratio[b]	0.84
SWS08	SW-DU-008	U-234	0.120 J
SWS08	SW-DU-008	U-235	0.012 U
SWS08	SW-DU-008	U-238	0.430
		Total Uranium	**0.56**
		U-238/U-234 Ratio[b]	3.58

[a] Represents sample designation developed in previous sampling programs.
[b] Unitless.

J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.
ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.
U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantitation limit.

Table 3-4. Surface Water Quality Parameters and Exposure Readings
Jefferson Proving Ground, Madison, Indiana

JPG Sample Designation[a]	Sample I.D.	pH	Temp (°C)	Conductivity (microSiemens/cm)	Dissolved Oxygen (mg/L)	Rad (µR/hr)
SWS01	SW-DU-001	7.23	18.9	0.390	7.82	6
SWS02	SW-DU-002	7.02	21.7	0.379	8.51	8
SWS03[b]	SW-DU-003					8
SWS04	SW-DU-004	5.96	13.9	0.423	5.21	8
SWS05	SW-DU-005	6.67	19.2	0.354	5.48	9
SWS06	SW-DU-006	7.14	23.0	0.263	5.51	7
SWS07	SW-DU-007	6.15	14.2	0.389	5.32	7
SWS08	SW-DU-008	6.41	18.3	0.371	4.01	6

[a] Represents sample designation developed in previous sampling programs.
[b] Dry stream precluded collection of sample and associated data.

Table 3-5. Uranium in Sediment
Jefferson Proving Ground, Madison, Indiana

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/g)
SES01	SD-DU-001	U-234	0.628
SES01	SD-DU-001	U-235	0.040 J
SES01	SD-DU-001	U-238	0.738
		Total Uranium	**1.41**
		U-238/U-234 Ratio[b]	1.18
SES01D	SD-DU-001D	U-234	0.502
SES01D	SD-DU-001D	U-235	0.031 J
SES01D	SD-DU-001D	U-238	0.564
		Total Uranium	**1.10**
		U-238/U-234 Ratio[b]	1.12
SES02	SD-DU-002	U-234	0.764
SES02	SD-DU-002	U-235	0.033 J
SES02	SD-DU-002	U-238	0.805
		Total Uranium	**1.60**
		U-238/U-234 Ratio[b]	1.05
SES03	SD-DU-003	U-234	0.652
SES03	SD-DU-003	U-235	0.033 J
SES03	SD-DU-003	U-238	0.766
		Total Uranium	**1.45**
		U-238/U-234 Ratio[b]	1.17
SES04	SD-DU-004	U-234	0.100
SES04	SD-DU-004	U-235	0.000 U
SES04	SD-DU-004	U-238	0.123
		Total Uranium	**0.22**
		U-238/U-234 Ratio[b]	1.23
SES05	SD-DU-005	U-234	0.223
SES05	SD-DU-005	U-235	0.020 J
SES05	SD-DU-005	U-238	0.381
		Total Uranium	**0.62**
		U-238/U-234 Ratio[b]	1.71

Table 3-5. Uranium in Sediment
Jefferson Proving Ground, Madison, Indiana (Continued)

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/g)
SES06	SD-DU-006	U-234	0.212
SES06	SD-DU-006	U-235	0.023 J
SES06	SD-DU-006	U-238	0.199
		Total Uranium	**0.43**
		U-238/U-234 Ratio[b]	0.94
SES07	SD-DU-007	U-234	0.320 J
SES07	SD-DU-007	U-235	0.023 J
SES07	SD-DU-007	U-238	0.284 J
		Total Uranium	**0.63**
		U-238/U-234 Ratio[b]	0.89
SES08	SD-DU-008	U-234	0.695 J
SES08	SD-DU-008	U-235	0.020 J
SES08	SD-DU-008	U-238	1.17 J
		Total Uranium	**1.89**
		U-238/U-234 Ratio[b]	1.68

[a] Represents sample designation developed in previous sampling programs.
[b] Unitless.
J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.
ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.
U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantitation limit.

Table 3-6. Uranium in Surface Soil
Jefferson Proving Ground, Madison, Indiana

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/g)
SOS01	SS-DU-001	U-234	0.819 J
SOS01	SS-DU-001	U-235	0.009 J
SOS01	SS-DU-001	U-238	0.715 J
		Total Uranium	**1.57**
		U-238/U-234 Ratio[b]	0.87
SOS02	SS-DU-002	U-234	0.146
SOS02	SS-DU-002	U-235	0.004 U
SOS02	SS-DU-002	U-238	0.208
		Total Uranium	**0.36**
		U-238/U-234 Ratio[b]	1.42
SOS02D	SS-DU-002D	U-234	0.752
SOS02D	SS-DU-002D	U-235	0.017 J
SOS02D	SS-DU-002D	U-238	0.850
		Total Uranium	**1.62**
		U-238/U-234 Ratio[b]	1.13
SOS03	SS-DU-003	U-234	0.674 J
SOS03	SS-DU-003	U-235	0.042 J
SOS03	SS-DU-003	U-238	0.773 J
		Total Uranium	**1.49**
		U-238/U-234 Ratio[b]	1.15
SOS04	SS-DU-004	U-234	0.625
SOS04	SS-DU-004	U-235	0.035 J
SOS04	SS-DU-004	U-238	0.594
		Total Uranium	**1.25**
		U-238/U-234 Ratio[b]	0.95

[a] Represents sample designation developed in previous sampling programs.
[b] Unitless.
J – Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.
ND – Indicates that one or more isotopes were not detected; therefore, the calculation was not performed.
U – Indicates that the data met all QA/QC requirements and the radionuclide was analyzed for but was not detected above the reported sample quantification limit.

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4. HISTORICAL DATA ASSESSMENT AND TREND ANALYSIS

Historical data from the ERMP are reviewed and discussed in this section in the context of existing action levels and corrective actions for environmental media documented in the SOP for the Environmental Radiation Monitoring (ERM). The SOP action levels and associated corrective actions are provided in Table 4-1.

Table 4-1. Action Levels and Corrective Actions for Total Uranium in Environmental Media Jefferson Proving Ground, Madison, Indiana

Medium	Total Uranium Action Level	Corrective Action
Groundwater and Surface Water	≥ 150 pCi/L*	Resample. If activity verified, notify NRC and assess results. The findings and recommended corrective actions will be documented for the Army's Radiation Control Committee. The Committee will provide recommendations to the Commander based on its evaluation.
	Less than 150 pCi/L	No action.
Soil and Sediment:		
Perimeter and Background Samples	≥ 35 pCi/g	Collect five additional samples in a 1-meter grid. If average activity exceeds 35 pCi/g, decontaminate to 35 pCi/g.
	Less than 35 pCi/g	No corrective action.

* Effluent concentration limit for uranium is 300 pCi/L in 10 CFR 20, Appendix B, Table 2, Column 2.
Source: U.S. Army 1999 and CHPPM 2000 (see Appendix A, pages A-6 and A-7).

An assessment of historical trends for ERMP data was first provided in the April 2006 Radiation Monitoring Report (SAIC 2006). That assessment focused on available sampling data for groundwater, surface water, sediment, and soil since 1998. Quality assurance/quality control (QA/QC) records for data collected prior to 1998 were not available to support the trend analyses. In addition, there were changes to analytical methods that were implemented beginning in December 2004.[1] Therefore, while historical data are reported since 1998, trend analyses included in this ERM report address the time period from December 2004 to the present. Surface water and groundwater results for the April 2004 sampling event also were not trended, given that the results were provided in units of micrograms per liter (µg/L) rather than pCi/L.

As noted above, the April 2006 Radiation Monitoring Report (SAIC 2006) provided detailed information about the trending methods employed and why certain data were or were not included in the initial trend analysis. To avoid confusion, that information is not repeated in this report. This report section re-examines the ERMP data for historical trends following the addition of the ERMP data collected during the October 2008 sampling event. Stated numbers of samples and summary statistics are based on data generated since December 2004 (when laboratory analytical methods were revised and standardized).

4.1 GROUNDWATER

For 94 discrete samples available from 11 monitoring wells (MW01 to MW11) during the period from 2004 through October 2008, the average total uranium activity-concentration is 1.41 pCi/L, the standard deviation is 1.15 pCi/L, and the maximum detected activity-concentration is 5.27 pCi/L. The activity-concentrations at each well are well below the 150 pCi/L action level for groundwater.

[1] Total uranium is now analyzed by alpha spectroscopy using American Society for Testing and Materials (ASTM) Method D3972-90M rather than the fluorometry and gamma spectroscopy methods applied previously.

Data for each monitoring well are summarized in run charts, as shown in Figures 4-1 through 4-11. Total uranium results are displayed along with each measurement's associated error bars. The error bars are expressed at 1.96 standard deviations and represent a 95 percent confidence interval. Where trend lines are provided, the associated coefficient of correlation also is provided (the R^2 value listed on each figure). An R^2 value that approaches 1.0 suggests a strong relationship between the sample results and the sampling dates.

The figures for all 11 individual monitoring wells indicate no significant trends. Only samples from MW-DU-005 and MW-DU-007 exhibited trend lines with R^2 values greater than 0.5 (i.e., somewhat significant) (0.546 and 0.554, respectively). In each of these instances, however, there is a decreasing trend in total uranium concentrations.

In addition to the aforementioned run charts (Figures 4-1 through 4-11), individual variable control charts were created in April 2006 for each monitoring well, with the upper control limit (UCL) and the lower control limit (LCL) defined at 3 standard deviations above or below the mean. The control charts were created to determine if any single sample result warranted further examination. These control charts were re-examined in this report. Results from MW-DU-002 reflect a concentration of 3.95 pCi/g, which exceeds the UCL of 3.32. All other total uranium results at each sampling location were within 3 standard deviations of the mean concentration. (Although the total uranium result for MW-DU-006 was 4.25 pCi/g, this value is only slightly above the mean of 3.992 pCi/L for this location and significantly less than its UCL of 7.007 pCi/L.) An example individual control chart is provided in Figure 4-12.

The 11 monitoring wells also were examined in aggregate to determine if some wells or particular sampling events were distinctive. A simple individual control chart was created using the pooled data for all monitoring wells and all data collected after December 2004 (Figure 4-13).

Figure 4-13 indicates four points that lie above the UCL applicable to the full data set. Each of the five points is for MW-DU-006. Clearly, this well has exhibited (and continues to exhibit) total uranium results exceeding that of the other wells. The U-238/U-234 ratio for each of these samples was equal to or greater than 0.90, eliminating DU as a likely cause. This well will continue to be monitored closely.

4.2 SURFACE WATER

For 78 discrete samples available from 8 surface water sampling locations (SW01 to SW08) during the period from 2004 through October 2008, the average total uranium activity-concentration is 0.63 pCi/L, the standard deviation is 1.06 pCi/L, and the maximum detected activity-concentration is 6.91 pCi/L. The activity-concentrations at each sample location are well below the 150 pCi/L action level for surface water.

Data for each surface water sampling location are summarized in run charts, as shown in Figures 4-14 through 4-21. Total uranium results are displayed along with each measurement's associated error bars. The error bars are expressed at 1.96 standard deviations and represent a 95 percent confidence interval. Where trend lines are provided, the associated coefficient of correlation also is provided (the R^2 value listed on each figure). As noted in Section 4.1, an R^2 value that approaches 1.0 suggests a strong relationship between the sample results and the sampling dates.

The figures for all eight individual surface water sampling locations indicate no significant trends. In addition, none of the samples exhibited trend lines with R^2 values greater than 0.5 (i.e., somewhat significant).

The eight surface water sampling locations also were examined in aggregate to determine if some locations or particular sampling events were distinctive. A simple individual control chart was created using the pooled data for all surface water sampling locations and all data collected after December 2004 (Figure 4-22).

Figure 4-22 indicates that only the data point from SW-DU-005 exceeded the UCL or was below the LCL.

All of the surface water results for the October sampling event were below the mean except SW-DU-005. These data will continue to be monitored to determine if there is a seasonal trend. Surface water sample SW-DU-005 exhibited a total uranium concentration of total uranium of 6.91 pCi/L for the October 2008 sampling effort. This result is about a factor of three higher than the 2.33 pCi/L UCL for the total population of surface water samples and is also slightly above the UCL of 6.78 pCi/L applicable to this sample location. Results for this sample were also above the UCL in October 2005 (SAIC 2006) and the October 2007 result for SW-DU-005 was a factor of about 2 higher than any previous result for this location. In addition, the U-238:U-234 isotopic ratio is 7.02 for this location for the October 2008 sampling. Results for this location are higher than would be expected and will continue to be closely monitored.

4.3 SEDIMENT

For 89 discrete samples available from 8 sediment sampling locations (SD01 to SD08) during the period from 2004 through October 2008, the average total uranium activity-concentration is 0.98 pCi/g, the standard deviation is 0.55 pCi/g, and the maximum detected activity-concentration is 2.80 pCi/g. The activity-concentrations at each location are well below the 35 pCi/g action level.

Data for each sediment sampling location are summarized in run charts, as shown in Figures 4-23 through 4-30. Total uranium results are displayed along with each measurement's associated error bars. The error bars are expressed at 1.96 standard deviations and represent a 95 percent confidence interval. Where trend lines are provided, the associated coefficient of correlation also is provided (the R^2 value listed on each figure). As noted in Section 4.1, an R^2 value that approaches 1.0 suggests a strong relationship between the sample results and the sampling dates. The figures for all eight individual sediment sampling locations indicate no significant trends.

The eight sediment sampling locations also were examined in aggregate to determine if some locations or particular sampling events were distinctive. None of the samples exhibited trend lines with R^2 values greater than 0.5 (i.e., somewhat significant).

A simple individual control chart was created using the pooled data for all sediment sampling locations and all data collected after December 2004 (Figure 4-31). Figure 4-31 indicates no new points above the UCL or below the LCL. The October 2008 sediment sampling results vary around the mean, as expected.

4.4 SOILS

For 51 discrete samples available from 4 surface soil sampling locations (SS01 to SS04) during the period from 2004 through October 2008, the average total uranium activity-concentration is 1.60 pCi/g, the standard deviation is 0.29 pCi/g, and the maximum detected activity-concentration is 2.25 pCi/g. The activity-concentrations at each location are well below the action level of 35 pCi/g. The October 2008 surface soil sampling results vary around the mean, as expected.

Data for each surface soil sampling location are summarized in run charts, as shown in Figures 4-32 through 4-35. Total uranium results are displayed along with each measurement's associated error bars. The error bars are expressed at 1.96 standard deviations and represent a 95 percent confidence interval. Where trend lines are provided, the associated coefficient of correlation also is provided (the R^2 value listed on each figure). As noted in Section 4.1, an R^2 value that approaches 1.0 suggests a strong relationship between the sample results and the sampling dates. The figures for all four individual surface

soil sampling locations indicate no significant trends. In addition, none of the surface soil sampling locations exhibited trend lines with R^2 values greater than 0.5 (i.e., somewhat significant).

The four surface soil sampling locations also were examined in aggregate to determine if some locations or particular sampling events were distinctive. A simple individual control chart was created using the pooled data for all surface soil sampling locations and all data collected after December 2004 (Figure 4-36). As data are added to the control chart, the UCL, mean, and LCL are automatically recalculated. Figure 4-36 reflects that one point, the result for SS-DU-002 (i.e., 0.36 pCi/g), fell below the LCL. A single low result has no immediate significance to the project.

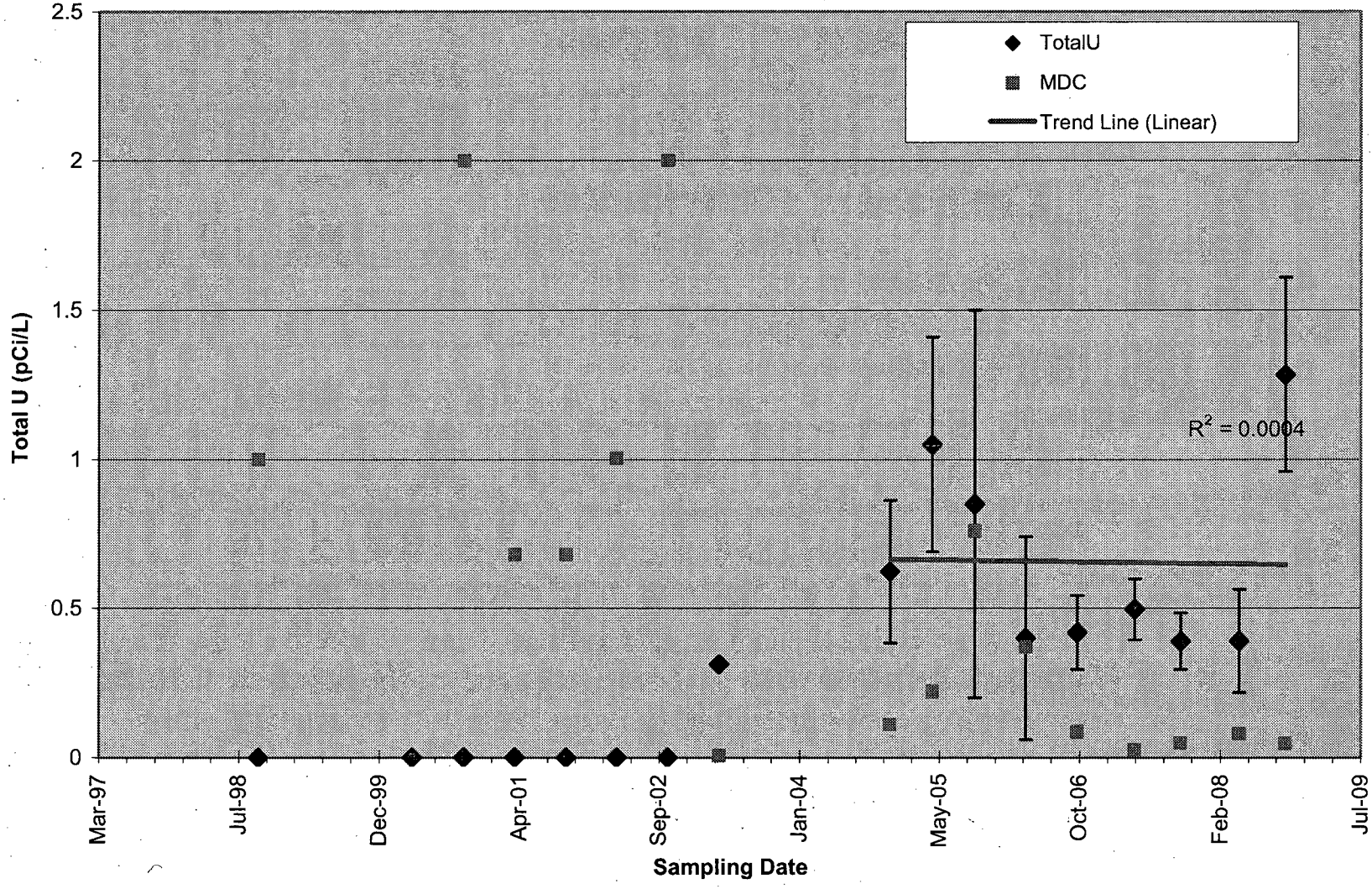


Figure 4-1. Total Uranium in MW-DU-001 (1998-2008)

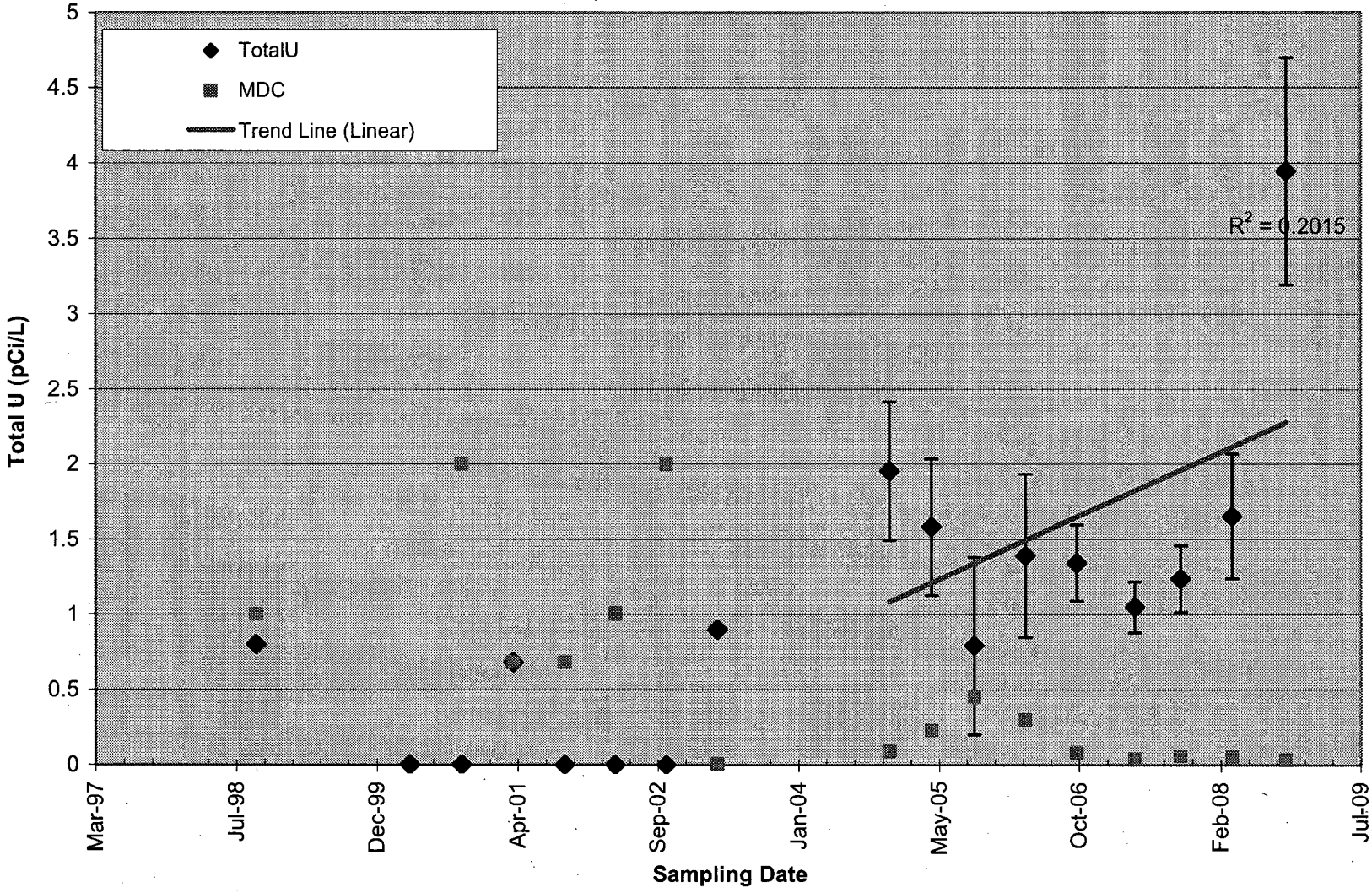


Figure 4-2. Total Uranium in MW-DU-002 (1998-2008)

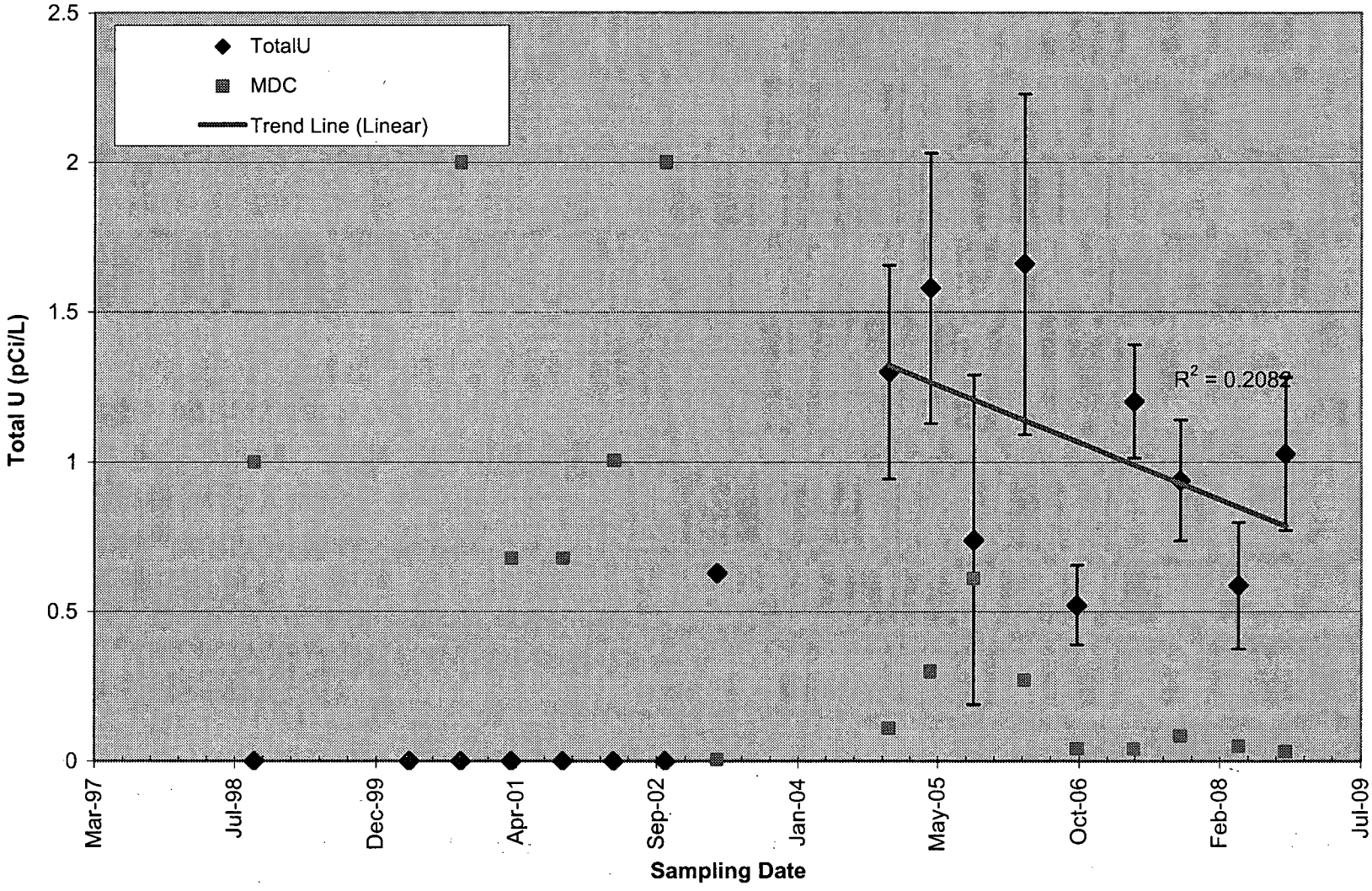


Figure 4-3. Total Uranium in MW-DU-003 (1998-2008)

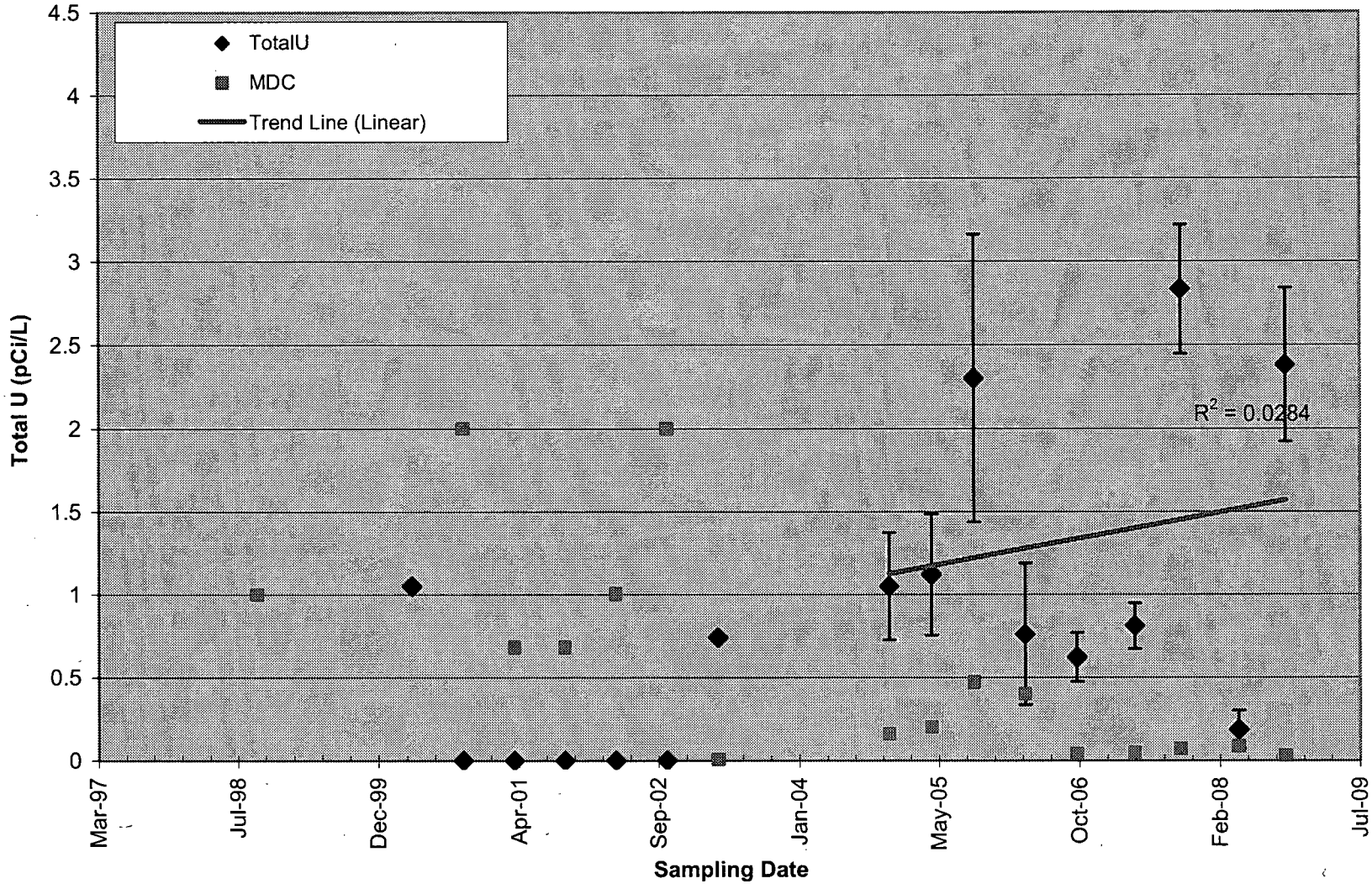


Figure 4-4. Total Uranium in MW-DU-004 (1998-2008)

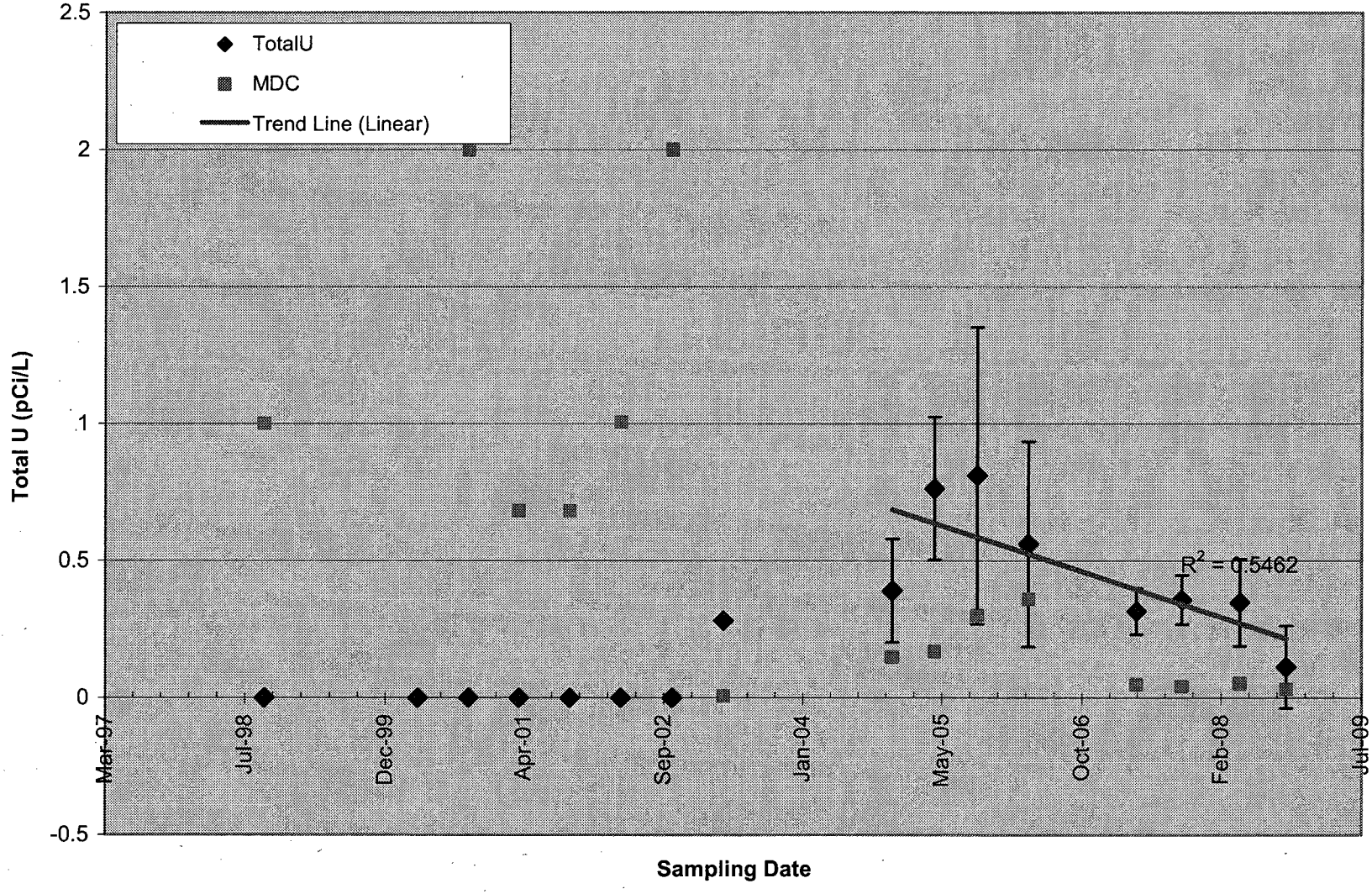
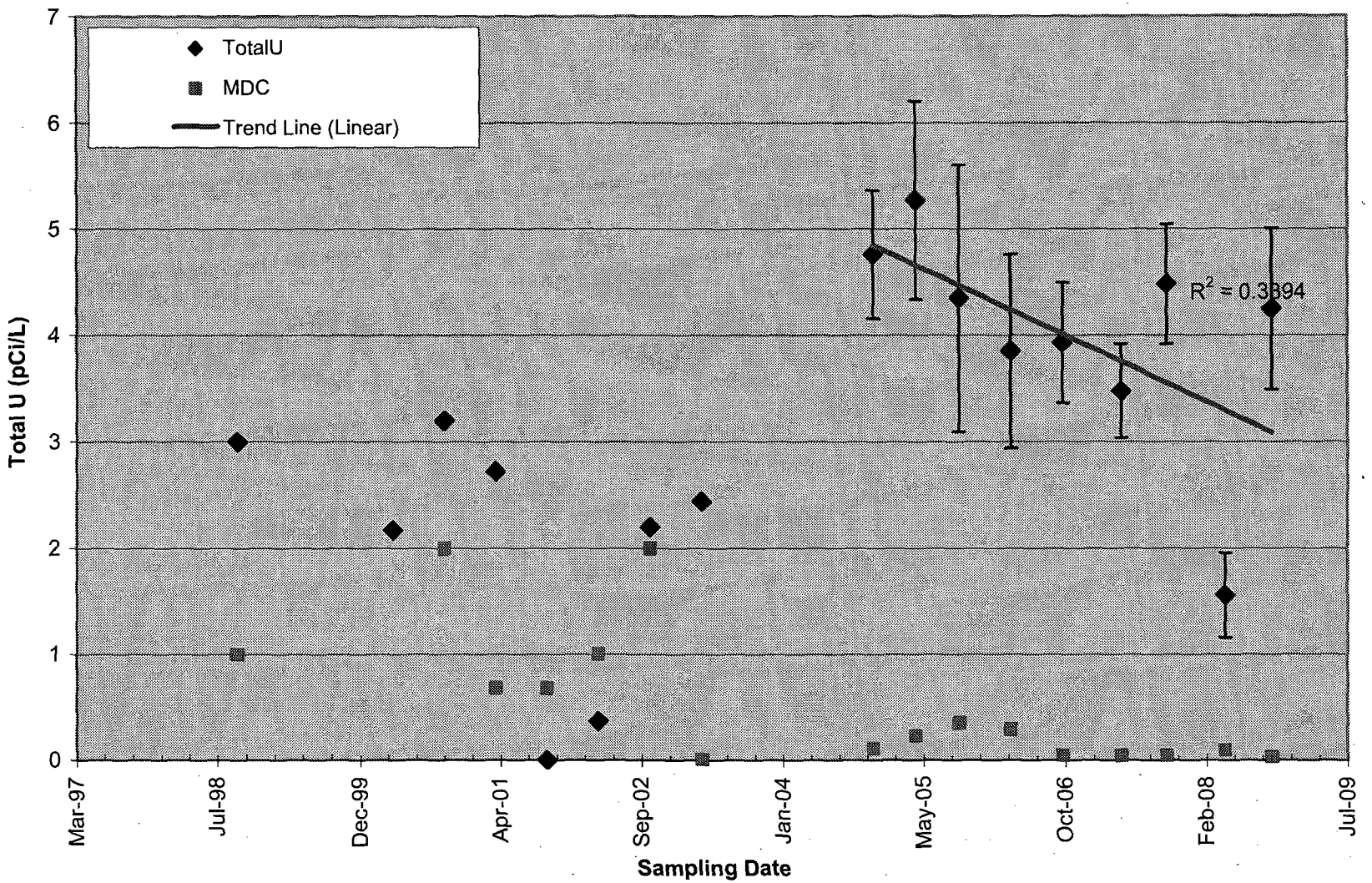


Figure 4-5. Total Uranium in MW-DU-005 (1998-2008)



NOTE: No sample was collected in October 2006 because the well was dry.

Figure 4-6. Total Uranium in MW-DU-006 (1998-2008)

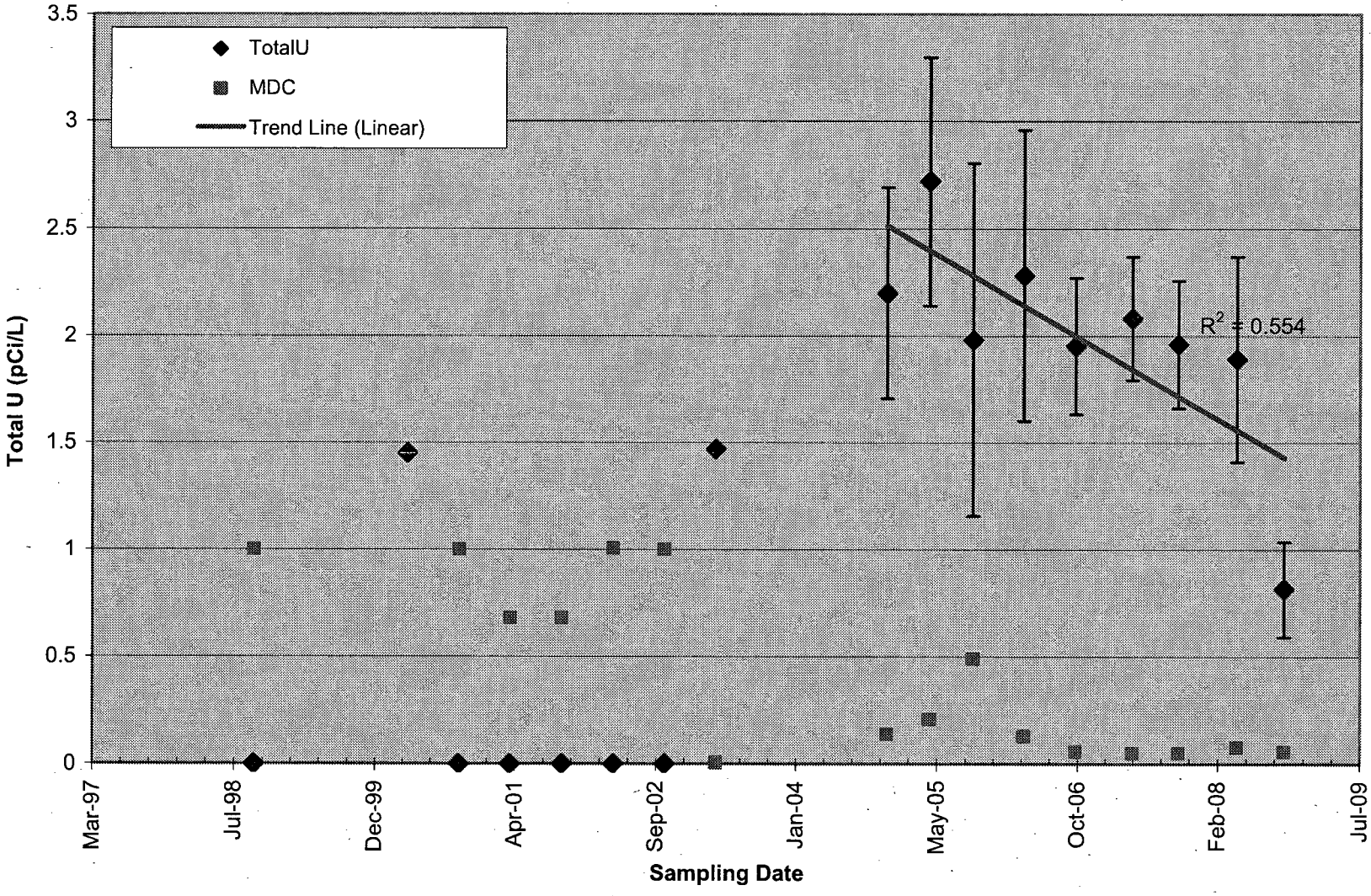


Figure 4-7. Total Uranium in MW-DU-007 (1998-2008)

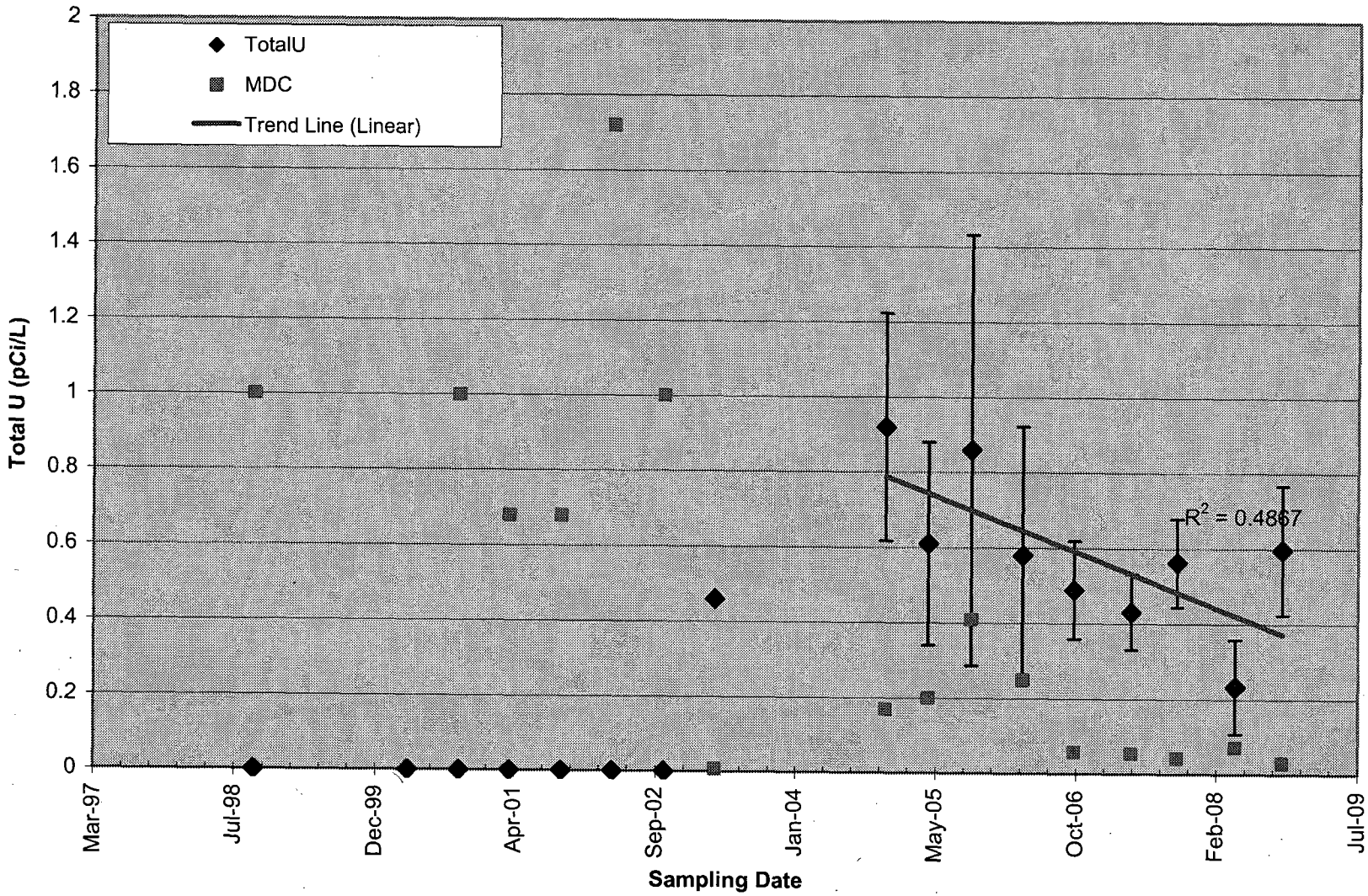


Figure 4-8. Total Uranium in MW-DU-008 (1998-2008)

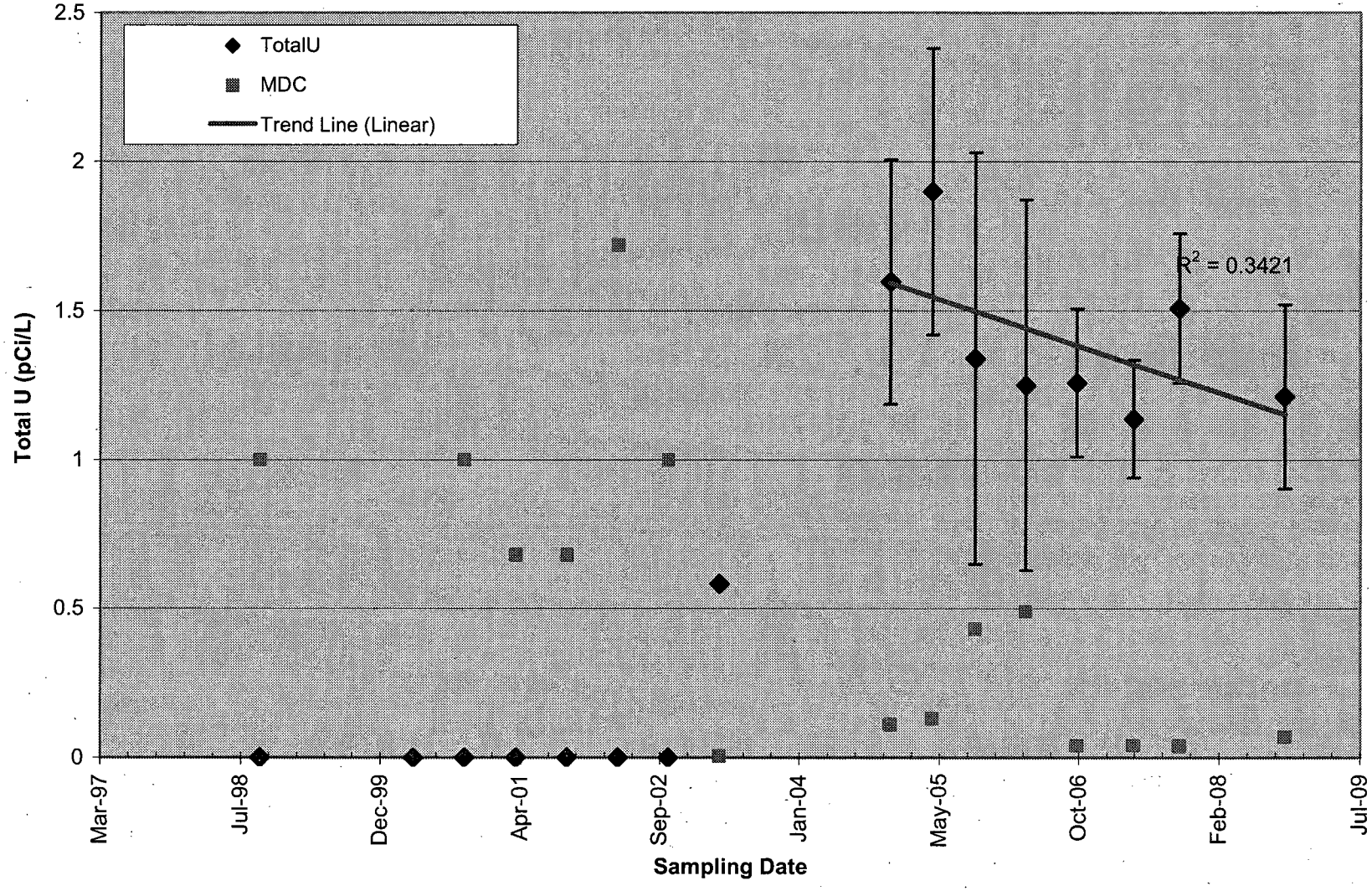


Figure 4-9. Total Uranium in MW-DU-009 (1998-2008)

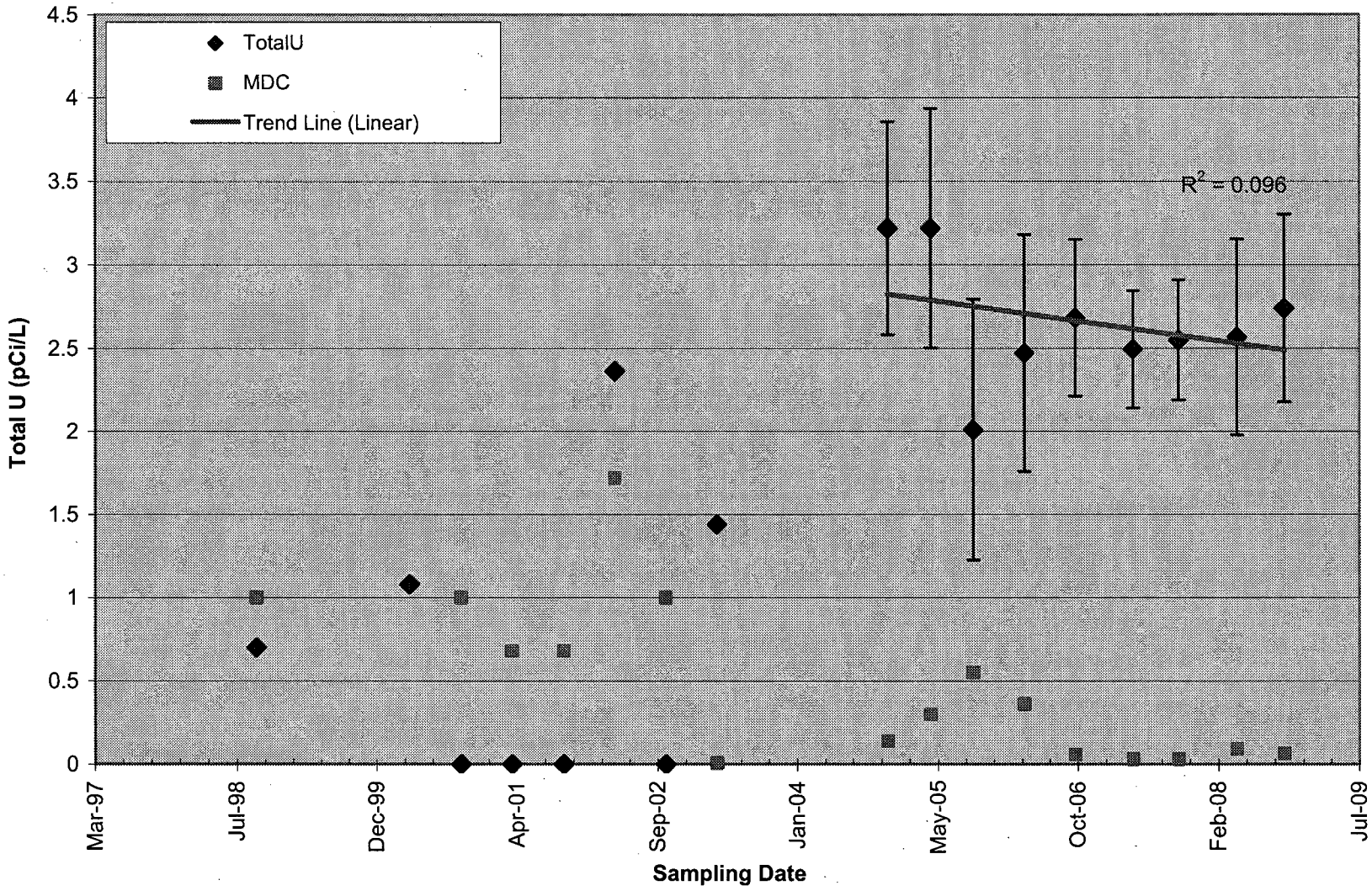
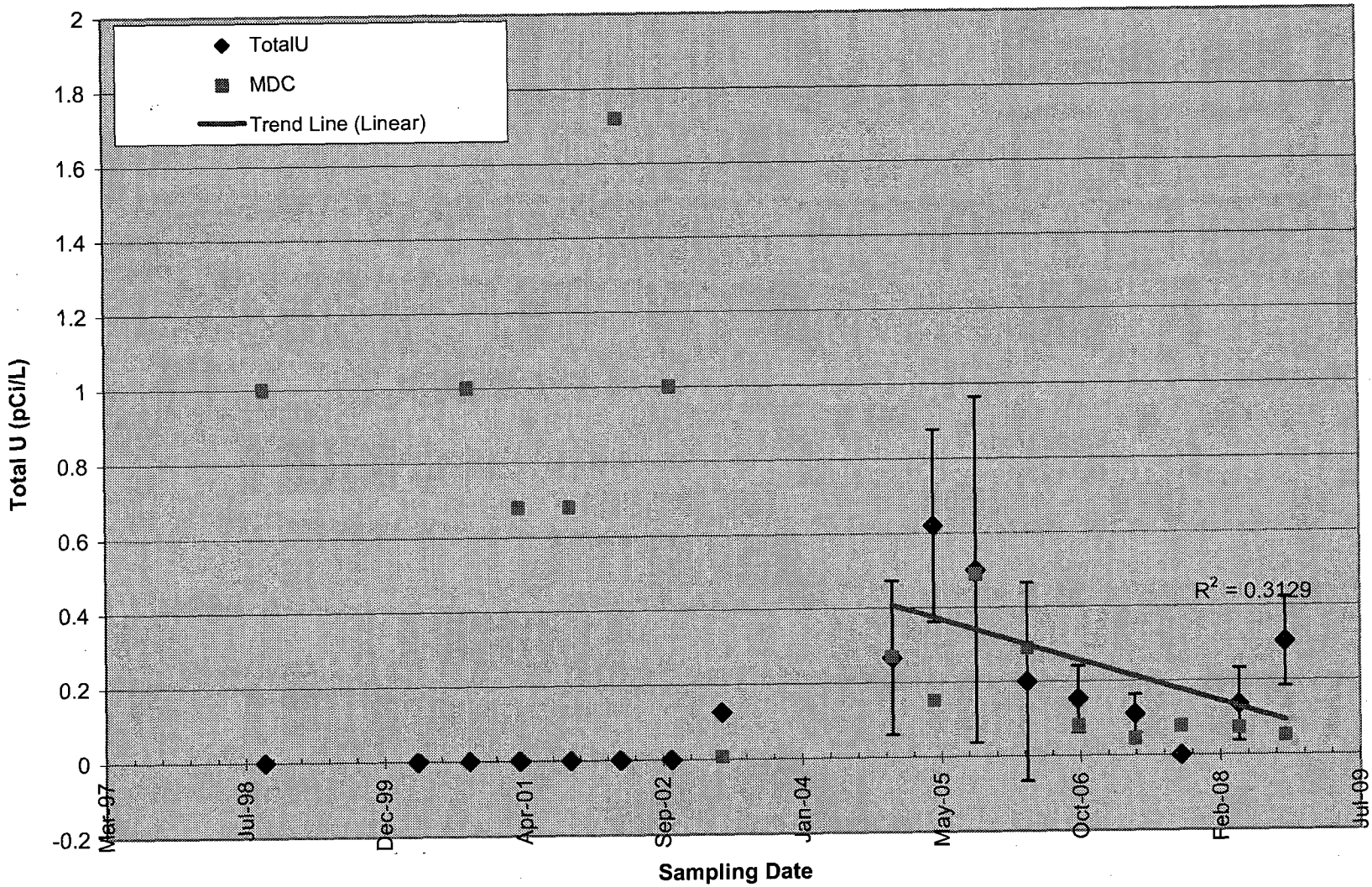


Figure 4-10. Total Uranium in MW-DU-010 (1998-2008)



NOTE: Uranium was not detected in the October 2007 sample.

Figure 4-11. Total Uranium in MW-DU-011 (1998-2008)

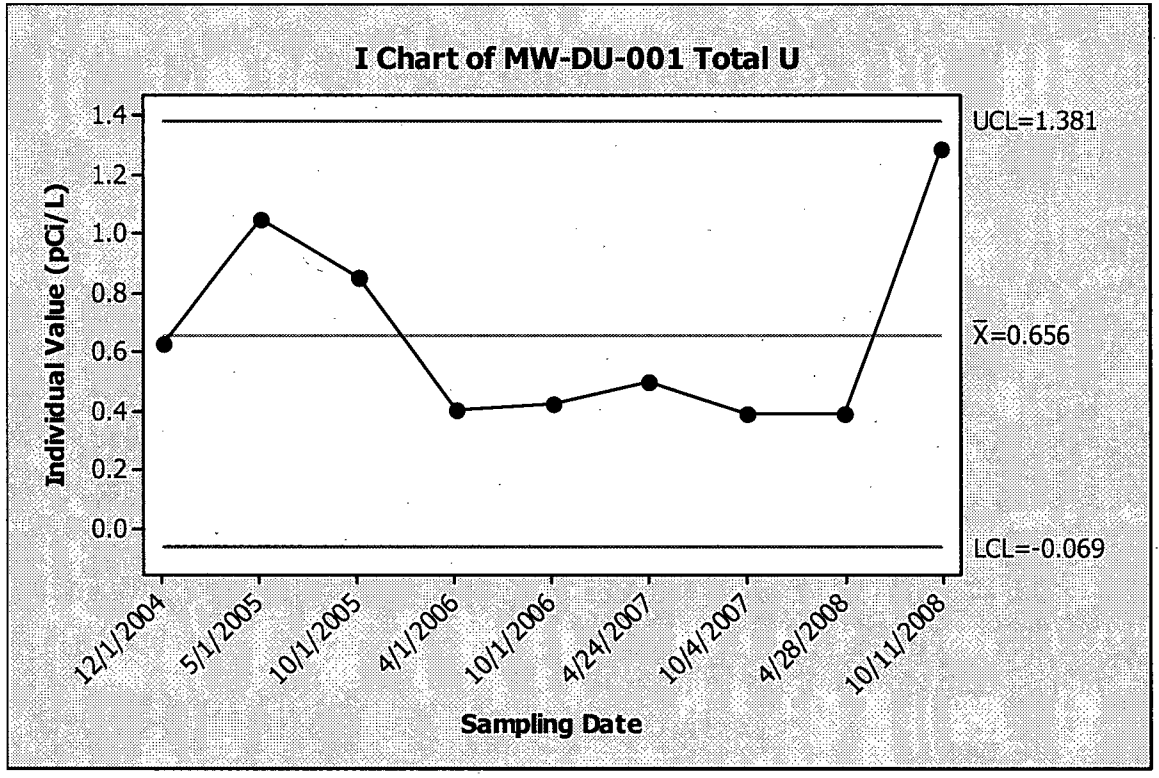


Figure 4-12. Variable Control Chart for Total Uranium in MW-DU-001 (2004-2008)

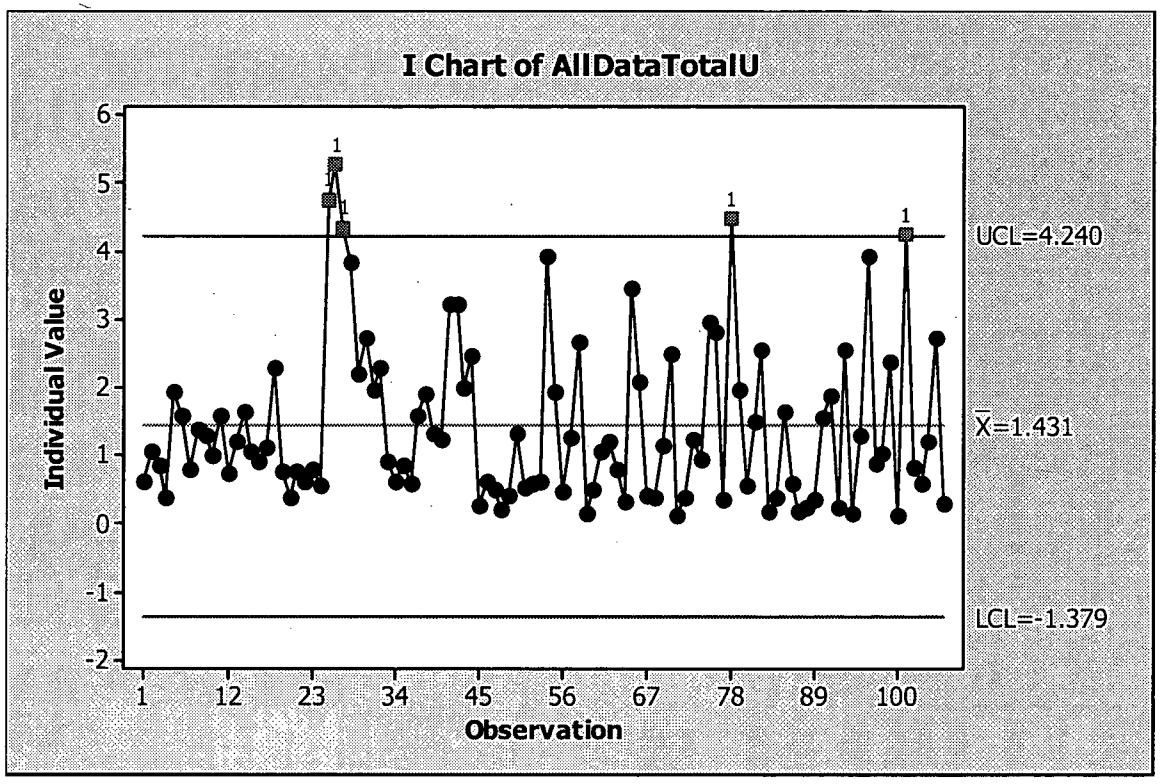


Figure 4-13. Control Chart for All Monitoring Well Data (2004-2008)

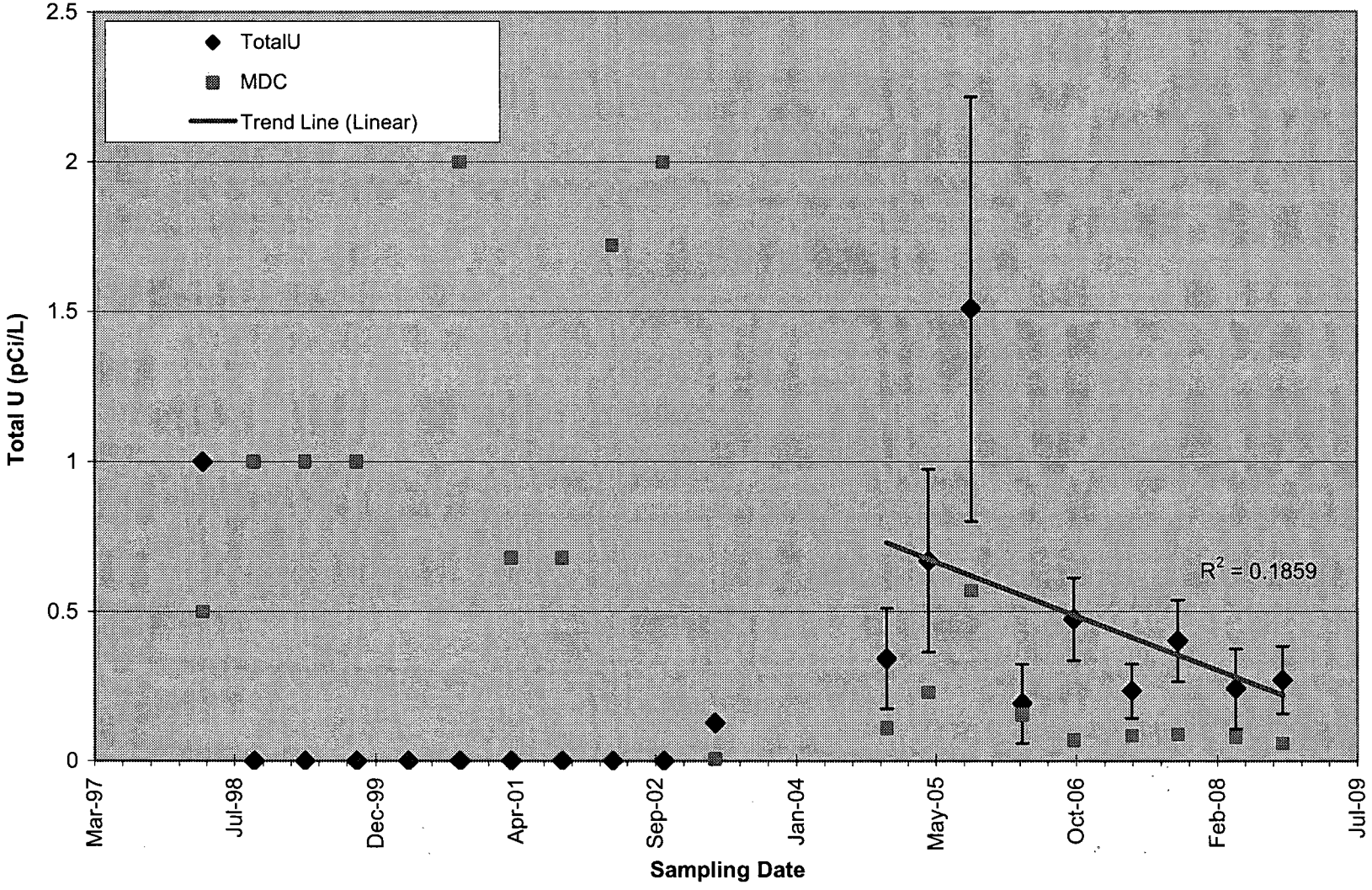


Figure 4-14. Total Uranium in SW-DU-001 (1998-2008)

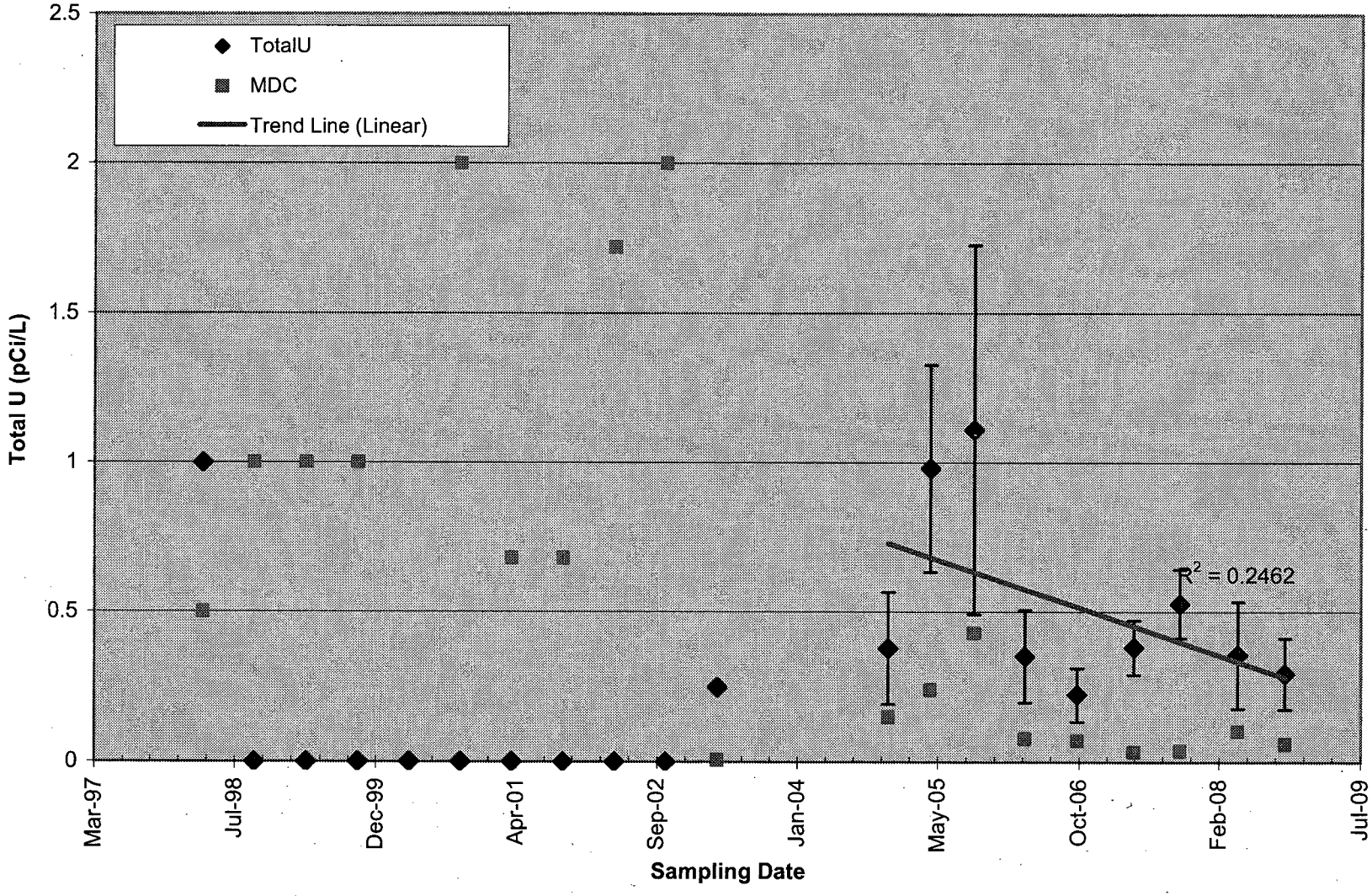
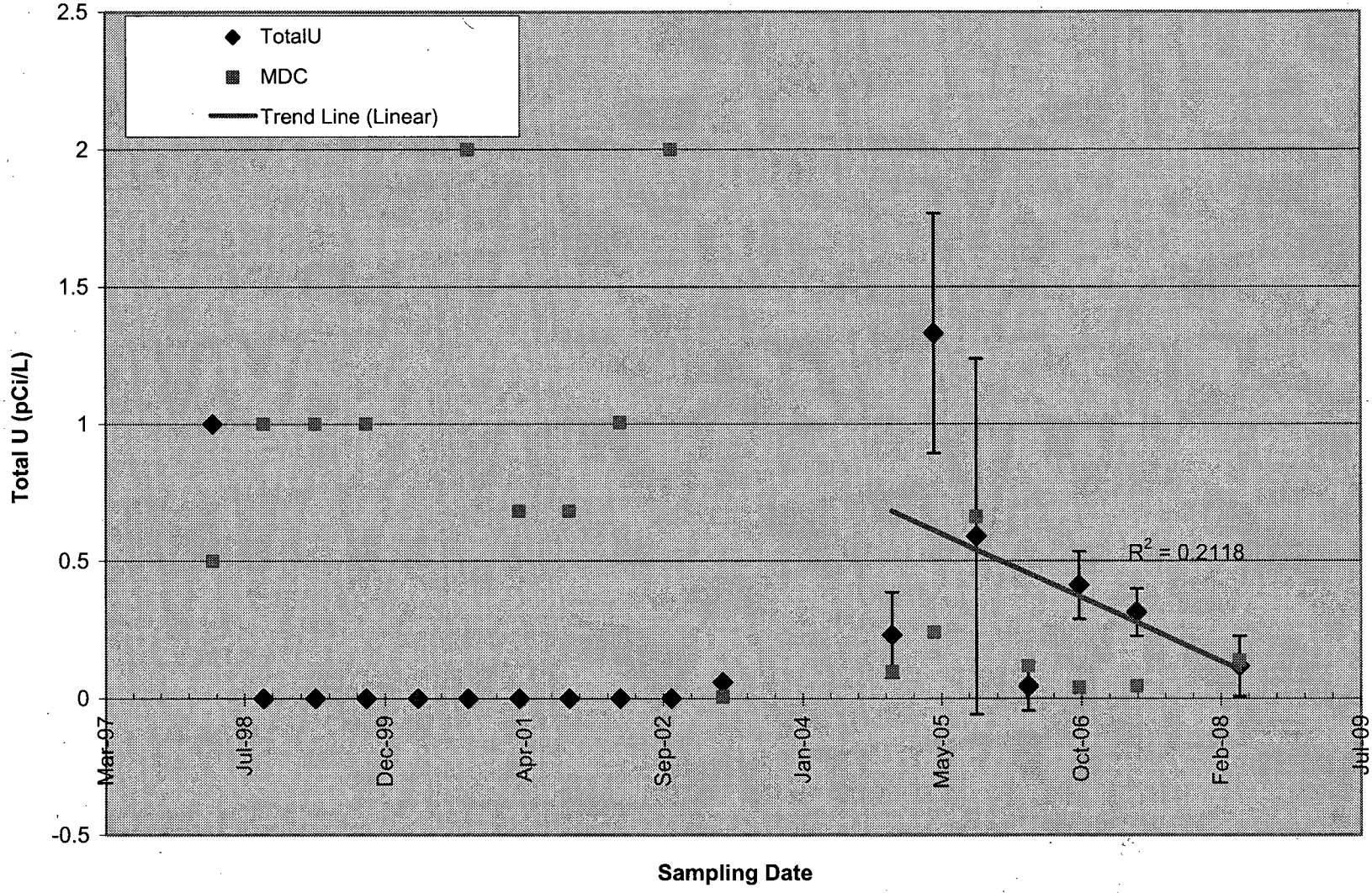


Figure 4-15. Total Uranium in SW-DU-002 (1998-2008)



NOTE: No sample collected in October 2007 or October 2008 as the creek was dry.

Figure 4-16. Total Uranium in SW-DU-003 (1998-2008)

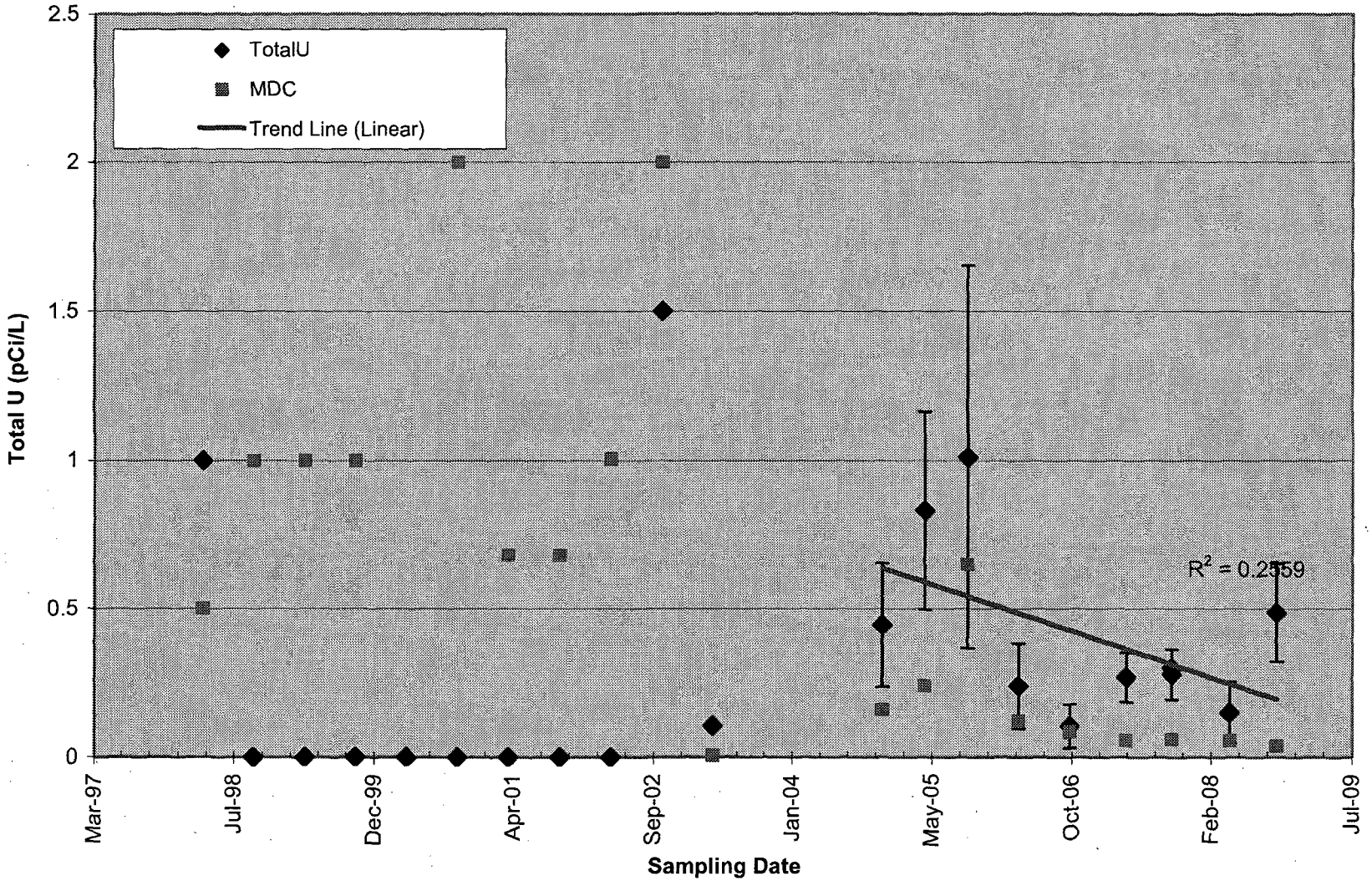
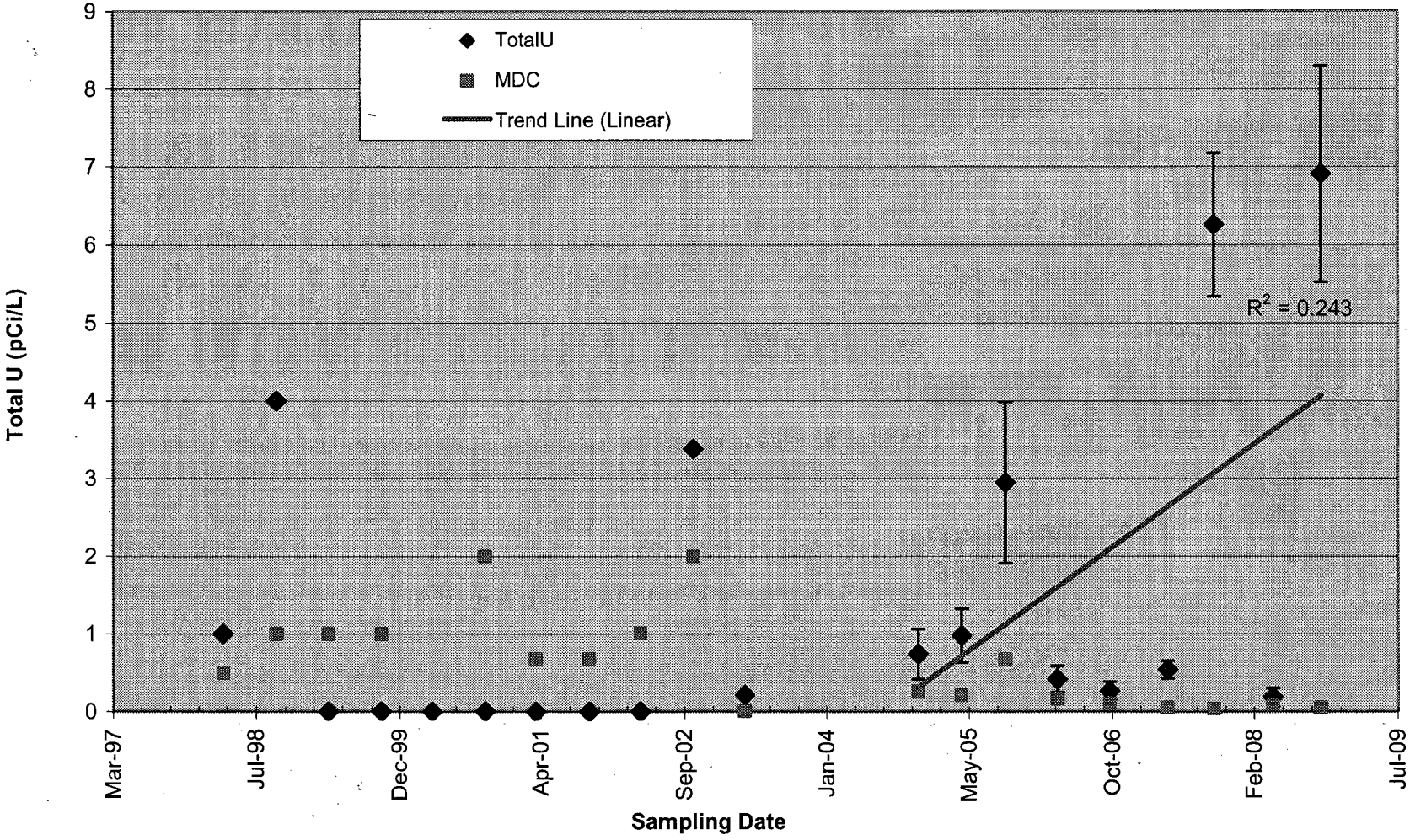
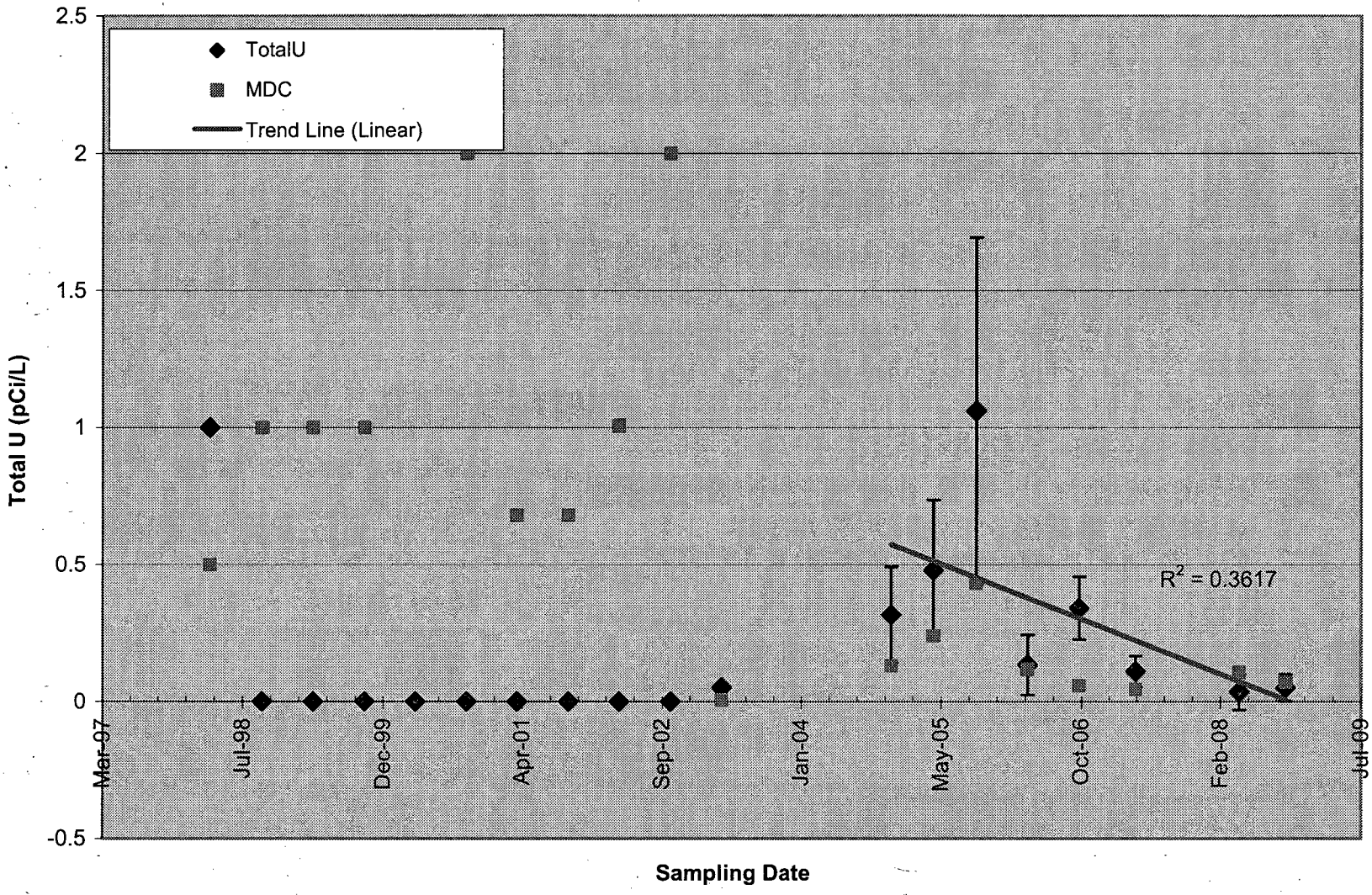


Figure 4-17. Total Uranium in SW-DU-004 (1998-2008)



NOTE: A large value of 29 pCi/g in October 1999 was removed because it was causing a compression of the Y axis scale.

Figure 4-18. Total Uranium in SW-DU-005 (1998-2008)



NOTE: No sample collected in October 2007 as the creek was dry.

Figure 4-19. Total Uranium in SW-DU-006 (1998-2008)

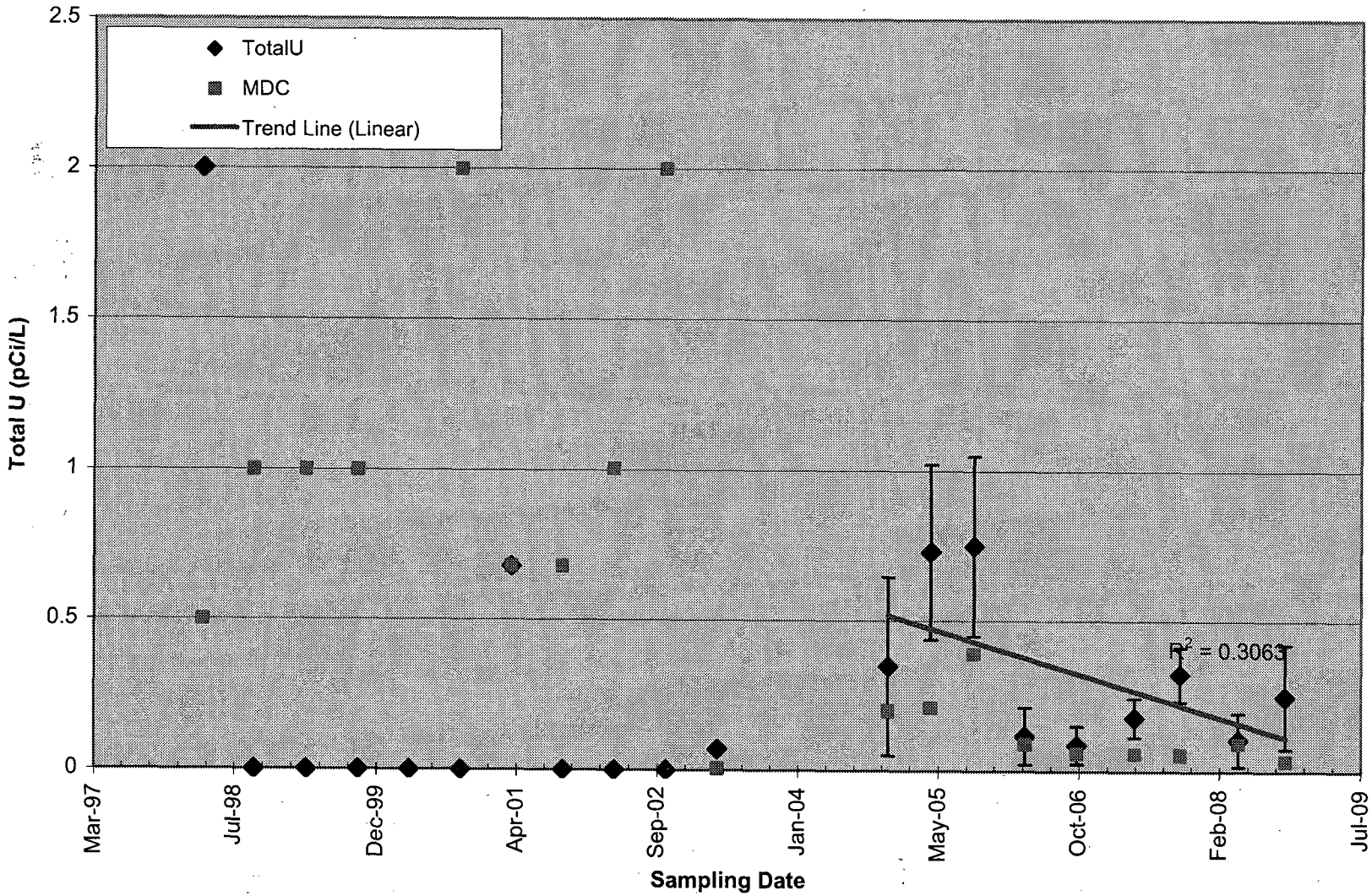


Figure 4-20. Total Uranium in SW-DU-007 (1998-2008)

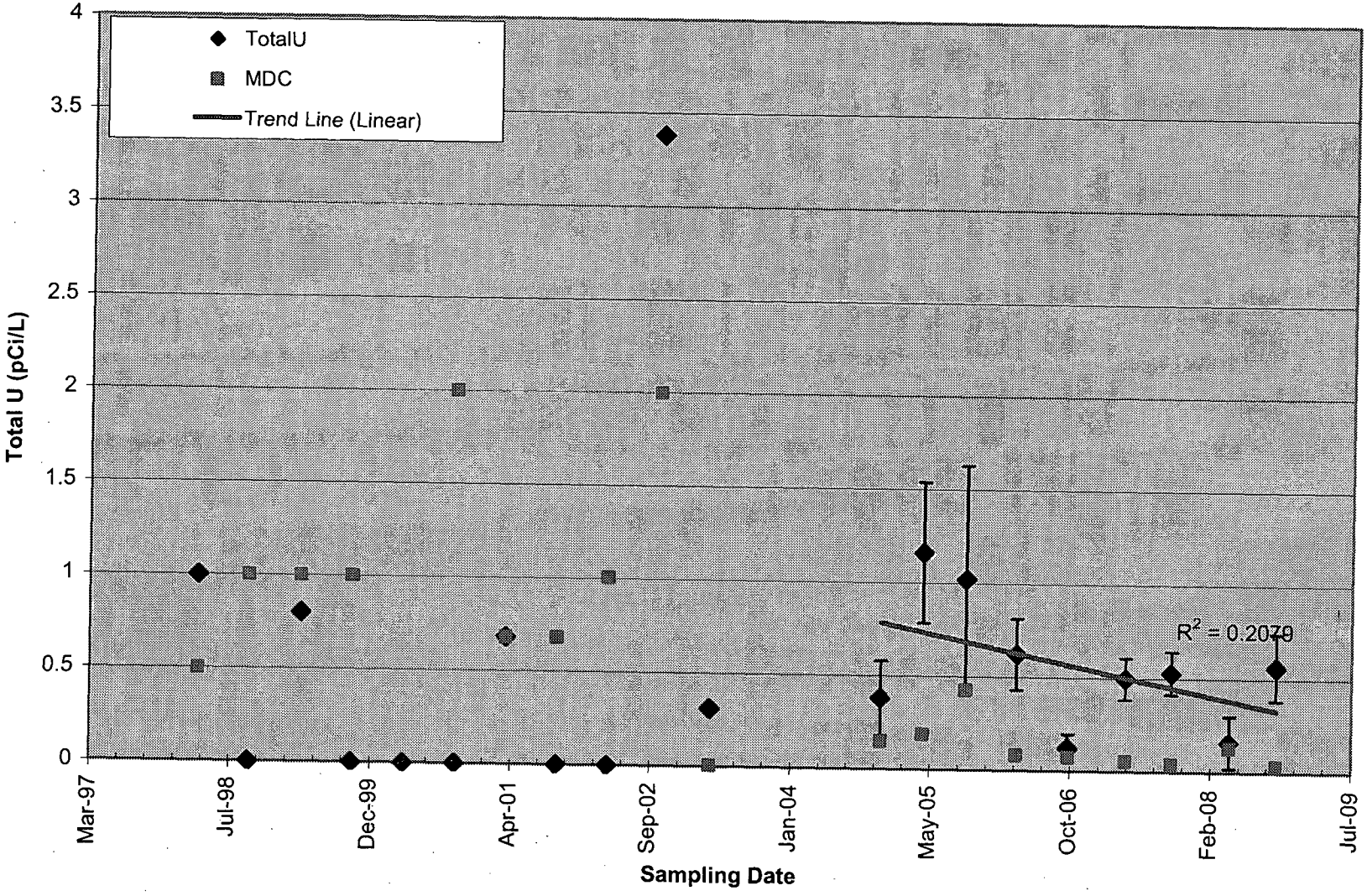


Figure 4-21. Total Uranium in SW-DU-008 (1998-2008)

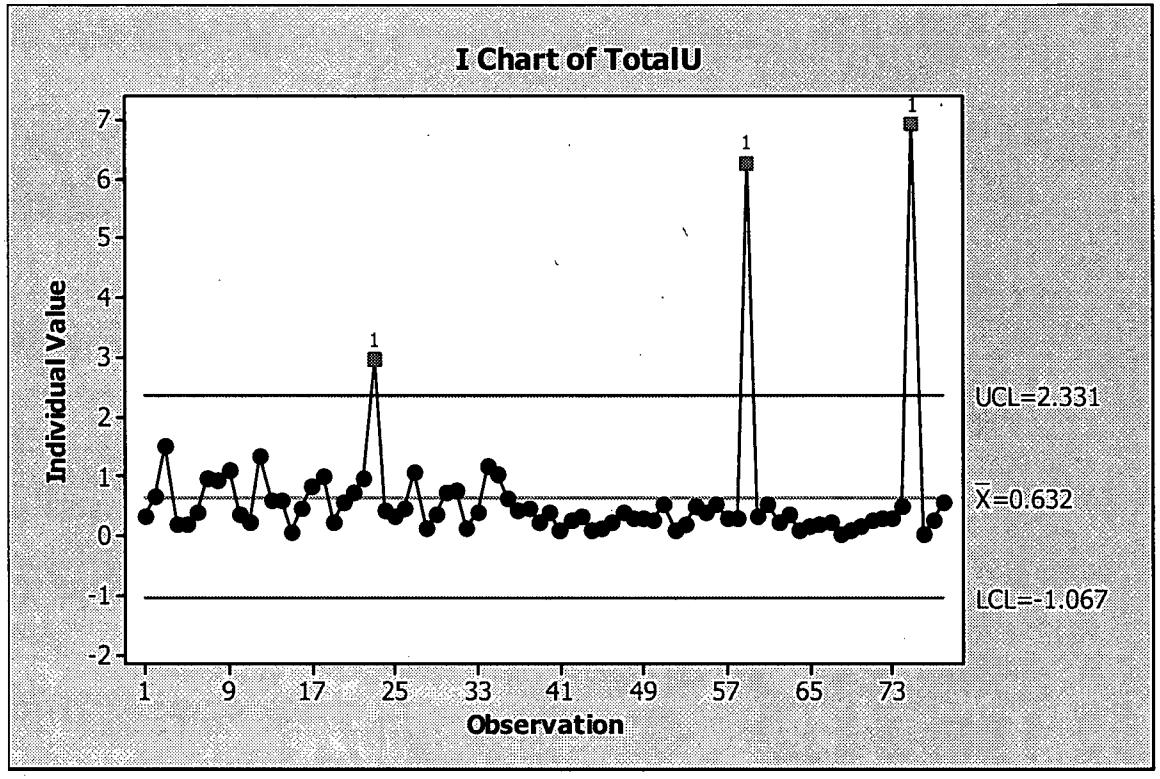


Figure 4-22. Control Chart for All Surface Water Data (2004-2008)

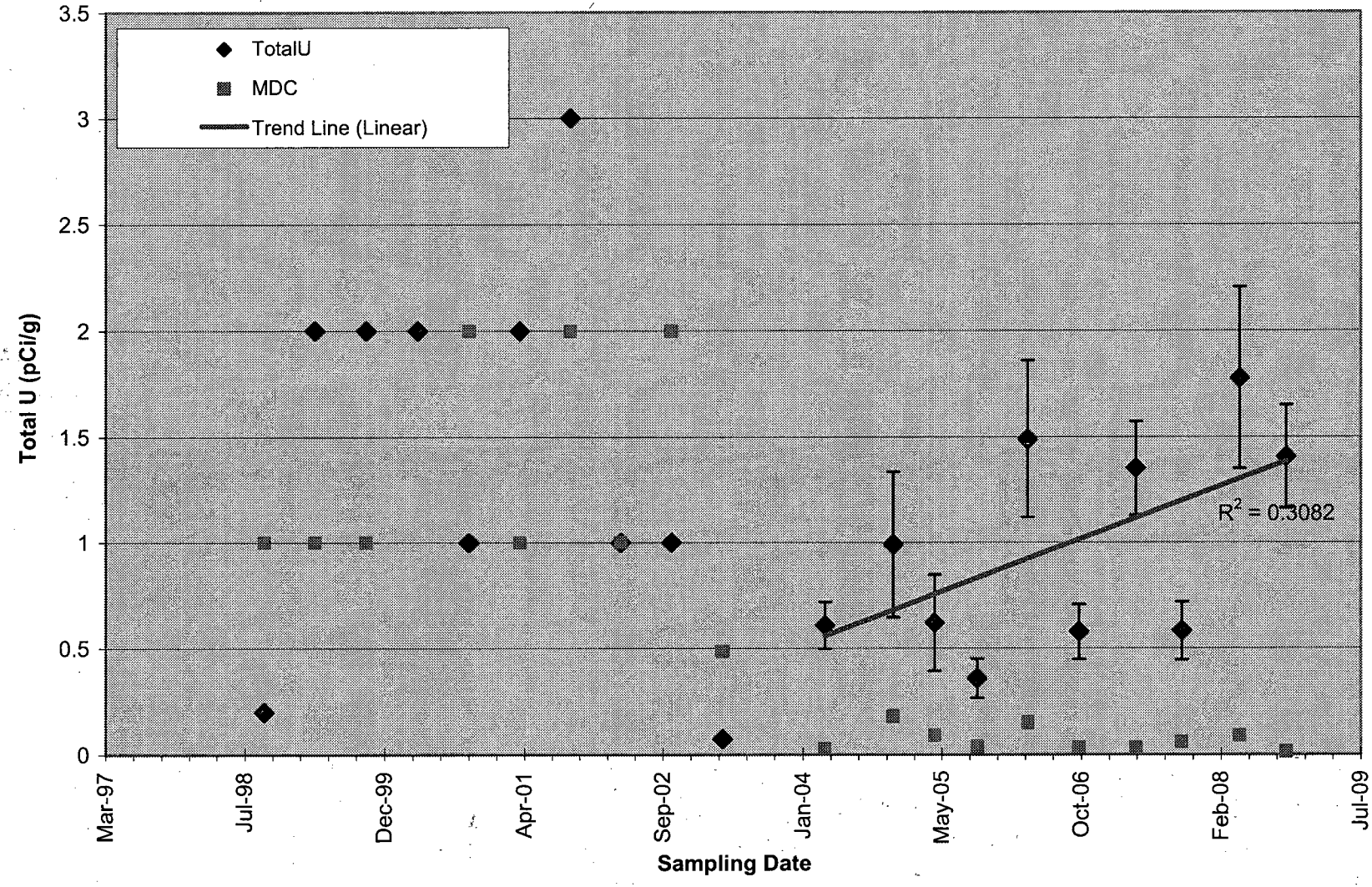


Figure 4-23. Total Uranium in SD-DU-001 (1998-2008)

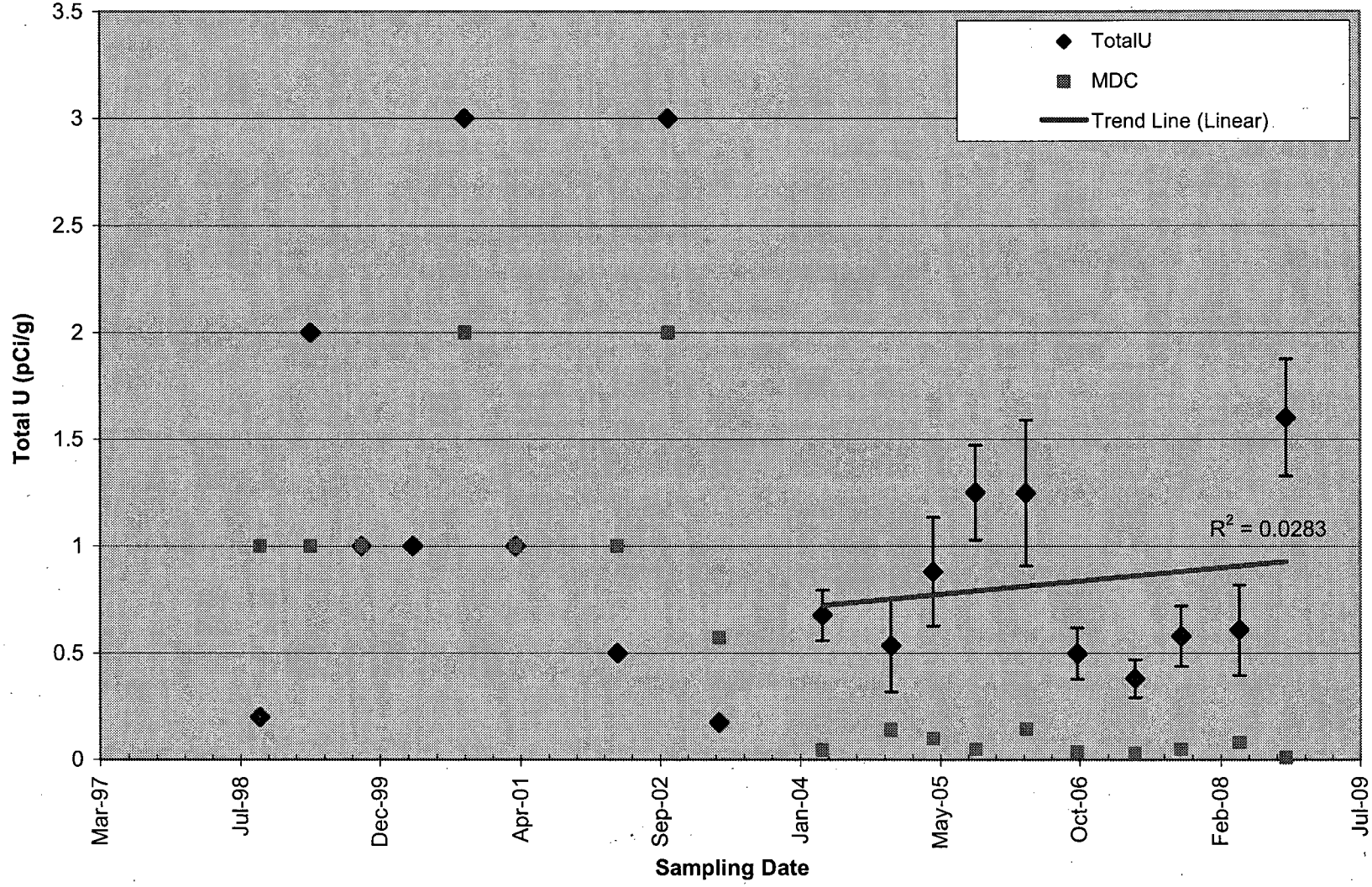


Figure 4-24. Total Uranium in SD-DU-002 (1998-2008)

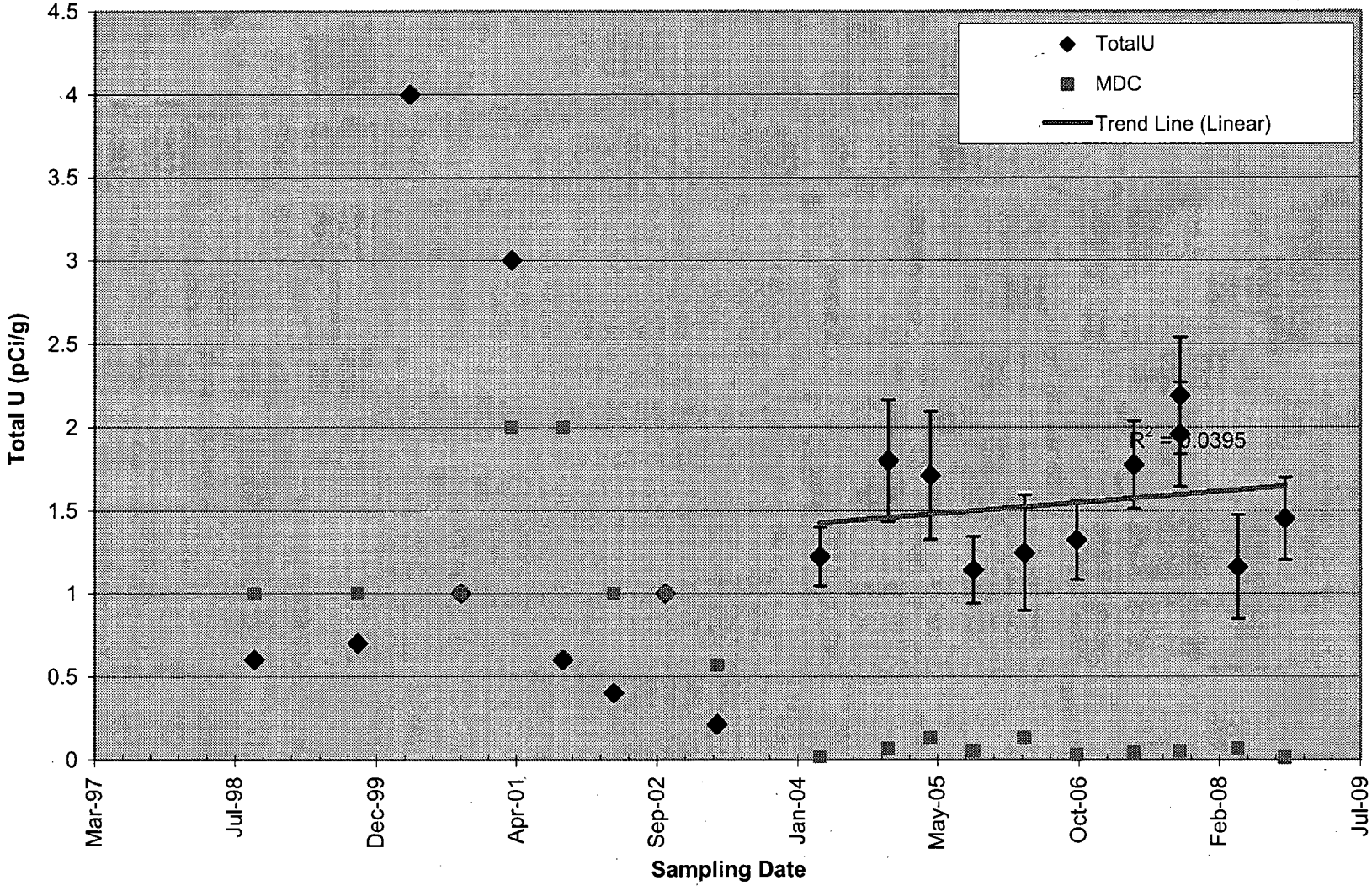


Figure 4-25. Total Uranium in SD-DU-003 (1998-2008)

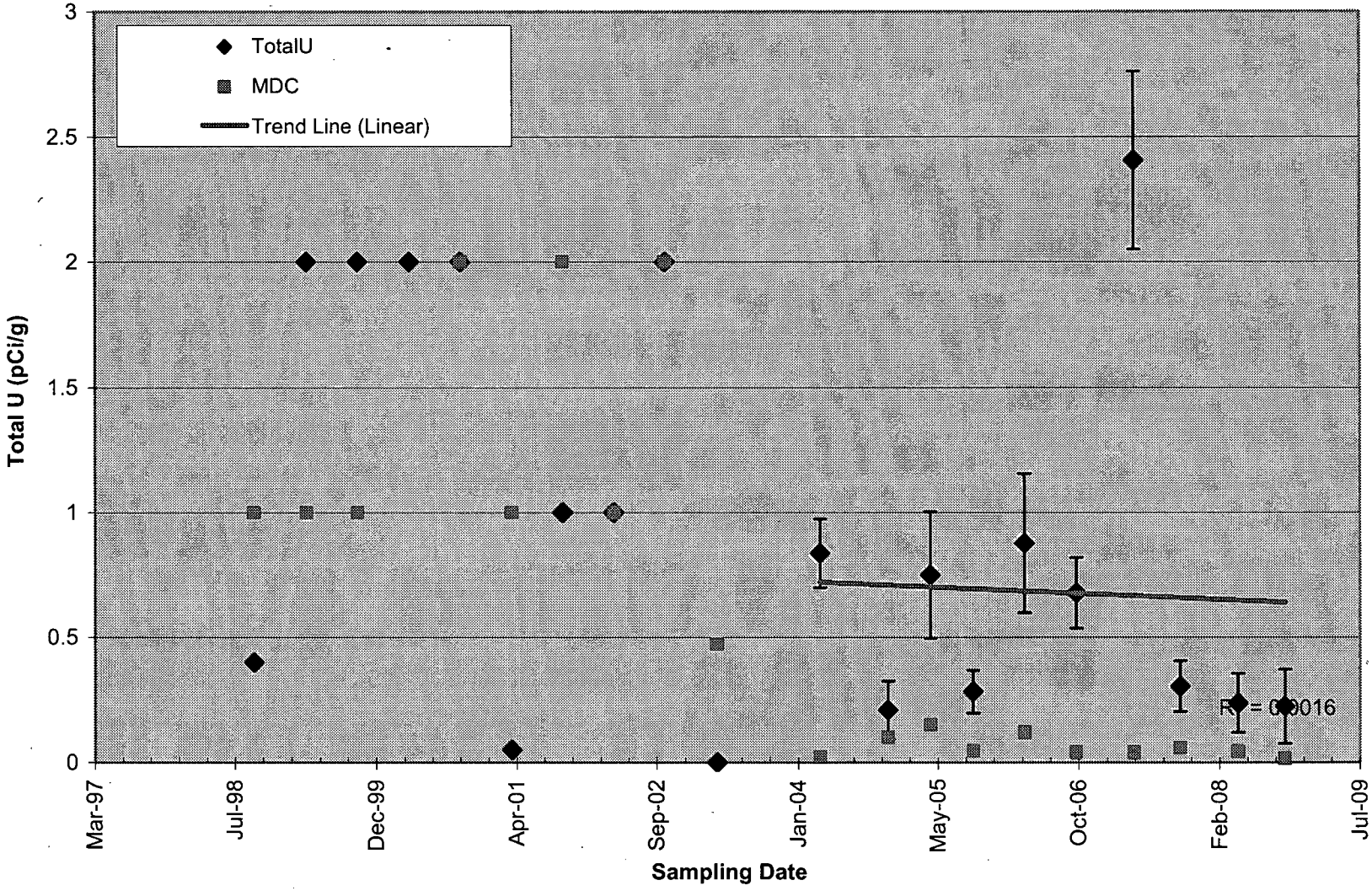


Figure 4-26. Total Uranium in SD-DU-004 (1998-2008)

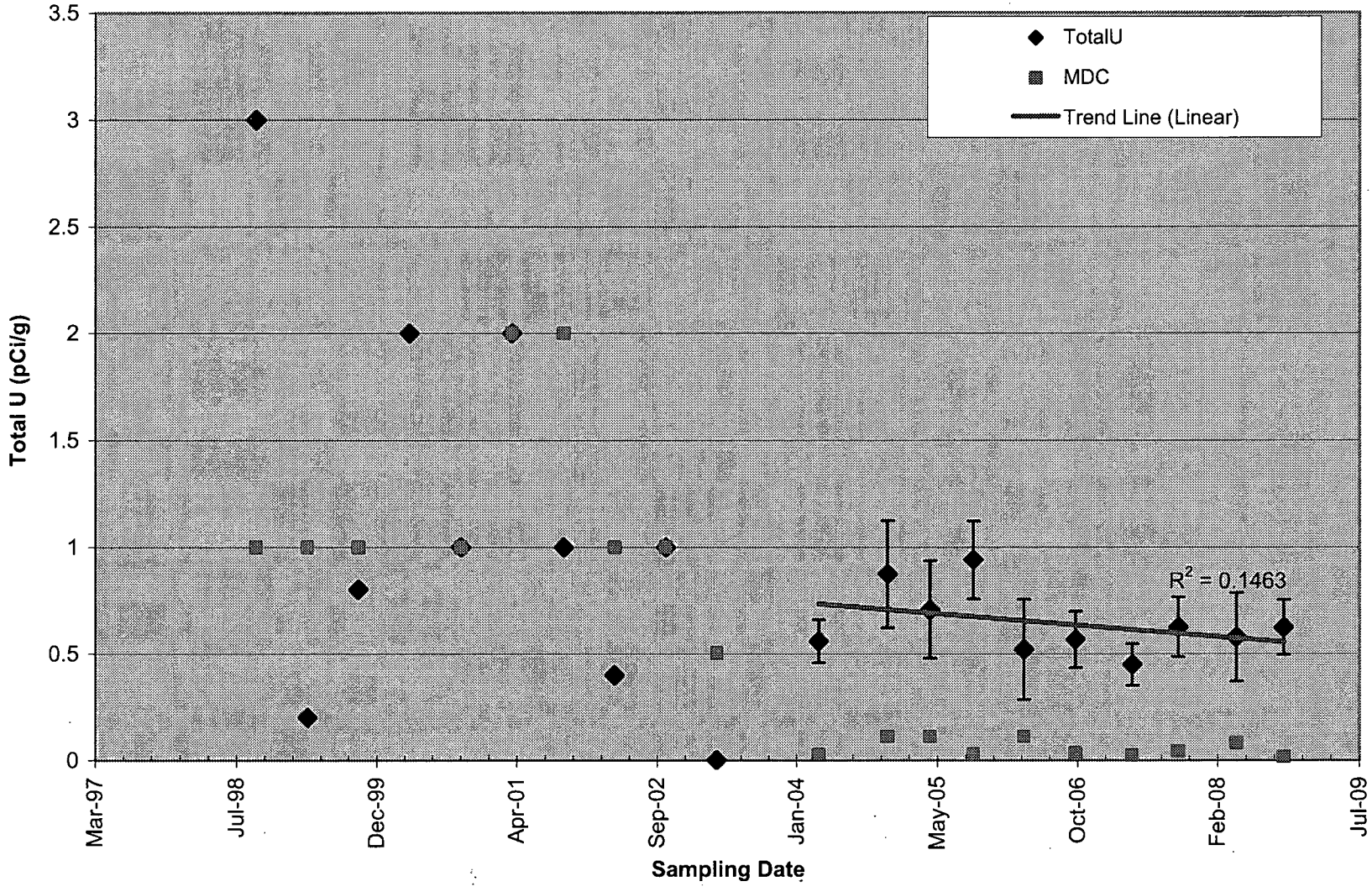


Figure 4-27. Total Uranium in SD-DU-005 (1998-2008)

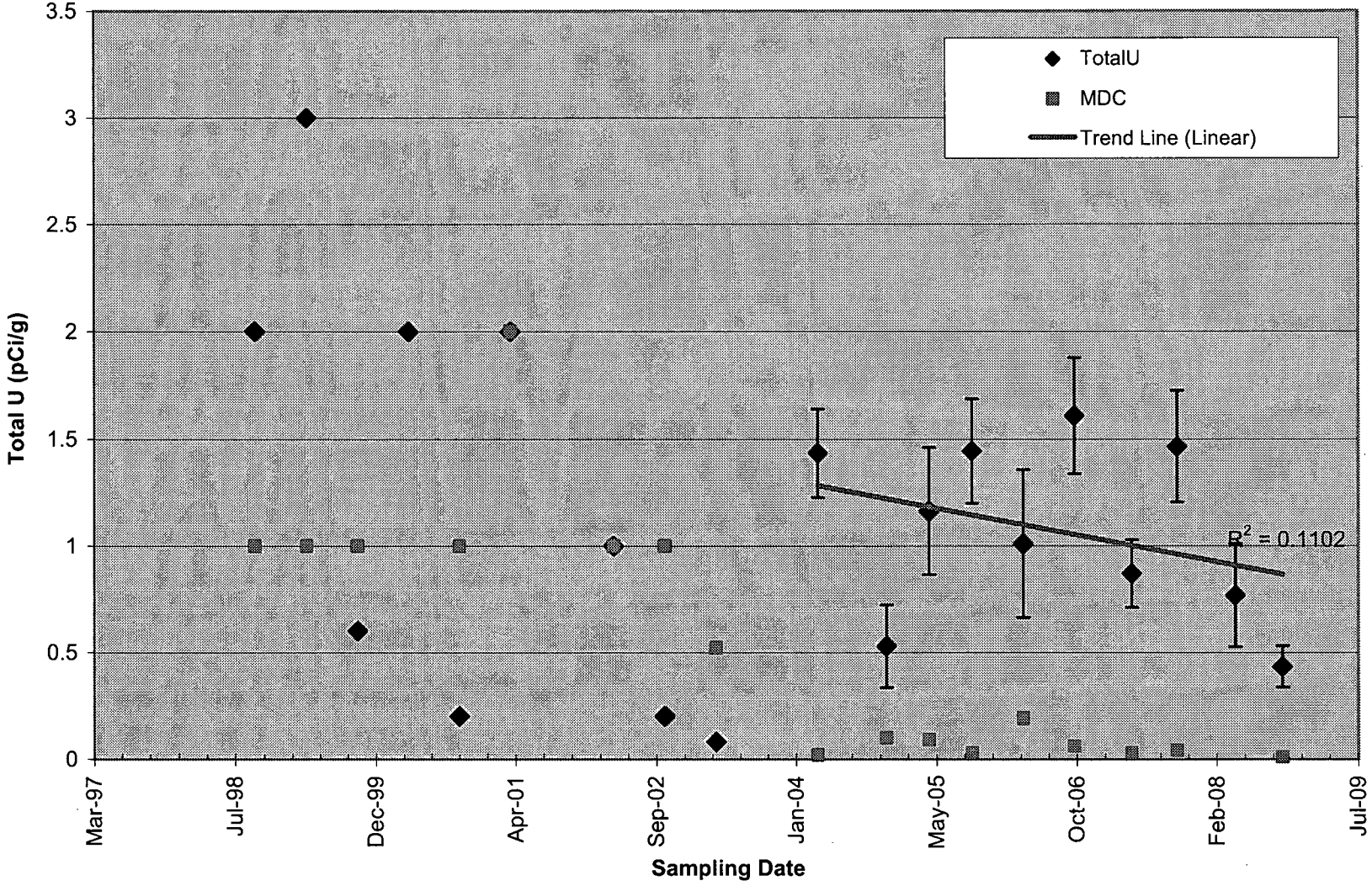


Figure 4-28. Total Uranium in SD-DU-006 (1998-2008)

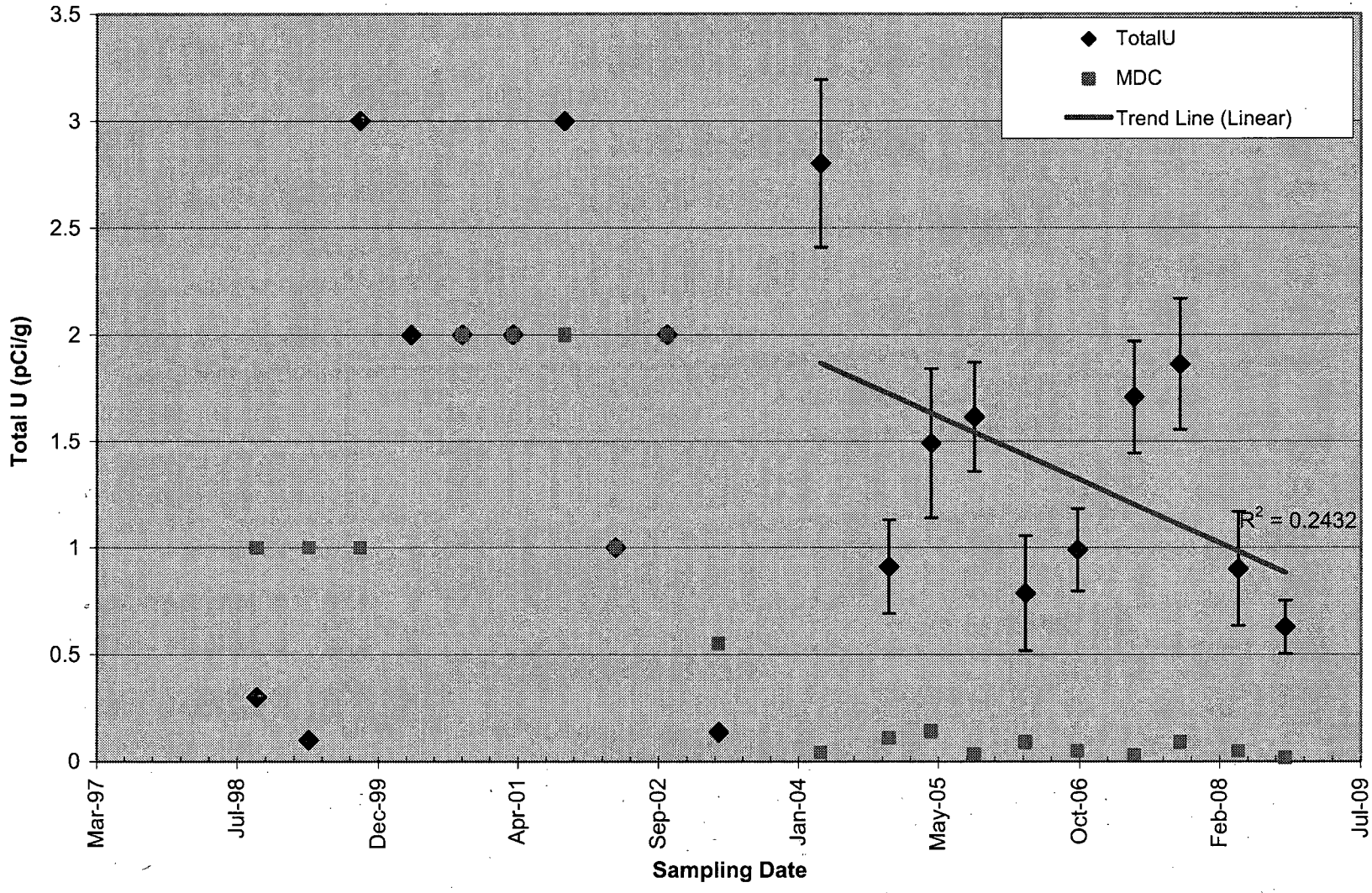


Figure 4-29. Total Uranium in SD-DU-007 (1998-2008)

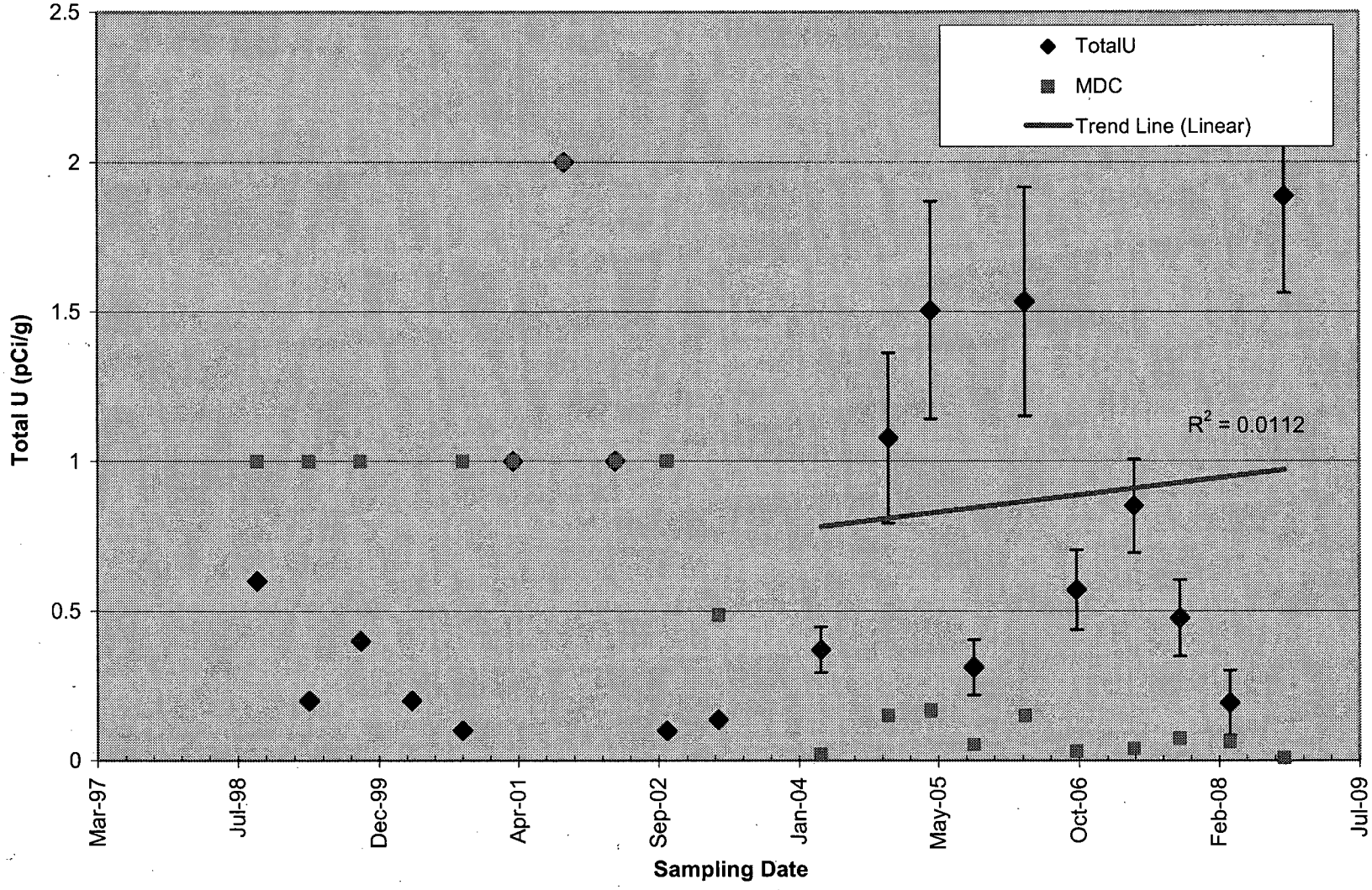


Figure 4-30. Total Uranium in SD-DU-008 (1998-2008)

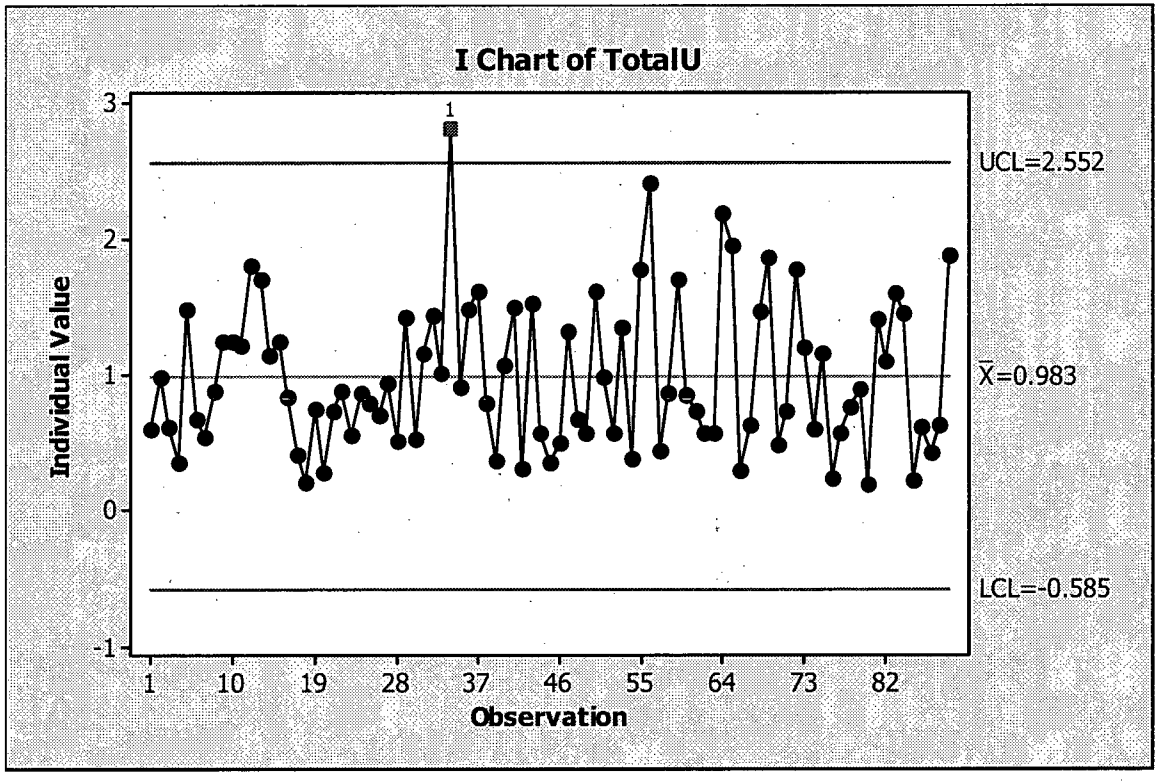


Figure 4-31. Control Chart for All Sediment Data (2004-2008)

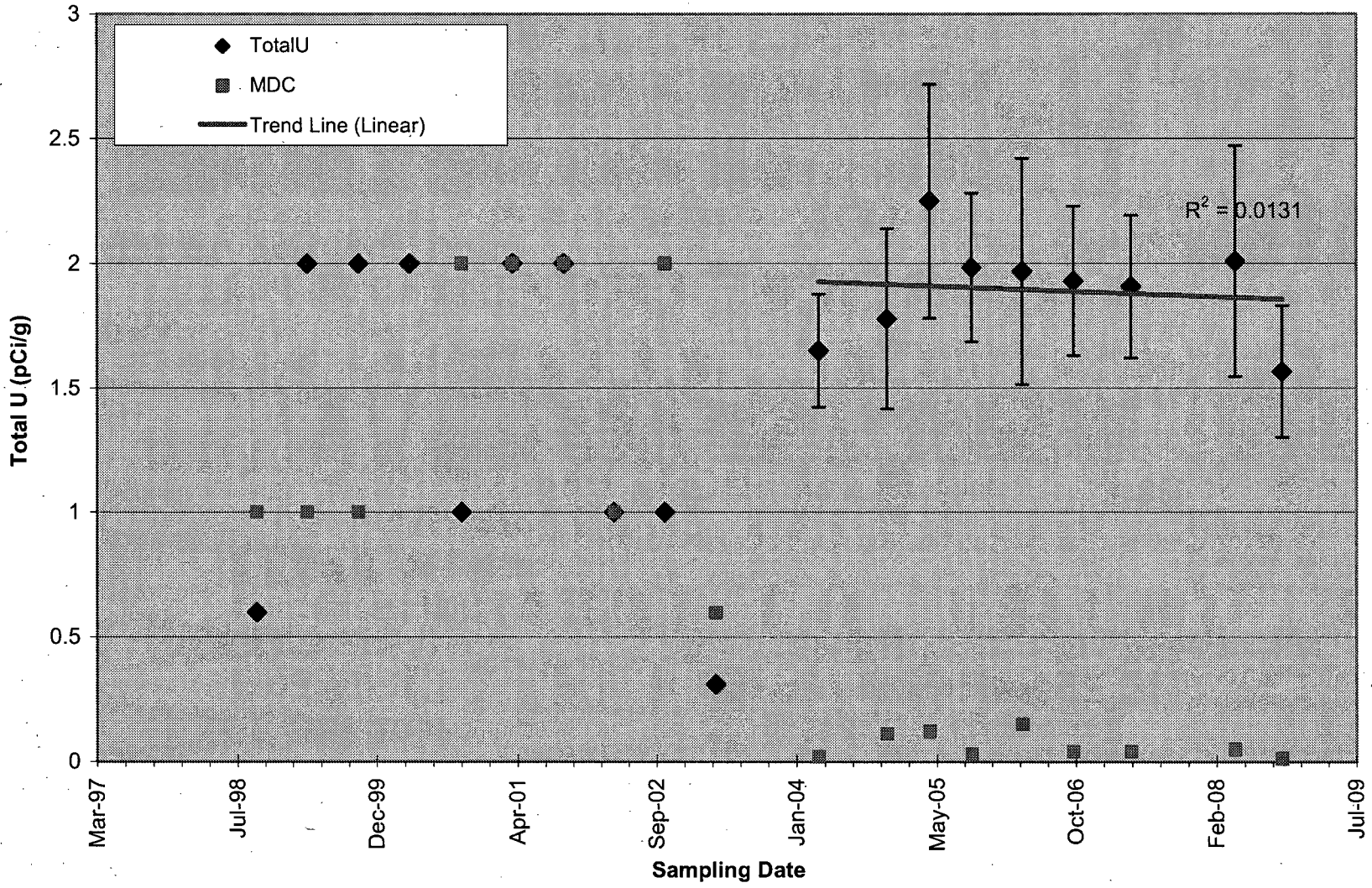


Figure 4-32. Total Uranium in SS-DU-001 (1998-2008)

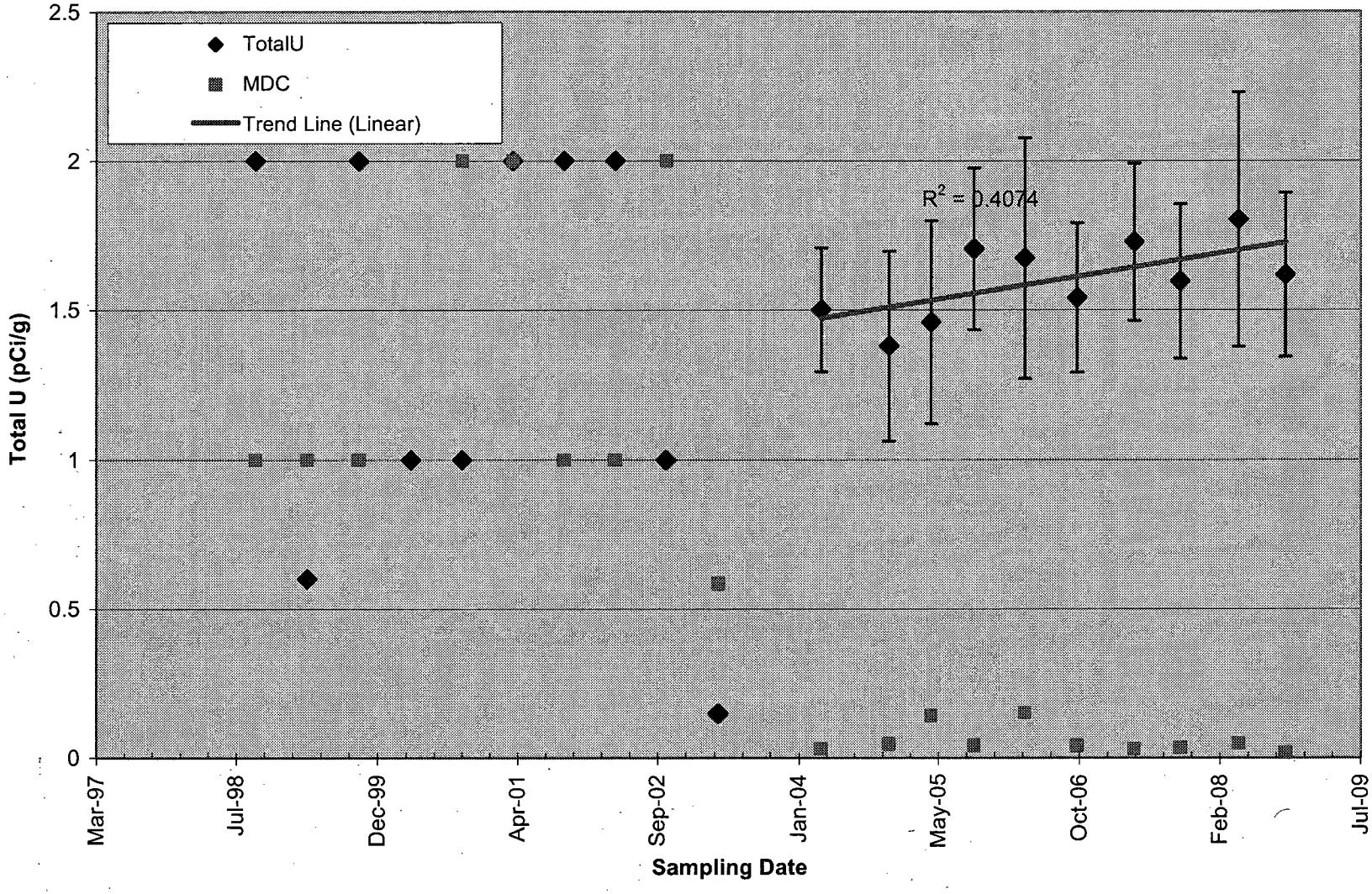


Figure 4-33. Total Uranium in SS-DU-002 (1998-2008)

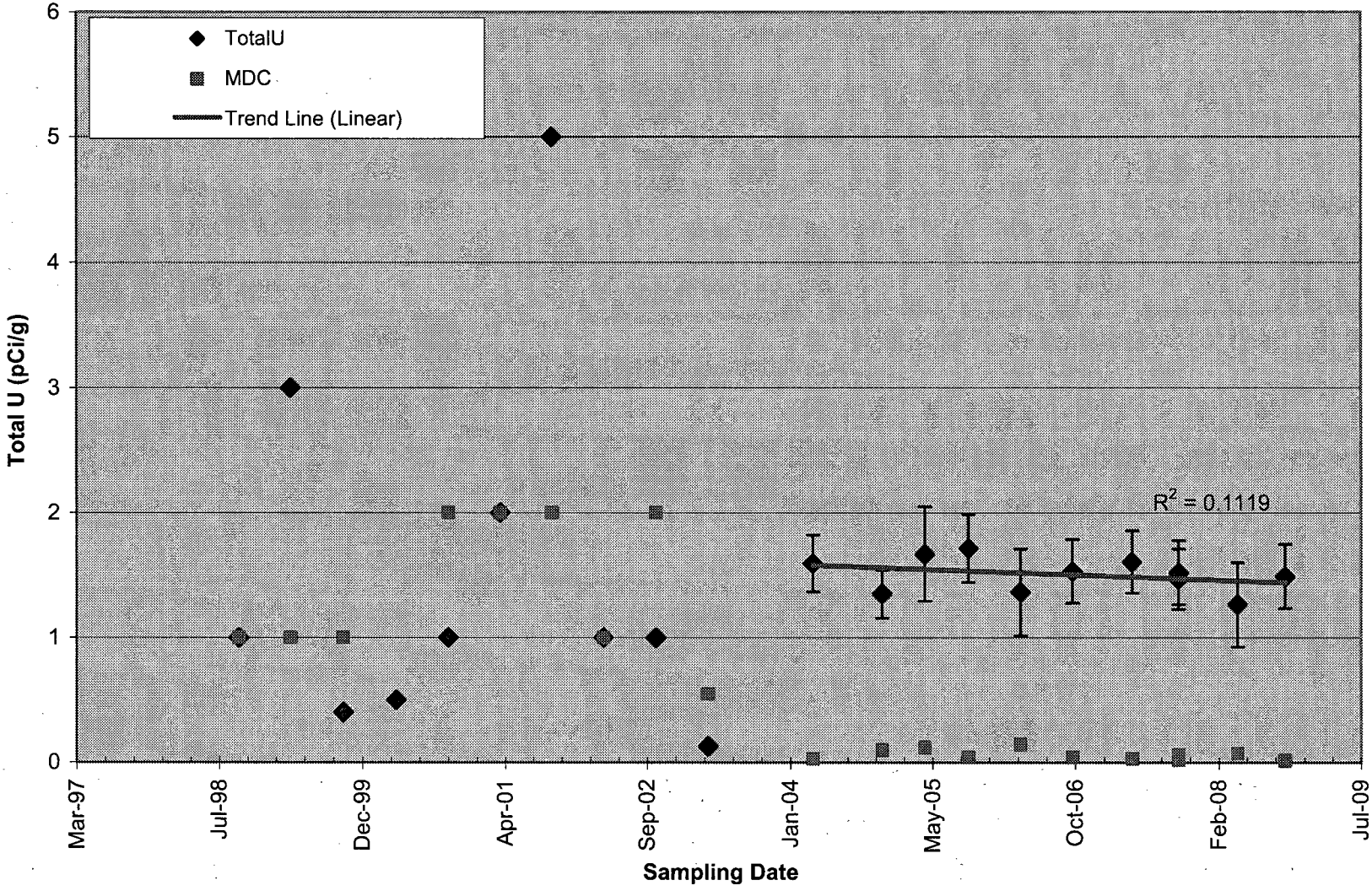


Figure 4-34. Total Uranium in SS-DU-003 (1998-2008)

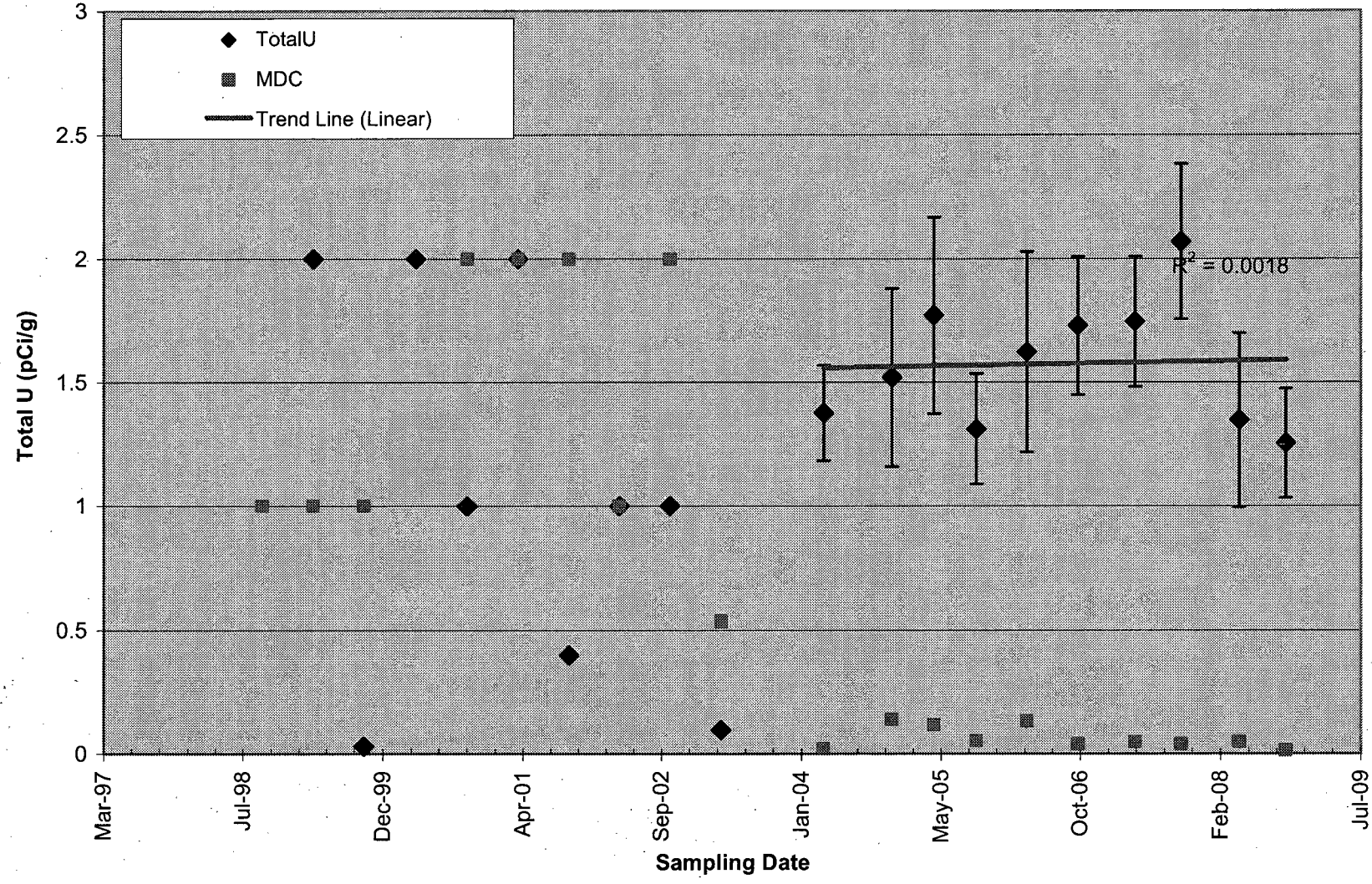


Figure 4-35. Total Uranium in SS-DU-004 (1998-2008)

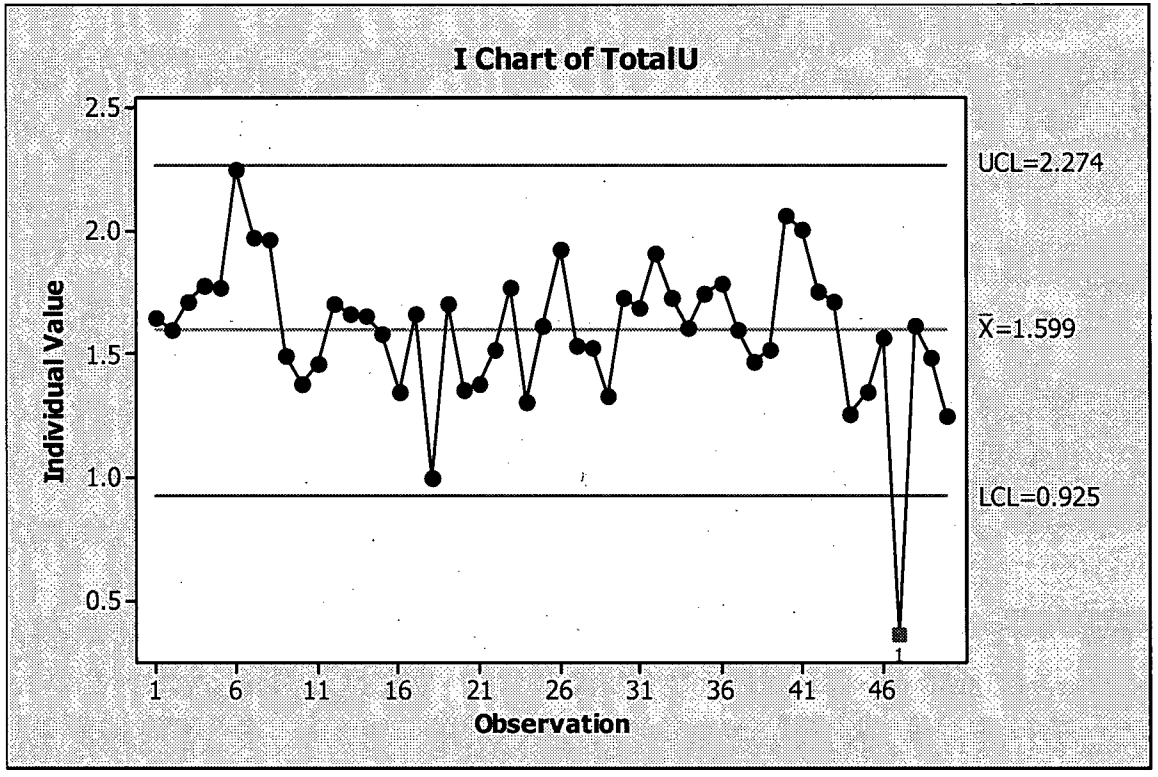


Figure 4-36. Control Chart for All Surface Soil Data (2004-2008)

5. CONCLUSIONS AND RECOMMENDATIONS

The October 2008 sampling event was conducted in accordance with the SOP (CHPPM 2000), and all data were determined to comply with the requirements of the Quality Assurance Project Plan (QAPP) (see Appendix A). The environmental media sample results are generally a small fraction of the action levels (see Table 4-1) established in the SOP. For the purposes of this report, samples with U-238/U-234 ratios in excess of 3 are investigated further to validate whether a sample result is representative of DU or natural uranium. A ratio exceeding 3 existed for groundwater sample MW01 and for surface water samples SWS05 and SWS08. Each of these samples was subjected to additional investigation as noted in Section 3. Trend analysis completed did not provide evidence of any notable increasing or decreasing trends in the environmental media sampled. Furthermore, no action levels defined in the Army's license were exceeded. Future environmental monitoring will continue to be completed in accordance with the SOP.

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6. REFERENCES

CHPPM (U.S. Army Center for Health Promotion and Preventative Medicine). 2000. Standard Operating Procedure, Depleted Uranium Sampling Program, Environmental Radiation Monitoring Program. SOP No. OHP 40-2. 10 March.

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Fujikawa, Y., M. Fukui, M. Sugahara, E. Ikeda, and M. Shimada. 2000. Variation in Uranium Isotopic Ratios 234U/238U and 235U/Total-U in Japanese Soil and Water Samples – Application to Environmental Monitoring. IAEA 10 Proceedings.

NRC (Nuclear Regulatory Commission). 1988. License Number SUB-1435 and Subsequent Amendments, Jefferson Proving Ground, Madison, Indiana. U.S. Army, TECOM, Aberdeen Proving Ground, Maryland. 8 May.

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U.S. Army. 1999. U.S. Army Test and Evaluation Command, Environmental Radiation Monitoring (ERM) Plan for Jefferson Proving Ground. Memorandum to Mr. Larry W. Camper, Chief, Decommissioning Branch, Division of Waste Management, Office of Nuclear Material Safety and Safeguards, United States Nuclear Regulatory Commission, Washington, DC 20555-001 from Dal M. Nett, Chief, Safety Division, Directorate for Mission Support.

U.S. Army. 2000. Standing Operating Procedure, Depleted Uranium Sampling Program, Environmental Radiation Monitoring Program, Jefferson Proving Ground, Madison, Indiana. MCHB-TS-OH. SOP No. OHP 40-2. Effective date, 10 March 2000.

U.S. Army. 2002. Decommissioning Plan for License SUB-1435. Jefferson Proving Ground, Madison, Indiana. Prepared for the U.S. Army SBCCOM by SAIC. June.

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APPENDIX A
STANDARD OPERATING PROCEDURE

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SOP No. OHP 40-2

Effective Date 10 Mar 00
Date Removed from Service _____

STANDING OPERATING PROCEDURE

Depleted Uranium Sampling Program
Environmental Radiation Monitoring Program
Jefferson Proving Ground, Madison, IN

This SOP supersedes, in its entirety, the SOP of the same name dated April 1998.

1. **Purpose.** This Standing Operating Procedure (SOP) prescribes policies, responsibilities, and procedures for administration and execution of the Health Physics Program (HPP), USACHPPM support of the Soldier and Biological Chemical Command (SBCCOM) biannual Environmental Radiation Monitoring (ERM) Program conducted at the Jefferson Proving Ground, Madison, Indiana.

2. **Authority.**

a. US Nuclear Regulatory Commission License No. SUB-1435.

b. Program Services Meeting, 14 September 1999, between SBCCOM and HPP, USACHPPM.

3. **Scope.** This SOP applies to Health Physics Program personnel performing the collection of environmental samples in support of the ERM.

4. **Definitions, Abbreviations.** A list of terms and abbreviations used in this SOP can be found in Annex A.

5. **Forms, Labels, and Worksheets.** A sample of all forms, sample labels, and sample collection worksheets can be found in Annex B.

6. **Point(s) of Contact for Program Coordination:**

a. **Soldier and Biological Chemical Command**
Ms. Joyce Kuykendall, SBCCOM Health Physicist
Comm: 410-436-7118
DSN : 584-7118
email: joyce.kuykendall@sbccom.apgea.army.mil

b. **US Army Center for Health Promotion and Preventive Medicine**
Health Physics Program (Pgm 26)
Comm: 410-436-3502
DSN : 584-3502
fax : 410-436-8261/8263

Radiologic, Classic and Clinical Chemistry Division (RCCCD)
Comm: 410-436-3983/8235
DSN: 584-8235

c. **Jefferson Proving Ground**
Mr. Ken Knouf, Site Manager
Mr. Phil Mann
Ms. Yvette Hayes
Comm: 812-273-2551/2522/6075

7. **Survey Coordination.**

a. Pre-Survey Coordination: 60 days prior to scheduled sample date.

1) Initial Coordination: - made through the SBCCOM Health Physicist. Close coordination with the site management team at JPG will be required to ensure support will be onsite at the time of sampling.

2) USACHPPM HPP Program Assistant, (410) 436-1303, (if call from the Edgewood Arsenal: 5-1303) will be contacted to initiate travel orders. Due to the nature of the sampling program, a four-wheel drive vehicle is required to perform this project. The project and associated report number will be 26-MA-8260-R#-YY. The R# will be a "1" for the October and "2" for the April survey, and the YY will be the current fiscal year.

3) Prepare CHPPM Form 330-R-E (Request for Laboratory Services. (See Annex B) This form can be found on the USACHPPM Web Site or through intranet FormFlow program. Current DLS Test Codes being used are as follows:

Evaluations for Uranium in Soils for the soil and sediment samples, DLS Test Code: 803; STD Method: G-002.

Evaluations for Uranium in Water for the ground and surface water samples, DLS Test Code: 586; STD Method: U-002.

Note: Sample containers for all medium except soils, are provided by SBCCOM and will be onsite however sample labels should be requested from the lab.

Ensure that sample bags, labels and coolers are shipped to the following address:

US Army Jefferson Proving Ground
1661 West J.P.G. Niblo Road (Bldg. 125)
Madison, IN 47250
(812) 273-2551

4) Request for instrumentation to support the sampling program should be made no later than 30 days prior to the scheduled departure date.

Radiation detection instrumentation and soil sampling tools will be coordinated through the HPP Instrumentation Coordinator, ext. 8228. Electronic message will be used for coordination.

Water Quality Instrumentation (pH meter, temperature, and conductivity) will be coordinated through the Surface Water and Waste Water Program (Pgm 32) at extension 3310/4211.

5) Final coordination for project should be completed no later than 14 days prior to departure date.

Contact the site management personnel at JPG and schedule dates for purging of wells prior to arrival. Purging should be accomplished no later than the Friday preceding and no earlier than 14 days prior to the scheduled start date of the sampling visit.

b. Field instrument quality control. Upon receipt of field instruments from the HPP Instrument Coordinator and the Surface Water and Waste Water Program, appropriate instrument quality control checks will be conducted to ensure proper operation prior to departure.

1) Radiation detection instrumentation will be checked for response against a radiation check source. This check source should also be shipped to the survey site for instrument verification on

site. The radiation check source used need not be a calibrated source as instrument response is the parameter being evaluated.

2) Water quality instruments should also be verified using guidance provided by water program personnel. At a minimum, verify the accuracy of the pH meter using the certified pH solution packets.

8. **Sample Collection.** Four separate sample matrixes will be collected in support of the ERM. Methodologies for sampling can be found in US Army Environmental Hygiene Agency (the predecessor to USACHPPM) Technical Guide 155, Environmental Sampling Guide, February 1993.

a. Ground Water Samples. A total of 11 monitoring wells have been established to be used for the Environmental Monitoring Program. Wells are indicated on the ground water sample map (figure 1, Anne C) using an alphanumeric code containing the letters MW and a two digit sample number (01-11).

1) Sample will be collected using a new hand bailer for each sample. Care will be taken when lowering the bailer into the well to prevent unnecessary aeration or contamination of the sample.

2) A total quantity to be collected will be 1 US gallon.

3) A portion of the first bailer full of water will be placed into a clean beaker, or other suitable container, and an evaluation of radiation level, temperature, pH and conductivity will be conducted and recorded.

4) Sample information will be recorded on the Ground Water Sample Collection Worksheet. (Annex B)

5) Samples will not be filtered or persevered in the field.

b. Soil Samples. A total of 4 soil samples will be collected, one from each corner of the trapezoidal impact area. Sample locations are indicated on the soil sample map (figure 2, Annex C).

1) Sample will be collected using a new or properly cleaned scoop, trowel, or other suitable tool. Sample will be placed in a self sealing (Ziploc®) bag.

2) A sample quantity of approximately 1000 grams will be collected.

3) Radiation dose rate measurements will be taken at 1 meter above the sample location and recorded on the Soil Sample Collection Worksheet (Annex B).

c. Surface Water Samples. A total of 8 sample locations have been identified for the collection of water sample from the two creeks that run through the DU impact area (figure 3, Annex C).

1) Sample will be collected using the grab method. Sample container will be positioned pointing upstream and below the surface of the water.

2) A sample quantity of 1 US gallon will be collected.

3) Radiation dose rate measurements will be taken at 1 meter above the sample location and recorded on the Surface Water Sample Worksheet (Annex B).

4) Water sample will not be filtered or preserved in the field.

d. Sediment Sample. A total of 8 sample locations have been identified for the collection of sediment samples from the two creeks that run through the DU impact area. Sediment samples will be collected at the sites selected for surface water collection (figure 3, Annex C).

1) Sample will be collected using a new or properly cleaned scoop, trowel, or other suitable tool. Sample will be placed in a glass sample jar.

2) Sediment sample will be collected only after the water sample has been collected.

3) While a sediment sample is usually considered a solid sample matrix, a certain amount of water is expected in the sample. The sample should not be drained of water that is collected as part of the sample.

4) Radiation dose rate measurements will be taken at 1 meter above the sample location and recorded on the Sediment Sample Worksheet (Annex B).

9. **Sample Management.** Since sample collected are in support of NRC License commitments, chain-of-custody procedures will be followed.

a. Samples will be secured from unauthorized access during the period of sampling.

b. Prior to shipment of samples to USACHPPM, a properly completed CHPPM Form 235-R-E, Chain of Custody Record (Annex B), will be placed in each shipping container. Survey personnel will maintain a copy of the Chain of Custody Record for verification of sample transport.

c. Water samples must reach RCCCD no later than 4 days from the time of sampling. To ensure this time frame is met and that the laboratory has time to filter and preserve the sample if necessary, water samples should be collected on the first day of the sampling trip and shipped the following day. It is not necessary to ship the water, sediments, and soils together.

10. **Sample Analysis.** Sample analysis of all environmental samples will be performed through the USACHPPM RCCCD.

a. Samples will be analyzed in accordance with RCCCD established protocols and procedures. All environmental samples will be coordinated with the SBCCOM RPO for disposal instructions.

1) Water samples will be analyzed fluorometrically for dissolved total uranium.

2) Soil and sediment samples will be analyzed using gamma spectroscopy, keying on the isotopic peaks of the Thorium-234. The thorium is the daughter of U-238 and is considered to be in equilibrium therefore the activity would be equal.

b. The QC for laboratory instruments will be performed by RCCCD.

c. Reports of analysis will be forwarded to the USACHPPM project officer responsible for requesting the sampling. Electronic as well as hard copy reports will be requested.

11. **Action Levels.** Every effort will be made to maintain radiation exposures and releases of radioactive and non-radioactive toxic metals to unrestricted areas as low as is reasonable achievable (ALARA).

a. The following criteria for the restricted area will be used to limit DU exposure. (Limits were established in the NRC Approved ERM)

SOIL:

- Perimeter and background samples:

  ≤ 35 pCi/g - no corrective action.

  > 35 pCi/g - collect 5 additional samples in a 1 meter square grid. If average > 35 pCi/g is confirmed, recommendation to decontaminate soil to ≤ 35 pCi/g will be made to the SBCCOM RPO.

- Sample locations along the lines of fire:

  < 100 pCi/g - no corrective action

  100-300 pCi/g - collect 5 additional samples in a 1 meter square grid. If average > 100 pCi/g is confirmed, investigate to determine reason for the high level.

  > 300 pCi/g - collect 5 additional samples in a 1 meter square grid. If average > 300 pCi/g is confirmed, investigate to determine reason for the high level and immediately notify the SBCCOM RPO to initiate notification to the NRC.

WATER:

- Uranium limit established in 10 CFR 2, Annex B is 3.0×10^{-1} pCi/ml

  < 1.5×10^{-1} pCi/ml - no corrective action.

  > 1.5×10^{-1} pCi/ml - resample; if results above 1.5×10^{-1} pCi/ml is confirmed, investigate to determine reason for the high level and immediately notify the SBCCOM RPO to initiate notification to the NRC.

b. Basis for Action. If any of the action levels are exceeded, an evaluation of cause will be performed by the SBCCOM RPO. The RPO will provide a report of findings to the RCC. Based on their determination, recommendations to the commander on corrective action will be made.

GARY J. MATCEK
MAJ, MS
Program Manager, Health Physics Program

ANNEX A

DEFINITIONS AND ABBREVIATION

1. **Definitions:**

a. **Action Level:** The numerical value that will cause the decision maker to choose one of the alternative actions. The action level may be a regulatory standard or may be a level set to ensure that corrective action is initiated before regulatory standards are met.

b. **Area:** A general term referring to any portion of a site, up to and including the entire site.

c. **Background Sample:** A sample collected from an area similar to the one being studied, but in an area thought to be free of contaminant of concern.

d. **Calibration:** Comparison of a measurement standard, instrument, or item with a standard or instrument of higher accuracy to detect and quantify inaccuracies and to report or eliminate those inaccuracies by adjustments.

e. **Chain-of-Custody:** Documentation of the possession and handling of a sample from the time it is collected to the final disposition.

f. **Detection Limit:** The lowest concentration at which given analytical procedures can identify.

e. **Duplicate Samples:** Samples collected simultaneously from the same source, under identical conditions, into separate containers.

g. **Ground Water Sample:** A sample of water taken from an established monitoring well.

h. **Preservation:** Techniques which retard physical and/or chemical changes in a sample after it has been collected.

i. **Quality Assurance:** A monitoring program which ensures the production of quality data and identifies and quantifies all sources of error associated with each step of the sampling and analytical effort.

j. **Sample:** A part or selection from a medium located in a survey area that represents the quality or quantity of a given parameter or nature of the whole area.

k. **Sediment:** A sample of the mineral and/or organic matter deposited by surface waters.

l. **Soil Sample:** A sample of the soil taken from the first 15 centimeters (6 inches) of surface soil.

m. **Split Sample:** A sample, which has been portioned into two or more containers from a single sample container.

n. **Surface Water:** Water found above the surface of the soil, particularly water contained in creeks and streams.

2. **Abbreviations:**

a.	DU	Depleted Uranium
b.	ERM	Environmental Radiation Monitoring Program
c.	g	gram
d.	HPP	Health Physics Program
e.	JPG	Jefferson Proving Ground
f.	ml	milliliter
g.	NRC	Nuclear Regulatory Commission
h.	pCi	pico-Curie

i.	QC	Quality Control
j.	RCCCD	Radiologic, Classic and Clinical Chemistry Division
k.	RPO	Radiation Protection Officer
l.	SBCCOM	Soldier and Biological, Chemical Command
m.	SOP	Standing Operating Procedure
n.	USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine

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ANNEX B

FORMS, LABELS AND WORKSHEETS

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Request for Laboratory Services

Directorate of Laboratory Sciences
REQUEST FOR LABORATORY SERVICES

PLEASE PRINT OR TYPE ALL REQUESTED INFORMATION

For DLS Use Only
LIMS JOB# _____
Date Received _____

PART 1: PROJECT INFORMATION

1. DATE OF REQUEST: 08/03/2000
2. PROJECT #: (CHPPM only) 26 MA 8260 XO# _____
3. FUND SOURCE: ☐ P84 ☐ DERA ☐ OTHER Supplemental *(Specify)* _____
4. DIVISION/PROGRAM: Health Physics Program
5. INSTALLATION: Jefferson Proving Ground
6. STATE WHERE SAMPLES TO BE COLLECTED: Indiana
7. NAME OF PROJECT OFFICER(s): Mr. David Collins
   TELEPHONE: (410) 436-3502 FAX# (410) 436-8261
   E-MAIL: david.collins@apg.amedd.army.mil
8. NAME OF SAMPLE COLLECTOR: Mr David Collins
9. PROJECT DESCRIPTION/OBJECTIVE *(Screen, Monitoring, Regulatory or Health Concern, Etc.)*:
   Sampling required as part of the Environmental Radiation Monitoring Plan
10. SAMPLE OR SITE HISTORY (High Toxicity, Etc):
    DU Firing Range
11. PROJECT COORDINATOR/DLS TECHNICAL CONSULTANT - Was project coordinated with DLS? ☒ YES ☐ NO
    Name of Person in DLS: Mr. Gary Wright ext. 8235

PART 2: TURNAROUND TIME REQUESTED

1. DATE RESULTS REQUIRED: _____
2. INDICATE THE APPROPRIATE SAMPLE OR PROJECT DESIGNATION:
   ☒ STANDARD
   (Note: All samples are routinely processed as Standard Analyses Unless Arrangements Have Been Made with DLS for High-Priority or Top-Priority Analyses.)
   ☐ HIGH-PRIORITY ☐ TOP-PRIORITY
   (Note: High-Priority and Top-Priority Requests should be Coordinated with DLS and are Subject to Cost Surcharges.)

PART 3: REPORT DISTRIBUTION OPTIONS

1. REPORT RESULTS BY: *(Indicate Preference)*
   ☒ cc:MAIL/E-MAIL TO ADDRESS: david.collins@apg.amedd.army.mil
   ☐ FAX TO *(Write Fax#)*: _____
   ☒ MAIL:

REQUESTED BY: Mr. David Collins
PRINT NAME: _____ SIGNATURE: _____
(Note: Signature Required if Submitted by Hard Copy)

CHPPM Form 330-R-E, 1 May 96, (MCHB-DC-LLI) Replaces AEHA Form 330-R, Jul 93, which is obsolete.

Figure B-1a

PART 4: PROJECT COORDINATION INFORMATION

1. DATE SAMPLES TO ARRIVE AT DLS: 12/04/2000

(Note: Prior Arrangements Must Be Made with SML for Samples That Will Arrive Outside of Routine Duty Hours which are M-F 0730 -1700)

Special Comments: Samples will arrive from the field without preservation or filtration.

2. SPECIAL HANDLING REQUIREMENTS:

- [x] CHAIN-OF-CUSTODY (COC)
- [ ] SAFETY CONSIDERATION/HAZARDOUS MATERIALS (Specify):
- [x] ANALYSES WITH SHORT-HOLDING TIMES (List Specific Analyses):
  Filter water samokes and test for dissolved U-238, No preservative add in the field.
- [ ] OTHER (Specify):

3. SAMPLE COLLECTION KIT:

DATE REQUIRED: 07/04/2000

CHECK PREFERENCE:

- [ ] 1. TO BE PICKED UP AT DLS BY PROJECT OFFICER
- [x] 2. SHIP TO: *(Please include Bldg # and Phone #)*

3 large coolers and bags for soil samples need to be shipped to site
U.S. Army Hefferson Proving Ground
1661 West J.P.G. Niblo Road (Bldg 125)
Madison, IN 47250
(812) 273-2551

PART 5: SAMPLE ANALYSIS INFORMATION

DLS TEST CODE	PROCEDURE DESCRIPTION	STD METHOD	MATRIX	NUMBER OF SAMPLES	SPECIAL REQUIREMENTS/COMMENTS (REQUESTS FOR EXTRA BLANKS OR
803	Uranium in Soil	G-002	Soil	5	Soil
586	Uranium in Water	U-002	Water	9	Surface Water (1 gal Cubitainer)
803	Uranium in Soil	G-002	Soil	9	Sediment
586	Uranium in Water	U-002	Water	12	Ground Water (1 gal Cubitainer)

Table May Be Continued on Next Page if Additional Space is Required.

Figure B-1b

Sample Labels

Below is an example of a label to placed on each sample container.

PROJECT #:
INSTALLATION:
POC:
SAMPLE #:
DATE COLLECTED:
TIME COLLECTED:
SAMPLE PRESERVED:
ANALYSIS REQUIRED:

Figure B-2

Effective Date _____
Date Removed from Service _____

JEFFERSON PROVING GROUND
DU SAMPLING PROGRAM
PROJECT NUMBER: 26-MA-R_-8260-__

GROUND WATER SAMPLES						
Sample ID	Sample Date	Exposure Reading (µR/hr)	Sample Locations	Comments		
				pH	Temp (°C)	Conductivity (µMHOS)
MW01			Well @ D-Road and Wonju Road (perimeter DU impact area)			
MW02			Well between C-Road & Wonju Road (perimeter DU impact area)			
MW03			Well between A-Road & gate on Wonju Road (perimeter DU impact area)			
MW04			Well on South Perimeter Rd. (Along south border of JPG)			
MW05			Well @ D-Road & Morgan Road (across Bridge No. 13) perimeter DU impact area			
MW06			Well @ C-Road & Morgan Road (perimeter DU impact area)			

SOP No. OHP 40-2

Effective Date _____
Date Removed from Service _____

JEFFERSON PROVING GROUND
DU SAMPLING PROGRAM
PROJECT NUMBER: 26-MA-R_-8260-__

GROUND WATER SAMPLES						
Sample ID	Sample Date	Exposure Reading (µR/hr)	Sample Locations	Comments		
				pH	Temp (°C)	Conductivity (µMHOS)
MW07			Well @ Oakdale School House on Morgan Road (perimeter DU impact area)			
MW08			Well @ Southwest Corner of JPG (Along south border of JPG)			
MW09			Well @ D-Road and Bridge No. 22 (inside DU impact area)			
MW10			Well on Center Recovery Road (inside DU impact area)			
MW11			Well on D-Road between Morgan and C Recovery Road (inside impact area)			
MW12			Duplicate or Split Sample _____			

SOP No. OHP 40-2

Effective Date _____
Date Removed from Service _____

JEFFERSON PROVING GROUND
DU SAMPLING PROGRAM
PROJECT NUMBER: 26-MA-R_-8260-__

SOIL SAMPLES				
Sample ID	Sample Date	Exposure Reading (µR/hr)	Sample Locations	JPG ID Code
SOS1			Vicinity at intersection of C-Road and Wonju Road)	(S44)
SOS2			Vicinity at intersection of E-Road and Morgan Road	(S48)
SOS3			0.5 miles east of intersection at C-Road & East Recovery Road	(S43)
SOS4			Corner of Morgan Road and C-Road	(S47)
SOS5			Duplicate or Split of ____	
SOS6			Well on south perimeter road along south border of JPG	B-1
SOS7			West Perimeter Road at Fork Creek	B-3
SOS8			South Perimeter Road of JPG	B-5
SOS9			Well on SW Corner of JPG	B-6

NOTE: Per letter from the NRC dated 7 Sep 99, soil sample locations S6 and S8 that were previously sampled will no longer require sampling. No other changes to the ERM Plan have been approved.

SOP No. OHP 40-2

Effective Date _____
Date Removed from Service _____

JEFFERSON PROVING GROUND
DU SAMPLING PROGRAM
PROJECT NUMBER: 26-MA-R_-8260-__

SURFACE WATER SAMPLES				
Sample ID	Sample Date	Exposure Reading (µR/hr)	Sample Locations	JPG ID Code
SWS1			West Perimeter Road Middle Fork Creek (exits JPG property)	SWBS (M1)
SWS2			Big Creek (exits JPG property)	SWBN (M2)
SWS3			Wonju Road Middle Fork Creek (enters DU impact area)	SWSE (M3)
SWS4			Big Creek (enters DU impact area)	SWNE (M4)
SWS5			Bridge No. 22 Big Creek	SWM (M5)
SWS6			Line of Fire Middle Fork Creek	SWS (M6)
SWS7			Bridge No. 12 @ Morgan Road Middle Fork Creek	SWSW (M7)
SWS8			Bridge No. 13 @ Morgan Road Big Creek	SWNW (M8)
SWS9			Duplicate or Split of SWS_	SWNE (M4)

SOP No. OHP 40-2

Effective Date _____
Date Removed from Service _____

JEFFERSON PROVING GROUND
DU SAMPLING PROGRAM
PROJECT NUMBER: 26-MA-R_-8260-__

SEDIMENT SAMPLES				
Sample ID	Sample Date	Exposure Reading (µR/hr)	Sample Locations	JPG ID Code
SES1			West Perimeter Road Middle Fork Creek (exits JPG property)	(M1)
SES2			Big Creek (exits JPG property)	(M2)
SES3			Wonju Road Middle Fork Creek (enters DU impact area)	(M3)
SES4			Big Creek (enters DU impact area)	(M4)
SES5			Bridge No. 22 Big Creek	(M5)
SES6			Line of Fire Middle Fork Creek	(M6)
SES7			Bridge No. 12 @ Morgan Road Middle Fork Creek	(M7)
SES8			Bridge No. 13 @ Morgan Road Big Creek	(M8)
SES9			Duplicate or Split of SES_	(M4)

Effective Date _____
Date Removed from Service _____

ANNEX C

SAMPLE LOCATION MAPS

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Jefferson Proving Ground: DU Sampling
GROUNDWATER MONITORING WELLS

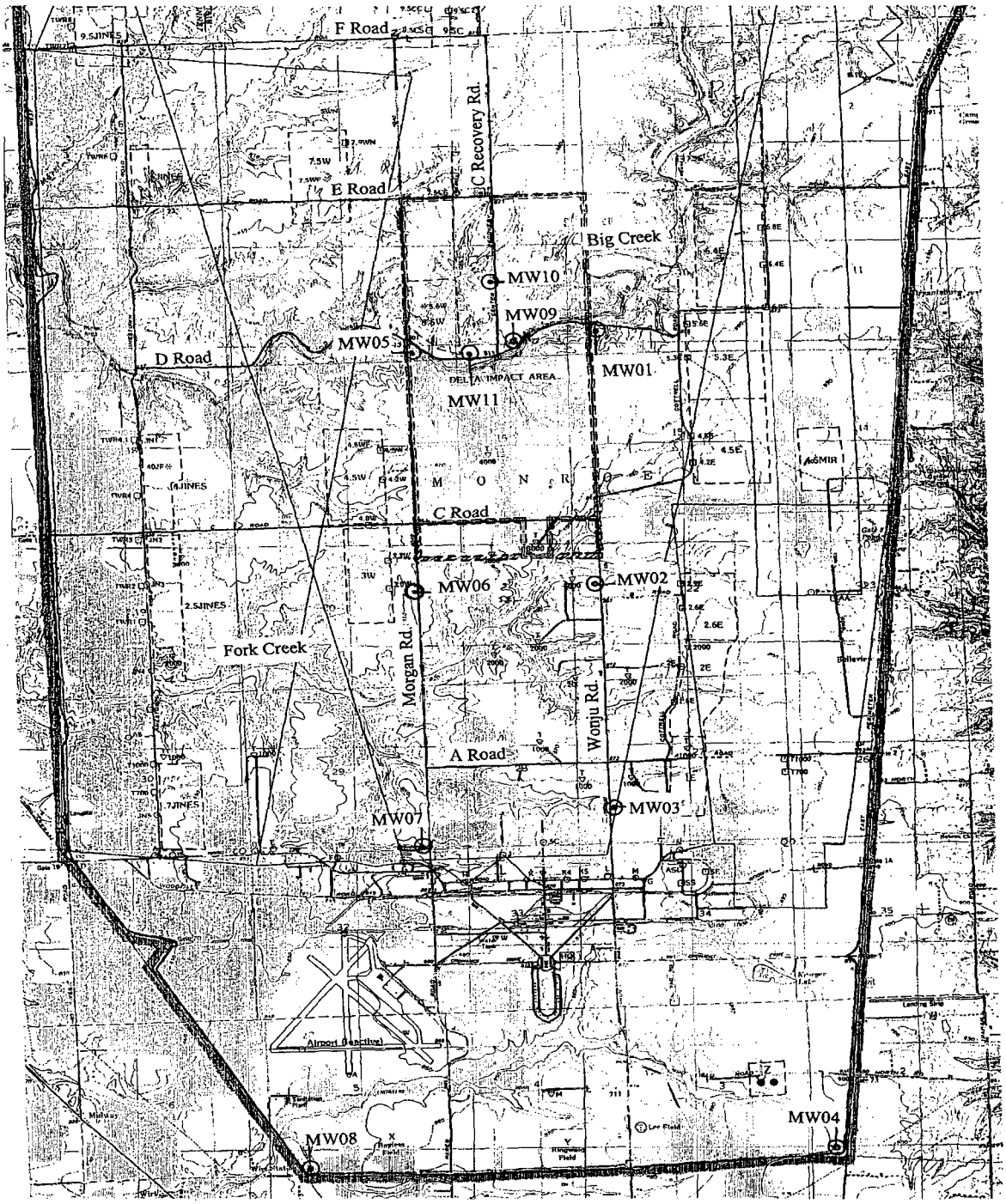

Figure 1: Groundwater samples (Sept. 1997)

Jefferson Proving Ground: DU Sampling
SOIL SAMPLES

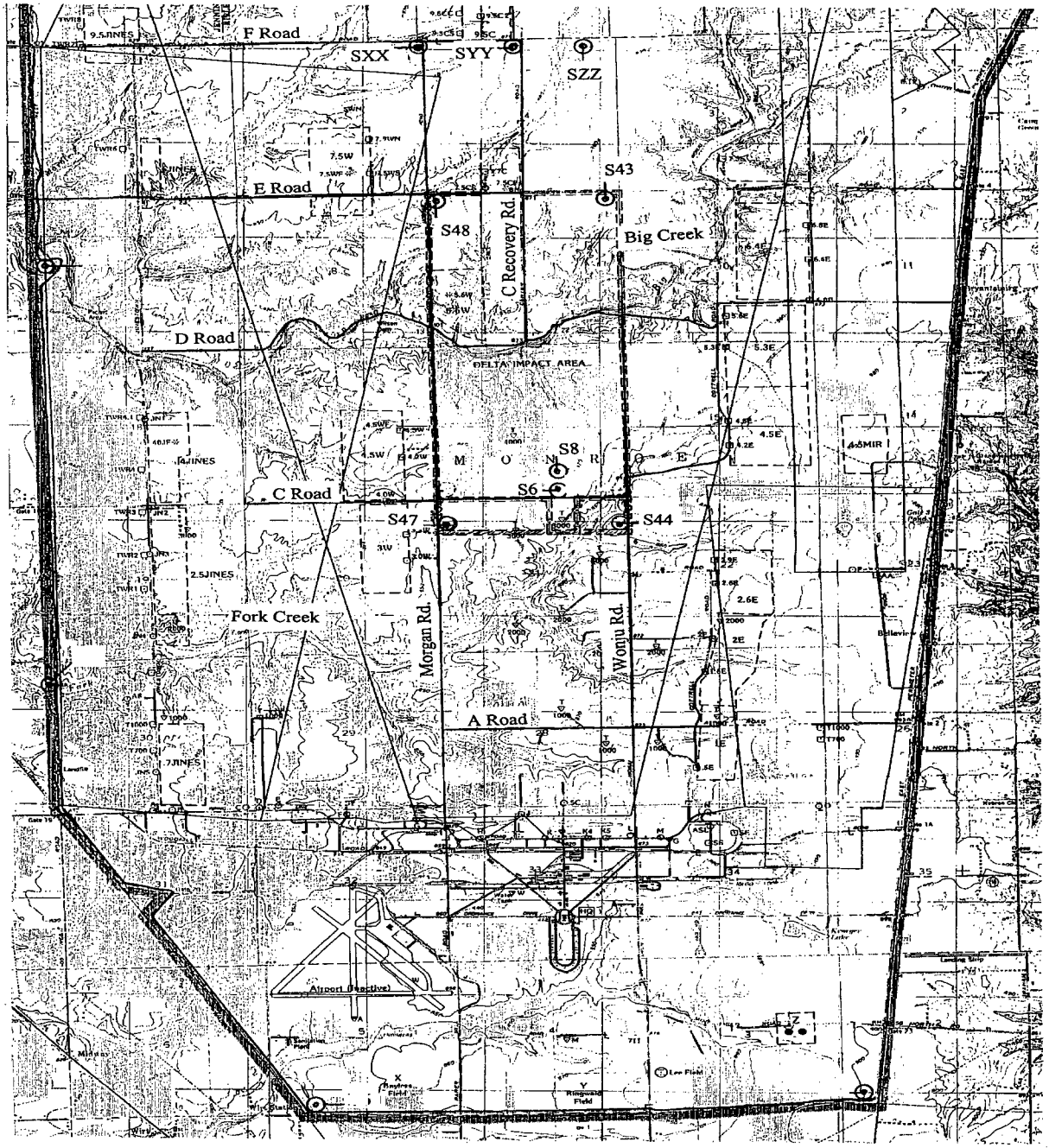

Figure 2: Soil Samples (Sept. 1997)

Jefferson Proving Ground: DU Sampling
SURFACEWATER & SEDIMENT SAMPLES

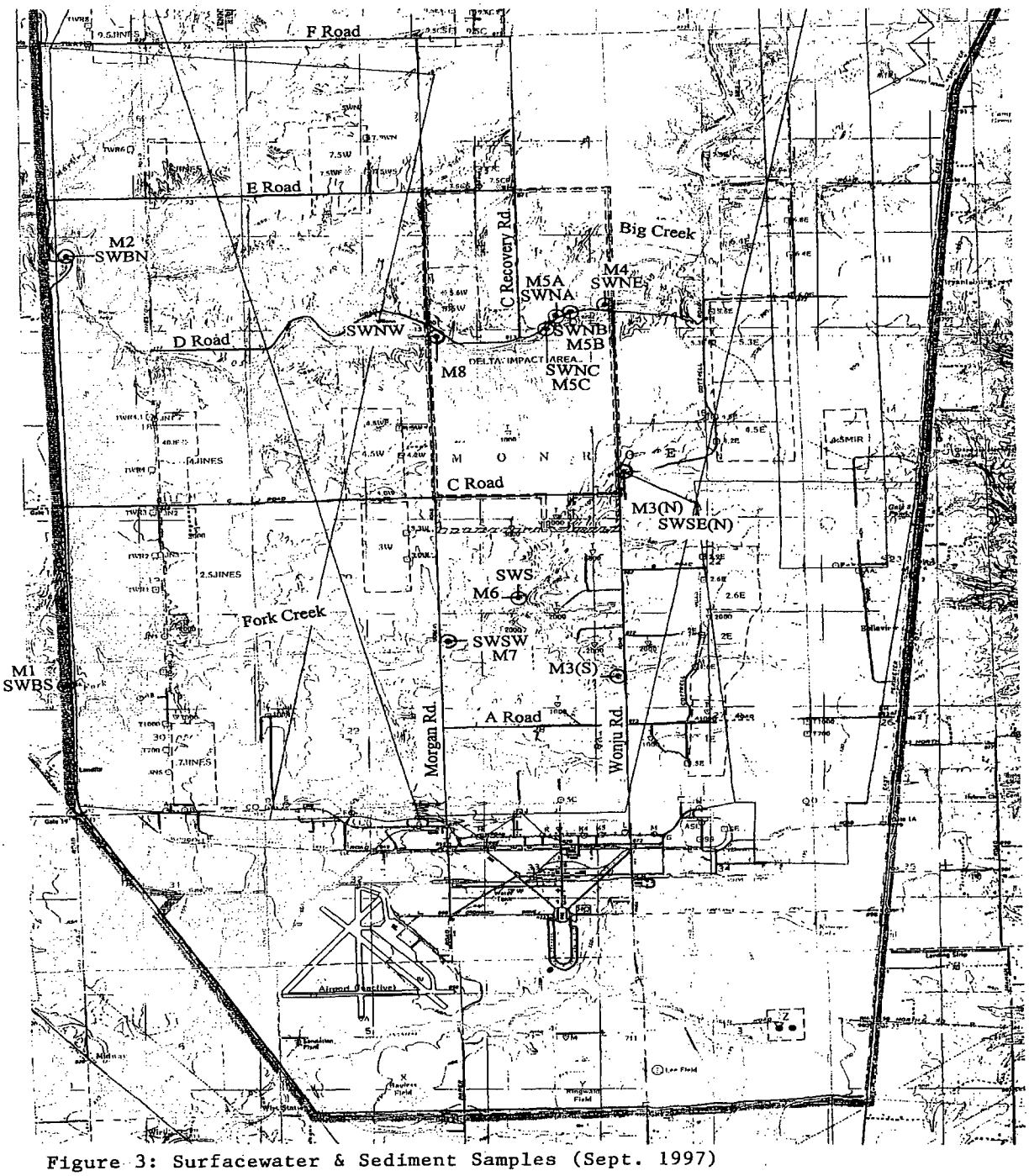

Figure 3: Surfacewater & Sediment Samples (Sept. 1997)

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APPENDIX B
FIELD LOGBOOK

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132

Location: Jefferson Proving Ground Date: 10/6/08

Project / Client: ERM Sampling - MW-DU-004

Note: The following information are transferred from other logbooks for JPG GW/SW/SED Sampling

1535 Arrived at well MW-4. Setting up to purge well. Initial water level at MW-4 is 13.09 ft BPVC. The bottom of the well is 24.18 ft BPVC. The pump is set at 22 ft BPVC.

1635 Collect sample MW-DU-004 (SAIC10E) at MW-4 for Total/Isotopic Uranium.

1725 Final water level at MW-4 is 16.4 ft BPVC.

SF 10/6/08

LS 10/6/08

B-1

133

Location: Jefferson Proving Ground Date: 10/7/08

Project / Client: ERM Sampling - MW-DU-003, MW-DU-007

Note: Following information are transferred from other logbooks for JPG GW/SW/SED Sampling.

0858 Arrived at well MW-3. The initial water level at MW-3 is 14.05 ft BPVC. Total depth of the well is 41.73 ft BPVC. The pump is set at 38 ft BPVC.

0957 Collect sample MW-DU-003 (SAIC10E) at MW-3 for Total/Isotopic Uranium. Also collect duplicate MW-DU-003 (SAIC10DE) for Total/Isotopic Uranium.

1302 Final water level at MW-3 is 30.08 ft BPVC.

1346 Arrived at well MW-7. The initial water level at MW-7 is 12.69 ft BPVC. Total depth of the well is 48.65 ft BPVC. Pump is set at 44 ft BPVC.

1458 Collect sample MW-DU-007 (SAIC10E) at MW-7 for Total/Isotopic Uranium.

1627 Final water level at MW-7 is 13.54 ft BPVC.

LS 10/7/08

Location Jefferson Proving Ground Date 10/10/08

Project / Client ERM Sampling - SS-DU-003, MW-DU-008, MW-DU-002

0915	Seth Stephenson (SAIC) collected surface soil sample SS-DU-003 (SAIC10E).
0950	Simon Fong (SAIC) arrived at mw-8 to bail well because the well went dry the previous day via pumping using a Fultz Pump. There is sufficient recharge to sample.
1001	Collect Sample MW-DU-008 (SAIC10E) for Total/ Isotopic Uranium.
1430	Simon arrived at MW-2 to pump well for samples because the well went dry in a previous day. There is sufficient recharge to sample.
1448	Collect sample MW-DU-002 (SAIC10E) for Total/ Isotopic Uranium.

SF 10/10/08

SF 10/10/08

B-2

Location Jefferson Proving Ground Date 10/11/08

Project / Client ERM Sampling

Note: Following information are transferred from other logbooks for JPG Gw/ SW/ SED Sampling.

0810	Matt Logan (SAIC) left Bldg. 125 (field office) to start ERM Sampling.
0840	Collect SS-DU-001. Soil composited with plastic scoop into ziploc bag and transferred to sample jar. Photo 62 of composite taken.
0850	Photo 63 of dry creek bed at SW-DU-003.
0905	Collect SD-DU-003. No flow at location. No water sample. Collect silty, moist sediment with plastic scoop and composited in Ziploc bag and transferred to sample jar. Photo 64 of sediment composite taken.
0920	Creek is pooled at SW-DU-004. South side of Bank, across from SGS-BC-03. Wongs D Road. Photo 65 of pooled water.
0925	Collect SW-DU-004. Bottle dipped directly from pooled water.
0940	Collect SD-DU-004. Sandy sediments composited into ziploc bag with plastic scoop and transferred to sample jar. Photo 66 of composite taken.
1020	Photo 67 of SW/ SD-DU-007 location taken.
1035	Collect SW-DU-007. Bottle dipped directly from stream. Collect on North Bank of bridge Middlefork & Morgan Rd.

SF 10/11/08

Location Jefferson Proving Ground Date 10/11/08

Project / Client ERM Sampling

1035 Collect SD-DU-007. Ufn med sand composited into Ziploc bag with plastic scoop. Seds collected on North Bank of creek, West of Bridge. Photo 68 of composite taken.

1105 Collect SS-DU-004. Silty dry soil composited into Ziploc bag w/ plastic scoop ad transferred to sample jar. Photo 69 of sample location taken. Photo 70 of Composite taken.

1145 Collected SW-DU-008. Pooled water ~40' East of bridge at Morgan and D Road. Photo 71 of water sample location. Water dipped from pool.

1150 Collected SD-DU-008. Photo 72 of location taken. Collect moist, silty sediment from North Bank of Big Creek ~15' East of bridge. Sediment composited with plastic scoop into Ziploc bag. Photo 73 of composite taken.

1245 Collect SW-DU-005. Photo 74 of location take. Dipped water from Pool East of bridge.

1250 Collect SD-DU-005. Fn-medgr sand collected from South Bank, East of Bridge. Composited into Zip Lock bag with plastic scoop.

1300 Photo 75 of composite sample taken.

JL 10/11/08

Location Jefferson Proving Ground Date 10/11/08

Project / Client ERM Sampling

1300 Collect SS-DU-002. Photo 76 of location taken. Composite silty soil into Ziploc bag with plastic scoop. Collected duplicate. Picture was not taken of composite.

1340 Collect SW-DU-002. Water dipped from Stream. East side of bridge on West Perimeter at Big Creek. No flow collected. Collected duplicate of water sample. Photo 77 of location taken.

1355 Collect SD-DU-002. Sediment composited into Zip loc bag with plastic scoop. Ufn sand silt collected from North Bank of Creek. East of Bridge ~30' upstream. Photo 78 of Sediment location taken, Photo 79 of Composite taken.

1415 Collected SW-DU-001. Water dipped from stream on west side of bridge at west perimeter and middle fork. photo 80 taken.

1430 Collect SD-DU-001. Collected silty sediment on North Bank of creek, ~40' upstream of bridge. Composited seds into Ziploc bag w/ plastic scoop. Photo 81 of location taken. Photo 82 of composite taken. Collected duplicate of sediment.

JL 10/11/08

138

Location: Jefferson Proving Ground Date: 10/11/08

Project / Client: ERM Sampling

1520 Collect SW-DU-006. Pooled water ~ 150' down-stream of original location. Dipped water from pool. Photo 84 of location taken.

1530. Collect SD-DU-006. Photo 85 of location taken. Composited sed's into zip lock bag w/ plastic scoop and transferred to sample jar. Fn. med sand on South Bank ~ 15' downstream of wher stream branches converge.

1610 Photo 86 of composite taken. Back at Bldg. 125 to prep samples.

1650. Leave Site.

SF 10/11/08

[signature] 10/11/08

B-4

139

Location: Jefferson Proving Ground Date: 10/14/08

Project / Client: ERM Sampling - MW-DU-009

0900 Collect MW-DU-009 (SAIC IDE) for Total / Isotopic Uranium. Well was not purged due to low water level. Only 1 liter volume for ERM collected.

SF 10/14/08

[signature] 10/14/08

Location Jefferson Proving Ground Date 10/21/08

Project / Client ERM Sampling - MW-DU-0005

1258 Arrived at MW-5. Initial water level at MW-5 is 18.21 ft BPVC. The pump is set at 32.28 ft BPVC, which is about 0.5 feet from bottom of well.

139 Collect sample MW-DU-0005 (SAIC10E) for Total / Isotopic Uranium at MW-5.

1517 Final water level at MW-5 is 24.70 ft BPVC.

SF 10/21/08

10/21/08

Location Jefferson Proving Ground Date 10/23/08

Project / Client ERM Sampling - MW-DU-0001

1137 Arrived at MW-1. The initial water level at MW-1 is 13.31 ft BPVC. The bottom of the well is 34.67 ft BPVC. The pump is set at 32.67 ft BPVC.

1201 Collect sample MW-DU-0001 (SAIC10E) for Total/Isotopic Uranium at MW-1.

1302 Final water level at MW-1 is 28.89 ft BPVC.

SF 10/23/08

10/23/08

142

Location Jefferson Proving Ground Date 10/27/08

Project / Client ERM Sampling - MW-DU-011, MW-DU-010, MW-DU-006

1135	Arrived at MW-11 to bail sample of groundwater due to low water level.
1200	Collect sample MW-DU-011 (SAIL10E) for Total / Isotopic Uranium.
1300	Arrived at MW-10 to bail groundwater sample due to low water level.
1330	Collect sample MW-DU-010 (SAIL10E) for Total / Isotopic Uranium.
1540	Arrived at MW-6 to bail groundwater sample due to low water level.
1550	Collect sample MW-DU-006 (SAIL10E) for Total / Isotopic Uranium.

SF 10/27/08

10/27/08

B-6

143

Location Date

Project / Client

Science Applications International Corporation
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pg 1 of 2

GROUNDWATER SAMPLE LOG

Project Name: Jefferson Proving Ground
Project Number: 01-1633-04-9381-310
Purged by: JG & EC
Sampled by: JG & EC
Checked by: ____ & ____

Well Identification: MW-1
Project Location: Madison, Indiana
Date: 10/12/08
Date: 10/23/08
Date: ____

WELL VOLUME CALCULATION:
Circle diameter and K used below: 1" I.D., K=0.041 gal/ft; (2" I.D., K=0.163 gal/ft) [circled]; 4" I.D., K=0.653 gal/ft; 6" I.D., K=1.469 gal/ft; 8" I.D., K=2.61 gal/ft; 10" ID, K=4.08 gal/ft

page 1 of 2

1 Well Volume:
Total Depth (34.66 ft) - Depth to Water (11.71 ft) = Height of water column (22.95 ft)
Height of water column (22.95 ft) x K value (.163 gal/ft) = 1 Well Volume (3.74 gal)

Purge Volume:
1 Well Volume (3.74 gallons) x 3 = 3 Well Volumes (11.22 gallons)
Purge Rate (____ gpm) x (____ min) = 1 Well Volume
Purge Rate (____ gpm) x (____ min) = 3 Well Volume

Time	Temp °C	pH	Cond. mS/cm	Turbidity NTU	D.O. mg/l	ORP mv	Purged Quantity	Well Volume	Depth to Water	Purge Rate
1412	16.5	7.12	*999	3	6.31	136	0		12.49	0
1417	17.4	7.15	.999*	1	6.98	119	0.25		13.43	0.05
1422	19.3	7.16	.997	2	6.08	117	0.35		13.94	0.02
1427	20.0	7.18	.999*	1	6.16	104	0.45		14.32	0.02
1432	20.9	7.20	*	1	9.08**	96	0.55		14.64	0.02
1437	23.1	7.16	*	0	4.84**	~~[illegible]~~	0.65		14.75	0.02
1442	19.0	7.81	*	1	9.82**	92	0.75		15.77	0.02
1447	18.3	7.77	*	1	7.0**	86	0.85		16.33	0.02
1452	19.7	7.73	*	-2	10.57**	84	0.95		17.21	0.02
1457	18.6	7.18	*	-2	4.34**	90	1.05		17.80	0.02
1502	18.5	7.23	*	-2	9.20**	90	1.15		18.79	0.02
1507	19.9	7.17	*	-2	1.87**	91	1.25		19.30	0.02
1512	19.1	7.29	*	-1	4.35**	92	1.35		19.84	0.02
1517	19.7	7.22	*	-2	9.61**	93	1.45		20.57	0.02
1522	20.1	7.27	*	-2	3.94**	96	1.55		20.73	0.02
1527	20.8	7.23	*	-2	6.60**	95	1.65		21.40	0.02
1532	18.3	7.29	*	-1	9.94**	85	1.75		22.25	0.02
1535	stop pump to check horiba calibration								~~23.[illegible]~~	
1542	begin pump again WL @ 22.8									
1544	17.8	6.35	*	-1	7.09**	149	2.00		23.60	0.05
1549	15.3	6.88	*	-1	9.93**	142	2.25		23.54	0.05
1554	19.2	7.02	*	-1	4.26**	135	2.35		24.57	0.02
1559	14.7	7.18	*	-1	6.90**	107	2.45		25.65	0.02
1604	14.7	7.15	*	-2	4.12**	104	2.55		26.10	0.02
1609	18.0	7.18***	*	-1	6.73**	95	2.65		27.23	0.02

emptied Horiba cell
MG 10/12/08

PURGE INFORMATION:
Time / Date Started: 1412 / 10/12/08
Time Purge End: 1432
Purge Method: Pump x Bailer ____
Depth to Intake: ~31.6 (ft)
Pump Type and ID: FULTZ
Purge Rate: 0.02-0.05 (gpm)
Purged Volume: 7.05 (gal)
Water Quality Meter: Horiba U-22#: 82121
How was yield measured? GRADUATED CYLINDER
Was well cavitated? Yes X No ____
Water containerized/Amount: NA
Grunfos controller set @ NA (Hertz)

JG 10/23/08

SAMPLING INFORMATION:
Time / Date Started: 1201 / 10/23/08
Sampled by: JG & EC
Sample Method: Bailer ____ Other Pump
Grab x Composite ____
# of Bottles Collected: 13 + 2 ERM
Bottle Preservatives: H_2SO_4, HNO_3
Recovering WL: 28.84' BPVC
Duplicate Sampling: NO
Laboratory: GPL
COC Form: ____

F.SAMP 1254

ADDITIONAL INFORMATION: (i.e. weather conditions; problems encountered; maintenance required; unusual color/odor; etc.)
slightly soft bottom
* above horiba reading ability range
Standing water in well casing [illegible]
[illegible]

Science Applications International Corporation
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GROUNDWATER SAMPLE LOG

Project Name: Jefferson Proving Ground
Project Number: 01-1633-04-9381-310
Purged by: JG & EC
Sampled by: _____ & _____
Checked by: _____ & _____

Well Identification: MW-1 (continued)
Project Location: Madison, Indiana
Date: 10/12/08
Date: _____
Date: _____

WELL VOLUME CALCULATION:
Circle diameter and K used below: 1" I.D., K=0.041 gal/ft; 2" I.D., K=0.163 gal/ft; 4" I.D., K=0.653 gal/ft; 6" I.D., K=1.469 gal/ft; 8" I.D., K=2.61 gal/ft; 10" ID, K=4.08 gal/ft

page 2 of 2

1 Well Volume:
Total Depth (_____ft) - Depth to Water (_____ft) = Height of water column (_____ft)
Height of water column (_____ft) x K value (_____gal/ft) = 1 Well Volume (_____gal)

Purge Volume:
1 Well Volume (_____gallons) x 3 = 3 Well Volumes (_____gallons)
Purge Rate (_____gpm) x (_____min) = 1 Well Volume
Purge Rate (_____gpm) x (_____min) = 3 Well Volume

Time	Temp °C	pH	Cond mS/cm	Turbidity NTU	D.O. mg/l	ORP mv	Purged Quantity	Well Volume	Depth to Water	Purge Rate
1614	17.2	7.19	0.999	-1	6.88	+84	6.75		29.09	0.02
1619	17.9	7.18	*	-1	6.92	+92	6.85		30.14	0.02
1624	18.0	7.20	*	-1	6.97	+97	6.95		[illegible]	0.02
1629	18.7	7.21	*	-1	6.76	+99	7.05		[illegible]	0.02
1633	WELL WENT DRY									
1200	14.4	6.89	0.908	7	8.70	+23			13.24	

pump now set at ~33.5'

EC 10/12/08

PUMP SET AT ~32' 10/23/08

30.71' init pump

PURGE INFORMATION:
Time / Date Started: _____ | _____
Time Purge End: 1423
Purge Method: Pump x Bailer _____
Depth to Intake: _____ (ft)
Pump Type and ID: _____
Purge Rate: _____ (gpm)
Purged Volume: _____ (gal)
Water Quality Meter: Horiba U-22#
How was yield measured? _____
Was well cavitated? Yes _____ No _____
Water containerized/Amount NA
Grunfos controller set @ NA (Hertz)

SAMPLING INFORMATION:
Time / Date Started: 1201 | 10/23/08
Sampled by: EC & JG
Sample Method: Bailer _____ Other Pump
Grab x Composite _____
# of Bottles Collected: _____
Bottle Preservatives: _____
Recovering WL: _____
Duplicate Sampling: _____
Laboratory: _____
COC Form: _____

ADDITIONAL INFORMATION: (i.e. weather conditions, problems encountered, maintenance required, unusual color/odor, etc.)
* see first page for description of (*). standing water around well PVC pipe appears lower

Science Applications International Corporation
From Science to Solutions

GROUNDWATER SAMPLE LOG

Project Name:	Jefferson Proving Ground		Well Identification:	MW-2	
Project Number:	01-1633-04-9381-310		Project Location:	Madison, Indiana	
Purged by:	JG &	EC	Date:	10/9/08	
Sampled by:	SF &		Date:	10/10/08	
Checked by:	&		Date:		

WELL VOLUME CALCULATION:

Circle diameter and K used below: 1" I.D., K=0.041 gal/ft; (2" I.D., K=0.163 gal/ft); 4" I.D., K=0.653 gal/ft; 6" I.D., K=1.469 gal/ft; 8" I.D., K=2.61 gal/ft; 10" ID, K=4.08 gal/ft

Top of well screen = 15.94 ft

1 Well Volume:

Total Depth (22.90 ft) - Depth to Water (14.32 ft) = Height of water column (8.58 ft)

Height of water column (8.58 ft) x K value (0.163 gal/ft) = 1 Well Volume (1.40 gal)

Purge Volume:

1 Well Volume (1.40 gallons) x 3 = 3 Well Volumes (4.2 gallons)

Purge Rate (_____gpm) x (_____min) = 1 Well Volume

Purge Rate (_____gpm) x (_____min) = 3 Well Volume

Time	Temp °C	pH	Cond mS/cm	Turbidity NTU	D.O. mg/l	ORP mv	Purged Quantity	Well Volume	Depth to Water	Purge Rate
1140	14.0	6.26	0.779	18.1	0.94	+104	0		15.99	0
1145	16.0	6.28	0.767	10.8	0.58	-97	0.2		15.96	0.050 0.04
1150	16.1	6.31	0.769	12.5	0.67	-94	0.4		16.3	0.04
1155	16.3	6.32	0.761	11.0	0.37	-95	0.6		16.56	0.04
1200	16.4	6.34	0.762	12.8	0.30	-98	0.8		16.82	0.04
1205	16.7	6.37	0.759	10.1	0.22	-90	1.0		17.03	0.04
1210	16.8	6.40	0.758	10.9	0.18	-89	1.2		17.16	0.04
1215	16.9	6.43	0.757	11.5	0.23	-89	1.4		17.26	0.04
1220	16.8	6.46	0.759	12.7	0.11	-91	1.6		17.49	0.04
1225	16.6	6.46	0.758	12.7	0.18	-90	1.8		17.59	0.04
1230	17.0	6.49	0.756	13.8	0.22	-90	2.0		17.65	0.04
1235	16.6	6.50	0.757	14.2	0.19	-90	2.2		18.84	0.04
1240	16.5	6.50	0.754	13.9	0.19	-86	2.4		19.18	0.04
1245	16.4	6.49	0.752	15.6	0.13	-84	2.6		19.63	0.04
1250	16.5	6.49	0.752	15.7	0.13	-84	2.8		19.79	0.04 19.50 EC 19.79
1255	16.6	6.49	0.751	16.7	0.10	-82	3.0		19.84	0.04 19.84
1300	16.5	6.50	0.752	16.9	0.04	-81	3.2		20.06	0.04
1305	16.6	6.50	0.750	17.5	0.04	-79	3.4		20.38	0.04 WELL PUMPED DRY
10/10/08	Collect	Sample								

JMG 10/8/08

PURGE INFORMATION:

Time / Date Started: 1140 | 10/8/08

Time Purge End: 1305

Purge Method: Pump x Bailer _____

Depth to Intake: ~21.5 (ft)

Pump Type and ID: FULTZ

Purge Rate: 0.04 (gpm)

Purged Volume: 3.4 (gal)

Water Quality Meter: Horiba U-22# 15302

How was yield measured? graduated cylinder

Was well cavitated? Yes X No X EC

Water containerized/Amount NA

Grunfos controller set @ NA (Hertz)

SAMPLING INFORMATION:

Time / Date Started: 1448 | 10/10/08

Sampled by: SF &

Sample Method: Bailer _____ Other Pump

Grab x Composite

# of Bottles Collected: 15 (including ERM)

Bottle Preservatives: H_2SO_4, HNO_3, None

Recovering WL: 22.85

Duplicate Sampling: No

Laboratory: GPL

COC Form:

ADDITIONAL INFORMATION: (i.e. weather conditions, problems encountered, maintenance required, unusual color/odor, etc.)

mid 60's, raining, insects, MW-2 slow to recharge

well went dry on 10/8/08 → sampled on 10/10/08

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GROUNDWATER SAMPLE LOG

Project Name:	Jefferson Proving Ground		Well Identification:	MW-3	
Project Number:	01-1633-04-9381-310		Project Location:	Madison, Indiana	
Purged by:	EC	& JG	Date:	10/7/08	
Sampled by:	EC	& JG	Date:	10/7/08	
Checked by:		&	Date:		

WELL VOLUME CALCULATION:

Circle diameter and K used below: 1" I.D., K=0.041 gal/ft; (2" I.D., K=0.163 gal/ft); 4" I.D., K=0.653 gal/ft; 6" I.D., K=1.469 gal/ft; 8" I.D., K=2.61 gal/ft; 10" ID, K=4.08 gal/ft

1 Well Volume:

Total Depth (41.73 ft) - Depth to Water (14.05 ft) = Height of water column (27.68 ft)

Height of water column (27.68 ft) x K value (0.163 gal/ft) = 1 Well Volume (4.51 gal)

Purge Volume:

1 Well Volume (4.51 gallons) x 3 = 3 Well Volumes (13.53 gallons)

Purge Rate (_____gpm) x (_____min) = 1 Well Volume

Purge Rate (_____gpm) x (_____min) = 3 Well Volume

Time	Temp °C	pH	Cond mS/cm	Turbidity NTU	D.O. mg/l	ORP mv	Purged Quantity	Well Volume	Depth to Water	Purge Rate
0915	16.8	5.56	0.742	31.1	1.96	+125	0		14.95	0.04
0920	15.0	5.73	0.750	68.3	0.00	173	0.2		14.93	0.04
0925	15.3	5.90	0.746	47.9	0.00	+75	0.4		14.97	0.04
0930	15.2	5.90	0.745	31.1	0.05	+69	0.6		17.10	0.04
0935	15.4	6.06	0.747	23.5	0.05	+40	0.8		17.29	0.04
0940	15.4	6.06	0.747	24.8	0.13	+35	1.0		17.21	0.04
0945	15.5	6.15	0.747	22.6	0.00	+20	1.2		17.45	0.04
0950	15.4	6.18	0.744	21.4	0.00	+23	1.4		17.45	0.04
0955	15.2	6.19	0.750	21.2	0.00	+10	1.6		15.20	0.03

JG 10/8/08

PURGE INFORMATION:

Time / Date Started: 0915 10/07/08

Time Purge End: 0955 10/7/08

Purge Method: Pump x Bailer _____

Depth to Intake: 38 ft BPVC (ft)

Pump Type and ID: Grundfos

Purge Rate: 0.03-0.04 (gpm)

Purged Volume: ~1.4 (gal)

Water Quality Meter: Horiba U-22#

How was yield measured? graduated cylinder

Was well cavitated? Yes _____ No x

Water containerized/Amount _____ NA

Grunfos controller set @ _____ NA (Hertz)

SAMPLING INFORMATION:

Time / Date Started: 0957 10/7/08

Sampled by: EC & JG

Sample Method: Bailer _____ Other Pump

Grab x Composite _____

# of Bottles Collected: 39 + 4 ERM (MS/MSD/ERM DUP)

Bottle Preservatives: HNO3, H2SO4

Recovering WL: 20.08 BPVC

Duplicate Sampling: MS/MSD ERM DUP

Laboratory: PL

COC Form:

ADDITIONAL INFORMATION: (i.e. weather conditions, problems encountered, maintenance required, unusual conditions, etc.)

Cloudy, Possible rain today

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GROUNDWATER SAMPLE LOG

Project Name:	Jefferson Proving Ground	Well Identification:	MW-4
Project Number:	01-1633-04-9381-310	Project Location:	Madison, Indiana
Purged by:	EG & JG	Date:	10/6/08
Sampled by:	EG & JG	Date:	10/6/08
Checked by:	&	Date:	

WELL VOLUME CALCULATION:

Circle diameter and K used below: 1" I.D., K=0.041 gal/ft; 2" I.D., K=0.163 gal/ft; 4" I.D., K=0.653 gal/ft; 6" I.D., K=1.469 gal/ft; 8" I.D., K=2.61 gal/ft; 10" ID, K=4.08 gal/ft

1 Well Volume:

Total Depth (24.18 ft) - Depth to Water (13.09 ft) = Height of water column (11.09 ft)

Height of water column (11.09 ft) x K value (0.163 gal/ft) = 1 Well Volume (1.81 gal)

Purge Volume:

1 Well Volume (1.81 gallons) x 3 = 3 Well Volumes (5.43 gallons)

Purge Rate (_____ gpm) x (_____ min) = 1 Well Volume

Purge Rate (_____ gpm) x (_____ min) = 3 Well Volume

Time	Temp °C	pH	Cond mS/cm	Turbidity NTU	D.O. mg/l	ORP mv	Purged Quantity	Well Volume	Depth to Water	Purge Rate
1550	21.9	6.71	0.723	53.7	1.82	+202	0		[illegible]	0.08
1555	18.7	6.10	0.822	70.3	0.00	+162	0.1		15.85	0.08
1600	15.9	10.010	0.819	40.9	0.00	+152	0.3		15.91	0.04
1605	18.1	10.00	0.828	23.0	0.00	+136	1.0		15.91	0.04
1610	18.1	10.01	0.828	35.0	0.00	+122	1.3		16.25	0.02
1615	19.8	10.00	0.821	26.1	0.00	+112	2.2		15.88	0.02
1620	Hold	10.15	0.829	21.9	0.00	+101	2.3		15.89	0.02
1625	19.5	10.20	0.827	22.9	0.00	+91	2.4		15.93	0.01
1630	19.8	10.25	0.820	24.0	0.00	+88	2.5		15.74	0.02
1635	19.6	10.27	0.825	20.2	0.00	+80	2.6		15.72	0.02

JW 10/8/08

PURGE INFORMATION:

Time / Date Started: 1540 | 10/6/08

Time Purge End: 1635 | 10/6/08

Purge Method: Pump x Bailer

Depth to Intake: 22 (ft)

Pump Type and ID: Fultz Pump

Purge Rate: 0.02 - 0.08 (gpm)

Purged Volume: 2.6 (gal)

Water Quality Meter: Horiba U-22#

How was yield measured? Graduated Cylinder

Was well cavitated? Yes ____ No X

Water containerized/Amount: NA

Grunfos controller set @ NA (Hertz)

SAMPLING INFORMATION:

Time / Date Started: 1635 | 10/6/08

Sampled by: EG & JG

Sample Method: Bailer ____ Other Pump

Grab X Composite ____

# of Bottles Collected: 13 + 2 EBK

Bottle Preservatives: HNO3, H2SO4

Recovering WL: 16.41 @ BPVC

Duplicate Sampling: NO

Laboratory: GDL

COC Form: ____

ADDITIONAL INFORMATION: (i.e. weather conditions, problems encountered, maintenance required, unusual color/odor, etc.)

Sunny with slight cloud coverage, ~80°F, insects

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Page 1 of 2

GROUNDWATER SAMPLE LOG

Project Name: Jefferson Proving Ground
Project Number: 01-1633-04-9381-310
Purged by: JG & EC
Sampled by: &
Checked by: &

Well Identification: MW-5
Project Location: Madison, Indiana
Date: 10/13/08
Date:
Date:

WELL VOLUME CALCULATION:

Circle diameter and K used below:
1" I.D., K=0.041 gal/ft
(2" I.D., K=0.163 gal/ft) (circled)
4" I.D., K=0.653 gal/ft
6" I.D., K=1.469 gal/ft
8" I.D., K=2.61 gal/ft
10" ID, K=4.08 gal/ft

1 Well Volume:
Total Depth (32.78 ft) - Depth to Water (17.56 ft) = Height of water column (15.22 ft)
Height of water column (15.22 ft) x K value (0.163 gal/ft) = 1 Well Volume (2.48 gal)

Purge Volume:
1 Well Volume (2.48 gallons) x 3 = 3 Well Volumes (7.44 gallons)
Purge Rate (____ gpm) x (____ min) = 1 Well Volume
Purge Rate (____ gpm) x (____ min) = 3 Well Volume

Time	Temp °C	pH	Cond. mS/cm	Turbidity NTU	D.O. mg/l	ORP mv	Purged Quantity	Well Volume	Depth to Water	Purge Rate
0825	14.1	5.60	5.50	-3	*2.19	+124	0		18.5'	0
0830	14.4	6.25	5.40	-3	0.36	+39	0.35		20.15	0.07
0835	14.5	6.47	5.40	-5	0.23	+24	0.7		20.89	
0840	14.6	6.60	5.47	-5	0.22	+18	1.05		21.33	
0845	14.8	6.68	5.67	-4	0.14	+9	1.40		21.75	
0850	15.0	6.74	5.72	-4	0.10	-1	1.75		22.03	
0855	15.1	6.76	5.92	-2	0.09	-19	2.1		22.16	
0900	15.3	6.78	6.07	0	0.07	-30	2.45		22.32	
0905	15.4	6.79	6.24	2	0.02	-35	2.8		22.54	
0910	16.5	6.81	6.39	4	0.02	-35	3.15		22.63	
0915	15.6	6.83	6.40	5	0.03	-33	~~3.35~~		22.70	0.02
0920	15.9	6.83	6.48	6	0.06	-35	3.35		22.90	
0925	15.8	6.86	6.69	7	0.01	-34	3.45		23.22	
0930	15.9	6.96	6.65	10	0.02	-29	3.55		23.60	
0935	15.8	6.86	6.67	10	0.04	-24	3.65		23.91	
0940	15.9	6.90	6.84	12	0.02	-22	3.75		24.09	
0945	16.9	6.95	7.10	13	0.02	-23	3.95		24.63	
0950	15.6	6.91	6.54	-8	0.34	-13	~~3.95~~		25.59	0.05
0955	15.6	6.89	6.95	-7	0.06	-12	4.35		26.1	0.05
1000	15.6	6.90	7.26	-6	0.00	-13	4.6		26.47	0.05
1005	15.7	6.96	7.94	-5	0.00	-16	5.05		27.28	0.09
1010	15.4	6.91	7.34	-3	0.00	-14	5.5		27.79	0.09
1015	16.0	6.84	13.1	4	0.03	-18	5.95		28.24	
1020	14.8	6.85	13.7	7	0.00	-21	6.4		28.59	
1025	15.2	6.95	14.0	14	0.00	-21	6.85		28.85	

PURGED HORIBA FLOW CELL (at 0945)
DROPPED PUMP DOWN 2' NOW AT ~31' (at 1010)

PURGE INFORMATION:
Time / Date Started: 0825 | 10/13/08
Time Purge End: 1033
Purge Method: Pump X Bailer
Depth to Intake: ~~~30.78~~ ~29.78 (ft)
Pump Type and ID: FULT7
Purge Rate: 0.02 - 0.09 (gpm)
Purged Volume: 7.3 (gal)
Water Quality Meter: Horiba U-22# 82121
How was yield measured? GRADUATED CYLINDER
Was well cavitated? Yes X No
Water containerized/Amount NA
Grunfos controller set @ NA (Hertz)

SAMPLING INFORMATION:
Time / Date Started: 1319 | 10/21/08 IWL 18.2
Sampled by: JG & EC
Sample Method: Bailer ~~X~~ Other Pump ✓
Grab X Composite
# of Bottles Collected: 13 + 2 ERM
Bottle Preservatives: HNO_3 + H_2SO_4
Recovering WL: 24.70
Duplicate Sampling: NONE
Laboratory: GPL
COC Form:

ADDITIONAL INFORMATION: (i.e. weather conditions, problems encountered, maintenance required, unusual color/odor, etc.)
*DO WAS SWITCHING B/W 3 VALUES, OUT OF RANGE OF HORIBA
weather: sunny, 80's, calm breeze
STANDING WATER in well casing around PVC

Science Applications International Corporation
From Science to Solutions™

GROUNDWATER SAMPLE LOG

Project Name: Jefferson Proving Ground
Project Number: 01-1633-04-9381-310
Purged by: EC & JG
Sampled by: _____ & _____
Checked by: _____ & _____

Well Identification: MW-5 (continued)
Project Location: Madison, Indiana
Date: 10/13/00
Date: _____
Date: _____

WELL VOLUME CALCULATION:

Circle diameter and K used below: 1" I.D., K=0.041 gal/ft; (2" I.D., K=0.163 gal/ft); 4" I.D., K=0.653 gal/ft; 6" I.D., K=1.469 gal/ft; 8" I.D., K=2.61 gal/ft; 10" ID, K=4.08 gal/ft

1 Well Volume:

Total Depth (_____ft) - Depth to Water (_____ft) = Height of water column (_____ft)
Height of water column (_____ft) x K value (_____gal/ft) = 1 Well Volume (_____gal)

Purge Volume:

1 Well Volume (_____gallons) x 3 = 3 Well Volumes (_____gallons)
Purge Rate (_____gpm) x (_____min) = 1 Well Volume
Purge Rate (_____gpm) x (_____min) = 3 Well Volume

Time	Temp °C	pH	Cond mS/cm	Turbidity NTU	D.O. mg/l	ORP mv	Purged Quantity	Well Volume	Depth to Water	Purge Rate
1030	15.9	6.85	14.2	19	0.00	-22	7.3		29.0	0.09
1033	WELL WENT DRY									
10/21/00 1315	14.8	6.18	14.7	1	2.81	+221			19.05	

EC 10/13/00

PURGE INFORMATION:

Time / Date Started: 0925 / 10/13/00
Time Purge End: 1033
Purge Method: Pump x Bailer _____
Depth to Intake: _____ (ft)
Pump Type and ID: _____
Purge Rate: _____ (gpm)
Purged Volume: _____ (gal)
Water Quality Meter: Horiba U-22®
How was yield measured? _____
Was well cavitated? Yes _____ No _____
Water containerized/Amount NA
Grunfos controller set @ NA (Hertz)

SAMPLING INFORMATION:

Time / Date Started: _____ / _____
Sampled by: _____ & _____
Sample Method: Bailer _____ Other Pump
Grab x Composite _____
# of Bottles Collected: _____
Bottle Preservatives: _____
Recovering WL: _____
Duplicate Sampling: _____
Laboratory: _____
COC Form: _____

ADDITIONAL INFORMATION (i.e. weather conditions, problems encountered, maintenance required, unusual conditions, etc.)

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GROUNDWATER SAMPLE LOG

Project Name:	Jefferson Proving Ground		Well Identification:	MW-6
Project Number:	01-1633-04-9381-310		Project Location:	Madison, Indiana
Purged by:	JG	& EC	Date:	~~10/8/~~ 10/9/08
Sampled by:		&	Date:	
Checked by:		&	Date:	

WELL VOLUME CALCULATION:

Circle diameter and K used below: 1" I.D., K=0.041 gal/ft; **(2" I.D., K=0.163 gal/ft)** [circled]; 4" I.D., K=0.653 gal/ft; 6" I.D., K=1.469 gal/ft; 8" I.D., K=2.61 gal/ft; 10" ID, K=4.08 gal/ft

43.02

1 Well Volume:
Total Depth (43.02 ft) - Depth to Water (24.33 ft) = Height of water column (18.69 ft)
Height of water column (18.69 ft) x K value (.163 gal/ft) = 1 Well Volume (3.05 gal)

32.73 top of screen
PUMP SET AT 42

Purge Volume:
1 Well Volume (3.05 gallons) x 3 = 3 Well Volumes (9.14 gallons)
Purge Rate (______ gpm) x (______ min) = 1 Well Volume
Purge Rate (______ gpm) x (______ min) = 3 Well Volume

Time	Temp °C	pH	Cond. mS/cm	Turbidity NTU	D.O. mg/l	ORP mv	Purged Quantity	Well Volume	Depth to Water	Purge Rate
1050	16.6	6.16	0.734	-5.6	0.79	+145	0		25.92	0
1055	16.0	6.30	0.743	986.0	0.15	+133	~~3.0~~		27.39	0.16
1100	16.4	6.38	0.744	436.0	0.12	+128	~~4.0~~		28.11	0.12
1105	16.7	6.43	0.747	299.0	0.20	+122	~~4.2~~		28.82	0.12
1110	17.1	6.47	0.746	218.0	0.20	+118	~~4.3~~		29.05	0.12
1115	17.2	6.51	0.754	193.0	0.28	+114	~~0.55~~		30.29	0.03
1120	17.0	6.51	0.755	134.0	0.29	+120	0.75		30.58	0.03
1125	17.3	6.51	0.753	121.0	0.47	+115	0.90		31.08	0.03
1130	17.6	6.53	0.753	120.0	0.49	+112	1.05		31.55	0.03
1135	16.9	6.54	0.766	142.0	0.65	+109	1.25		32.74	0.04
1140	16.7	6.55	0.747	95.9	1.36	+110	1.45		33.44	0.04
1145	16.9	6.54	0.745	79.1	1.18	+111	1.65		33.89	0.04
1150	17.4	6.55	0.744	78.6	1.24	+108	1.85		34.15	0.04
1155	18.0	6.56	0.744	61.5	1.45	+108	2.05		34.58	0.04
1200	18.8	6.57	0.744	57.0	1.58	+108	2.25		34.96	0.04
1205	19.3	6.60	0.760	92.0	1.72	+108	2.45		35.44	0.04
1210	16.5	6.58	0.739	85.4	2.13	+107	2.65		36.44	0.04
1215	17.2	6.56	0.729	66.4	2.57	+107	2.85		37.34	0.04
1220	17.7	6.59	0.729	56.7	2.58	+105	3.05		37.87	0.04
1225	19.0	6.60	0.729	56.9	2.53	+105	3.25		38.29	0.04
1230	19.4	6.61	0.729	66.6	2.60	+106	3.45		38.54	0.04
1235	18.3	6.62	0.734	75.1	2.64	+106	3.65		39.18	0.04
1240	19.4	6.62	0.732	90.9	2.61	+109	3.85		39.65	0.04
1845	18.7	6.61	0.730	81.6	2.57	+109	4.05		39.96	0.04
1250	19.1	6.61	0.729	84.0	2.62	+110	4.25		40.30	0.04

Purged Qt.
0.3 ~~0.30~~
0.4 ~~0.40~~
0.3 ~~0.50~~
0.4 ~~0.60~~
0.75

EMPTIED FLOW CELL

IWL 36.41

PURGE INFORMATION:

- Time / Date Started: 1050 / 10/9/05
- Time Purge End: 1300
- Purge Method: Pump x Bailer ______
- Depth to Intake: ~42 (ft)
- Pump Type and ID: FULTZ
- Purge Rate: 0.02 - 0.040 (gpm)
- Purged Volume: 4.45 (gal)
- Water Quality Meter: Horiba U-22# 15302
- How was yield measured? GRADUATED CYLINDER
- Was well cavitated? Yes X No ______
- Water containerized/Amount: NA
- Grunfos controller set @ NA (Hertz)

SAMPLING INFORMATION:

- Time / Date Started: 1041 / 10/21/08
- Sampled by: JG & EC
- Sample Method: Bailer X Other Pump
- Grab x Composite ______
- # of Bottles Collected: 4
- Bottle Preservatives: HNO_3
- Recovering WL: went Dry
- Duplicate Sampling: none
- Laboratory: GPL
- COC Form: ______

ADDITIONAL INFORMATION: (i.e. weather conditions, problems encountered, maintenance required, unusual color/odor, etc.)
* Flashing number out of range for Horiba

1205 1st two sample bottles were collected with pump, then switch to bailing well. minimum vol were collected for anions and metals

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page 2 of 2

GROUNDWATER SAMPLE LOG

Project Name: Jefferson Proving Ground
Project Number: 01-1633-04-9381-310
Purged by: EC & JG
Sampled by: ______ & ______
Checked by: ______ & ______

Well Identification: MW-6 (continued)
Project Location: Madison, Indiana
Date: 10/9/08
Date: ______
Date: ______

WELL VOLUME CALCULATION:

Circle diameter and K used below: 1" I.D., K=0.041 gal/ft; 2" I.D., K=0.163 gal/ft; 4" I.D., K=0.653 gal/ft; 6" I.D., K=1.469 gal/ft; 8" I.D., K=2.61 gal/ft; 10" ID, K=4.08 gal/ft

1 Well Volume:

Total Depth (43.02 ft) - Depth to Water (24.33 ft) = Height of water column (18.69 ft)

Height of water column (______ ft) x K value (______ gal/ft) = 1 Well Volume (______ gal)

Purge Volume:

1 Well Volume (______ gallons) x 3 = 3 Well Volumes (______ gallons)

Purge Rate (______ gpm) x (______ min) = 1 Well Volume

Purge Rate (______ gpm) x (______ min) = 3 Well Volume

	Time	Temp °C	pH	Cond mS/cm	Turbidity NTU	D.O. mg/l	ORP mv	Purged Quantity	Well Volume	Depth to Water	Purge Rate
	1255	17.6	6.61	0.737	2780	2.66	+109	4.45		41.39	0.04
	1300	WELL WENT DRY									
					11/25/08 JMG						
10/21	1638	14.3	6.08	*0.90	820	6.23	+216			37.90	0.03
					JMG 11/25/08						

PURGE INFORMATION:

Time / Date Started: 1050 / 10/9/08
Time Purge End: 1300
Purge Method: Pump x Bailer ______
Depth to Intake: ~42' (ft)
Pump Type and ID: FULT3
Purge Rate: 0.02 - 0.06 (gpm)
Purged Volume: 4.45 (gal)
Water Quality Meter: Horiba U-22#
How was yield measured? GRADUATED CYLINDER
Was well cavitated? Yes X No ______
Water containerized/Amount: NA
Grunfos controller set @ NA (Hertz)

SAMPLING INFORMATION:

Time / Date Started: ______ / ______
Sampled by: ______ & ______
Sample Method: Bailer ______ Other Pump
Grab x Composite ______
# of Bottles Collected: ______
Bottle Preservatives: ______
Recovering WL: ______
Duplicate Sampling: ______
Laboratory: ______
COC Form: ______

ADDITIONAL INFORMATION: (i.e. weather conditions, problems encountered, maintenance required, unusual color/odor, etc.)

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GROUNDWATER SAMPLE LOG

Project Name:	Jefferson Proving Ground		Well Identification:	MW-7	
Project Number:	01-1633-04-9381-310		Project Location:	Madison, Indiana	
Purged by:	JG & EC		Date:	10/7/08	
Sampled by:	JG & EC		Date:	10/7/08	
Checked by:	&		Date:		

WELL VOLUME CALCULATION:

Circle diameter and K used below: 1" I.D., K=0.041 gal/ft; (2" I.D., K=0.163 gal/ft); 4" I.D., K=0.653 gal/ft; 6" I.D., K=1.469 gal/ft; 8" I.D., K=2.61 gal/ft; 10" ID, K=4.08 gal/ft

1 Well Volume:

Total Depth (48.65 ft) - Depth to Water (12.69 ft) = Height of water column (35.96 ft)

Height of water column (35.96 ft) x K value (0.163 gal/ft) = 1 Well Volume (5.86 gal)

Purge Volume:

1 Well Volume (5.86 gallons) x 3 = 3 Well Volumes (17.58 gallons)

Purge Rate (_____gpm) x (_____min) = 1 Well Volume

Purge Rate (_____gpm) x (_____min) = 3 Well Volume

Time	Temp °C	pH	Cond mS/cm	Turbidity NTU	D.O. mg/l	ORP mv	Purged Quantity	Well Volume	Depth to Water	Purge Rate
1400	20.1	6.38	0.791	167.6	0.99	-91	0.16		15.63	0.21
1405	16.9	6.24	0.799	119.8	0.02	-96	0.16		15.44	0.16
1410	16.0	6.15	0.817	69.9	0.00	-103	1.4		15.16	0.17
1415	15.9	6.11	0.828	45.6	0.00	-111	2.2		15.40	0.08
1420	15.6	6.09	0.8108	73.3	0.00	-111	6.2		15.29	0.08
1425	15.5	6.27	0.905	82.1	0.00	-122	6.6		15.29	0.08
1430	15.4	6.33	0.913	81.5	0.00	-125	7.0		15.34	0.08
1435	15.7	6.35	0.919	89.1	0.00	-129	7.4		15.48	0.08
1440	15.1	6.36	0.919	93.0	0.00	-129	7.8		15.68	0.08
1445	15.0	6.38	0.924	103.0	0.00	-130	8.2		15.53	0.08
1450	15.2	6.42	0.929	13.4	0.00	-127	8.6		15.54	0.08
1455	15.1	6.43	0.933	18.2	0.00	-131	9.0		15.54	0.08

JAR 10/8/08

PURGE INFORMATION:

Time / Date Started: 1400 | 10/7/08

Time Purge End: 1455

Purge Method: Pump x Bailer _____

Depth to Intake: ~14 (ft)

Pump Type and ID: FULTZ,

Purge Rate: 0.08-0.21 (gpm)

Purged Volume: 9.0 (gal)

Water Quality Meter: Horiba U-22# 15302

How was yield measured? Graduated Cylinder

Was well cavitated? Yes _____ No ~~X~~

Water containerized/Amount _____ NA

Grunfos controller set @ _____ NA (Hertz)

SAMPLING INFORMATION:

Time / Date Started: 1458 | 10/7/08

Sampled by: JG & EC

Sample Method: Bailer _____ Other Pump

Grab x Composite _____

# of Bottles Collected: 3 + 2 EPA MS+MSD+Blank

Bottle Preservatives: HNO3 + H2SO4

Recovering WL: 13.54

Duplicate Sampling: MS/MSD

Laboratory: GPL

COC Form: _____

ADDITIONAL INFORMATION: (i.e. weather conditions, problems encountered, maintenance required, unusual color/odor, etc.)

Cloudy, ~80°F, Horiba 15302 DSL screen needs fixed (fogs). Well is in good shape

Science Applications International Corporation
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GROUNDWATER SAMPLE LOG

Project Name:	Jefferson Proving Ground	Well Identification:	MW-8
Project Number:	01-1633-04-9381-310	Project Location:	Madison, Indiana
Purged by:	EC & JG	Date:	10/9/08
Sampled by:	EC & JG	Date:	10/9/08
Checked by:	&	Date:	

WELL VOLUME CALCULATION:

Circle diameter and K used below: 1" I.D., K=0.041 gal/ft; (2" I.D., K=0.163 gal/ft) circled; 4" I.D., K=0.653 gal/ft; 6" I.D., K=1.469 gal/ft; 8" I.D., K=2.61 gal/ft; 10" ID, K=4.08 gal/ft

init. wl- 0824 23.68
29.871
20.51 top of wick

1 Well Volume:

Total Depth (29.87 ft) - Depth to Water (23.68 ft) = Height of water column (6.19 ft)

Height of water column (6.19 ft) x K value (0.163 gal/ft) = 1 Well Volume (1.009 gal)

Purge Volume:

1 Well Volume (1.009 gallons) x 3 = 3 Well Volumes (3.027 gallons) ~3.03 gal

Purge Rate (______ gpm) x (______ min) = 1 Well Volume

Purge Rate (______ gpm) x (______ min) = 3 Well Volume

Time	Temp °C	pH	Cond mS/cm	Turbidity NTU	D.O. mg/l	ORP mv	Purged Quantity	Well Volume	Depth to Water	Purge Rate
0840	13.1	5.64	0.856	-4.3	2.09	+81	0		25.43	0
0845	12.7	6.18	0.826	-5.8	0.53	+58	0.075		25.51	0.015
0850	12.7	6.40	0.790	-5.6	0.29	+43	0.15		25.74	0.015
0855	12.7	6.52	0.703	-6.1	0.48	+39	0.225		26.03	0.015
0900	12.8	6.59	0.750	-6.0	0.103	+37	0.3		26.16	0.015
0905	12.8	6.69	0.741	-6.2	0.100	+39	0.375		25.96	0.015
0910	12.7	6.70	0.733	-6.3	0.57	+45	0.45		25.92	0.015
0915	12.8	6.73	0.730	-5.7	0.80	+46	0.525		25.96	0.015
0920	13.0	6.71	0.722	-6.4	0.87	+40	~~0.5~~ 0.600		26.13	0.015
	sampling started at 0921 per SE									
	well went dry									
1402	[illegible]									
[illegible]	well went dry									

JG 10/9/08

PURGE INFORMATION:

Time / Date Started: 0840 / 10/9/08
Time Purge End: 0920
Purge Method: Pump x, Bailer ______
Depth to Intake: ~29.6 (ft)
Pump Type and ID: FULTZ
Purge Rate: 0.015 (gpm)
Purged Volume: 0.600 (gal)
Water Quality Meter: Horiba U-22# 83121
How was yield measured? GRADUATED CYLINDER
Was well cavitated? Yes X No ~~[illegible]~~
Water containerized/Amount: NA
Grunfos controller set: @ NA (Hertz)

SAMPLING INFORMATION:

Time / Date Started: 0921 / 10/10/08
Sampled by: JG & EC
Sample Method: Bailer ______ Other Pump
Grab x Composite ______
# of Bottles Collected: 7
Bottle Preservatives: HNO3
Recovering WL: well went dry
Duplicate Sampling: NO
Laboratory: GPL
COC Form: ______

ADDITIONAL INFORMATION: (i.e. weather conditions, problems encountered, maintenance required, unusual color/odor, etc.)

~MID 60°F SUNNY NEGATIVE TURBIDITY READINGS WERE TAKEN CAUSE THE HORIBA WAS CAL WITH A NEG # AND MAY BE OFF SEE LOG BOOK FOR MW-8
[illegible]

Science Applications International Corporation
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GROUNDWATER SAMPLE LOG

Project Name: Jefferson Proving Ground
Project Number: 01-1633-04-9381-310
Purged by: ______ & ______
Sampled by: [signature] & MJL
Checked by: ______ & ______

Well Identification: MW-9
Project Location: Madison, Indiana
Date:
Date: 10-14-08
Date:

WELL VOLUME CALCULATION:

Circle diameter and K used below: 1" I.D., K=0.041 gal/ft; 2" I.D., K=0.163 gal/ft; 4" I.D., K=0.653 gal/ft; 6" I.D., K=1.469 gal/ft; 8" I.D., K=2.61 gal/ft; 10" ID, K=4.08 gal/ft

1 Well Volume:

Total Depth (______ft) - Depth to Water (35.78 ft) = Height of water column (______ft)
Height of water column (______ft) x K value (______gal/ft) = 1 Well Volume (______gal)

Purge Volume:

1 Well Volume (______gallons) x 3 = 3 Well Volumes (______gallons)
Purge Rate (______gpm) x (______min) = 1 Well Volume
Purge Rate (______gpm) x (______min) = 3 Well Volume

Time	Temp °C	pH	Cond mS/cm	Turbidity NTU	D.O. mg/l	ORP mv	Purged Quantity	Well Volume	Depth to Water	Purge Rate

PURGE INFORMATION:

Time / Date Started: ______ / ______
Time Purge End: ______
Purge Method: Pump x Bailer ______
Depth to Intake: ______ (ft)
Pump Type and ID: ______
Purge Rate: ______ (gpm)
Purged Volume: ______ (gal)
Water Quality Meter: Horiba U-22#
How was yield measured? ______
Was well cavitated? Yes X No ______
Water containerized/Amount NA
Grunfos controller set @ NA (Hertz)

SAMPLING INFORMATION:

Time / Date Started: 0930 / 10-14-08
Sampled by: MJL &
Sample Method: Bailer X Other —
Grab x Composite ______
# of Bottles Collected: 8
Bottle Preservatives: HNO_3, mix
Recovering WL: 38'
Duplicate Sampling: ______
Laboratory: ______
COC Form: ______

ADDITIONAL INFORMATION: (i.e. weather conditions, problems encountered, maintenance required, unusual color/odor, etc.)

Well not purged due to small WC. Collected filtered and unfiltered (), ERM () unfiltered, metals filtered and unfiltered, anions unfiltered and nitrate and alkalinity. Bottles filled by priority and min vol requirements

Science Applications International Corporation
From Science to Solutions

GROUNDWATER SAMPLE LOG

Project Name: Jefferson Proving Ground
Project Number: 01-1633-04-9381-310
Purged by: MJL & [illegible]
Sampled by: MJL & STS
Checked by: [illegible] & [illegible]

Well Identification: MW-10
Project Location: Madison, Indiana
Date: 10.23.08
Date: 10.27.08
Date:

WELL VOLUME CALCULATION:

Circle diameter and K used below: 1" I.D., K=0.041 gal/ft; (2" I.D., K=0.163 gal/ft); 4" I.D., K=0.653 gal/ft; 6" I.D., K=1.469 gal/ft; 8" I.D., K=2.61 gal/ft; 10" ID, K=4.08 gal/ft

18.81 gal screen + BH vol

1 Well Volume:

Total Depth (41.53 ft) - Depth to Water (11.65 ft) = Height of water column (_____ft)
Height of water column (_____ft) x K value (_____gal/ft) = 1 Well Volume (_____gal)

Purge Volume:

1 Well Volume (_____gallons) x 3 = 3 Well Volumes (_____gallons)
Purge Rate (_____gpm) x (_____min) = 1 Well Volume
Purge Rate (_____gpm) x (_____min) = 3 Well Volume

Time	Temp °C	pH	Cond mS/cm	Turbidity NTU	D.O. mg/l	ORP mv	Purged Quantity	Well Volume	Depth to Water	Purge Rate
0840	11.3	5.90	0.814	3.96	5.16	43				0.07
0845	13.0	6.44	0.814	44.1	6.44	16			13.96	0.07
0850	13.0	6.53	0.808	36.8	0.19	-6			13.39	0.07
0855	13.0	6.58	0.802	15.7	0.18	-15			13.47	0.06
0900	11.9	6.76	0.795	11.3	0.28	-1	14		13.28	0.04
0905	11.6	6.71	0.789	7.8	0.46	6			13.94	0.04
0910	11.4	6.73	0.784	6.3	0.67	13			13.42	0.03
0915	11.6	6.74	0.775	3.1	1.01	15			13.96	0.03
0920	11.6	6.75	0.769	1.6	1.51	21			13.89	0.04
0925	11.8	6.76	0.766	0.0	1.85	26			13.95	0.04
0930	11.8	6.77	0.765	0.0	2.08	29			13.95	0.04
0935	11.9	6.78	0.765	0.0	2.19	32			13.97	0.04
0940	11.9	6.78	0.764	0.0	2.31	33	3		13.89	0.05
0945	12.1	6.78	0.763	0.0	2.42	37			13.94	0.05
0950	12.3	6.79	0.759	0.0	2.54	40			13.97	0.04
0955	12.6	6.78	0.757	0.0	2.67	43			13.93	0.04
1000	12.6	6.79	0.752	0.0	2.79	44			14.08	0.04
1005	12.7	6.79	0.748	0.0	2.90	44			13.85	0.05
1010	12.5	6.79	0.745	0.0	3.01	41			13.76	0.04
1015	12.5	6.80	0.708	0.0	3.55	40			13.71	0.06
1020	12.5	6.79	0.780	0.0	1.30	32				
1025	12.5	6.78	0.734	0.0	1.11	28			13.80	0.05
1030	12.5	6.79	0.746	0.0	0.98	21			13.81	0.06
1035	12.7	6.79	0.753	0.0	0.99	14			13.79	0.05
1040	12.7	6.79	0.759	0.0	0.86	12	6		13.80	0.05

PURGE INFORMATION:

Time / Date Started: 0840 | 10.23.08
Time Purge End: 1111
Purge Method: Pump x Bailer
Depth to Intake: 39.5 (ft)
Pump Type and ID: Fultz 16387
Purge Rate: ~0.05 (gpm)
Purged Volume: 8 (gal)
Water Quality Meter: Horiba U-22# 16358
How was yield measured? Calculated capture rate
Was well cavitated? Yes x No
Water containerized/Amount NA
Grunfos controller set @ NA (Hertz)

SAMPLING INFORMATION:

Time / Date Started: 1330 | 10.27.08
Sampled by: MJL & STS
Sample Method: Bailer x Other
Grab x Composite
# of Bottles Collected: 13
Bottle Preservatives: HNO3, H2SO4, none
Recovering WL: 11.46
Duplicate Sampling:
Laboratory:
COC Form:

ADDITIONAL INFORMATION (i.e. weather conditions, problems encountered, maintenance required, unusual color/odor, etc.)

Science Applications International Corporation
From Science to Solutions™

GROUNDWATER SAMPLE LOG

Project Name:	Jefferson Proving Ground	Well Identification:	MW-10
Project Number:	01-1633-04-9381-310	Project Location:	Madison, Indiana
Purged by:	MJL &	Date:	10-23-08
Sampled by:	&	Date:	
Checked by:	&	Date:	

WELL VOLUME CALCULATION:

Circle diameter and K used below:

1" I.D., K=0.041 gal/ft	6" I.D., K=1.469 gal/ft
2" I.D., K=0.163 gal/ft	8" I.D., K=2.61 gal/ft
4" I.D., K=0.653 gal/ft	10" ID, K=4.08 gal/ft

1 Well Volume:

Total Depth (_____ft) - Depth to Water (_____ft) = Height of water column (_____ft)

Height of water column (_____ft) x K value (_____gal/ft) = 1 Well Volume (_____gal)

Purge Volume:

1 Well Volume (_____gallons) x 3 = 3 Well Volumes (_____gallons)

Purge Rate (_____gpm) x (_____min) = 1 Well Volume

Purge Rate (_____gpm) x (_____min) = 3 Well Volume

Time	Temp °C	pH	Cond mS/cm	Turbidity NTU	D.O. mg/l	ORP mv	Purged Quantity	Well Volume	Depth to Water	Purge Rate
1045	12.6	6.80	0.765	0.0	0.76	16			33.71	0.05
1050	13.2	6.81	0.759	1.7	0.76	4			34.25	0.06
1055	13.5	6.83	0.774	1.3	0.71	-3			34.68	
1100	13.8	6.82	0.779	1.5	0.65	-9			35.58	0.06
1105	14.1	6.83	0.780	2.8	0.63	-11			36.10	
1110	13.9	6.84	0.787	8.9	0.57	-27			38.01	0.07
1111							0.8			

PURGE INFORMATION:

Time / Date Started: _____ / _____

Time Purge End: _____

Purge Method: Pump x Bailer _____

Depth to Intake: _____ (ft)

Pump Type and ID: _____

Purge Rate: _____ (gpm)

Purged Volume: _____ (gal)

Water Quality Meter: Horiba U-22#

How was yield measured? _____

Was well cavitated? Yes_____ No_____

Water containerized/Amount NA

Grunfos controller set @ NA (Hertz)

SAMPLING INFORMATION:

Time / Date Started: _____ / _____

Sampled by: _____ & _____

Sample Method: Bailer _____ Other Pump

Grab x Composite _____

# of Bottles Collected: _____

Bottle Preservatives: _____

Recovering WL: _____

Duplicate Sampling: _____

Laboratory: _____

COC Form: _____

ADDITIONAL INFORMATION: (i.e. weather conditions, problems encountered, maintenance required, unusual color/odor, etc.)

Science Applications International Corporation
From Science to Solutions™

GROUNDWATER SAMPLE LOG

Project Name:	Jefferson Proving Ground	Well Identification:	MW-11
Project Number:	01-1633-04-9381-310	Project Location:	Madison, Indiana
Purged by:	[illegible] & EC	Date:	10/8/08
Sampled by:	MSL & SLS	Date:	10.9.08
Checked by:	____ & ____	Date:	____

WELL VOLUME CALCULATION:

Circle diameter and K used below:
1" I.D., K=0.041 gal/ft
2" I.D., K=0.163 gal/ft
4" I.D., K=0.653 gal/ft
6" I.D., K=1.469 gal/ft
8" I.D., K=2.61 gal/ft
10" ID, K=4.08 gal/ft

1 Well Volume:

Total Depth (42.46 ft) - Depth to Water (30.92 ft) = Height of water column (11.54 ft)

Height of water column (11.54 ft) x K value (.163 gal/ft) = 1 Well Volume (1.88 gal)

Purge Volume:

1 Well Volume (1.88 gallons) x 3 = 3 Well Volumes (5.64 gallons)

Purge Rate (____ gpm) x (____ min) = 1 Well Volume

Purge Rate (____ gpm) x (____ min) = 3 Well Volume

Time	Temp °C	pH	Cond mS/cm	Turbidity NTU	D.O. mg/l	ORP mv	Purged Quantity	Well Volume	Depth to Water	Purge Rate
0901	15.5	5.95	21.0	57.7	2.12	11	0		35.47	0
0906	15.2	6.31	13.9	31.9	0.00	-31	0.2		34.99	0.04
0911	15.3	6.54	8.69	14.3	0.00	-34	0.4		35.41	0.04
0916	15.5	6.62	8.00	15.0	0.00	-27	0.6		35.58	0.04
0921	15.8	6.70	7.59	18.4	0.30	-22	0.8		36.46	0.04
0926	15.9	6.74	7.24	19.6	0.58	-15	1.0		36.91	0.04
0931	15.8	6.77	5.79	29.4	1.10	-14	1.25		38.26	0.05
0936	15.6	6.76	5.58	24.7	1.29	-13	1.50		39.24	0.05
0941	15.8	6.72	5.11	23.8	1.26	-2	1.75		____	0.05
0944	well dry									

JMG 10/9/08

PURGE INFORMATION:

Time / Date Started: 0901 | 10/8/08
Time Purge End: ~41.5
Purge Method: Pump x Bailer ____
Depth to Intake: ~41.5 (ft)
Pump Type and ID: Fultz
Purge Rate: 0.04 - 0.05 (gpm)
Purged Volume: 1.75 (gal)
Water Quality Meter: Horiba U-22#
How was yield measured? graduated cylinder
Was well cavitated? Yes X No ____
Water containerized/Amount ____ NA
Grunfos controller set @ NA (Hertz)

SAMPLING INFORMATION:

Time / Date Started: 1200 | 10.9.08
Sampled by: MSL & SLS
Sample Method: Bailer X Other ~~Pump~~
Grab x Composite ____
# of Bottles Collected: 2
Bottle Preservatives: HNO3, non
Recovering WL: 34.58
Duplicate Sampling: ____
Laboratory: ____
COC Form: ____

ADDITIONAL INFORMATION: (i.e. weather conditions, problems encountered, maintenance required, unusual color/odor, etc.)

Mid 60's, raining. Collected unfiltered / filtered uranium, RAM uranium, anions unfiltered / filtered, metals unfiltered / filtered and alkalinity before well stabilized

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SW-DU-001 / SD-DU-001 DATE COLLECTED (MM/DD/YY): 10-11-08

TIME: 1415 / 1430 Dup of Sed

SAMPLING LOCATION CODE: _____

DESCRIPTION: Sediment / Surface water

SAMPLING POINT CODE: _____

DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____ : _____ TO _____ BLS

SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Sunny 80°F ACTIVITIES IN AREA: _____

FIELD OBSERVATIONS: No flow. Water collected on W side of bridge of W Perimeter Road and Middle Fork. Silty soil collected on N bank of creek, ~40' upstream of bridge. Collected DUP of both.

Bkgd = 47 cpm 44-9 A-1

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	45	cpm		
TEMPERATURE:	18.9	°C		
pH:	7.23	S.U.		
CONDUCTIVITY:	0.390	ms/cm		
REDOX:	205	mV		
DO:	7.84	mg/L		
ORGANIC VAPORS:	NM	NM		
TURBIDITY:	0.6	NTU		
OTHER dose	6	uR		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: _____ (Signature) QC Checked By: _____ (Signature)

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SW-DU-002 / SO-DU-002 DATE COLLECTED (MM/DD/YY): 10-11-08

TIME: 1340 QVP of water 1355

SAMPLING LOCATION CODE: _____

DESCRIPTION: Surface water / sediment

SAMPLING POINT CODE: _____

DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____ : _____ TO _____ BLS

SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Sunny 80°F ACTIVITIES IN AREA: _____

FIELD OBSERVATIONS: Concrete bridge on W Peruvian Rd at Dog Creek

Water collected E side of bridge

Sediment collected ≈ 30' upstream of bridge, N bank E of bridge.

Soils are USA Gold - silty.

Background: 49 cpm.

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	35	cpm		
TEMPERATURE:	21.7	°C		
pH:	7.09	S.U.		
CONDUCTIVITY:	0.354	mS/cm		
REDOX:	235	mV		
DO:	8.51	mg/L		
ORGANIC VAPORS:	NM	NM		
TURBIDITY:	0.0	NTU		
OTHER dose :	8	uR		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: _____ (Signature) QC Checked By: _____ (Signature)

SAMPLE LOG SHEET

PROJECT NAME: UPG **PROJECT NO:**

SAMPLE ID NUMBER: SD-DU-0003 DATE COLLECTED (MM/DD/YY): 10-11-08
TIME: 0905

SAMPLING LOCATION CODE: _____
DESCRIPTION: Sediment / surface water

SAMPLING POINT CODE: _____
DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____ : _____ TO _____ BLS
SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Sunny 60°F ACTIVITIES IN AREA: _____
FIELD OBSERVATIONS: Creek is dry. No water sample Collected sediment upstream of steel bridge at Wanye and Cattail on N bank. Silty mud sediment

Background 44-9-A1 = 42cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	49	cpm		
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER dose :	8	uR	B	

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:
No water

Recorded By: _____ (Signature) QC Checked By: _____ (Signature)

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SD-DU-004 / SW-DU-004 DATE COLLECTED (MM/DD/YY): 10-11-08
TIME: 0940 / 0925

SAMPLING LOCATION CODE: ______
DESCRIPTION: Sediment / Surface water sample

SAMPLING POINT CODE: ______
DESCRIPTION ______

NORTHING: ______ EASTING: ______ ELEVATION: ______

SAMPLE DEPTH CODE: ____:____ TO ______ BLS
SAMPLE MEDIA CODE: ______ DESCRIPTION: ______

WEATHER: Sunny 60°F ACTIVITIES IN AREA: ______
FIELD OBSERVATIONS: Creek pooled. Collected water sample from pool on S side of Big Creek across from SGS-BC-03. Wagon & D. [illegible] Collected fn-med gr sand at S bank of Big Creek across from SGS-BC03 Stream channel mainly bedrock. No fn gr deposits

Background = 39 [illegible] cpm 44-9-A1
8 µR

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	78	cpm		
TEMPERATURE:	13.9	C		
pH:	5.96	su		
CONDUCTIVITY:	0.423	mS/cm		
REDOX:	330	mV		
DO:	5.21	mg/L		
ORGANIC VAPORS:				
TURBIDITY:	0	NTU		
OTHER Dose:	8	µR		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) ______

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: [signature] (Signature) QC Checked By: ______ (Signature)

SAMPLE LOG SHEET

PROJECT NAME: JPG **PROJECT NO:**

SAMPLE ID NUMBER: SW-DU-005 / SD-DU-005 DATE COLLECTED (MM/DD/YY): 10-11-08
TIME: 1245 / 1250

SAMPLING LOCATION CODE: _____
DESCRIPTION: Surface water / Sediment

SAMPLING POINT CODE: _____
DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____ : _____ TO _____ BLS
SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Sunny 70°F ACTIVITIES IN AREA: _____
FIELD OBSERVATIONS: No flow, creek pooled. Collected water E of concrete bridge on D-road, north bank.
Collected sediment from S bank of Big Creek E of bridge

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	4	cpm		
TEMPERATURE:	14.2	°C		
pH:	6.67	SU.		
CONDUCTIVITY:	0.334	ms/cm		
REDOX:	244	mV		
DO:	5.48	mg/L		
ORGANIC VAPORS:	1.1	ppm		
TURBIDITY:	0.0	NTU		
OTHER Base :	9	unit		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: _____ (Signature) QC Checked By: _____ (Signature)

SAMPLE LOG SHEET

PROJECT NAME: JPG **PROJECT NO:**

SAMPLE ID NUMBER: SD-00-006 / SW-00-006 DATE COLLECTED (MM/DD/YY): 10-11-08
TIME: 1530 / 1520

SAMPLING LOCATION CODE:
DESCRIPTION: Surface water / Sediment sample

SAMPLING POINT CODE:
DESCRIPTION

NORTHING: EASTING: ELEVATION:

SAMPLE DEPTH CODE: ____ : ____ TO ________ BLS
SAMPLE MEDIA CODE: DESCRIPTION:

WEATHER: Sunny 80°F ACTIVITIES IN AREA:
FIELD OBSERVATIONS: Location dry. Pooled water downstream of location ~ 150'. Dipped sample there. Collected fr-med sand on S bank ~ 15' downstream of where stream branches converge

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	47	cpm		
TEMPERATURE:	23.0	°C		
pH:	7.14	S.U.		
CONDUCTIVITY:	0.263	mS/cm		
REDOX:	257	mV		
DO:	5.31	mg/L		
ORGANIC VAPORS:	NM	NM		
TURBIDITY:	0.0	NTU		
OTHER dose	7	uR		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY)

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: [signature] QC Checked By:
(Signature) (Signature)

SAMPLE LOG SHEET

PROJECT NAME: SPG **PROJECT NO:**

SAMPLE ID NUMBER: SW-00-007 / SD-00-007 DATE COLLECTED (MM/DD/YY): 10-11-02 TIME: 1030 / 1035

SAMPLING LOCATION CODE:
DESCRIPTION: Sediment / surface water

SAMPLING POINT CODE:
DESCRIPTION

NORTHING: EASTING: ELEVATION:

SAMPLE DEPTH CODE: : TO BLS
SAMPLE MEDIA CODE: DESCRIPTION:

WEATHER: Sunny 65°F ACTIVITIES IN AREA:
FIELD OBSERVATIONS: Stream channel on bedrock. Middle fork @ Morgan
Collected water on N side of creek channel, W of bridge No flow
Collected vfn. med gr sand from N bank, W of bridge

Background = 7 uR, 449A-1 30 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	41	cpm		
TEMPERATURE:	14.2	°C		
pH:	6.18	s.u.		
CONDUCTIVITY:	0.389	mS/cm		
REDOX:	81	mV		
DO:	5.32	mg/L		
ORGANIC VAPORS:	NM	NM		
TURBIDITY:	9.0	NTU		
OTHER ______:				

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY)

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: [signature] (Signature) QC Checked By: (Signature)

99-011MOP65)040899 FTP-1215, Revision 0, 4/07/99

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SW-DU-008 / SD-DU-008 DATE COLLECTED (MM/DD/YY): 10-11-08

TIME: 1145 / 1150

SAMPLING LOCATION CODE: _____

DESCRIPTION: Surface water / Sediment

SAMPLING POINT CODE: _____

DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____ : _____ TO _____ BLS

SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Sunny 65°F ACTIVITIES IN AREA: _____

FIELD OBSERVATIONS: No flow at Creek, Pooled water ~ 40' E of bridge at Morgan and D. Road. Sample location collected mostly silty sediment ~ 15' E of bridge Morgan and D. Road on N bank of Big Creek

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	42	cpm		
TEMPERATURE:	18.3	°C		
pH:	6.41	s.u.		
CONDUCTIVITY:	0.371	ms/cm		
REDOX:	311	mV		
DO:	4.01	mg/L		
ORGANIC VAPORS:	N/A	N/A		
TURBIDITY:	0.0	NTU		
OTHER Base :	6	unk		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: _____ (Signature) QC Checked By: _____ (Signature)

SAMPLE LOG SHEET

PROJECT NAME: JP6 **PROJECT NO:**

SAMPLE ID NUMBER: SS-DU-001 DATE COLLECTED (MM/DD/YY): 10-11-08
TIME: 0840

SAMPLING LOCATION CODE: _____
DESCRIPTION: Surface Soil Sample

SAMPLING POINT CODE: _____
DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____ : _____ TO _____ BLS
SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Sunny 60°F ACTIVITIES IN AREA: _____
FIELD OBSERVATIONS: Collect soil ~ 20' W of Wagon Rd. just N of Southern limit of DU area. Moist silty soil w/ some root material.

Background = 49
44-9-A1 49cpm Micro-R-B Blue 10 µR

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	42	cpm	449A	
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER _____ :				

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: _____ (Signature) QC Checked By: _____ (Signature)

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SS-OU-0002 DATE COLLECTED (MM/DD/YY): 10.11.08
TIME: 1300
100 g of soil

SAMPLING LOCATION CODE: ____
DESCRIPTION: Surface soil

SAMPLING POINT CODE: ____
DESCRIPTION ____

NORTHING: ____ EASTING: ____ ELEVATION: ____

SAMPLE DEPTH CODE: ____ : ____ TO ____ BLS
SAMPLE MEDIA CODE: ____ DESCRIPTION: ____

WEATHER: Sunny 75°F ACTIVITIES IN AREA: ____
FIELD OBSERVATIONS: Collected surface soil SE of Malgen / E. Road sign, ~10' from sign on hill. Silty soil. Collected 100g of soil

Bkdg = 29 cpm with 44-9-A1

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	49	cpm		
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER Dose :	9	µR		

SAMPLE TYPE:
- ☒ GRAB
- ☐ SPATIAL COMPOSITE
- ☐ TIME COMPOSITE
- ☐ QC TRIP BLANK
- ☐ QC RINSATE
- ☐ QC FIELD BLANK
- ☐ OTHER (SPECIFY) ____

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: [signature] (Signature) QC Checked By: ____ (Signature)

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SS - DU - 003 DATE COLLECTED (MM/DD/YY): 10-10-08
TIME: 0915

SAMPLING LOCATION CODE: _____
DESCRIPTION: Surface Soil

SAMPLING POINT CODE: _____
DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____ : _____ TO _____ BLS
SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Sunny, 65°F ACTIVITIES IN AREA: _____
FIELD OBSERVATIONS: Just into the DU area Eastern side Mature timber stand (Hardwood, oak & Maple) moved Detritus natural out of the way (leaves) ~ 1/2 mile West of Wanju Road North of Big Creek along an old forest road since grown in.

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	54	cpm		
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER _____:				

SAMPLE TYPE: ☑ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: ☑ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☐ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: Cory Littlefield (Signature) QC Checked By: _____ (Signature)

SAMPLE LOG SHEET

PROJECT NAME: UPG PROJECT NO:

SAMPLE ID NUMBER: SS-NW-0004 DATE COLLECTED (MM/DD/YY): 10-11-08
TIME: 1405

SAMPLING LOCATION CODE:
DESCRIPTION: Surface Soil

SAMPLING POINT CODE:
DESCRIPTION

NORTHING: EASTING: ELEVATION:

SAMPLE DEPTH CODE: : TO BLS
SAMPLE MEDIA CODE: DESCRIPTION:

WEATHER: Sunny 65°F ACTIVITIES IN AREA:
FIELD OBSERVATIONS: Collected dry silty soil ≈ 80' E of Monger Rd just N of S end of OU area. Tree uprooted E of sample location

Background 42cpm 44-9-A1

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	47	cpm		
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER Dose	7	μR		

SAMPLE TYPE: ☒ GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE
☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK
☐ OTHER (SPECIFY)

SAMPLE COLLECTED: ☒ YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: ☒ YES ☐ NO
IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: (Signature) QC Checked By: (Signature)

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APPENDIX C
DATA VALIDATION SUMMARY

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C. DATA VALIDATION SUMMARY

C.1 GPL SDGs 810035, 810048, 810072, 810092, 810094, 810155, 810180, 810211

This report contains the results from the data validation technical review for the Jefferson Proving Ground (JPG) Environmental Radiation Monitoring (ERM) October 2008 samples and analyses that are associated with the above-referenced laboratory and sample delivery group (SDG) number. Surface water sample SW-DU-003 was not collected because the sampling location was dry. These data points have been selected for data validation, and the sample data summary sheets on the following pages specifically identify the samples and analyses associated with this validation review.

The JPG validation technical review was conducted in accordance with the U.S. Environmental Protection Agency (USEPA) *Contract Laboratory Program* (CLP) *National Functional Guidelines for Inorganic Data Review* (July 2002) and Science Applications International Corporation (SAIC) Quality Assurance Technical Procedure (QATP) No. TP-DM-300-7, *Data Validation* (Revision 0, 2/2004). The validation technical review was based on the information and documentation supplied by the associated laboratory. The analyses were evaluated against criteria established in the related analytical procedures and the JPG data quality requirements.

The attachment to this report provides the sample data summary sheets for the samples associated with the above-referenced SDGs. These summary sheets identify the analytical values and the qualifiers for each sample and parameter. The attachment also outlines the validation qualifiers and reason codes used in the validation of the data.

Report Summary	
Total Number of Samples	34
Total Number of Data Points	102
Total Number of Rejected Data Points	0
Percent Completeness (approval to rejection ratio)	100%

C.1.1 ANALYTICAL CATEGORY: RADIOCHEMICAL

- Uranium-234 (U-234), Uranium-235 (U-235), and Uranium-238 (U-238) were determined by alpha spectrometry (American Society for Testing and Materials [ASTM] D3972-90M).
- Groundwater and surface water were analyzed in SDG 805042. Sediment/soil samples were analyzed in SDGs 804157 and 804185.

1. The following items (as applicable) have been addressed during the validation review:

- Sample custody, integrity, and preservation
- Sample handling and preparation
- Holding times
- Instrument calibration and performance
- Dilution factors
- Detection limits
- Laboratory background and carry-over
- Overall assessment of the data
- Quality control (QC)
  - Calibration checks and background
  - Preparation blanks
  - Laboratory control samples
  - Field blanks (if available)
  - Field duplicates (if available)
  - Chemical yield (tracer recovery)
  - Laboratory duplicates.

2. The above items were found to be acceptable, except as follows:

- ***Overall Assessment of Data***—U-234, U-235, and U-238 sample data with results greater than the minimum detectable concentration (MDC) were qualified as estimated, *J*, reason code 37 in instances where the associated error was greater than 50 percent of the sample result.
- ***Tracer Recovery***—Tracer recoveries were slightly elevated in samples SS-DU-001 SAIC10E, SD-DU-007 SAIC10E, and SD-DU-008 SAIC10E. U-234, U-235, and U-238 sample data results greater than the MDC were qualified as estimated, *J*, reason code 38 in these samples.

The attached sample data summary for soil and water samples provides the qualifiers and the appropriate validation code for all samples.

SAMPLE INDEX	
Laboratory: **GPL**	*SDG #:* **810035, 810048, 810072, 810092, 810094, 810155, 810180, 810211**

Client Sample I.D.	Laboratory Sample I.D.	Date Collected	Analyses Performed
MW-DU-001 SAIC010E	SAC08-8860-01	10/23/08	Isotopic Uranium
MW-DU-002 SAIC010E	SAC08-8748-02	10/10/08	Isotopic Uranium
MW-DU-003 SAIC010E	SAC08-8769-01	10/7/08	Isotopic Uranium
MW-DU-003 SAIC010DE	SAC08-8769-02	10/7/08	Isotopic Uranium
MW-DU-004 SAIC010E	SAC08-8711-01	10/6/08	Isotopic Uranium
MW-DU-005 SAIC010E	SAC08-8812-01	10/21/08	Isotopic Uranium
MW-DU-006 SAIC010E	SAC08-8829-03	10/27/08	Isotopic Uranium
MW-DU-007 SAIC010E	SAC08-8769-03	10/7/08	Isotopic Uranium
MW-DU-008 SAIC010E	SAC08-8748-01	10/10/08	Isotopic Uranium
MW-DU-009 SAIC010E	SAC08-8803-01	10/14/08	Isotopic Uranium
MW-DU-010 SAIC010E	SAC08-8829-02	10/27/08	Isotopic Uranium
MW-DU-011 SAIC010E	SAC08-8829-01	10/27/08	Isotopic Uranium
SW-DU-001 SAIC10E	SAC08-8870-07	10/11/08	Isotopic Uranium
SW-DU-002 SAIC10E	SAC08-8870-05	10/11/08	Isotopic Uranium
SW-DU-002 SAIC10DE	SAC08-8870-06	10/11/08	Isotopic Uranium
SW-DU-003 SAIC10E	NA	NA	NA
SW-DU-004 SAIC10E	SAC08-8870-01	10/11/08	Isotopic Uranium
SW-DU-005 SAIC10E	SAC08-8870-04	10/11/08	Isotopic Uranium
SW-DU-006 SAIC10E	SAC08-8870-08	10/11/08	Isotopic Uranium
SW-DU-007 SAIC10E	SAC08-8870-02	10/11/08	Isotopic Uranium
SW-DU-008 SAIC10E	SAC08-8870-03	10/11/08	Isotopic Uranium
SS-DU-001 SAIC10E	SAC08-8800-01	10/11/08	Isotopic Uranium
SS-DU-002 SAIC10E	SAC08-8800-08	10/11/08	Isotopic Uranium
SS-DU-002 SAIC10DE	SAC08-8800-09	10/11/08	Isotopic Uranium
SS-DU-003 SAIC10E	SAC08-8749-01	10/10/08	Isotopic Uranium
SS-DU-004 SAIC10E	SAC08-8800-05	10/11/08	Isotopic Uranium
SD-DU-001 SAIC10E	SAC08-8800-11	10/11/08	Isotopic Uranium
SD-DU-001 SAIC10DE	SAC08-8800-12	10/11/08	Isotopic Uranium
SD-DU-002 SAIC10E	SAC08-8800-10	10/11/08	Isotopic Uranium
SD-DU-003 SAIC10E	SAC08-8800-02	10/11/08	Isotopic Uranium
SD-DU-004 SAIC10E	SAC08-8800-03	10/11/08	Isotopic Uranium
SD-DU-005 SAIC10E	SAC08-8800-07	10/11/08	Isotopic Uranium
SD-DU-006 SAIC10E	SAC08-8800-13	10/11/08	Isotopic Uranium
SD-DU-007 SAIC10E	SAC08-8800-04	10/11/08	Isotopic Uranium
SD-DU-008 SAIC10E	SAC08-8800-06	10/11/08	Isotopic Uranium

NA – Not applicable. Sample could not be collected because sample location was dry.

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ATTACHMENT

JEFFERSON PROVING GROUND
SAMPLE DATA SUMMARY SHEETS

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SAMPLE DATA SUMMARY – SOILS	
Laboratory: GPL	*SDG #:* 810072, 810092

Isotopic Uranium ASTM D3972-90M							
Sample I.D.	**Analyte**	**Result**	**Error**	**MDC**	**Units**	**Qualifier**	**Reason Code**
SS-DU-001 SAIC10E	U-234	0.819	0.197	0.012	pCi/g	J	38
SS-DU-001 SAIC10E	U-235	0.032	0.022	0.009	pCi/g	J	37, 38
SS-DU-001 SAIC10E	U-238	0.715	0.175	0.007	pCi/g	J	38
SS-DU-002 SAIC10E	U-234	0.146	0.052	0.014	pCi/g		
SS-DU-002 SAIC10E	U-235	0.004	0.007	0.010	pCi/g	U	
SS-DU-002 SAIC10E	U-238	0.208	0.067	0.008	pCi/g		
SS-DU-002 SAIC10DE	U-234	0.752	0.184	0.017	pCi/g		
SS-DU-002 SAIC10DE	U-235	0.017	0.016	0.009	pCi/g	J	37
SS-DU-002 SAIC10DE	U-238	0.850	0.205	0.007	pCi/g		
SS-DU-003 SAIC10E	U-234	0.674	0.171	0.008	pCi/g	J	38
SS-DU-003 SAIC10E	U-235	0.042	0.028	0.010	pCi/g	J	37, 38
SS-DU-003 SAIC10E	U-238	0.773	0.192	0.015	pCi/g	J	38
SS-DU-004 SAIC10E	U-234	0.625	0.158	0.014	pCi/g		
SS-DU-004 SAIC10E	U-235	0.035	0.025	0.009	pCi/g	J	37
SS-DU-004 SAIC10E	U-238	0.594	0.151	0.014	pCi/g		
SD-DU-001 SAIC10E	U-234	0.628	0.159	0.008	pCi/g		
SD-DU-001 SAIC10E	U-235	0.040	0.027	0.010	pCi/g	J	37
SD-DU-001 SAIC10E	U-238	0.738	0.183	0.014	pCi/g		
SD-DU-001 SAIC10DE	U-234	0.502	0.132	0.014	pCi/g		
SD-DU-001 SAIC10DE	U-235	0.031	0.023	0.017	pCi/g	J	37
SD-DU-001 SAIC10DE	U-238	0.564	0.145	0.008	pCi/g		
SD-DU-002 SAIC10E	U-234	0.764	0.189	0.008	pCi/g		
SD-DU-002 SAIC10E	U-235	0.033	0.024	0.010	pCi/g	J	37
SD-DU-002 SAIC10E	U-238	0.805	0.198	0.008	pCi/g		
SD-DU-003 SAIC10E	U-234	0.652	0.162	0.013	pCi/g		
SD-DU-003 SAIC10E	U-235	0.033	0.023	0.009	pCi/g	J	37
SD-DU-003 SAIC10E	U-238	0.766	0.186	0.013	pCi/g		
SD-DU-004 SAIC10E	U-234	0.100	0.040	0.016	pCi/g		

Isotopic Uranium ASTM D3972-90M							
Sample I.D.	**Analyte**	**Result**	**Error**	**MDC**	**Units**	**Qualifier**	**Reason Code**
SD-DU-004 SAIC10E	U-235	0.000	0.135	0.009	pCi/g	U	
SD-DU-004 SAIC10E	U-238	0.123	0.046	0.014	pCi/g		
SD-DU-005 SAIC10E	U-234	0.223	0.070	0.014	pCi/g		
SD-DU-005 SAIC10E	U-235	0.020	0.019	0.017	pCi/g	J	37
SD-DU-005 SAIC10E	U-238	0.381	0.106	0.016	pCi/g		
SD-DU-006 SAIC10E	U-234	0.212	0.069	0.009	pCi/g		
SD-DU-006 SAIC10E	U-235	0.023	0.020	0.011	pCi/g	J	37
SD-DU-006 SAIC10E	U-238	0.199	0.066	0.009	pCi/g		
SD-DU-007 SAIC10E	U-234	0.320	0.091	0.008	pCi/g	J	38
SD-DU-007 SAIC10E	U-235	0.023	0.020	0.017	pCi/g	J	37, 38
SD-DU-007 SAIC10E	U-238	0.284	0.083	0.008	pCi/g	J	38
SD-DU-008 SAIC10E	U-234	0.695	0.171	0.007	pCi/g	J	38
SD-DU-008 SAIC10E	U-235	0.020	0.017	0.009	pCi/g	J	37, 38
SD-DU-008 SAIC10E	U-238	1.17	0.273	0.007	pCi/g	J	38

SAMPLE DATA SUMMARY – WATERS	
Laboratory: **GPL**	*SDG #:* **810035, 810048, 810072, 810092, 810094, 810155, 810180, 810211**

Isotopic Uranium ASTM D3972-90M							
Sample I.D.	**Analyte**	**Result**	**Error**	**MDC**	**Units**	**Qualifier**	**Reason Code**
MW-DU-001 SAIC010E	U-234	0.182	0.094	0.047	pCi/L	J	37
MW-DU-001 SAIC010E	U-235	0.012	0.024	0.033	pCi/L	U	
MW-DU-001 SAIC010E	U-238	1.09	0.311	0.047	pCi/L		
MW-DU-002 SAIC010E	U-234	2.71	0.671	0.027	pCi/L		
MW-DU-002 SAIC010E	U-235	0.025	0.036	0.034	pCi/L	U	
MW-DU-002 SAIC010E	U-238	1.21	0.342	0.027	pCi/L		
MW-DU-003 SAIC010E	U-234	0.652	0.213	0.027	pCi/L		
MW-DU-003 SAIC010E	U-235	-0.005	0.010	0.058	pCi/L	U	
MW-DU-003 SAIC010E	U-238	0.246	0.112	0.027	pCi/L		
MW-DU-003 SAIC010DE	U-234	0.631	0.209	0.027	pCi/L		
MW-DU-003 SAIC010DE	U-235	0.037	0.044	0.033	pCi/L	J	37
MW-DU-003 SAIC010DE	U-238	0.359	0.142	0.027	pCi/L		
MW-DU-004 SAIC010E	U-234	1.28	0.352	0.025	pCi/L		
MW-DU-004 SAIC010E	U-235	0.092	0.071	0.031	pCi/L	J	37
MW-DU-004 SAIC010E	U-238	1.01	0.290	0.025	pCi/L		
MW-DU-005 SAIC010E	U-234	0.047	0.043	0.025	pCi/L	J	37
MW-DU-005 SAIC010E	U-235	0.000	0.135	0.031	pCi/L	U	
MW-DU-005 SAIC010E	U-238	0.065	0.051	0.025	pCi/L	J	37
MW-DU-006 SAIC010E	U-234	2.18	0.556	0.027	pCi/L		
MW-DU-006 SAIC010E	U-235	0.099	0.076	0.033	pCi/L	J	37
MW-DU-006 SAIC010E	U-238	1.97	0.510	0.027	pCi/L		
MW-DU-007 SAIC010E	U-234	0.573	0.193	0.026	pCi/L		
MW-DU-007 SAIC010E	U-235	0.019	0.036	0.057	pCi/L	U	
MW-DU-007 SAIC010E	U-238	0.222	0.104	0.026	pCi/L		
MW-DU-008 SAIC010E	U-234	0.215	0.099	0.024	pCi/L		
MW-DU-008 SAIC010E	U-235	0.033	0.040	0.030	pCi/L	J	37
MW-DU-008 SAIC010E	U-238	0.348	0.134	0.024	pCi/L		
MW-DU-009 SAIC010E	U-234	0.986	0.290	0.027	pCi/L		
MW-DU-009 SAIC010E	U-235	-0.010	0.014	0.069	pCi/L	U	
MW-DU-009 SAIC010E	U-238	0.226	0.106	0.027	pCi/L		
MW-DU-010 SAIC010E	U-234	1.94	0.506	0.064	pCi/L		
MW-DU-010 SAIC010E	U-235	0.050	0.053	0.034	pCi/L	J	37

Isotopic Uranium ASTM D3972-90M							
Sample I.D.	Analyte	Result	Error	MDC	Units	Qualifier	Reason Code
MW-DU-010 SAIC010E	U-238	0.751	0.238	0.027	pCi/L		
MW-DU-011 SAIC010E	U-234	0.247	0.110	0.051	pCi/L		
MW-DU-011 SAIC010E	U-235	0.011	0.023	0.030	pCi/L	U	
MW-DU-011 SAIC010E	U-238	0.045	0.042	0.024	pCi/L	J	37
SW-DU-001 SAIC10E	U-234	0.121	0.074	0.027	pCi/L	J	37
SW-DU-001 SAIC10E	U-235	0.020	0.037	0.059	pCi/L	U	
SW-DU-001 SAIC10E	U-238	0.130	0.077	0.027	pCi/L	J	37
SW-DU-002 SAIC10E	U-234	0.132	0.079	0.079	pCi/L	J	37
SW-DU-002 SAIC10E	U-235	-0.005	0.010	0.010	pCi/L	U	
SW-DU-002 SAIC10E	U-238	0.162	0.088	0.027	pCi/L	J	37
SW-DU-002 SAIC10DE	U-234	0.092	0.068	0.051	pCi/L	J	37
SW-DU-002 SAIC10DE	U-235	0.026	0.038	0.036	pCi/L	U	
SW-DU-002 SAIC10DE	U-238	0.170	0.092	0.029	pCi/L	J	37
SW-DU-004 SAIC10E	U-234	0.154	0.0889	0.030	pCi/L		
SW-DU-004 SAIC10E	U-235	0.014	0.028	0.037	pCi/L	U	
SW-DU-004 SAIC10E	U-238	0.318	0.137	0.030	pCi/L		
SW-DU-005 SAIC10E	U-234	0.848	0.255	0.026	pCi/L		
SW-DU-005 SAIC10E	U-235	0.105	0.077	0.032	pCi/L	J	37
SW-DU-005 SAIC10E	U-238	5.96	1.36	0.053	pCi/L		
SW-DU-006 SAIC10E	U-234	0.041	0.042	0.028	pCi/L	J	37
SW-DU-006 SAIC10E	U-235	-0.010	0.015	0.072	pCi/L	U	
SW-DU-006 SAIC10E	U-238	0.010	0.021	0.028	pCi/L	U	
SW-DU-007 SAIC10E	U-234	0.135	0.081	0.028	pCi/L	J	37
SW-DU-007 SAIC10E	U-235	0.000	0.135	0.035	pCi/L	U	
SW-DU-007 SAIC10E	U-238	0.114	0.073	0.028	pCi/L	J	37
SW-DU-008 SAIC10E	U-234	0.120	0.074	0.027	pCi/L	J	37
SW-DU-008 SAIC10E	U-235	0.012	0.025	0.034	pCi/L	U	
SW-DU-008 SAIC10E	U-238	0.430	0.160	0.027	pCi/L		

KEY TO THE DATA VALIDATION QUALIFIERS

QUALIFIERS	
U	Indicates that the data met all quality assurance/quality control (QA/QC) requirements, and that the radionuclide was analyzed for but was not detected above the reported sample quantitation limit.
J	Indicates that the radionuclide was positively identified; the associated numerical value is the approximate concentration of the radionuclide in the sample.
UJ	Indicates that the radionuclide was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
N	The analysis indicates the presence of a radionuclide for which there is presumptive evidence to make a "tentative identification."
R	Indicates that the sample results for the radionuclide are rejected or unusable due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the radionuclide cannot be verified.

Data Validation Reason Code

37 Associated error was greater than 50 percent of the sample result.
38 Tracer yield exceeded the control limits.

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