RADIATION MONITORING REPORT FOR LICENSE SUB-1435 JEFFERSON PROVING GROUND

Summary of Results for October 2010 Sampling Event

FINAL

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LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
µR/hr	Microroentgens per hour
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
MDC	Minimum Detectable Concentration
mg/L	Milligrams per liter
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
U-234	Uranium-234
U-235	Uranium-235
U-238	Uranium-238
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 1985).

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 2010 sampling event, which is the second of two planned sampling events in 2010 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), data validation summary (Appendix C), and activity ratios for mixtures of depleted and natural uranium (Appendix D). 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 Institute for Public Health's (formerly 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 in October 2010. 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, elevated radiation levels) were observed during the sampling effort.

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. Data uncertainties are reported with two standard deviations (95 percent confidence level). 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). Information relative to uranium-238/uranium-234 (U-238/U-234) activity ratios for mixtures of depleted and natural uranium is provided in Appendix D.

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 have been presented in previous reports, but the field crew was unable to obtain measurements due to inadequate volumes of water in wells. Low rainfall, as demonstrated by the fact that surface water locations also exhibited low or no flow at the time of the October 2010 sampling event, contributed to the lack of adequate groundwater volumes. Total uranium concentrations in the October 2010 groundwater samples ranged from 0.40 ± 0.12 to 5.7 ± 0.6 picocurie per liter (pCi/L) with an average concentration of 1.6 ± 1.0 pCi/L, computed using the average value for duplicates.

In addition to the individual isotopic concentrations, Table 3-1 presents the U-238/U-234 ratios for each sample, which ranged from 0.22 ± 0.14 to 1.2 ± 0.2. A U-238/U-234 ratio of 3.0 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 3.0 are investigated further to validate if the sample is representative of DU or natural uranium. No sample exceeded this criterion with the highest ratio encountered being 1.2 ± 0.4 for MW-DU-004.

3.2 SURFACE WATER

The concentrations of total dissolved uranium in surface water at six sampling locations plus one duplicate sample are presented in Table 3-2. Samples could not be collected from SW-DU-003 and SW-DU-006 because the creek was dry. Water quality parameter measurements are presented in Table 3-3. Total uranium concentrations ranged from 0.31 ± 0.12 to 19 ± 1.6 pCi/L with an average concentration of 6.1 ± 2.5 pCi/L, computed using the average values for duplicates. The maximum uranium concentration was for SW-DU-005. The U-238/U-234 ratios for surface samples ranged from 0.69 ± 0.14 to 7.8 ± 0.1. Samples SW-DU-004, SW-DU-004D, and SW-DU-005 exhibited U-238/U-234 ratios of 6.4 ± 0.7, 6.6 ± 0.7, and 7.8 ± 0.8, respectively. Given that the U-238/U-234 ratios for these samples exceeded 3.0, investigations were performed in an attempt to determine a cause for the elevated ratios. As noted above, samples could not be collected at locations SW-DU-003 and SW-DU-006 because the creek was dry. Investigations, including consultation with field crew members, confirm that stream flow at the time of the October 2010 sampling event was generally very low, including lack of flow at SW-DU-004 and SW-DU-005. As such, samples from SW-DU-04 and SW-DU-05 were collected from relatively static pools rather than from free flowing stream waters typically encountered in this segment of Big Creek. Investigation also confirmed that the stream commonly exhibits reduced flow during the fall sampling events. Photographs in Figures 3-2 and 3-3 reflect the stream flow in the vicinity of SW-DU-004 at the time of the October 2010 field event while Figure 3-4 reflects stream flow in October 2008. It is also notable that locations SW-DU-004 and SW-DU-005 are well within the DU Impact Area and that

gamma walkover surveys performed in 2008 confirmed the presence of penetrators within the stream channel both upstream and downstream from these locations such that these locations are likely subject to higher concentrations of DU. Based on available evidence, it is concluded that elevated uranium in SW-DU-004 and SW-DU-005 is the result, in part, of the proximity of the sampling locations to the DU Impact Area in combination with low stream flow such that the concentration per unit volume was elevated.

3.3 SEDIMENT

The concentrations of total uranium in sediment at eight sampling locations plus one duplicate sample are presented in Table 3-4. Sediment samples were collected at the same locations as surface water samples, as shown in Figure 3-1. Total uranium concentrations ranged from 0.23 ± 0.06 to 1.40 ± 0.16 picocuries per gram (pCi/g), with an average concentration of 0.88 ± 0.39 pCi/g, computed using the average value for duplicates.

The U-238/U-234 ratio for the samples ranged from 0.72 ± 0.06 to 2.65 ± 0.11. Given that no sample exceeded a U-238/U-234 ratio of 3.0, additional investigations were not required.

3.4 SOILS

The concentrations of total uranium in surface soil at four surface soil sample locations plus one duplicate sample are presented in Table 3-5. Total uranium concentrations ranged from 0.88 ± 0.12 to 1.6 ± 0.2, with an average concentration of 1.3 ± 0.3 pCi/g, computed using the average value for duplicates. The U-238/U-234 ratios ranged from 0.98 ± 0.12 to 1.3 ± 0.1. 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.

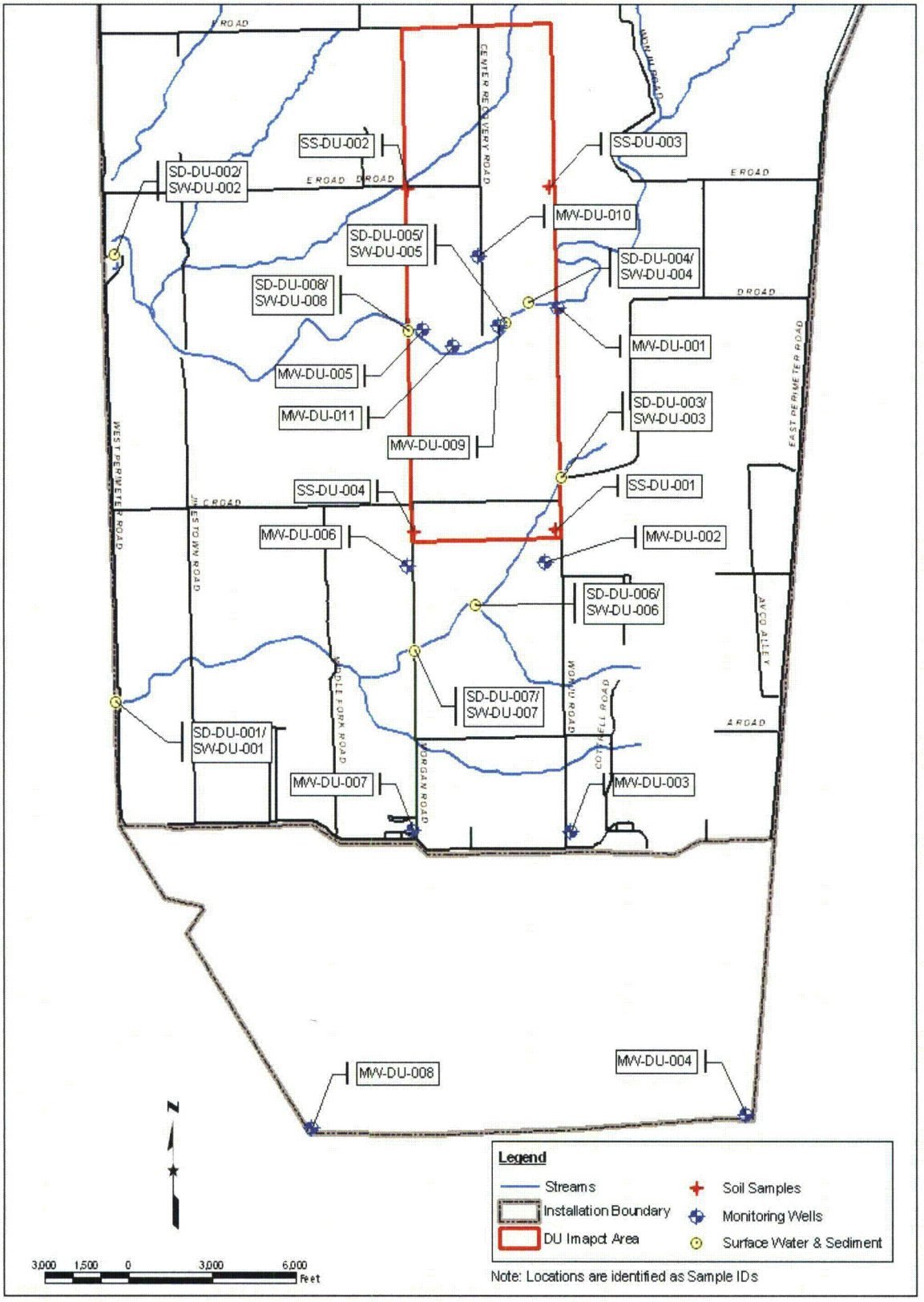

Figure 3-1. Sampling Locations for the JPG ERM Program

Figure 3-2. October 2010 Downstream View from SW-DU-04

Figure 3-3. October 2010 Upstream View from SW-DU-04

Figure 3-4. October 2008 View from SW-DU-04

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

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/L)[c]
MW01	MW-DU-001	U-234	0.23 ± 0.10
MW01	MW-DU-001	U-235	-0.0031 ± 0.0062 U
MW01	MW-DU-001	U-238	0.24 ± 0.10
		Total Uranium	**0.47 ± 0.14**
		U-238/U-234 Ratio[b]	1.1 ± 0.6
MW02	MW-DU-002	U-234	1.6 ± 0.3
MW02	MW-DU-002	U-235	0.021 ± 0.035 U
MW02	MW-DU-002	U-238	0.70 ± 0.18
		Total Uranium	**2.3 ± 0.3**
		U-238/U-234 Ratio[b]	0.45 ± 0.14
MW03	MW-DU-003	U-234	0.75 ± 0.17
MW03	MW-DU-003	U-235	0.027 ± 0.038 U
MW03	MW-DU-003	U-238	0.39 ± 0.12
		Total Uranium	**1.2 ± 0.2**
		U-238/U-234 Ratio[b]	0.52 ± 0.20
MW04	MW-DU-004	U-234	0.59 ± 0.16
MW04	MW-DU-004	U-235	0.04 ± 0.05 U
MW04	MW-DU-004	U-238	0.68 ± 0.17
		Total Uranium	**1.3 ± 0.24**

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

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/L)[c]
		U-238/U-234 Ratio[b]	1.2 ± 0.4
MW05	MW-DU-005	U-234	0.26 ± 0.10
MW05	MW-DU-005	U-235	0.011 ± 0.022 U
MW05	MW-DU-005	U-238	0.13 ± 0.07 J
		Total Uranium	**0.40 ± 0.12**
		U-238/U-234 Ratio[b]	0.50 ± 0.33
MW06	MW-DU-006	U-234	3.0 ± 0.4
MW06	MW-DU-006	U-235	0.13 ± 0.08 J
MW06	MW-DU-006	U-238	2.6 ± 0.4
		Total Uranium	**5.7 ± 0.6**
		U-238/U-234 Ratio[b]	0.88 ± 0.18
MW07	MW-DU-007	U-234	0.81 ± 0.18
MW07	MW-DU-007	U-235	0.008 ± 0.023 U
MW07	MW-DU-007	U-238	0.34 ± 0.11
		Total Uranium	**1.2 ± 0.2**
		U-238/U-234 Ratio[b]	0.42 ± 0.12
MW07D	MW-DU-007D	U-234	0.79 ± 0.18
MW07D	MW-DU-007D	U-235	0.045 ± 0.045 J
MW07D	MW-DU-007D	U-238	0.37 ± 0.12
		Total Uranium	**1.2 ± 0.2**
		U-238/U-234 Ratio[b]	0.47 ± 0.19
Merged MW07 and MW07D		U-234	0.80 ± 0.13
		U-235	0.016 ± 0.020
		U-238	0.44 ± 0.12
		Total Uranium	**1.2 ± 0.18**
		U-238/U-234 Ratio[d]	0.44 ± 0.12
MW08	MW-DU-008	U-234	0.33 ± 0.11
MW08	MW-DU-008	U-235	0.016 ± 0.032 U
MW08	MW-DU-008	U-238	0.22 ± 0.09
		Total Uranium	**0.57 ± 0.15**
		U-238/U-234 Ratio[b]	0.66 ± 0.40
MW09	MW-DU-009	U-234	0.63 ± 0.17
MW09	MW-DU-009	U-235	0.0 ± 0.013 U
MW09	MW-DU-009	U-238	0.23 ± 0.10
		Total Uranium	**0.86 ± 0.20**
		U-238/U-234 Ratio[b]	0.37 ± 0.19
MW010	MW-DU-010	U-234	2.2 ± 0.36
MW010	MW-DU-010	U-235	0.061 ± 0.62 U
MW010	MW-DU-010	U-238	1.0 ± 0.23
		Total Uranium	**3.2 ± 0.43**

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

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/L)[c]
		U-238/U-234 Ratio[b]	0.47 ± 0.13
MW011	MW-DU-011	U-234	0.39 ± 0.13
MW011	MW-DU-011	U-235	0.009 ± 0.025 U
MW011	MW-DU-011	U-238	0.086 ± 0.058 J
		Total Uranium	**0.49 ± 0.14**
		U-238/U-234 Ratio[b]	0.22 ± 0.17

[a] Represents sample designation developed in previous sampling programs.
[b] Unitless.
[c] Uncertainties specified are laboratory values with two standard deviations (95% confidence level).
[d] Average total uranium for MW-DU-007 and its duplicate is 1.2 ± 0.3 pCi/L.
I.D. – Identification.
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. Uranium in Surface Water
Jefferson Proving Ground, Madison, Indiana

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/L)[c]
SWS01	SW-DU-001	U-234	0.18 ± 0.09
SWS01	SW-DU-001	U-235	0.01 ± 0.02 U
SWS01	SW-DU-001	U-238	0.13 ± 0.07 J
		Total Uranium	**0.32 ± 0.12**
		U-238/U-234 Ratio[b]	0.69 ± 0.50
SWS02	SW-DU-002	U-234	0.12 ± 0.07 J
SWS02	SW-DU-002	U-235	0.0 0.01 U
SWS02	SW-DU-002	U-238	0.19 ± 0.09
		Total Uranium	**0.31 ± 0.11**
		U-238/U-234 Ratio[b]	1.6 ± 1.1
SWS04	SW-DU-004	U-234	1.9 ± 0.3
SWS04	SW-DU-004	U-235	0.24 ± 0.11
SWS04	SW-DU-004	U-238	12 ± 1.2
		Total Uranium	**14 ± 1.2**
		U-238/U-234 Ratio[b]	6.4 ± 1.2
SWS04D	SW-DU-004D	U-234	2.1 ± 0.3
SWS04D	SW-DU-004D	U-235	0.33 ± 0.14
SWS04D	SW-DU-004D	U-238	14 ± 1.4
		Total Uranium	**16 ± 1.4**
		U-238/U-234 Ratio[b]	6.6 ± 1.3
MERGED SW04 AND SW04D		U-234	2.0 ± 0.2
		U-235	0.27 ± 0.09
		U-238	13 ± 0.94
		Total Uranium	**16 ± 0.97**

Table 3-2. Uranium in Surface Water
Jefferson Proving Ground, Madison, Indiana (Continued)

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/L)[c]
		U-238/U-234 Ratio[d]	6.5 ± 0.9
SWS05	SW-DU-005	U-234	2.2 ± 0.3
SWS05	SW-DU-005	U-235	0.26 ± 0.11
SWS05	SW-DU-005	U-238	17 ± 1.6
		Total Uranium	**19 ± 1.6**
		U-238/U-234 Ratio[b]	7.8 ± 1.4
SWS07	SW-DU-007	U-234	0.29 ± 0.13
SWS07	SW-DU-007	U-235	0.017 ± 0.033 U
SWS07	SW-DU-007	U-238	0.26 ± 0.12
		Total Uranium	**0.57 ± 0.18**
		U-238/U-234 Ratio[b]	0.90 ± 0.60
SWS08	SW-DU-008	U-234	0.34 ± 0.12
SWS08	SW-DU-008	U-235	0.015 ± 0.035 U
SWS08	SW-DU-008	U-238	0.76 ± 0.18
		Total Uranium	**1.1 ± 0.22**
		U-238/U-234 Ratio[b]	2.2 ± 0.95

[a] Represents sample designation developed in previous sampling programs.
[b] Unitless.
[c] Uncertainties specified are laboratory values with two standard deviations (95% confidence level).
[d] Average total uranium for SW-DU-004 and its duplicate is 15 ± 1.9 pCi/L.
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 3-3. Surface 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)
SWS01	SW-DU-001	7.2	12	0.42	4.7	5
SWS02	SW-DU-002	6.7	11	0.55	5.7	6
SWS03[b]	SW-DU-003					8
SWS04	SW-DU-004	6.1	11	0.58	7.4	9
SWS05	SW-DU-005	7.0	18	0.53	7.1	7
SWS06[b]	SW-DU-006					8
SWS07	SW-DU-007	5.9	11	0.89	3.4	7
SWS08	SW-DU-008	7.3	18	0.63	7.2	6

[a] Represents sample designation developed in previous sampling programs.
[b] Surface water samples SW-DU-003 and SW-DU-006 could not be collected, because the stream was dry.
C – Degrees Celsius
µR/hr – Microroentgens per hour
mg/L – Milligrams per liter
mS/cm – MilliSiemens per centimeter

Table 3-4. Uranium in Sediment
Jefferson Proving Ground, Madison, Indiana

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/g)[c]
SES01	SD-DU-001	U-234	0.59 ± 0.11
SES01	SD-DU-001	U-235	0.048 ± 0.032 J
SES01	SD-DU-001	U-238	0.67 ± 0.12
		Total Uranium	**1.3 ± 0.1**
		U-238/U-234 Ratio[b]	1.1 ± 0.2
SES02	SD-DU-002	U-234	0.38 ± 0.09
SES02	SD-DU-002	U-235	0.016 ± 0.021 U
SES02	SD-DU-002	U-238	0.36 ± 0.08
		Total Uranium	**0.76 ± 0.12**
		U-238/U-234 Ratio[b]	0.94 ± 0.30
SES03	SD-DU-003	U-234	0.67 ± 0.12
SES03	SD-DU-003	U-235	0.051 ± 0.032 J
SES03	SD-DU-003	U-238	0.64 ± 0.11
		Total Uranium	**1.4 ± 0.2**
		U-238/U-234 Ratio[b]	0.96 ± 0.24
SES04	SD-DU-004	U-234	0.13 ± 0.05 J
SES04	SD-DU-004	U-235	0.0 ± 0.005 U
SES04	SD-DU-004	U-238	0.097 ± 0.039 J
		Total Uranium	**0.23 ± 0.06**
		U-238/U-234 Ratio[b]	0.75 ± 0.40
SES05	SD-DU-005	U-234	0.17 ± 0.05
SES05	SD-DU-005	U-235	0.007 ± 0.014 U
SES05	SD-DU-005	U-238	0.45 ± 0.09
		Total Uranium	**0.63 ± 0.11**
		U-238/U-234 Ratio[b]	2.6 ± 1.0
SES06	SD-DU-006	U-234	0.76 ± 0.12
SES06	SD-DU-006	U-235	0.032 ± 0.024
SES06	SD-DU-006	U-238	0.61 ± 0.11
		Total Uranium	**1.4 ± 0.2**
		U-238/U-234 Ratio[b]	0.80 ± 0.19
SES06D	SD-DU-006D	U-234	0.66 ± 0.11
SES06D	SD-DU-006D	U-235	0.023 ± 0.021 J
SES06D	SD-DU-006D	U-238	0.47 ± 0.09
		Total Uranium	**1.2 ± 0.2**
		U-238/U-234 Ratio[b]	0.71 ± 0.18
MERGED SD06 and SD06D		U-234	0.71 ± 0.08
		U-235	0.027 ± 0.016
		U-238	0.53 ± 0.07
		Total Uranium	**1.2 ± 0.11**
		U-238/U-234 Ratio[b]	0.75 ± 0.13
SES07	SD-DU-007	U-234	0.38 ± 0.08
SES07	SD-DU-007	U-235	0.012 ± 0.018 U
SES07	SD-DU-007	U-238	0.33 ± 0.07
		Total Uranium	**0.72 ± 0.11**
		U-238/U-234 Ratio[b]	0.87 ± 0.27

Table 3-4. Uranium in Sediment
Jefferson Proving Ground, Madison, Indiana (Continued)

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/g)[c]
SES08	SD-DU-008	U-234	0.11 ± 0.05 J
SES08	SD-DU-008	U-235	0.007 ± 0.021 U
SES08	SD-DU-008	U-238	0.21 ± 0.06
		Total Uranium	**0.33 ± 0.08**
		U-238/U-234 Ratio[d]	1.9 ± 1.0

[a] Represents sample designation developed in previous sampling programs.
[b] Unitless.
[c] Uncertainties specified are laboratory values with two standard deviations (95% confidence level).
[d] Average total uranium for SD-DU-06 and its duplicate is 1.3 ± 0.22 pCi/g.
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 3-5. Uranium in Surface Soil
Jefferson Proving Ground, Madison, Indiana

JPG Sample Designation[a]	Sample I.D.	Analyte	Result (pCi/g)[c]
SOS01	SS-DU-001	U-234	0.66 ± 0.11
SOS01	SS-DU-001	U-235	0.046 ± 0.03 J
SOS01	SS-DU-001	U-238	0.8 ± 0.1
		Total Uranium	**1.5 ± 0.2**
		U-238/U-234 Ratio[b]	1.2 ± 0.3
SOS02	SS-DU-002	U-234	0.79 ± 0.13
SOS02	SS-DU-002	U-235	0.032 ± 0.026 J
SOS02	SS-DU-002	U-238	0.80 ± 0.13
		Total Uranium	**1.6 ± 0.2**
		U-238/U-234 Ratio[b]	1.0 ± 0.2
SOS03	SS-DU-003	U-234	0.43 ± 0.09
SOS03	SS-DU-003	U-235	0.017 ± 0.019 U
SOS03	SS-DU-003	U-238	0.57 ± 0.10
		Total Uranium	**1.0 ± 0.1**
		U-238/U-234 Ratio[b]	1.3 ± 0.4
SOS04	SS-DU-004	U-234	0.40 ± 0.09
SOS04	SS-DU-004	U-235	0.036 ± 0.029 J
SOS04	SS-DU-004	U-238	0.53 ± 0.10
		Total Uranium	**0.96 ± 0.13**
		U-238/U-234 Ratio[b]	1.3 ± 0.3

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

JPG Sample	Sample I.D.	Analyte	Result (pCi/g)[c]
SOS04D	SS-DU-004D	U-234	0.44 ± 0.09
SOS04D	SS-DU-004D	U-235	0.008 ± 0.012 U
SOS04D	SS-DU-004D	U-238	0.43 ± 0.09
		Total Uranium	**0.88 ± 0.12**
		U-238/U-234 Ratio[b]	0.98 ± 0.27
MERGED SS04 and SS04D		U-234	0.42 ± 0.06
		U-235	0.012 ± 0.011
		U-238	0.47 ± 0.06
		Total Uranium	**0.92 ± 0.09**
		U-238/U-234 Ratio[d]	1.1 ± 0.2

[a] Represents sample designation developed in previous sampling programs.
[b] Unitless.
[c] Uncertainties specified are laboratory values with two standard deviations (95% confidence level).
[d] Average total uranium for SS-DU-04 and its duplicate is 0.92 ± 0.12 pCi/g.
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 JPG License Holder 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 Title 10, Code of Federal Regulations (CFR), Part 20 (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 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 2010 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 142 discrete samples available from 11 monitoring wells (MW01 to MW11) during the period from 2004 through October 2010, the average total uranium activity-concentration is 1.4 pCi/L, the standard deviation is 1.1 pCi/L, and the maximum detected activity-concentration is 5.7 pCi/L. The activity-concentrations at each well are 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 R2 value listed on each figure). An R2 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. In addition, no monitoring wells exhibited trend lines with R2 values greater than 0.5 (i.e., somewhat significant).

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 three 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 updated with new data and re-examined in this report. All total uranium results at each sampling location for the October 2010 sampling effort were within two standard deviations of the mean concentration. 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 four points is for MW-DU-006. Clearly, this well has exhibited (and continues to exhibit) total uranium results exceeding that of the other wells, but individual sample results vary about the mean as expected and based on the slope of the trend line, generally exhibits decreasing activity. The U-238/U-234 ratio for each of these samples continues to suggest that DU is not a likely cause. This well will continue to be monitored closely.

4.2 SURFACE WATER

For 112 discrete samples available from 8 surface water sampling locations (SW01 to SW08) during the period from 2004 through October 2010, the average total uranium activity-concentration is 0.96 pCi/L, the standard deviation is 2.8 pCi/L, and the maximum detected activity-concentration is 19 pCi/L. These values exclude data from SW-DU-003 and SW-DU-006, which could not be collected because the creek was dry at those sampling locations for the October 2010 sampling event. 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 R2 value listed on each figure). As noted in Section 4.1, an R2 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 R2 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 five data points exceeded the UCL. SW-DU-005 exhibited total uranium concentrations of 6.3, 6.9, and 19 pCi/L in October 2007, October 2008, and October 2010, respectively, with each of these concentrations exceeding the UCL. Analytical results for SW-DU-004 reflected a

concentration of 14 and 16 pCi/L for the sample and duplicate, respectively, for the October 2010 sampling event. These values exceeded the UCL of 3.1. Although the result for SW-DU-005 for the April 2010 sampling (0.44 pCi/L) fell within the normal range, both SW-DU-004 and SW-DU-005 will continue to be monitored closely.

4.3 SEDIMENT

For 125 discrete samples available from 8 sediment sampling locations (SD01 to SD08) during the period from 2004 through October 2010, the average total uranium activity-concentration is 0.97 pCi/g, the standard deviation is 0.53 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 R2 value listed on each figure). As noted in Section 4.1, an R2 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 R2 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 2010 sediment sampling results vary around the mean, as expected.

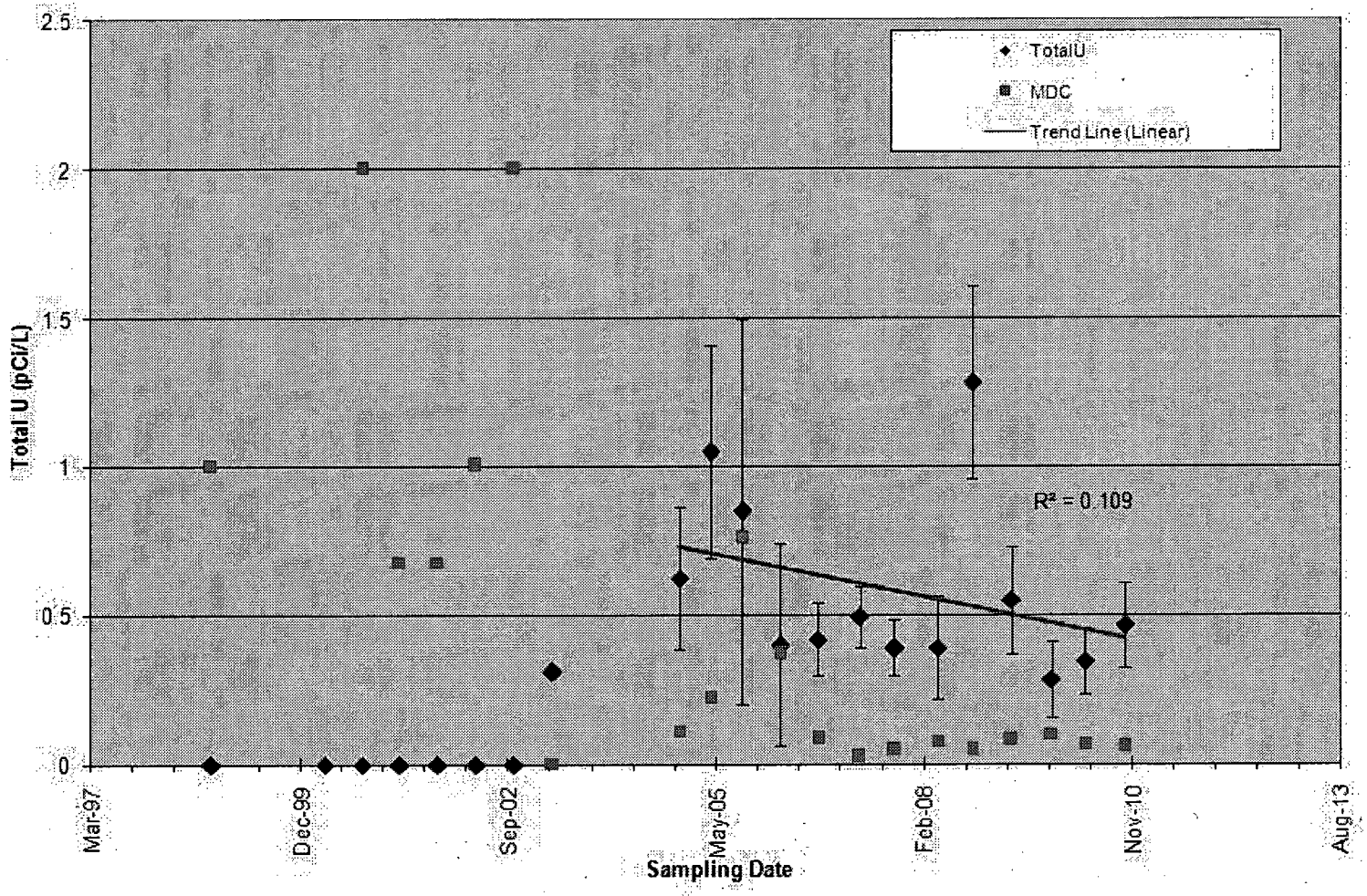
4.4 SOILS

For 71 discrete samples available from 4 surface soil sampling locations (SS01 to SS04) during the period from 2004 through October 2010, the average total uranium activity-concentration is 1.6 pCi/g, the standard deviation is 0.30 pCi/g, and the maximum detected activity-concentration is 2.3 pCi/g. The activity-concentration at each location are well below the action level of 35 pCi/g.

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 R2 value listed on each figure). As noted in Section 4.1, an R2 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, the figures indicate that none of the sample locations exhibited trend lines such that the correlation is somewhat significant. Although the slope of the trend line for SS-DU-002 previously suggested a possible increase in the total uranium concentration at this location, current data to include the R2 are within normal parameters. Nonetheless, results from this location will continue to be monitored closely.

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), previously fell below the LCL for a prior sampling event (October 2008). In addition, the results of SS-DU-004 and

its duplicate for the October 2010 sampling event reflected results of 0.96 and 0.88 pCi/g, respectively. Given an LCL of 0.92 pCi/g, results of SS-DU-004 were slightly below the UCL, and the mean of the SS-DU-004 and its duplicate equaled the UCL. Although such results have no immediate significance to the project, the results will continue to be monitored.



MDC – Minimum Detectable Concentration

Figure 4-1. Total Uranium in MW-DU-001 (1998-2010)

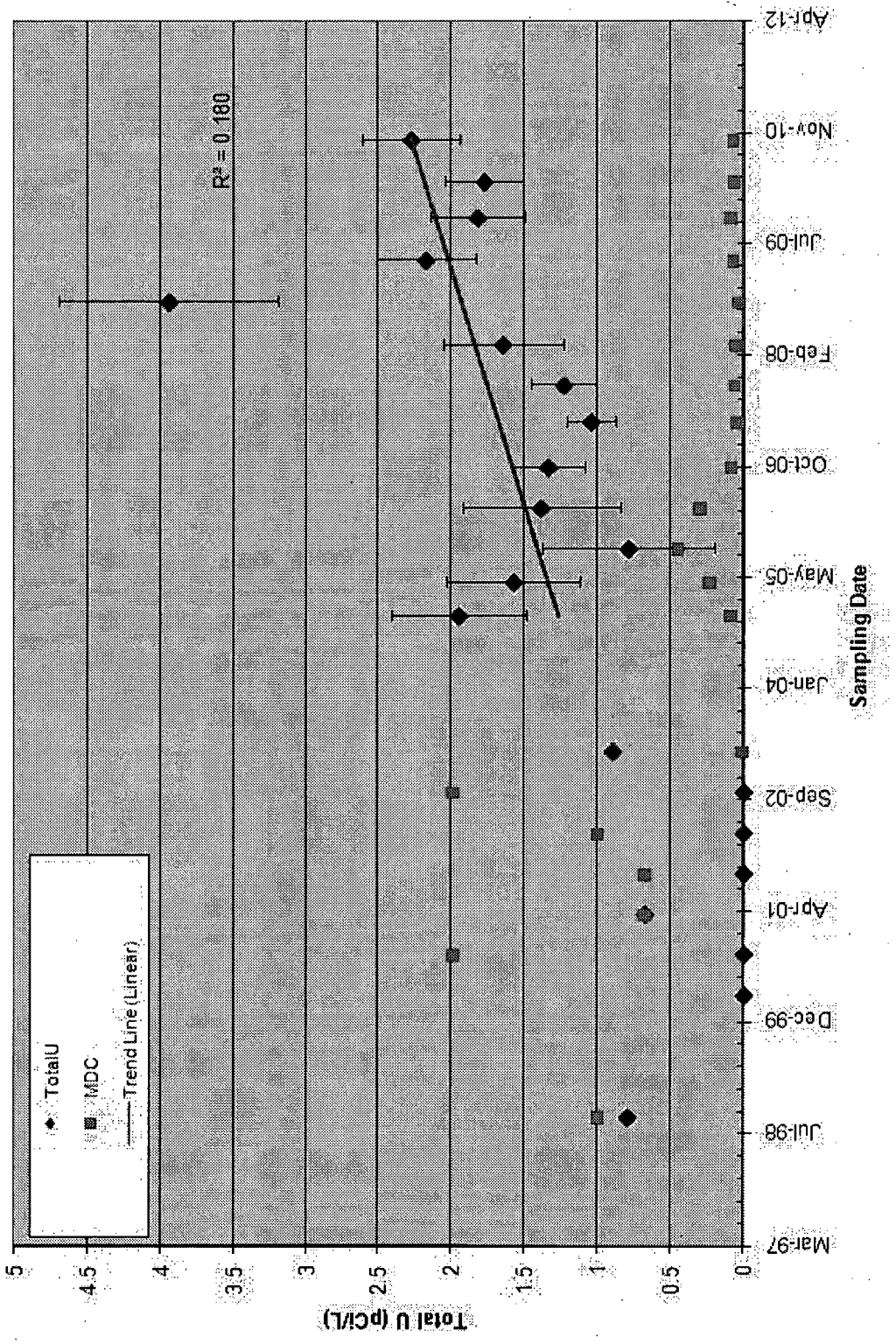
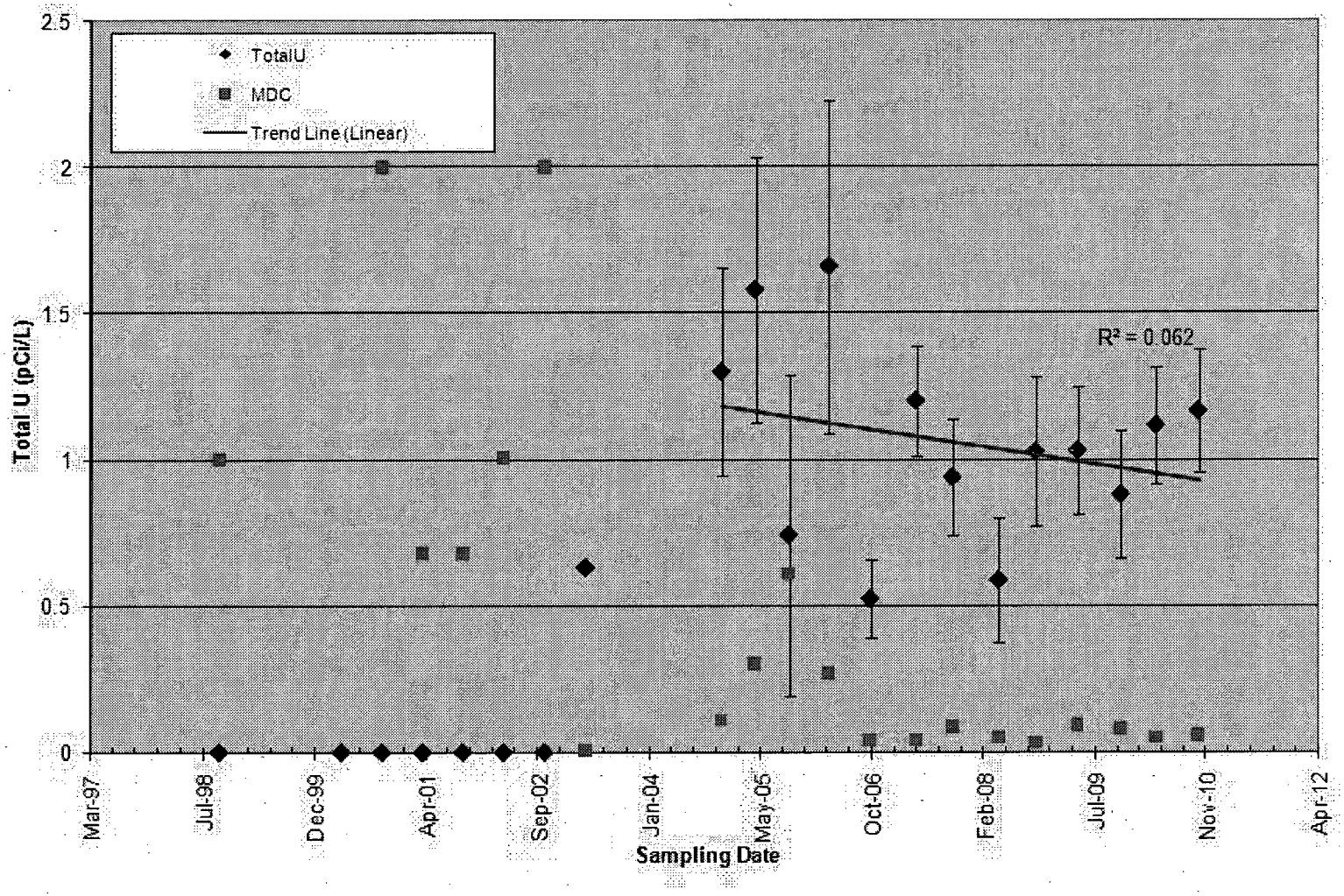
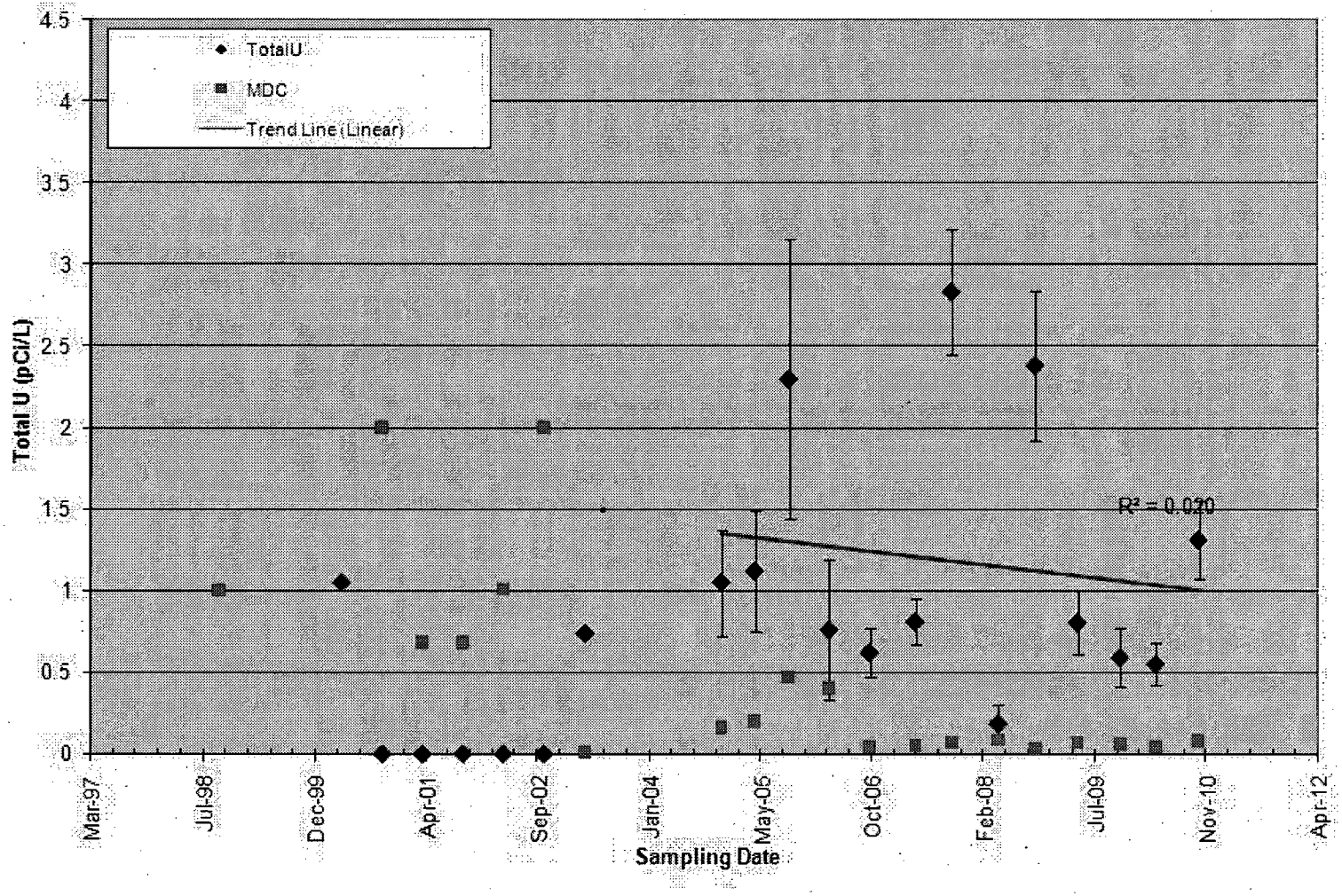


Figure 4-2. Total Uranium in MW-DU-002 (1998-2010)



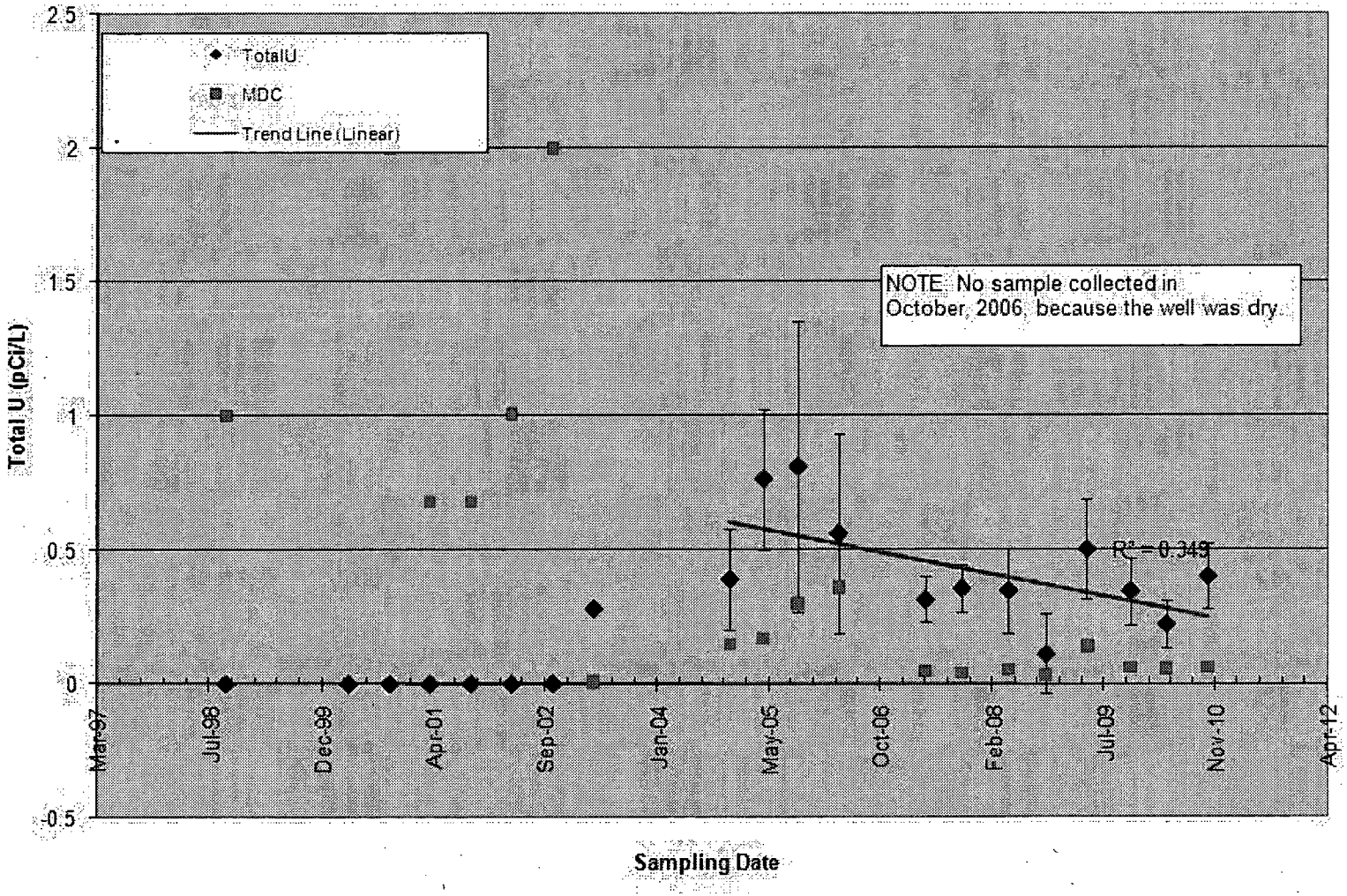
MDC – Minimum Detectable Concentration

Figure 4-3. Total Uranium in MW-DU-003 (1998-2010)



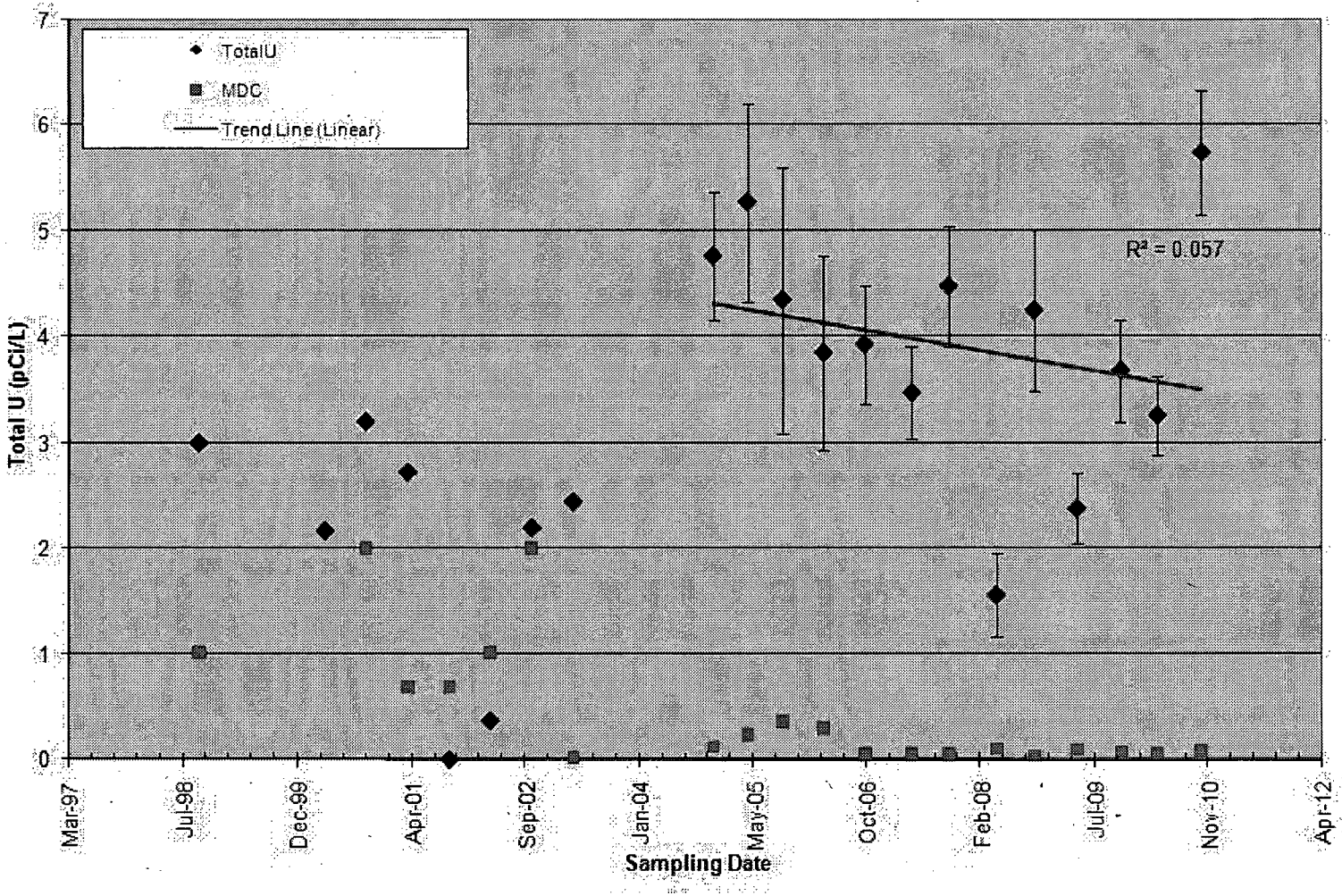
MDC – Minimum Detectable Concentration

Figure 4-4. Total Uranium in MW-DU-004 (1998-2010)



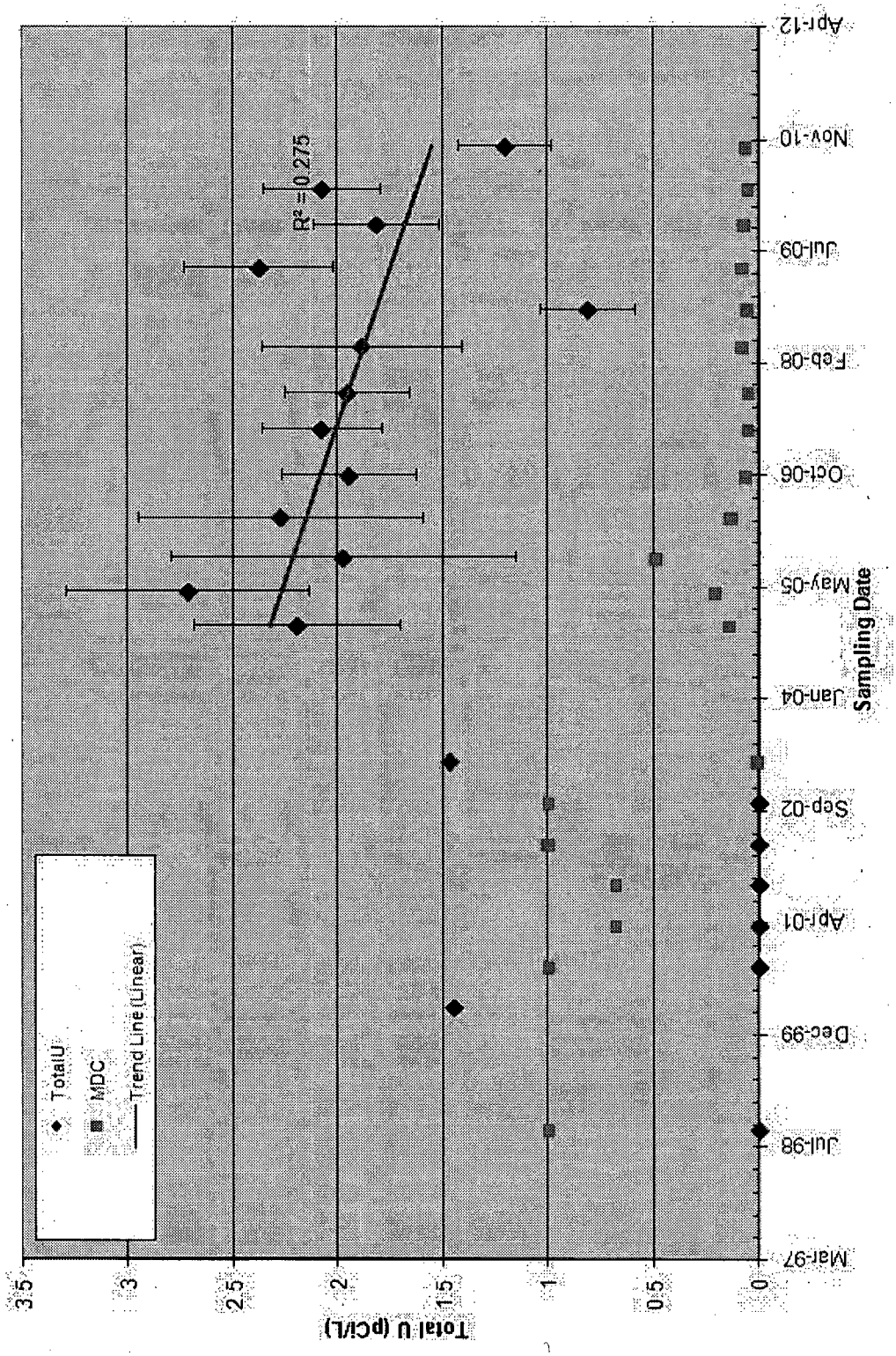
MDC – Minimum Detectable Concentration

Figure 4-5. Total Uranium in MW-DU-005 (1998-2010)



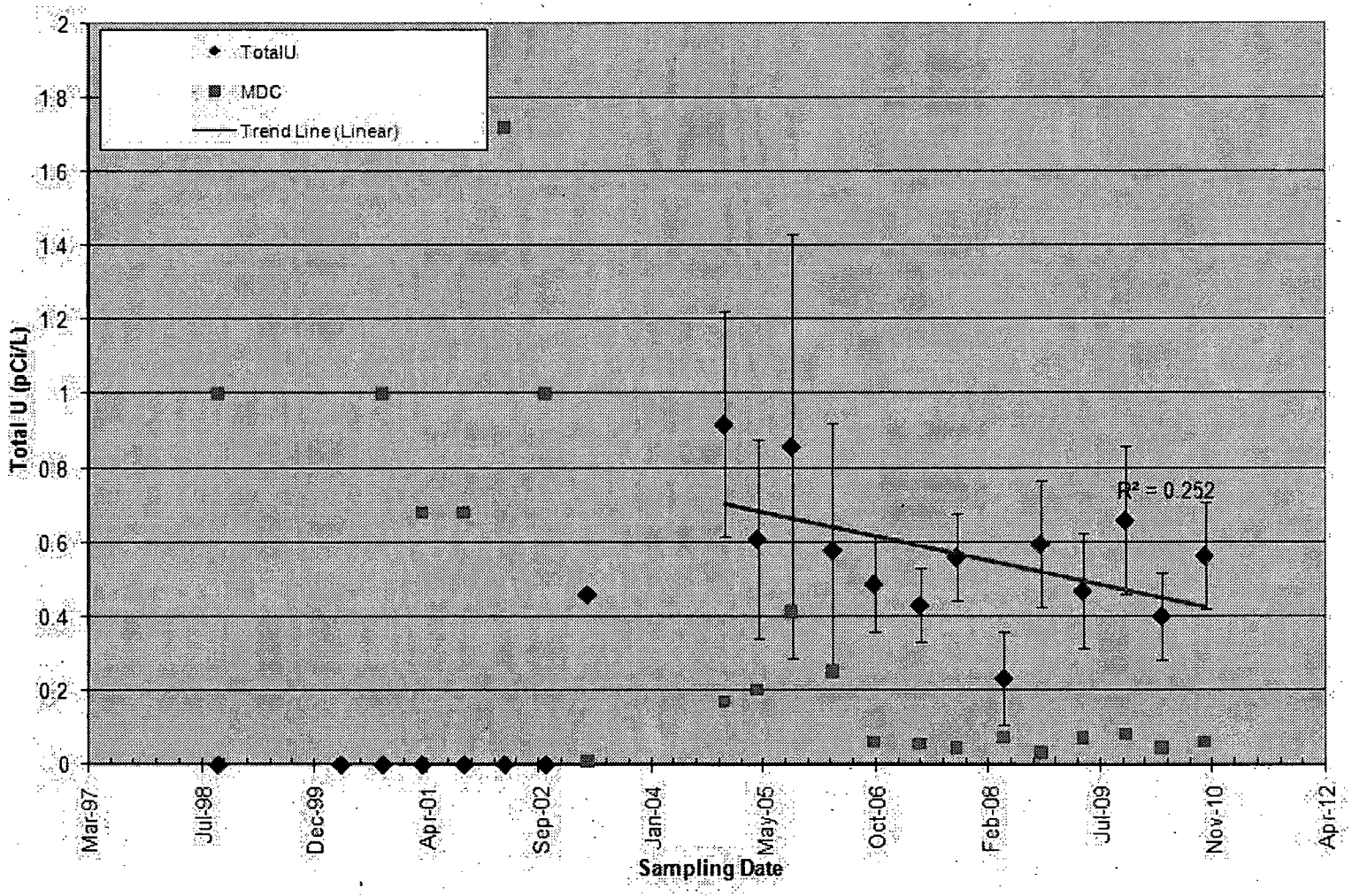
MDC – Minimum Detectable Concentration
NOTE: No sample was collected in October 2006 because the well was dry.

Figure 4-6. Total Uranium in MW-DU-006 (1998-2010)



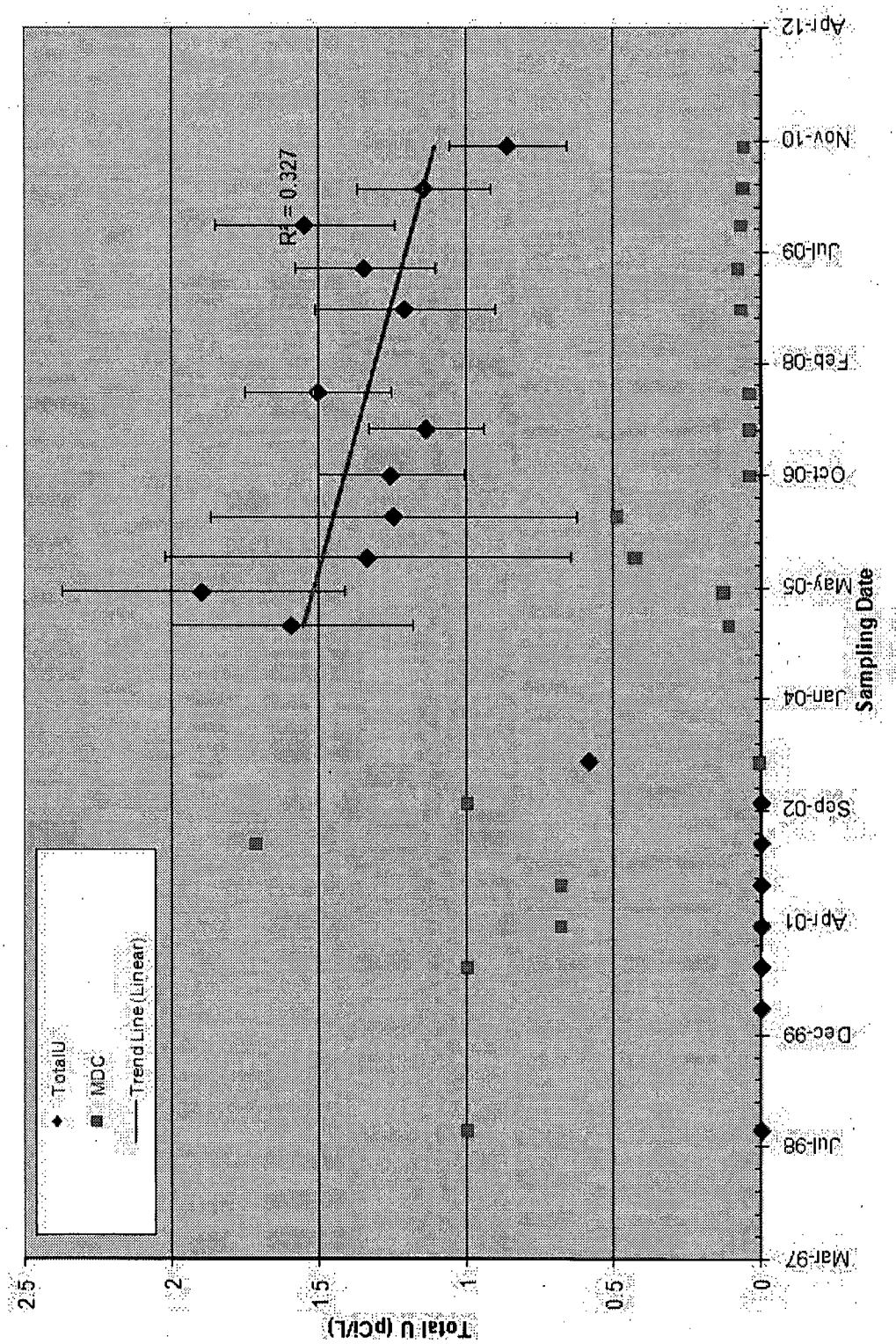
MDC – Minimum Detectable Concentration

Figure 4-7. Total Uranium in MW-DU-007 (1998-2010)



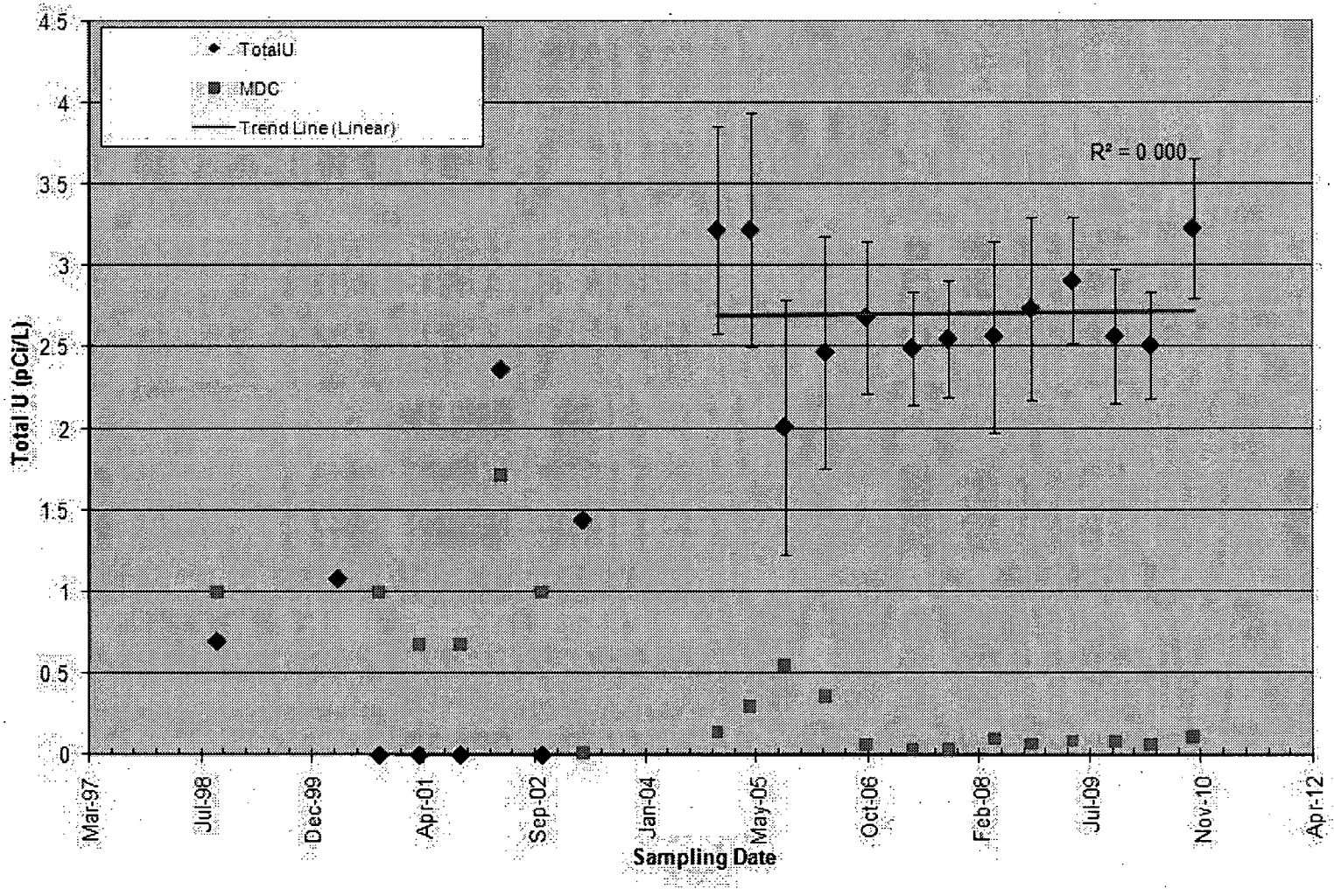
MDC – Minimum Detectable Concentration

Figure 4-8. Total Uranium in MW-DU-008 (1998-2010)



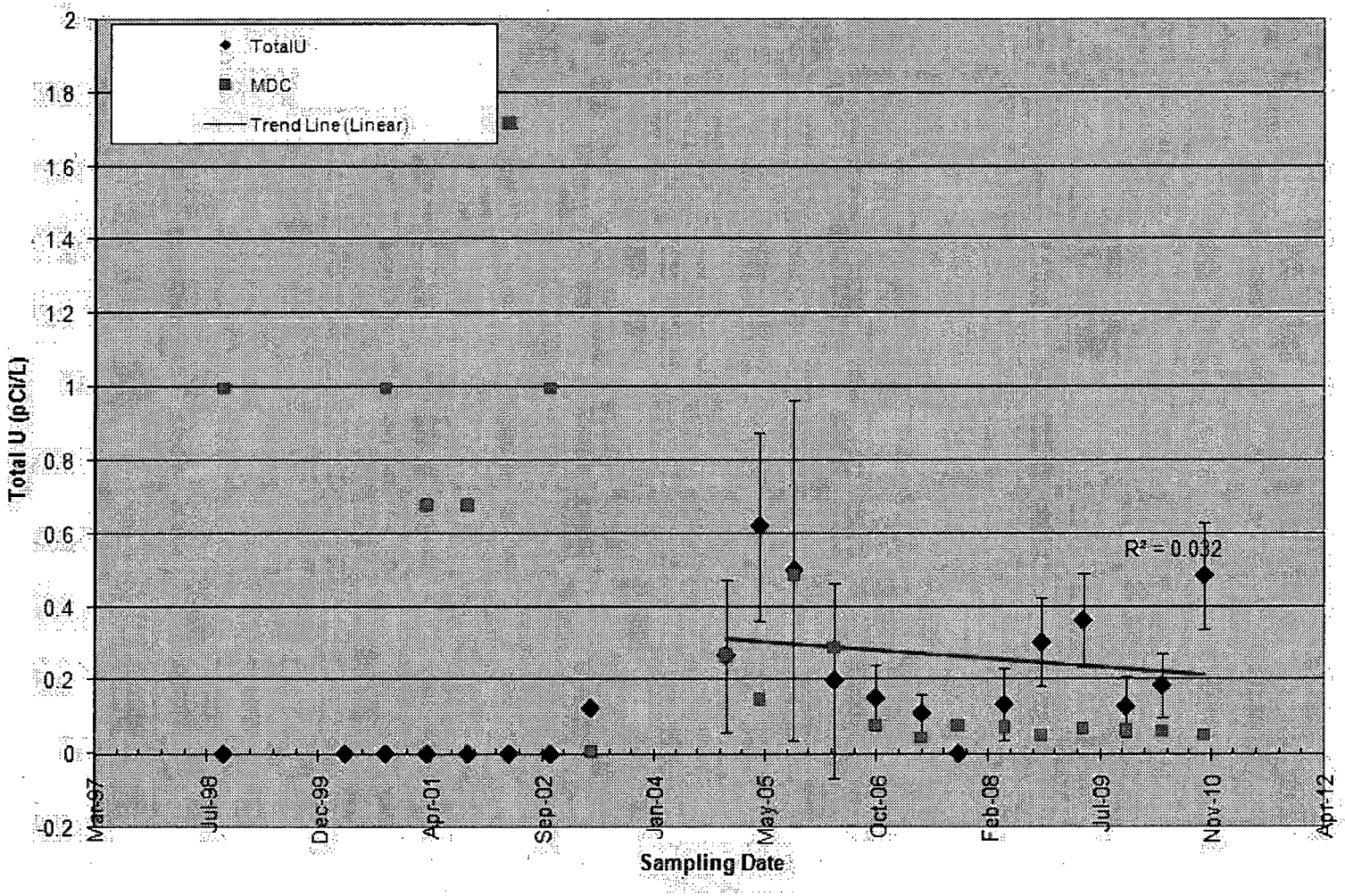
MDC – Minimum Detectable Concentration

Figure 4-9. Total Uranium in MW-DU-009 (1998-2010)



MDC – Minimum Detectable Concentration

Figure 4-10. Total Uranium in MW-DU-010 (1998-2010)



MDC – Minimum Detectable Concentration
NOTE: Uranium was not detected in the October 2007 sample.

Figure 4-11. Total Uranium in MW-DU-011 (1998-2010)

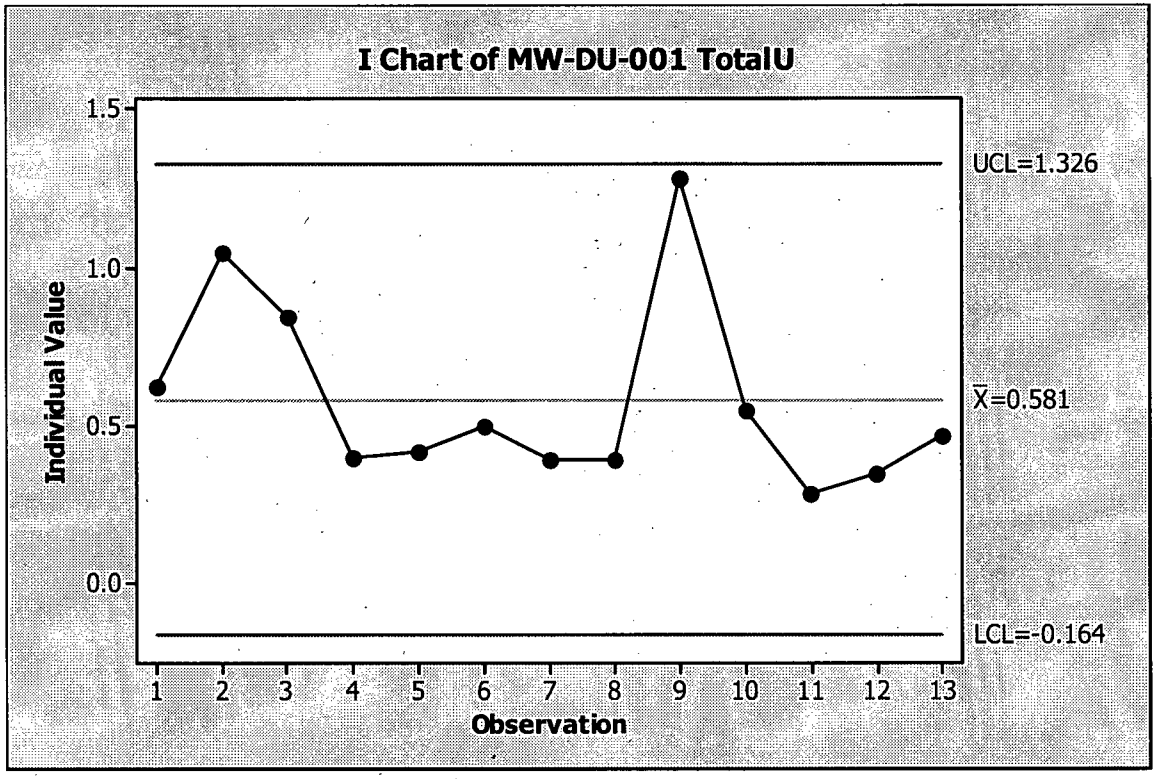


Figure 4-12. Variable Control Chart for Total Uranium in MW-DU-001 (2004-2010)

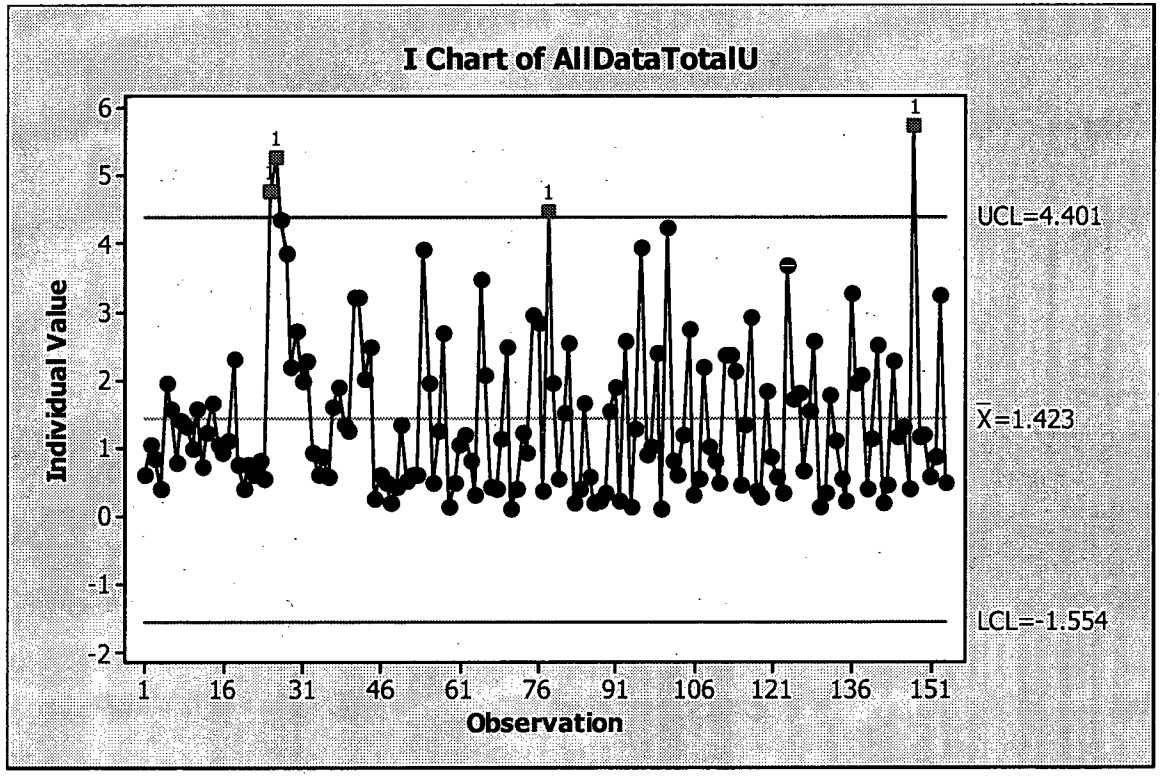
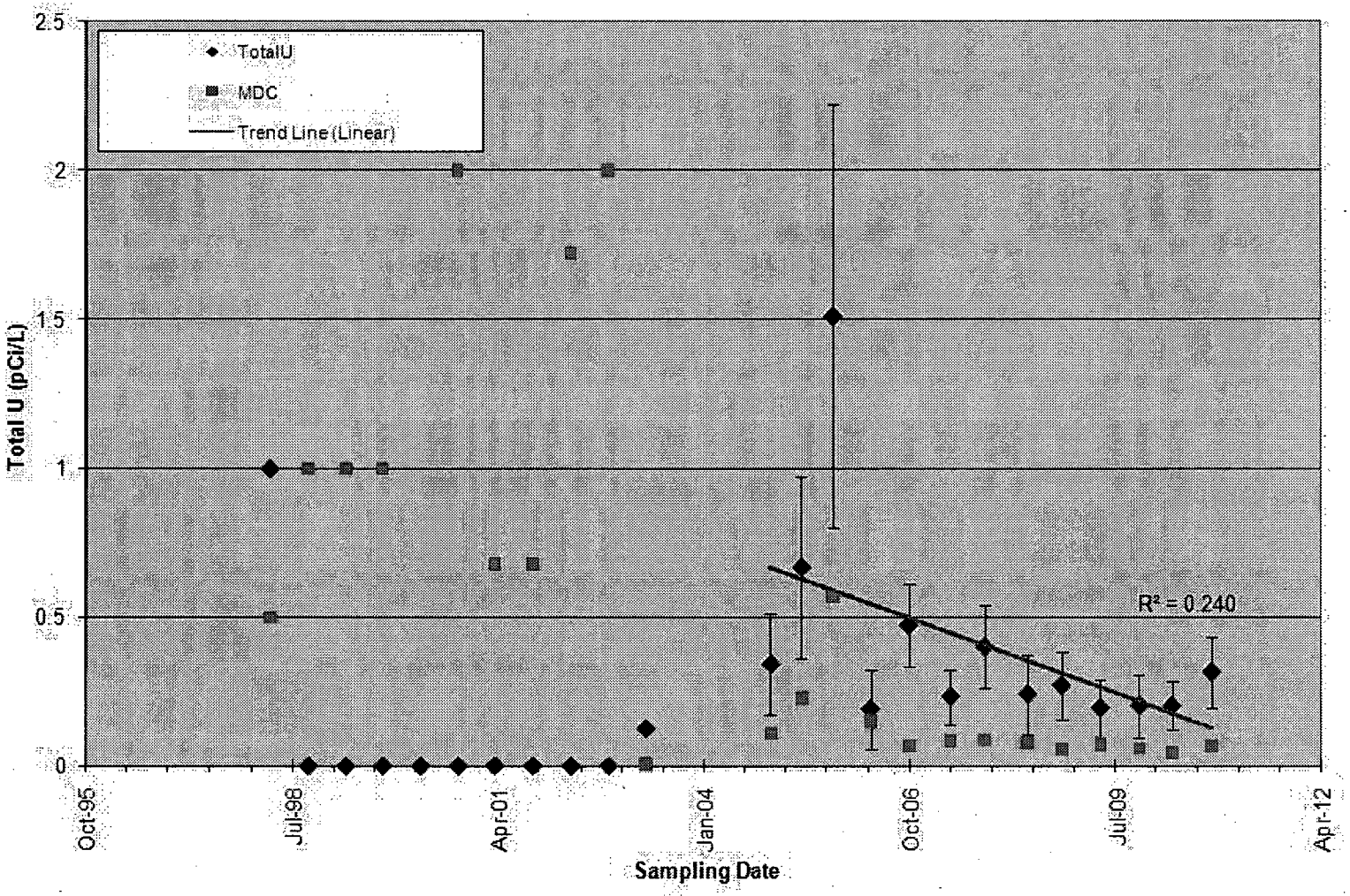
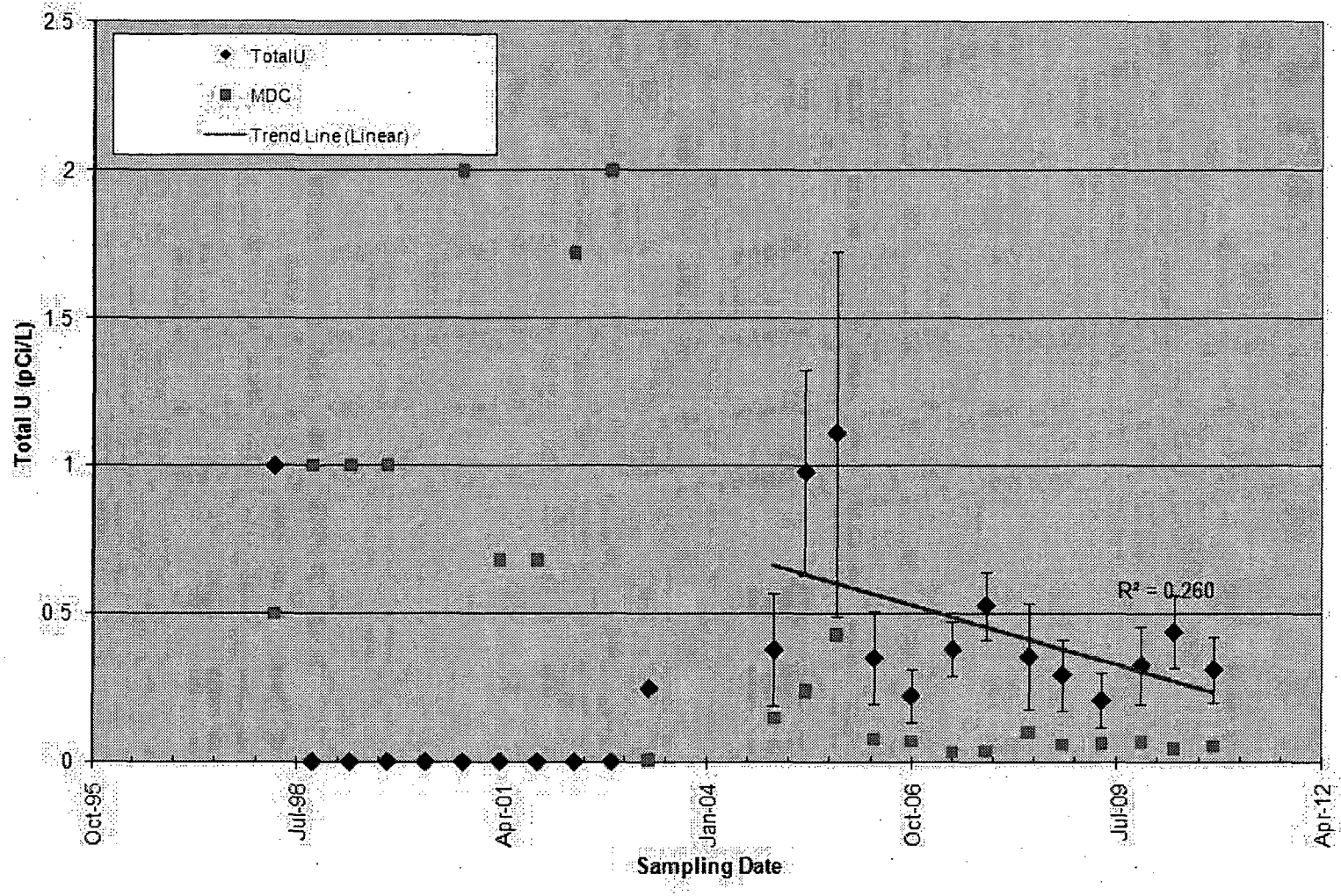


Figure 4-13. Control Chart for All Monitoring Well Data (2004-2010)



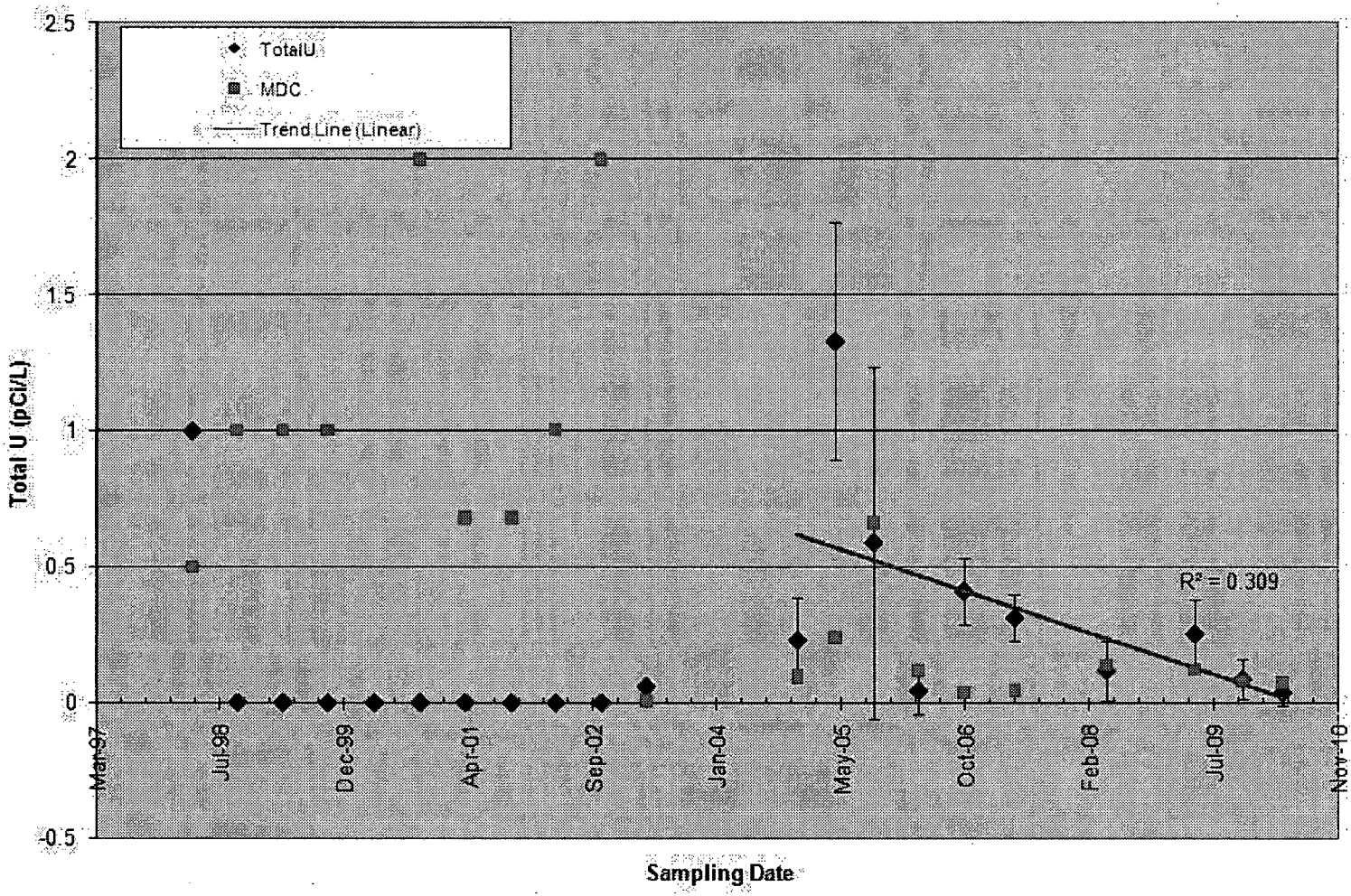
MDC – Minimum Detectable Concentration

Figure 4-14. Total Uranium in SW-DU-001 (1998-2010)



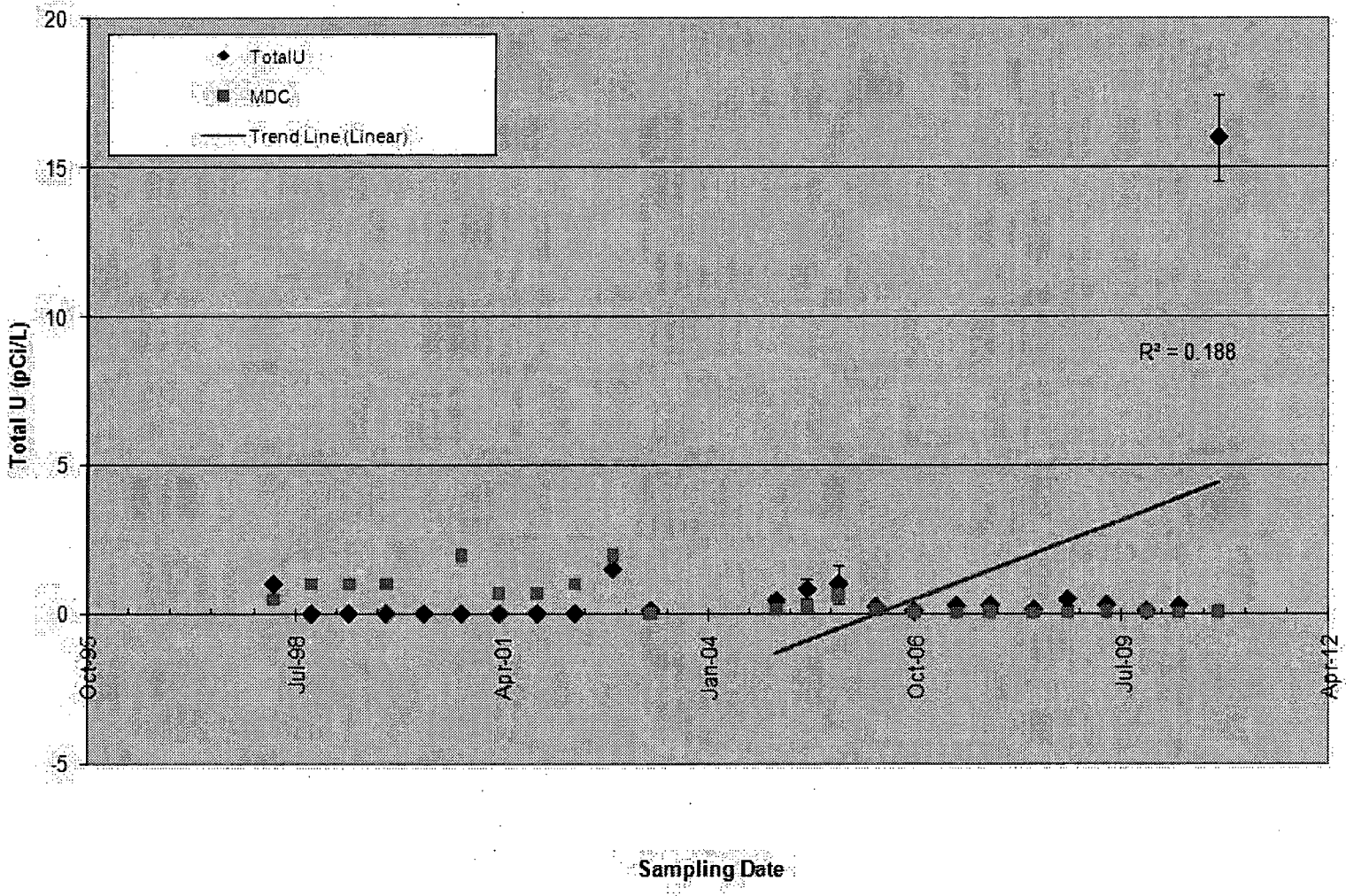
MDC – Minimum Detectable Concentration

Figure 4-15. Total Uranium in SW-DU-002 (1998-2010)



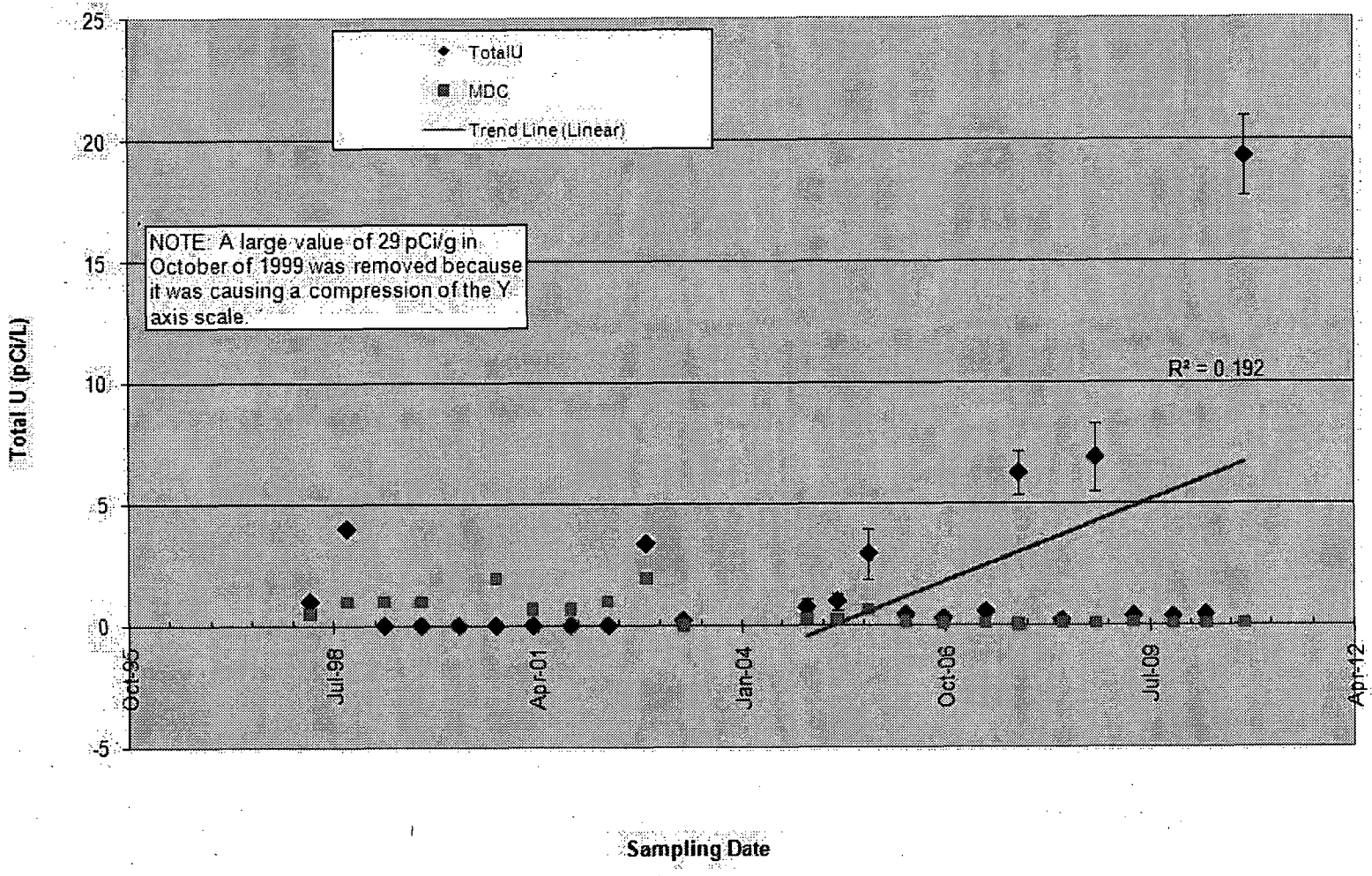
MDC – Minimum Detectable Concentration
NOTE: No sample was collected in October 2007, October 2008, or October 2010 as the creek was dry.

Figure 4-16. Total Uranium in SW-DU-003 (1998-2010)



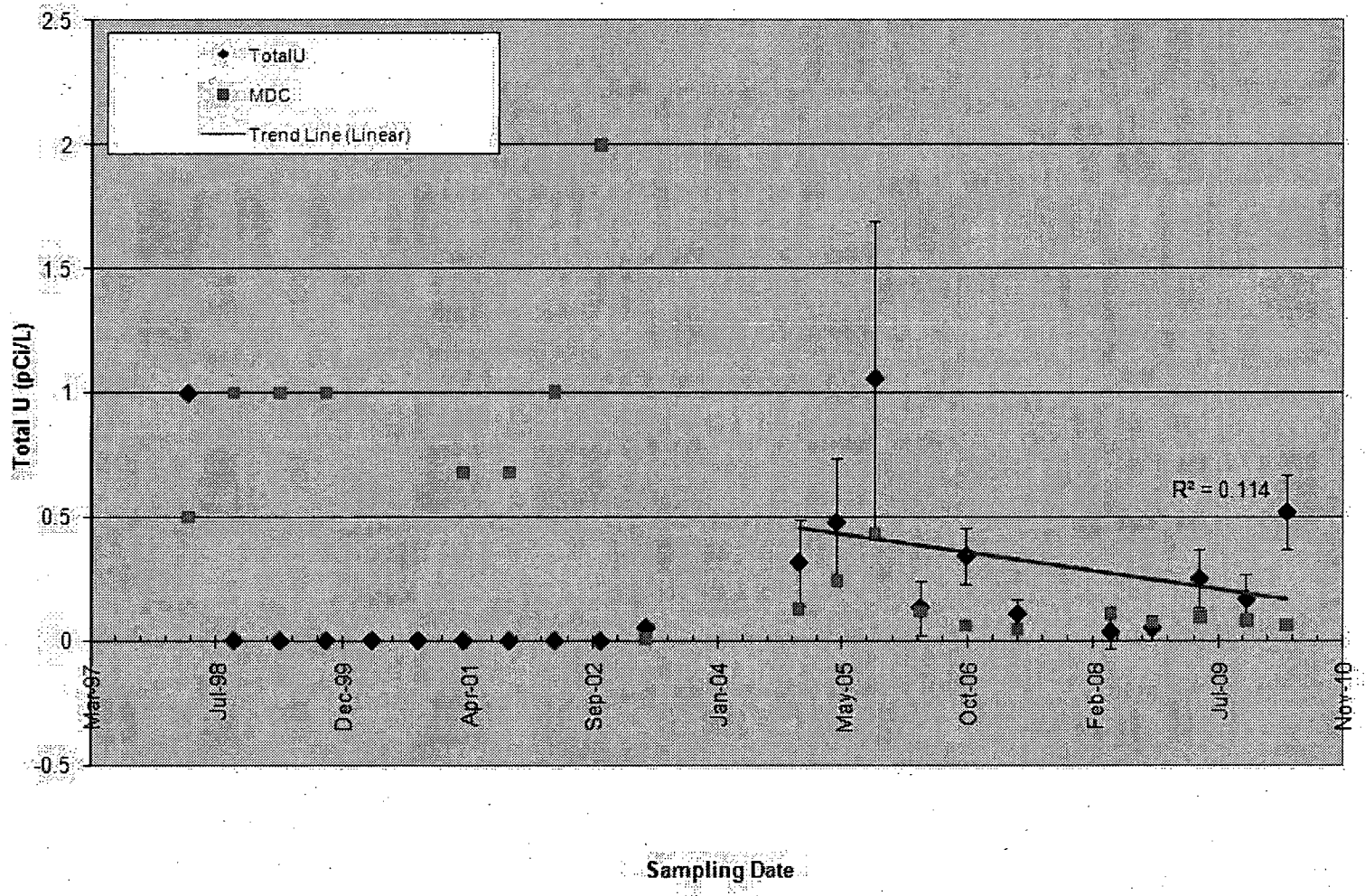
MDC – Minimum Detectable Concentration

Figure 4-17. Total Uranium in SW-DU-004 (1998-2010)



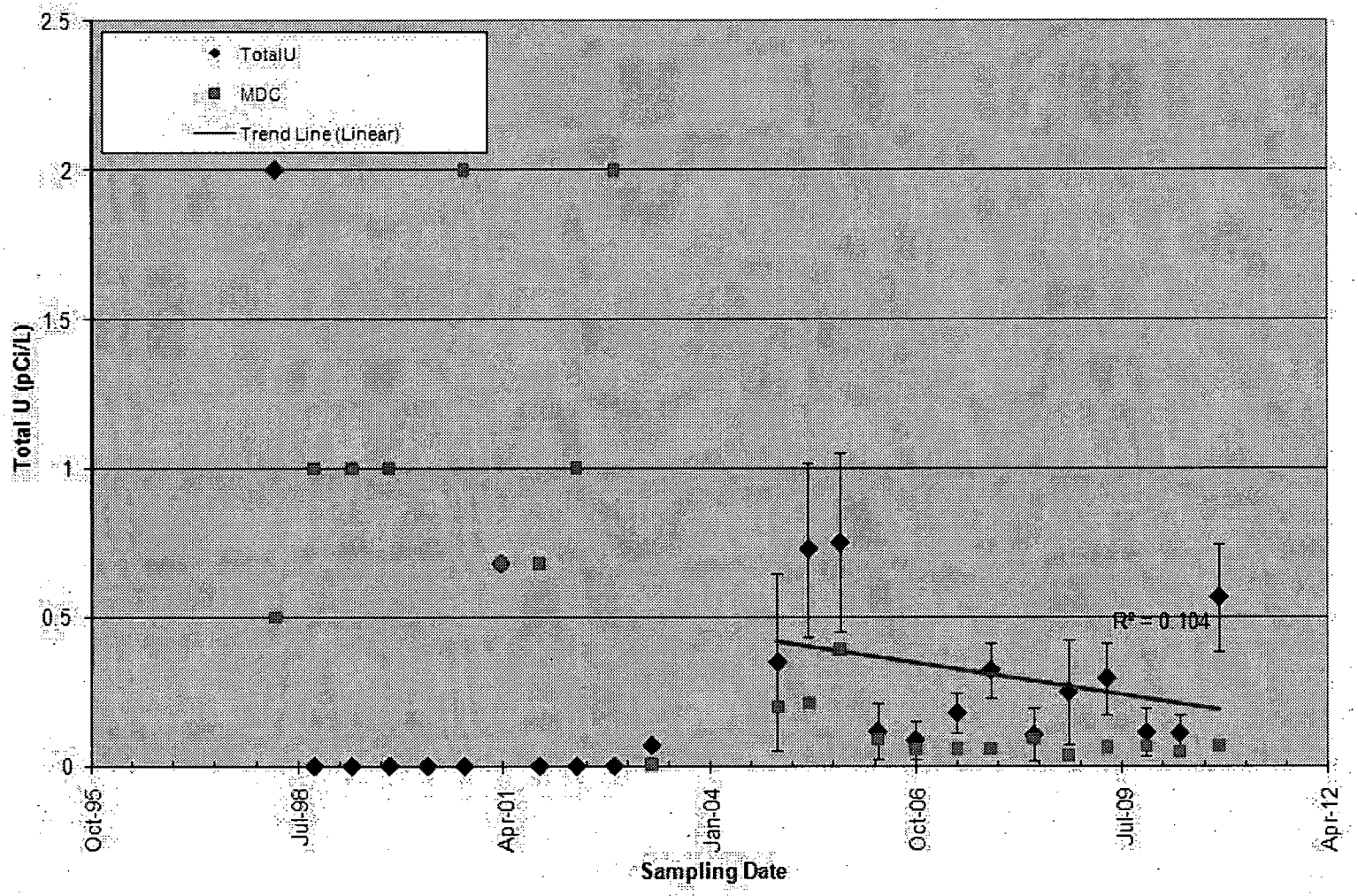
MDC – Minimum Detectable Concentration

Figure 4-18. Total Uranium in SW-DU-005 (1998-2010)



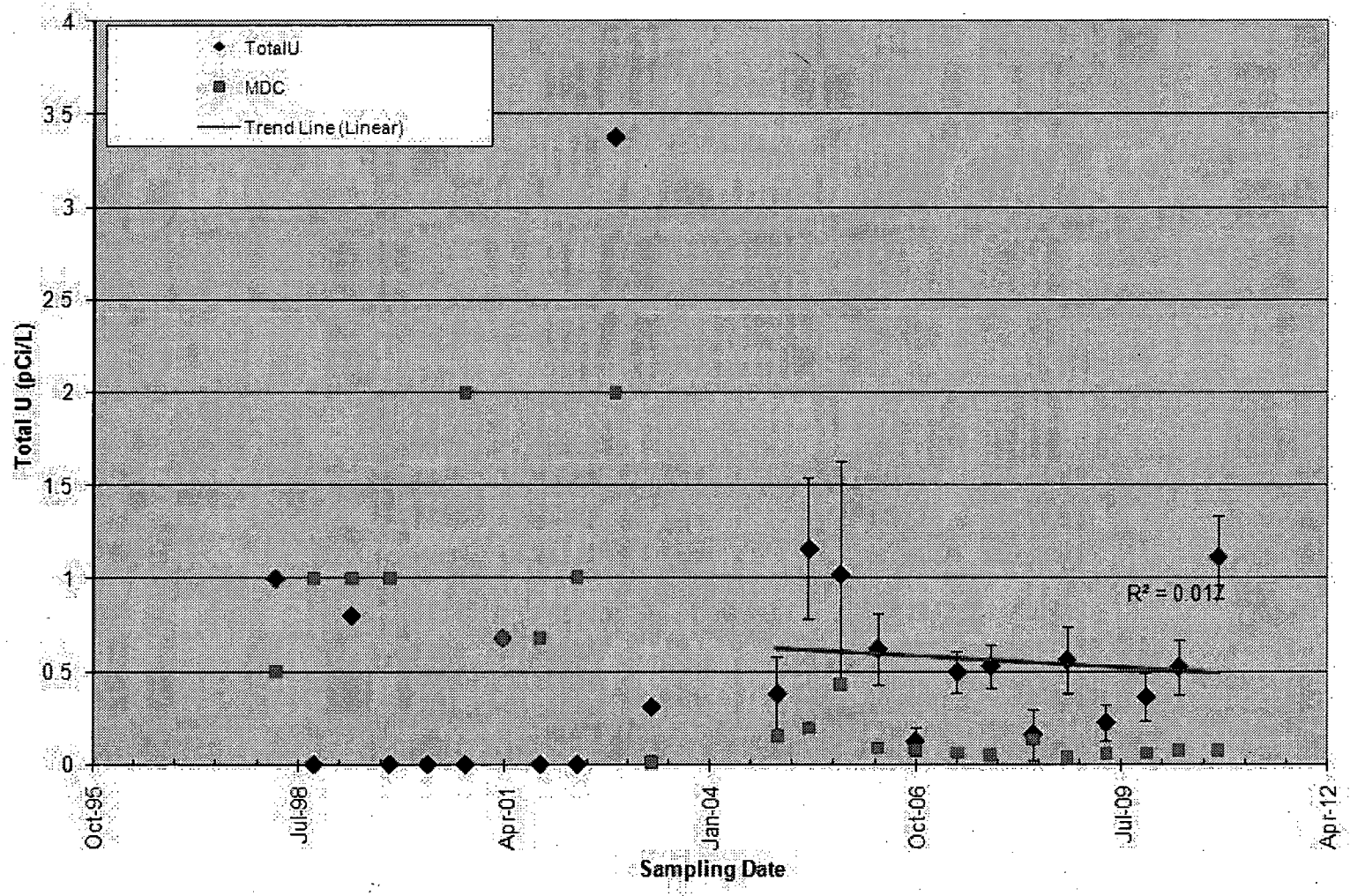
MDC – Minimum Detectable Concentration
NOTE: No sample was collected in October 2007 or October 2010 as the creek was dry.

Figure 4-19. Total Uranium in SW-DU-006 (1998-2010)



MDC – Minimum Detectable Concentration

Figure 4-20. Total Uranium in SW-DU-007 (1998-2010)



MDC – Minimum Detectable Concentration

Figure 4-21. Total Uranium in SW-DU-008 (1998-2010)

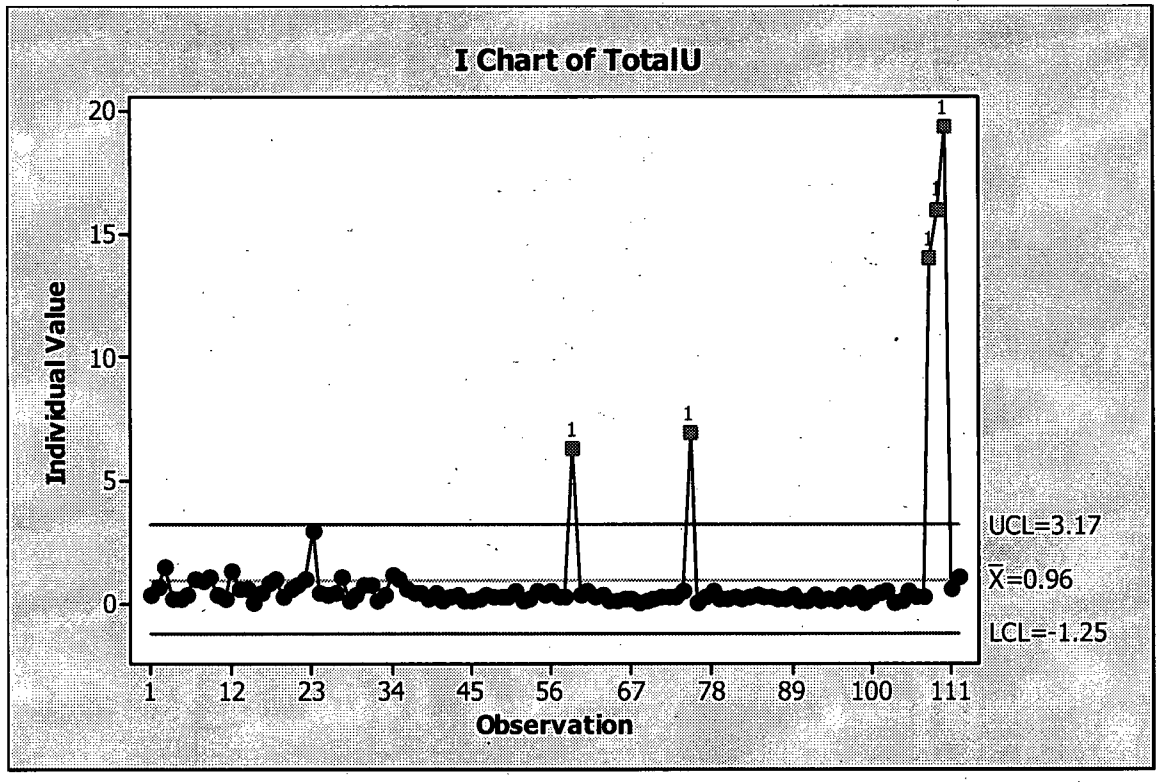
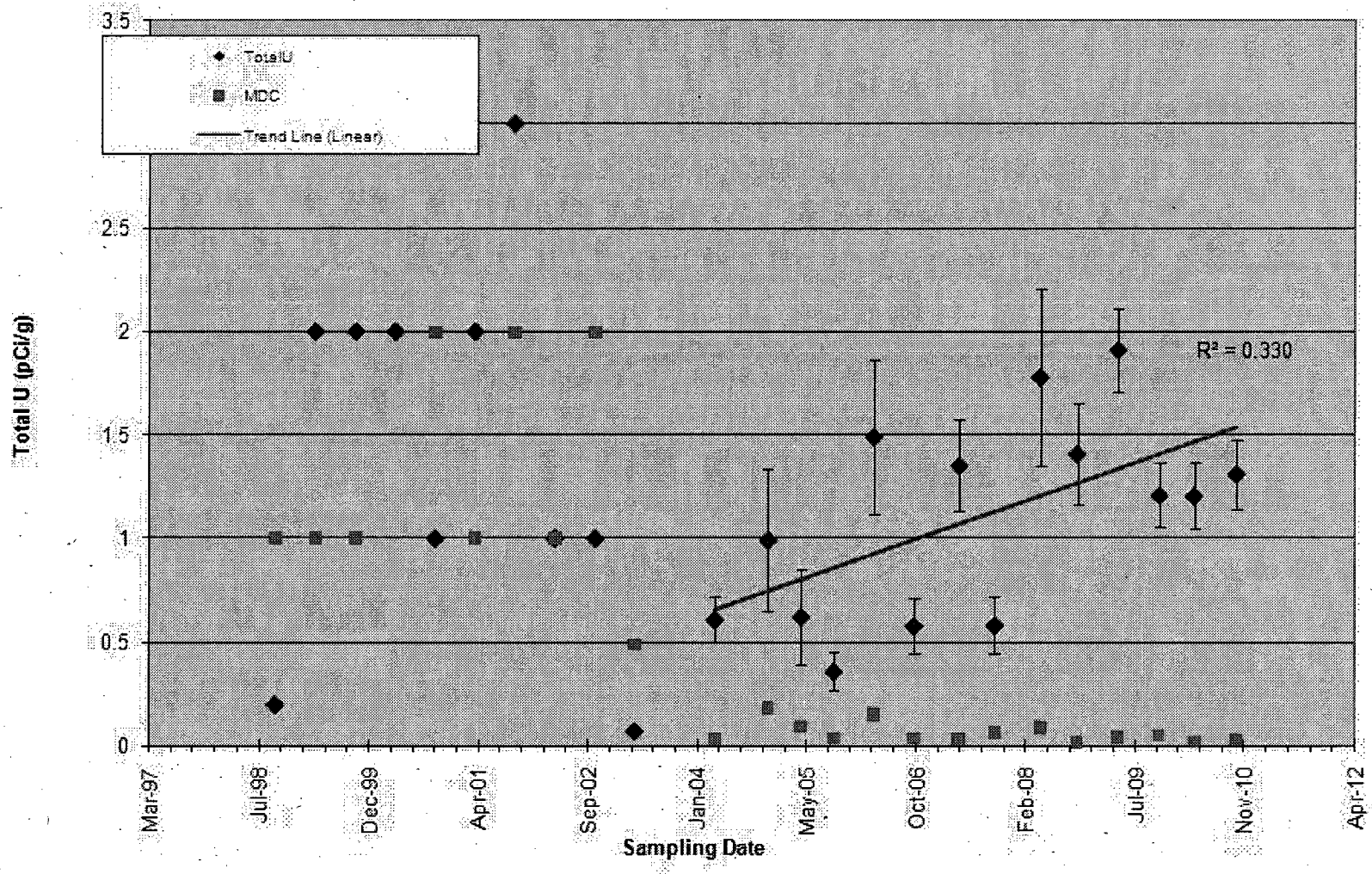
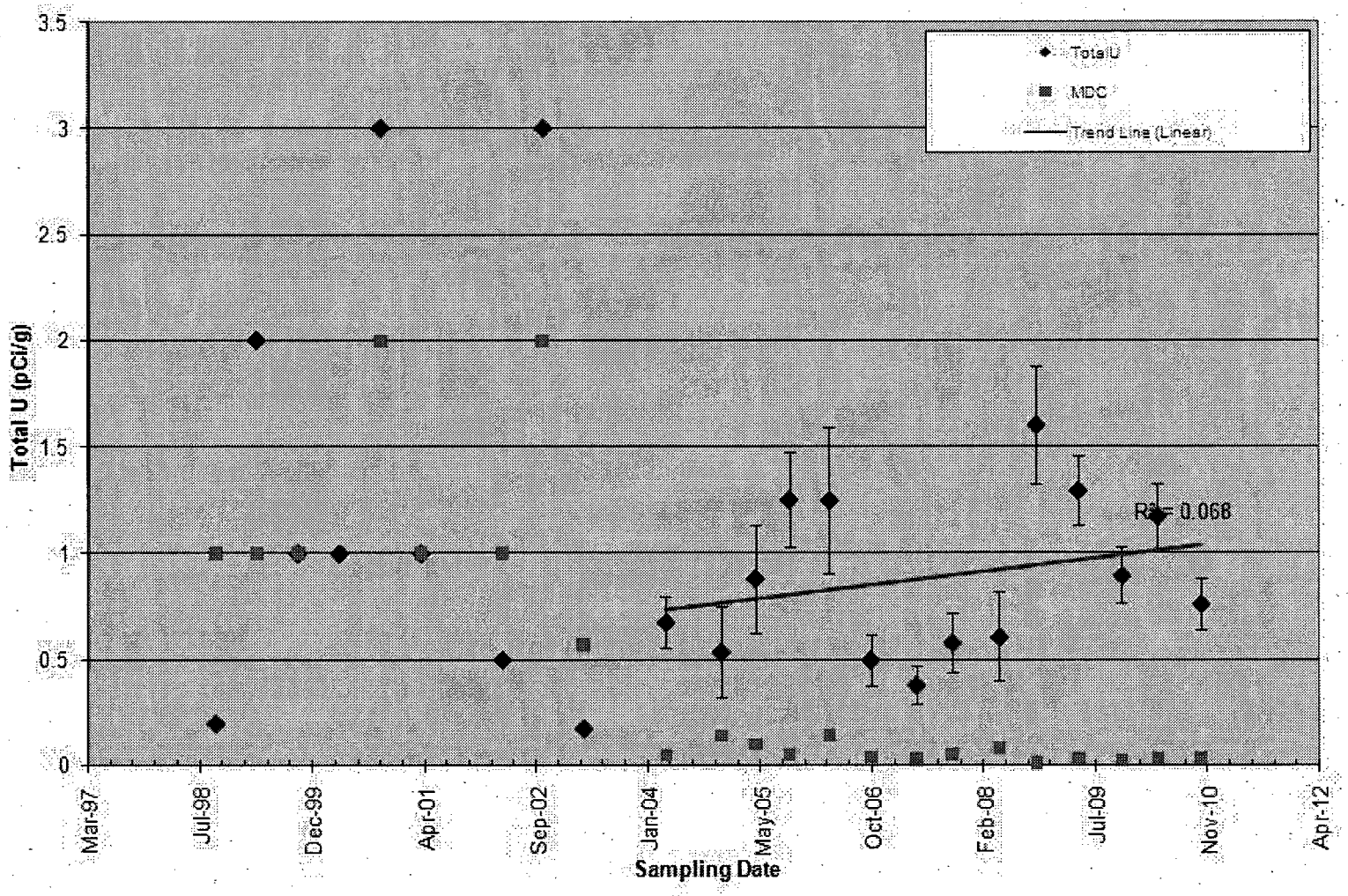


Figure 4-22. Control Chart for All Surface Water Data (2004-2010)



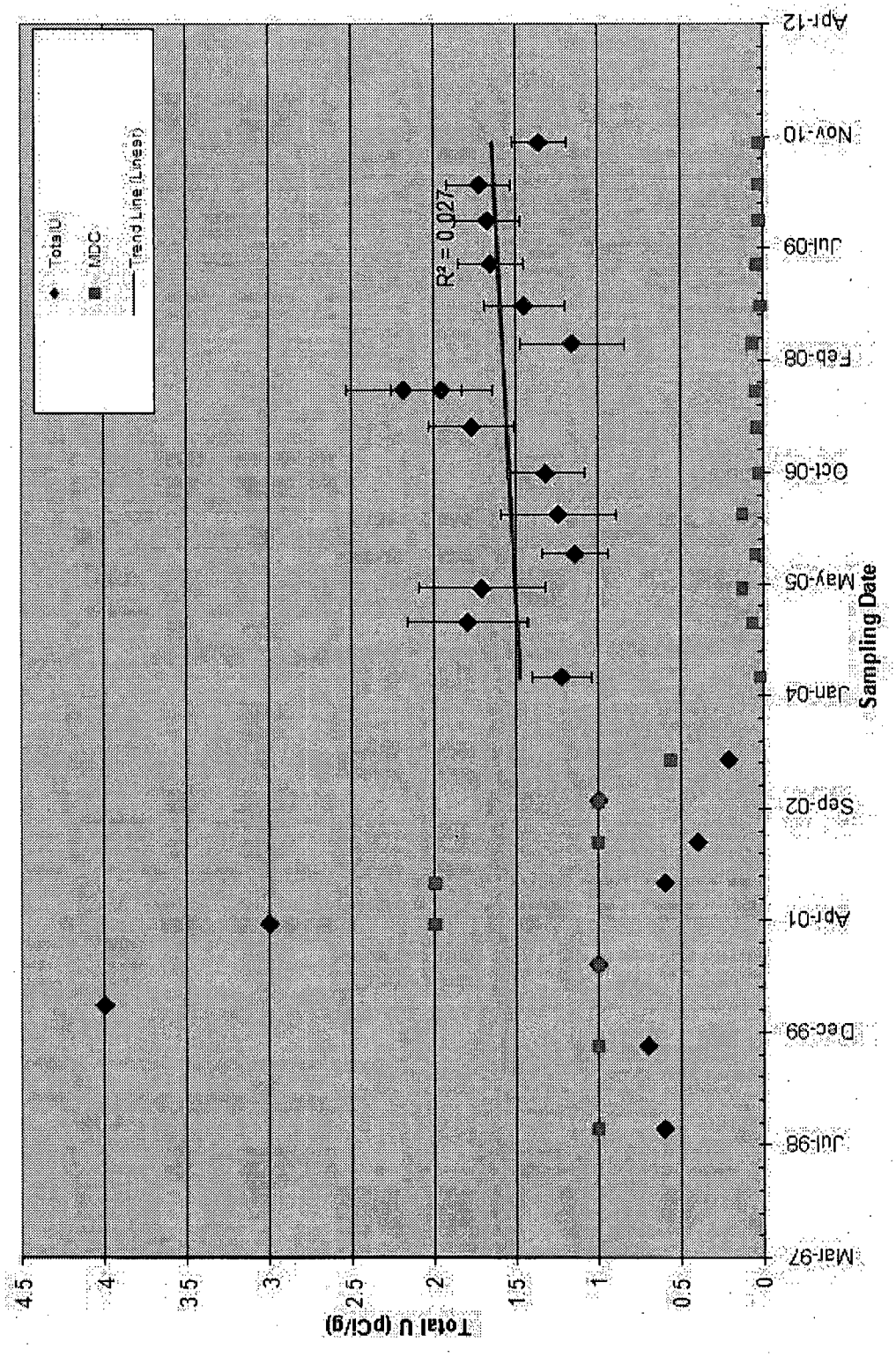
MDC – Minimum Detectable Concentration

Figure 4-23. Total Uranium in SD-DU-001 (1998-2010)



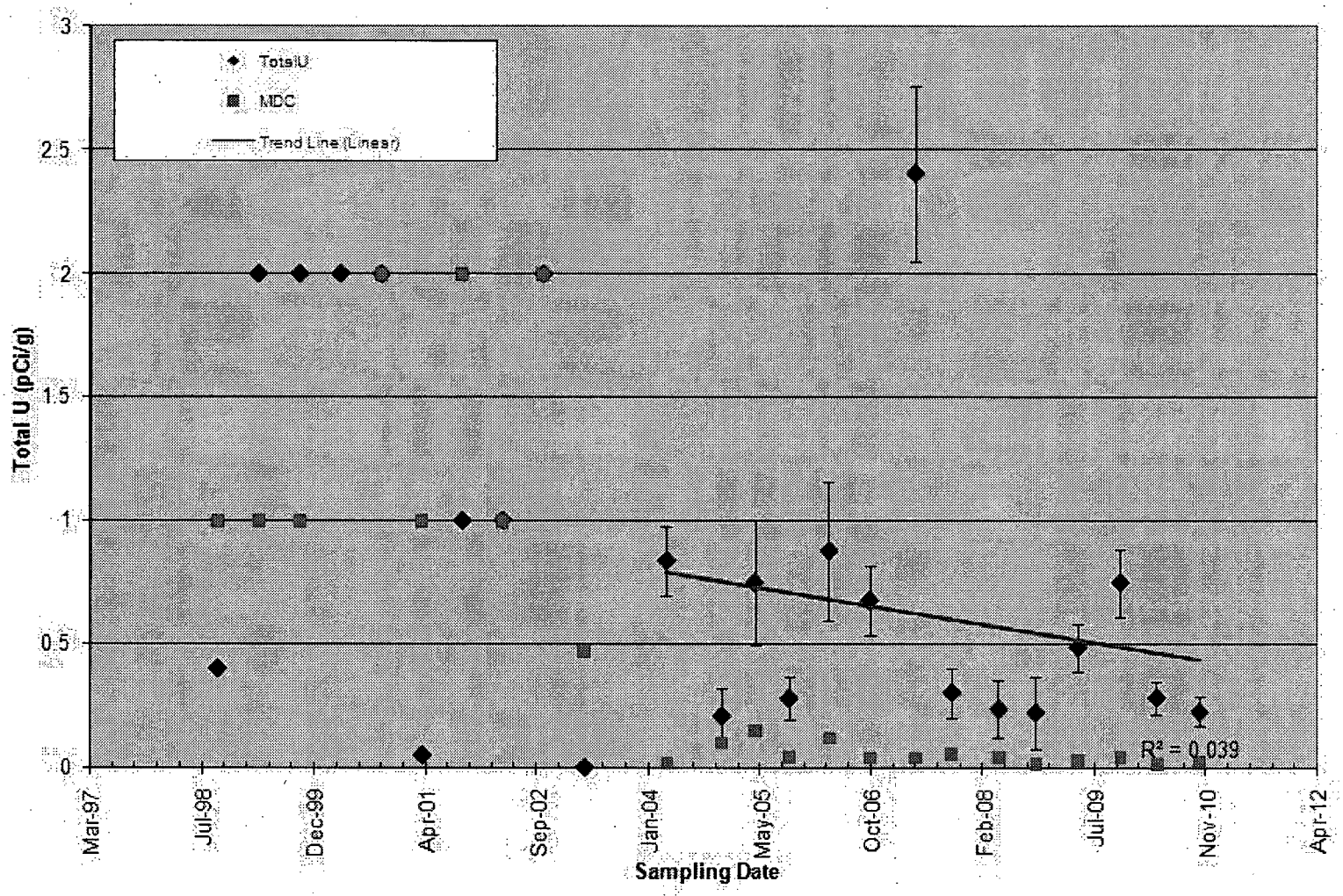
MDC – Minimum Detectable Concentration

Figure 4-24. Total Uranium in SD-DU-002 (1998-2010)



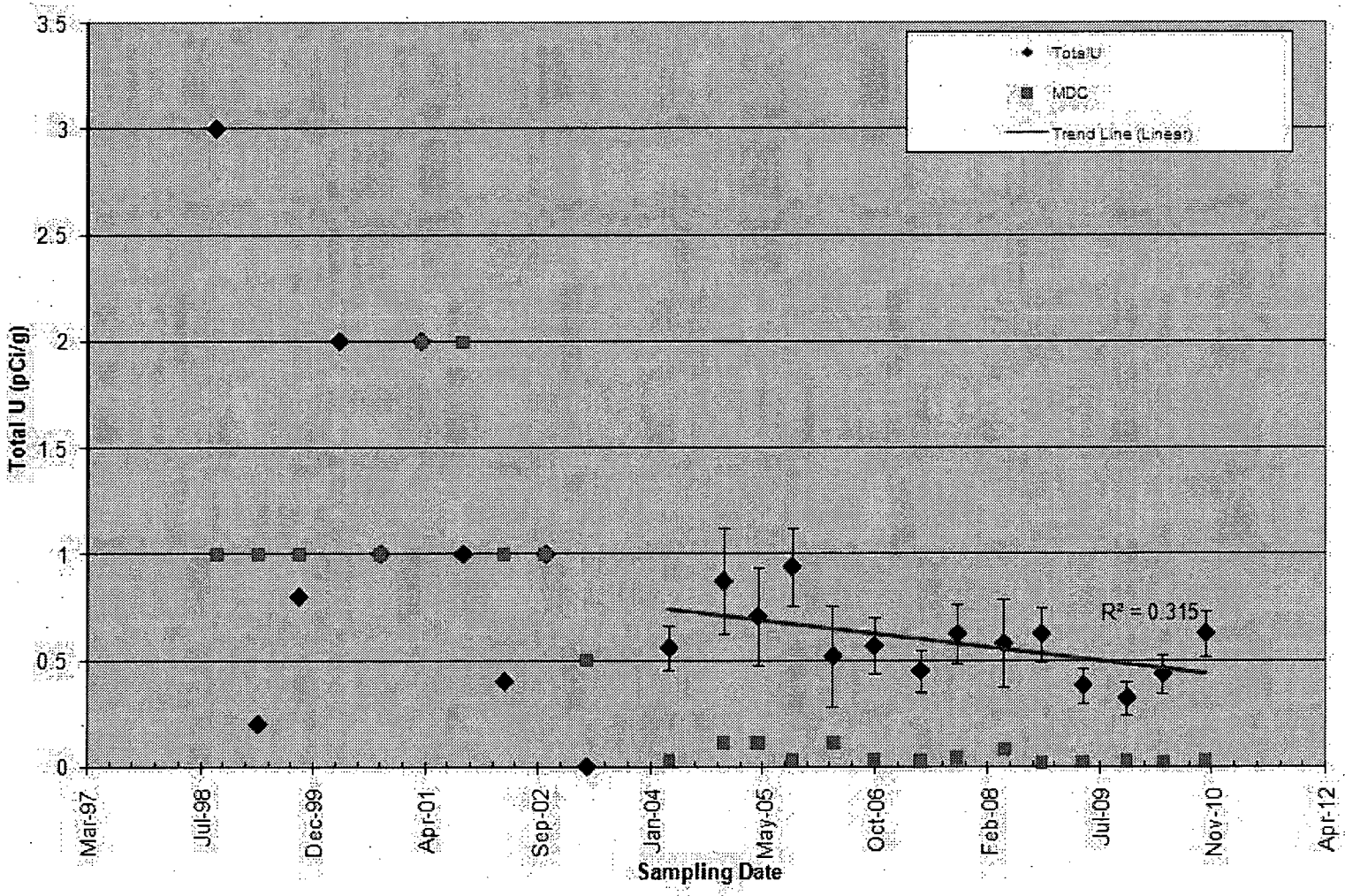
MDC – Minimum Detectable Concentration

Figure 4-25. Total Uranium in SD-DU-003 (1998-2010)



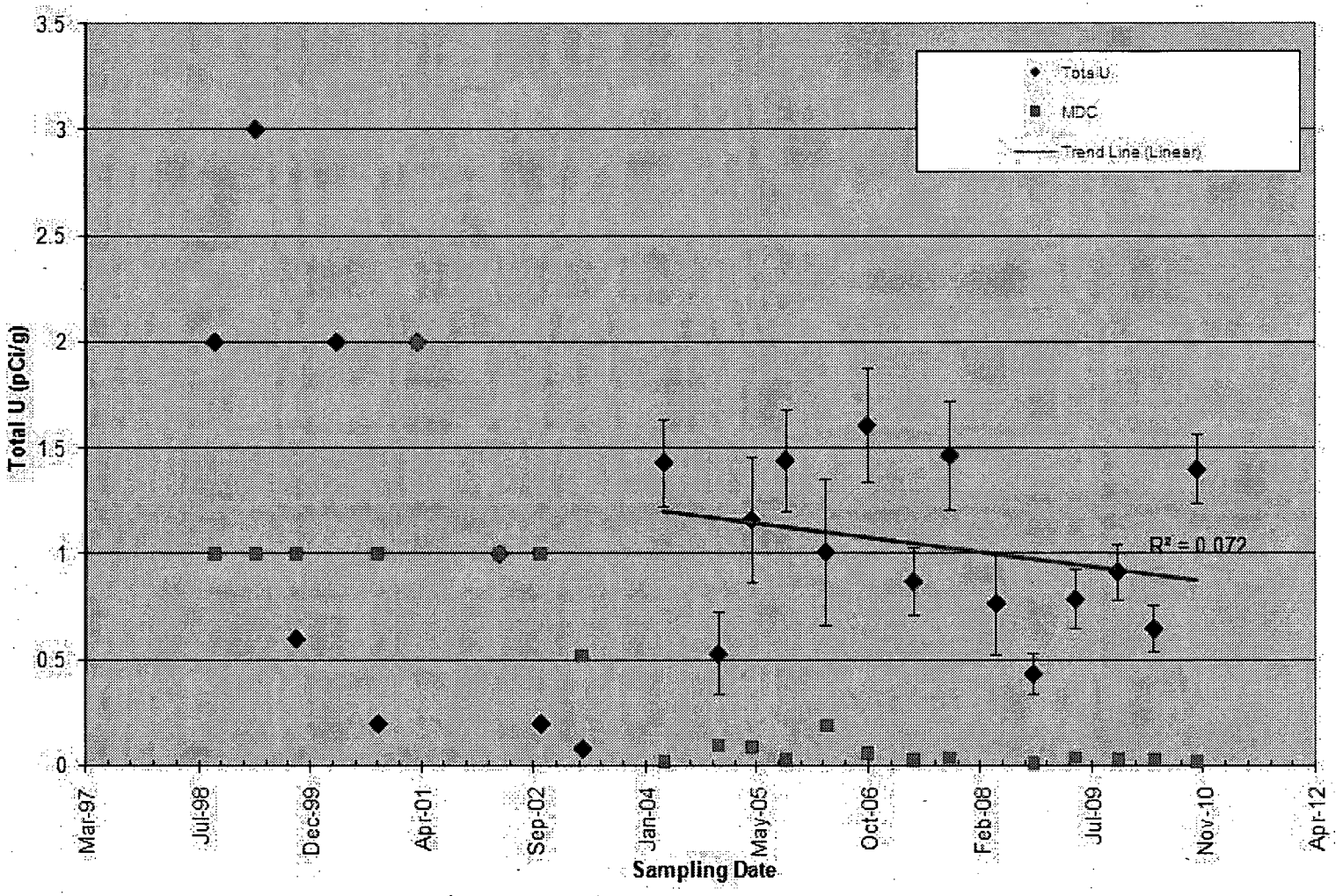
MDC – Minimum Detectable Concentration

Figure 4-26. Total Uranium in SD-DU-004 (1998-2010)



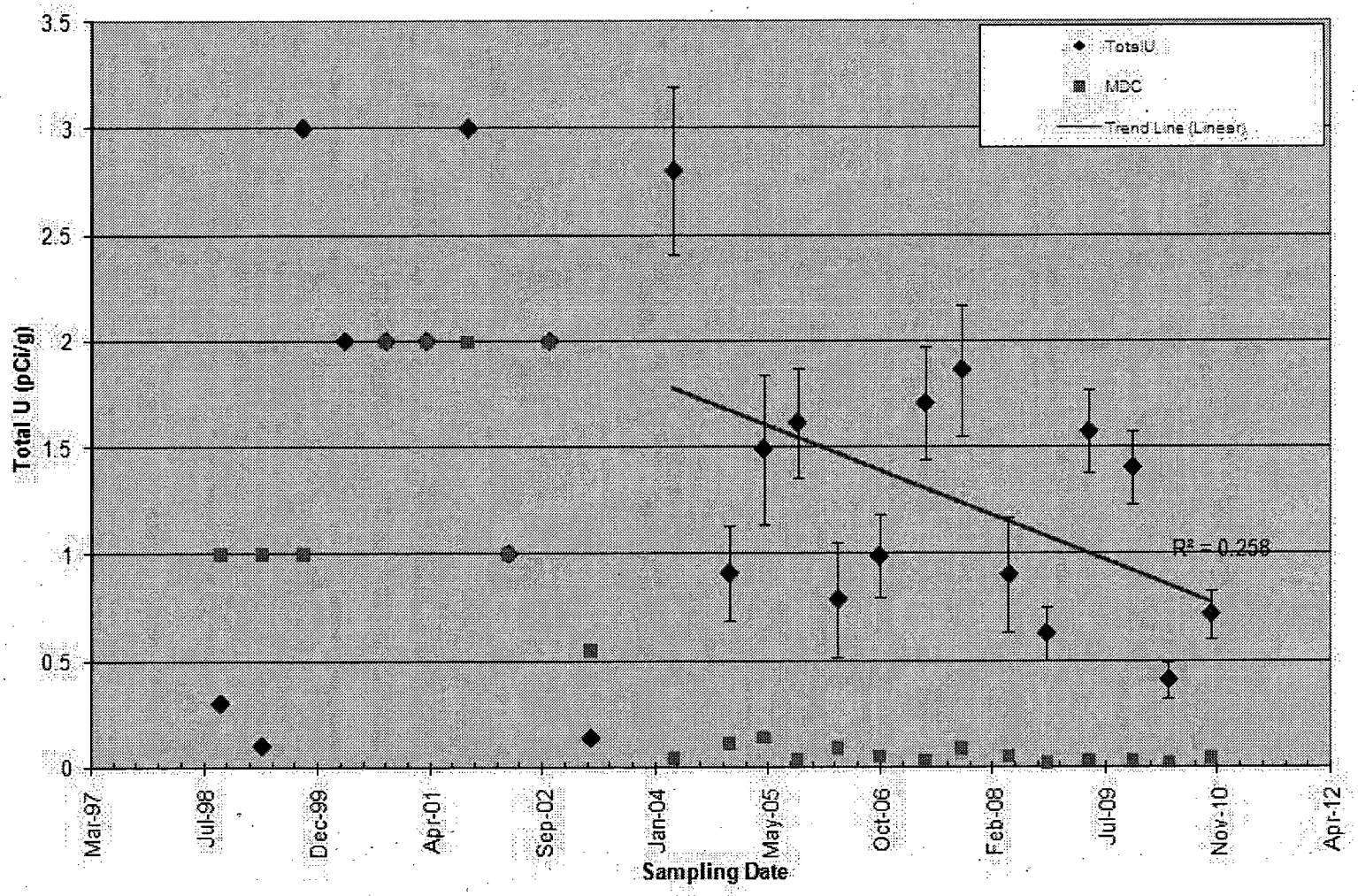
MDC – Minimum Detectable Concentration

Figure 4-27. Total Uranium in SD-DU-005 (1998-2010)



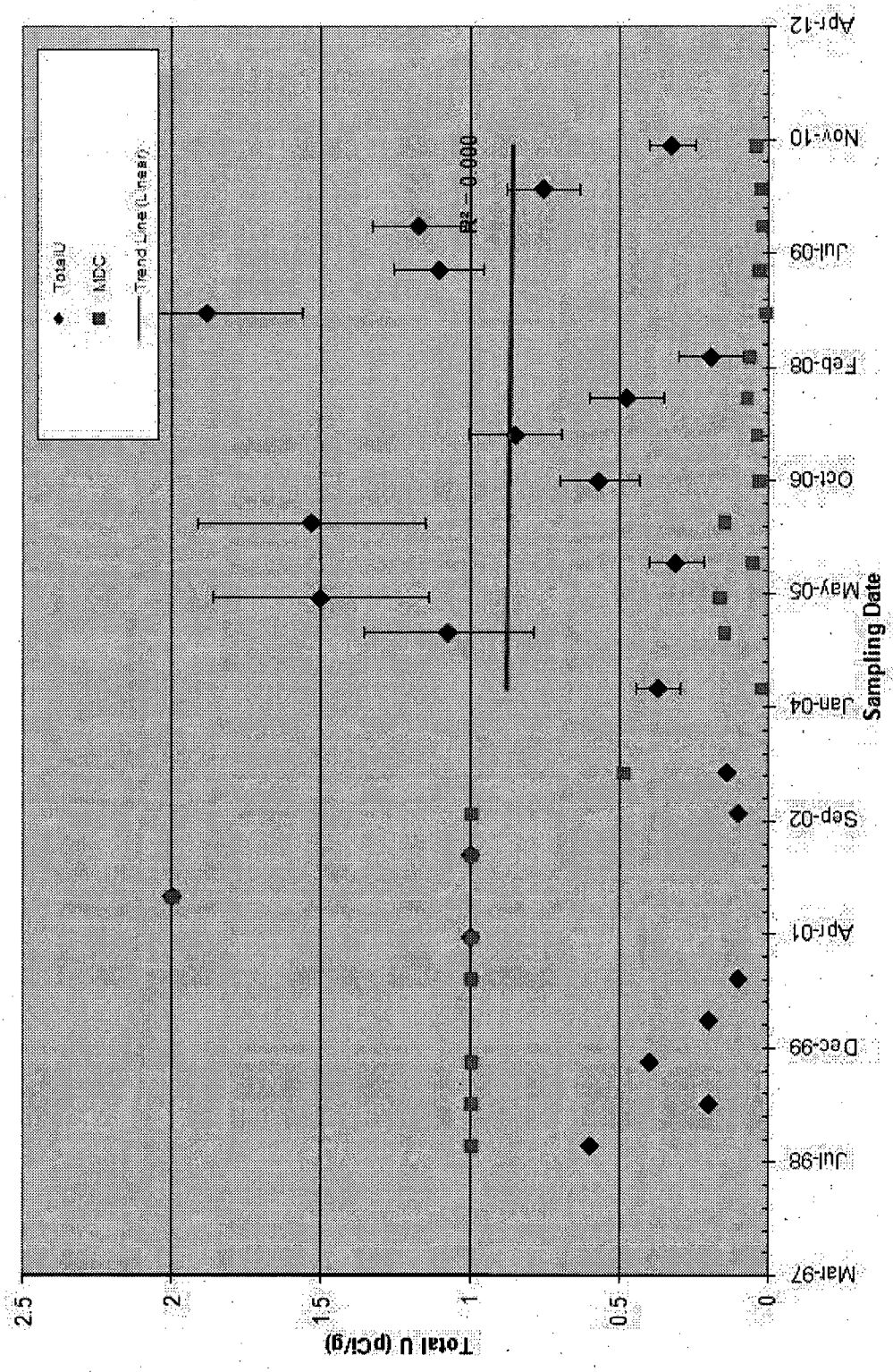
MDC – Minimum Detectable Concentration

Figure 4-28. Total Uranium in SD-DU-006 (1998-2010)



MDC – Minimum Detectable Concentration

Figure 4-29. Total Uranium in SD-DU-007 (1998-2010)



MDC – Minimum Detectable Concentration

Figure 4-30. Total Uranium in SD-DU-008 (1998-2010)

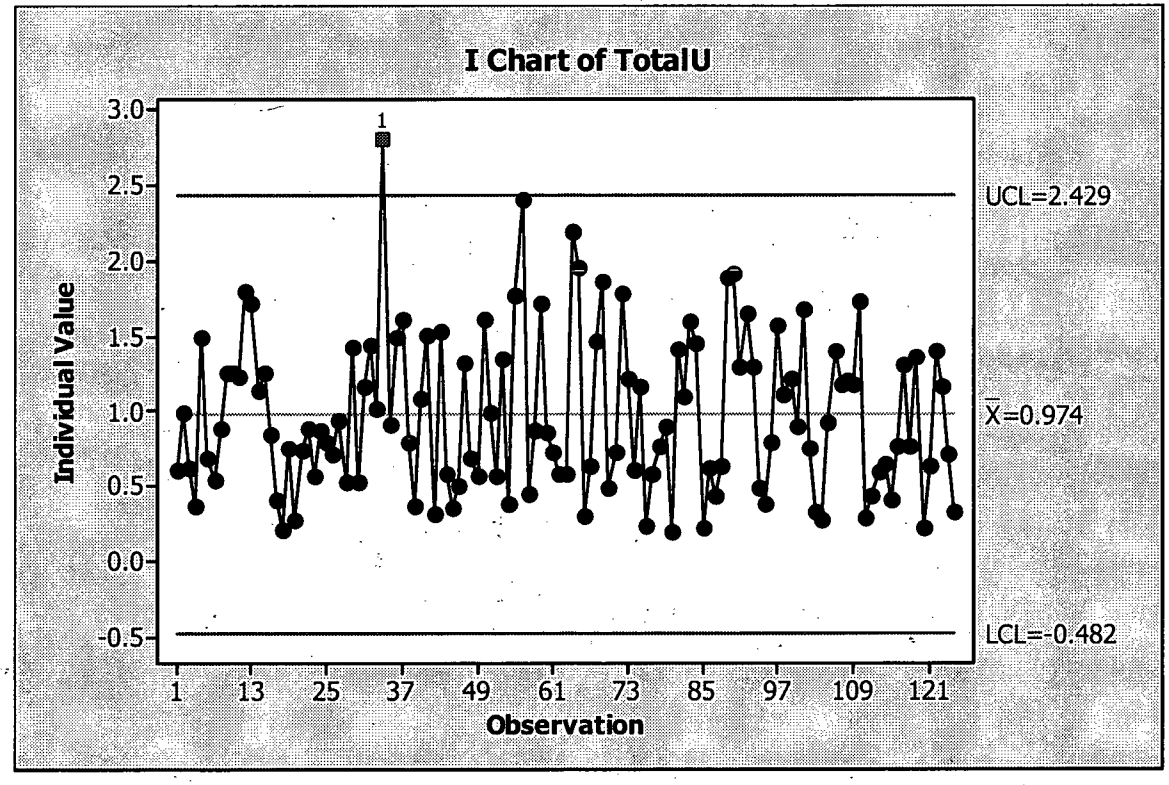
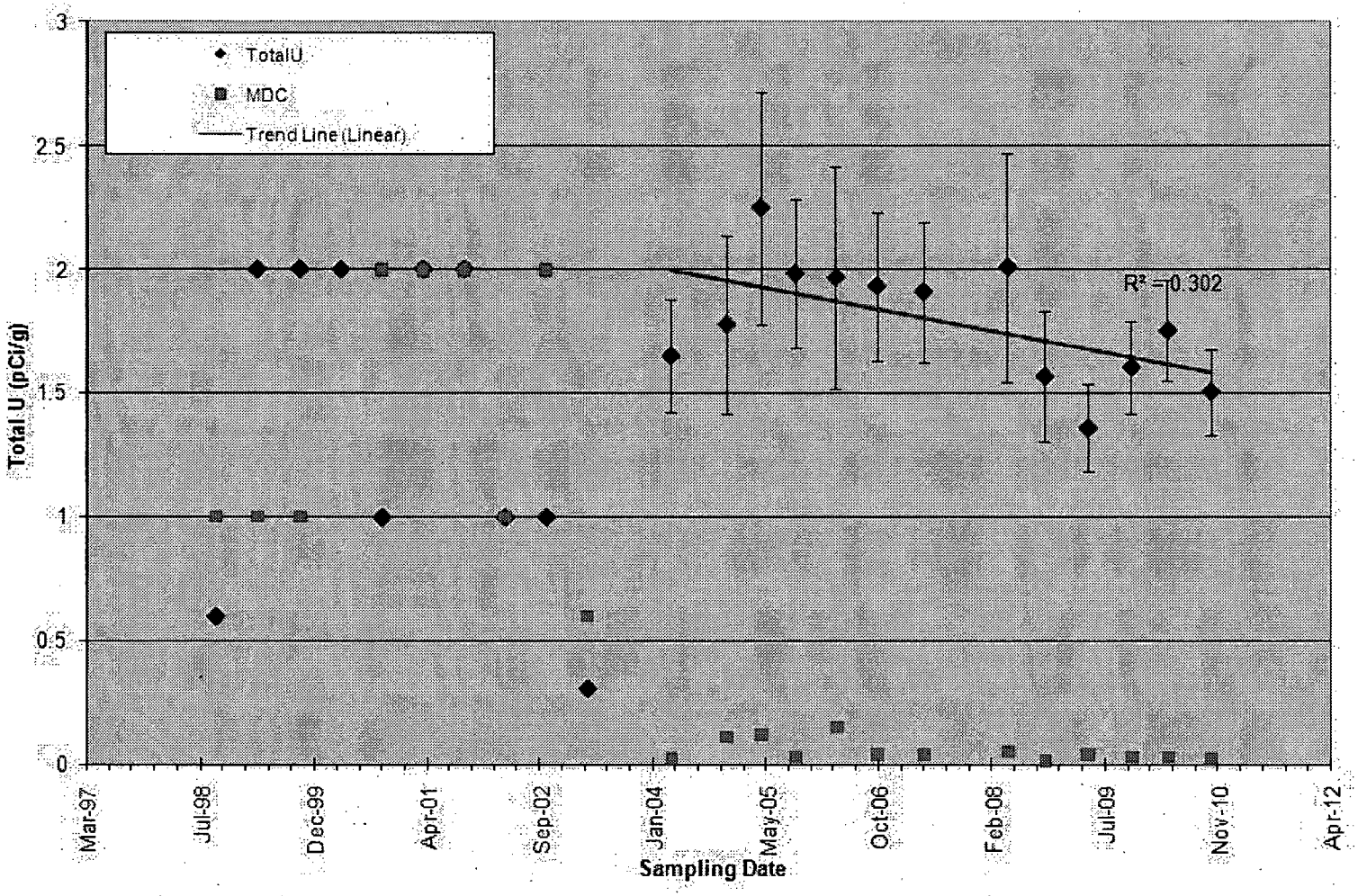
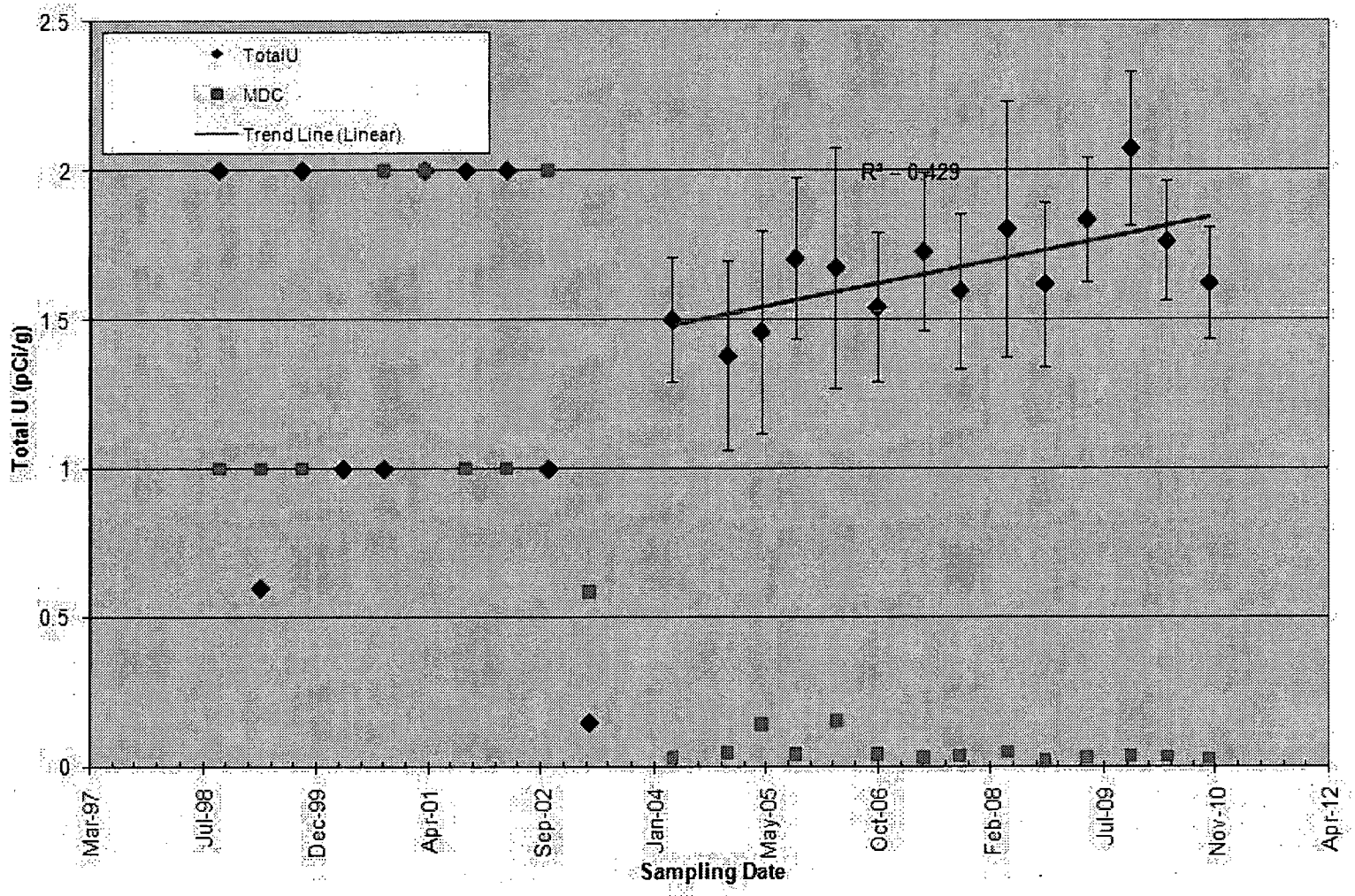


Figure 4-31. Control Chart for All Sediment Data (2004-2010)



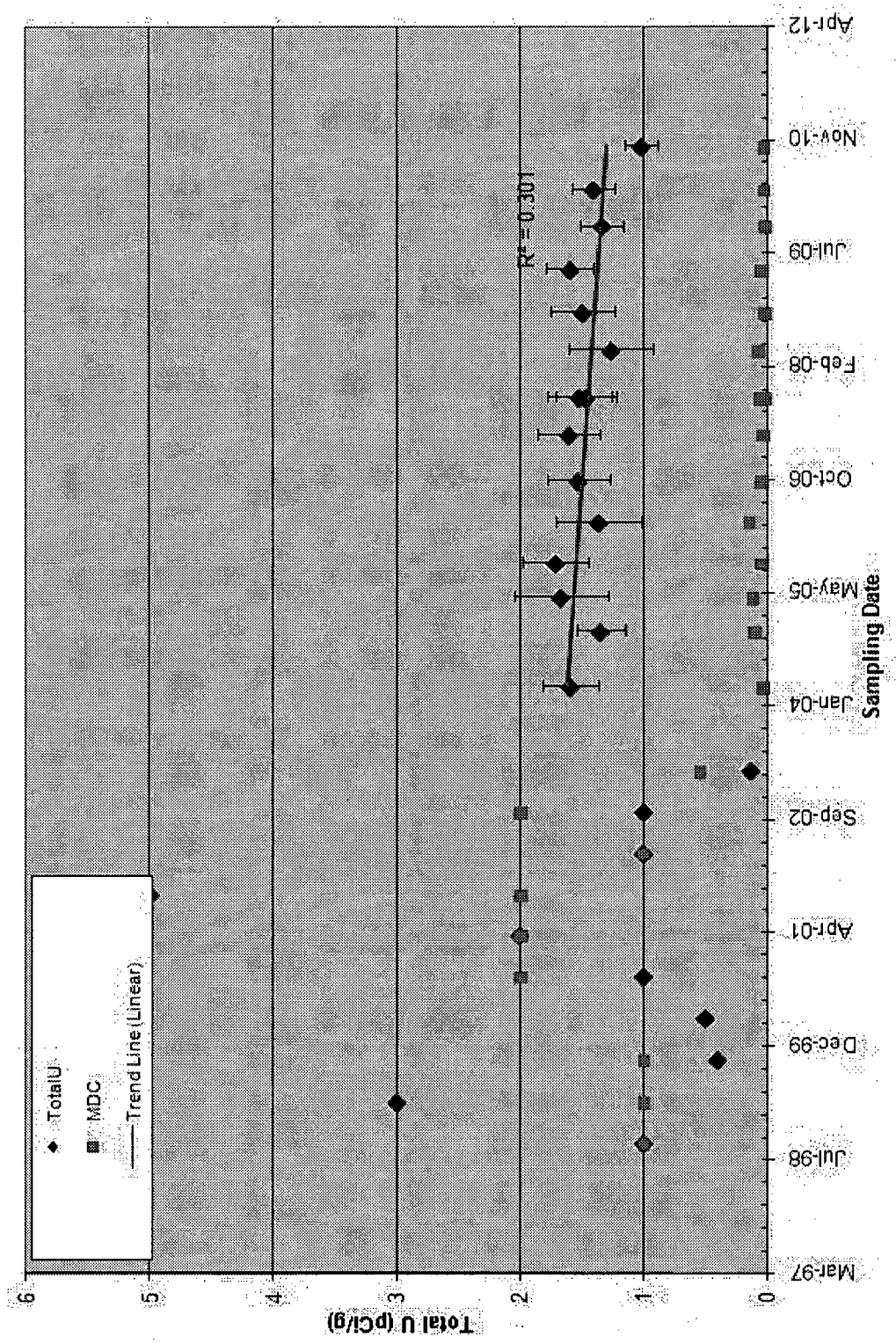
MDC – Minimum Detectable Concentration

Figure 4-32. Total Uranium in SS-DU-001 (1998-2010)



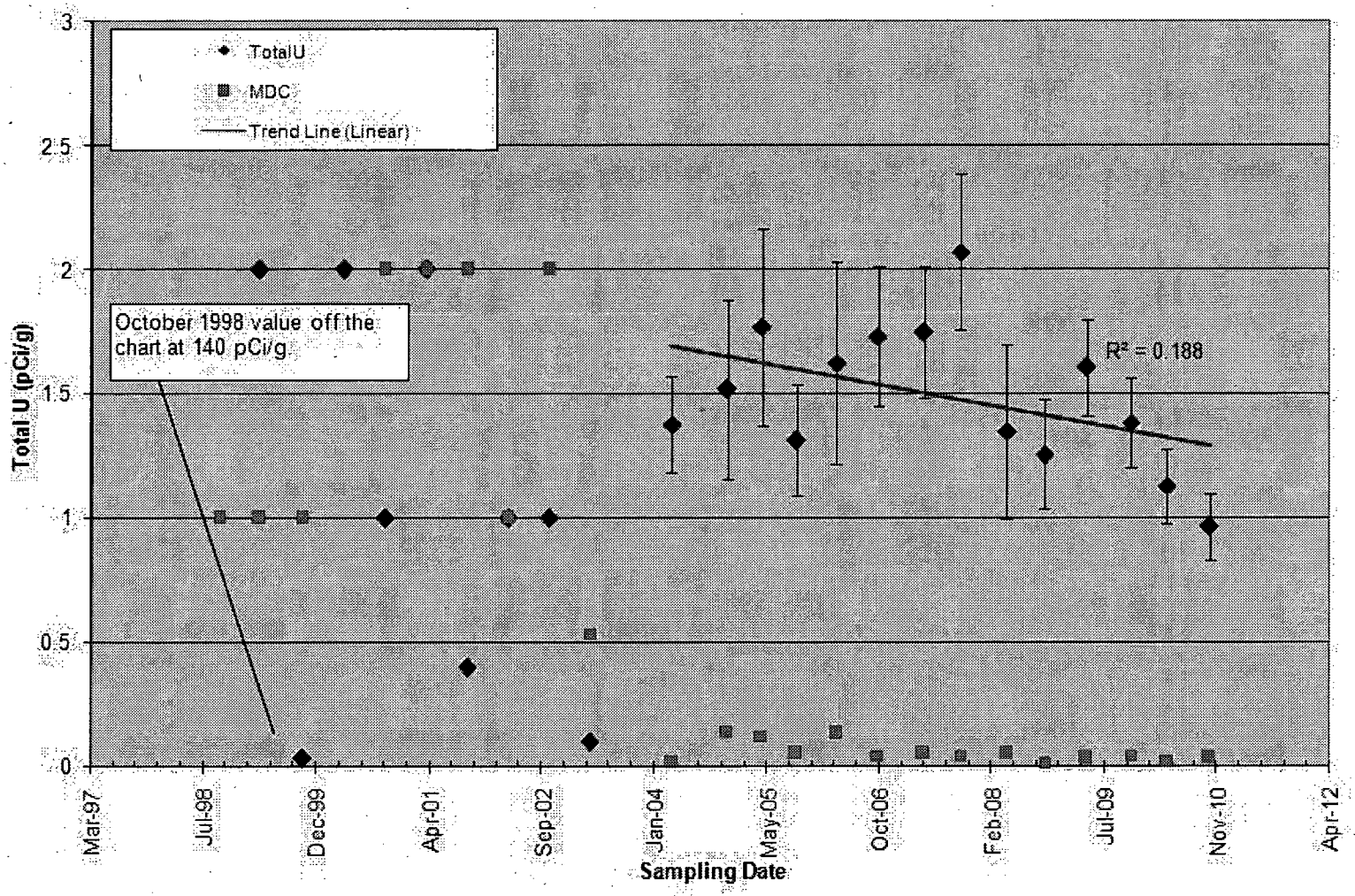
MDC – Minimum Detectable Concentration

Figure 4-33. Total Uranium in SS-DU-002 (1998-2010)



MDC – Minimum Detectable Concentration

Figure 4-34. Total Uranium in SS-DU-003 (1998-2010)



MDC – Minimum Detectable Concentration

Figure 4-35. Total Uranium in SS-DU-004 (1998-2010)

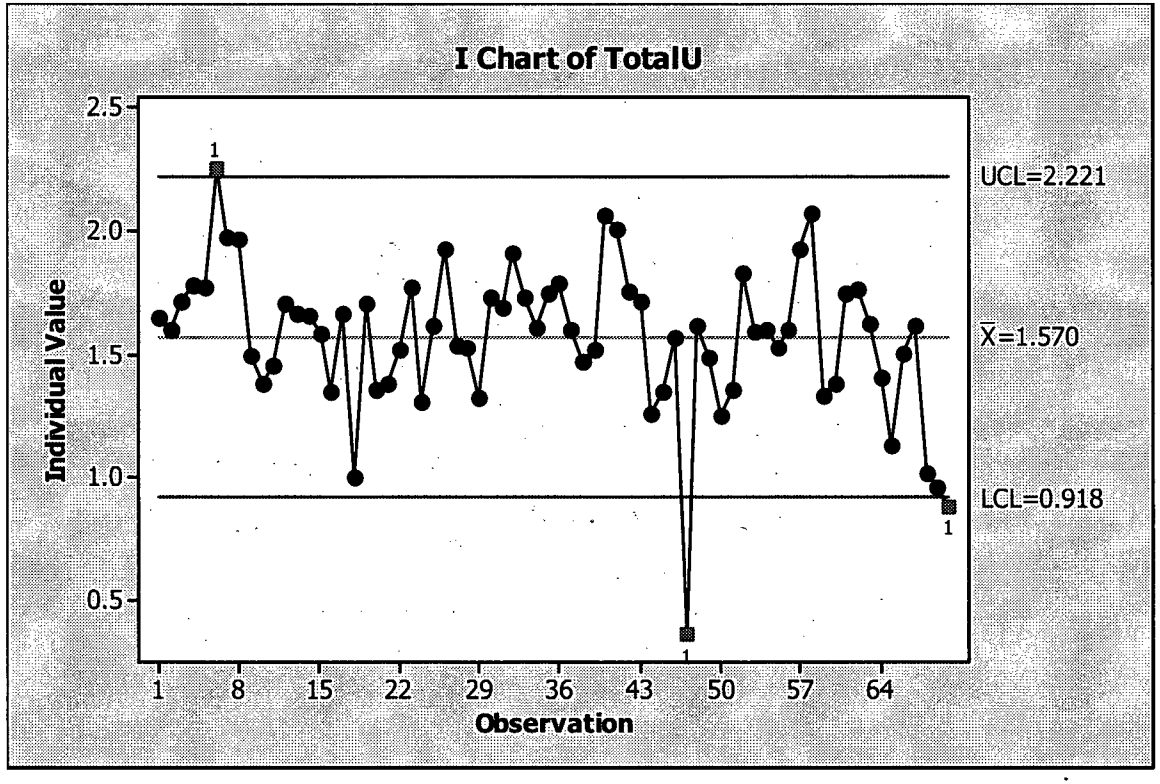


Figure 4-36. Control Chart for All Surface Soil Data (2004-2010)

5. CONCLUSIONS AND RECOMMENDATIONS

The October 2010 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 3.0 are investigated further to validate whether a sample result is representative of DU or natural uranium. Ratios exceeding 3.0 were encountered for SW-DU-04, SW-DU-04D, and SW-DU-05 with U-238/U-234 ratios of 6.4, 6.6, and 7.8, respectively. Surface water locations SW-DU-04 and SW-DU-05 are well within the JPG DU Impact Area and were comparatively dry at the time of the sampling event. As such, lack of flowing water in combination with DU penetrators located upstream of and downstream from SW-DU-04 and SW-DU-05 are believed to have played a major role in the fact that concentrations of uranium, as DU, were elevated relative to background at these locations. Trend analysis completed reflected that no sample location exhibited an R2 value indicating that the trend was somewhat significant. 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.

CFR (Code of Federal Regulations). 2008. 10 CFR 20. Energy. Nuclear Regulatory Commission. Standards for Protection Against Radiation.

NRC (Nuclear Regulatory Commission). 1985. License Number SUB-1435, Jefferson Proving Ground, Madison, Indiana. U.S. Army, TECOM, Aberdeen Proving Ground, Maryland.

SAIC (Science Applications International Corporation). 2006. Radiation Monitoring Report for License SUB-1435 Jefferson Proving Ground, Summary of Results for 10-13 April 2006 Sampling Event. Final. October.

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

ANNEX B

FORMS, LABELS AND WORKSHEETS

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 98, (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 samples 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)			

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 _____			

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)

ANNEX C

SAMPLE LOCATION MAPS

Jefferson Proving Ground: DU Sampling
GROUNDWATER MONITORING WELLS

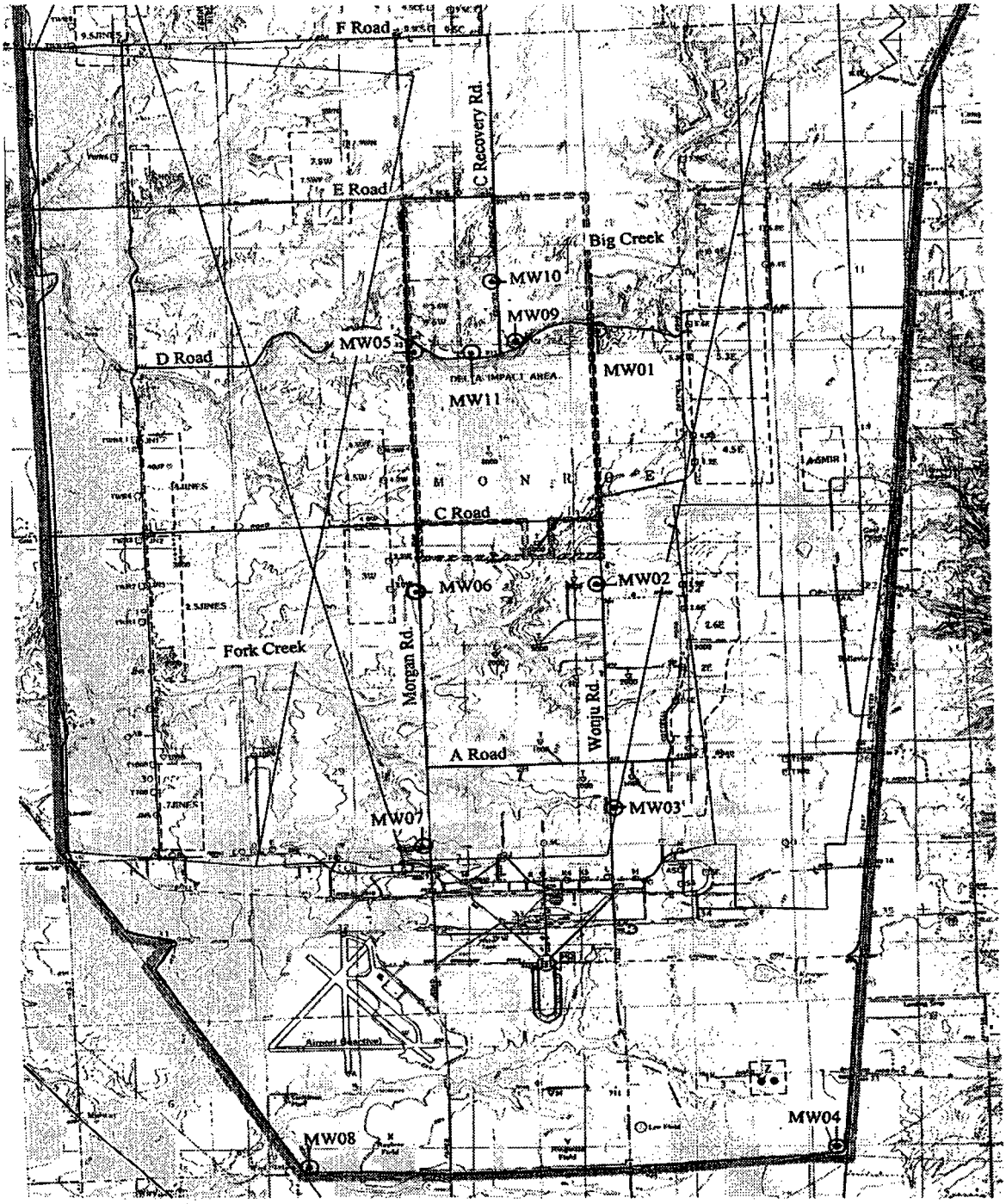

Figure 1: Groundwater samples (Sept. 1997)

Jefferson Proving Ground: DU Sampling
SOIL SAMPLES

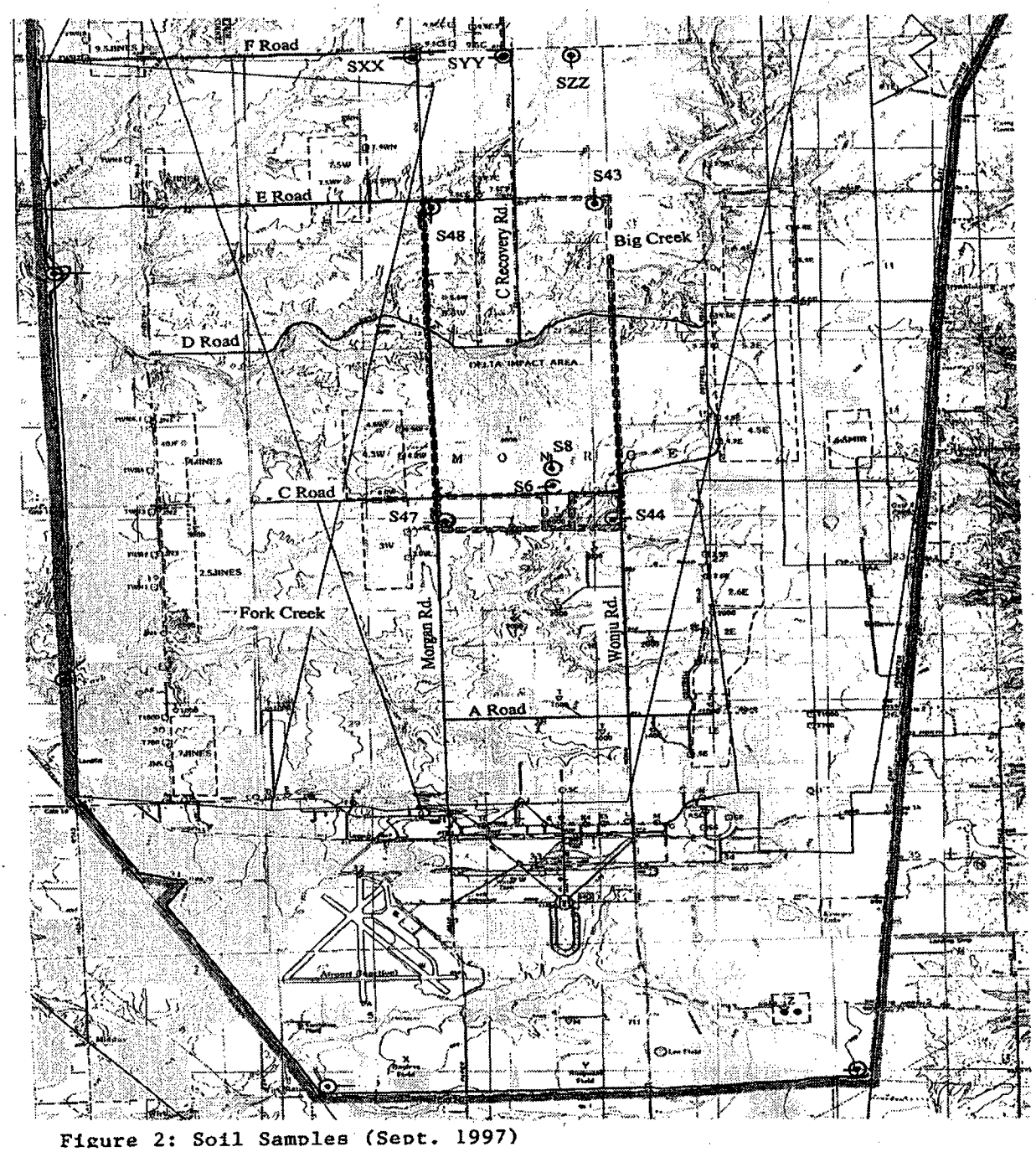

Figure 2: Soil Samples (Sept. 1997)

Jefferson Proving Ground: DU Sampling
SURFACEWATER & SEDIMENT SAMPLES

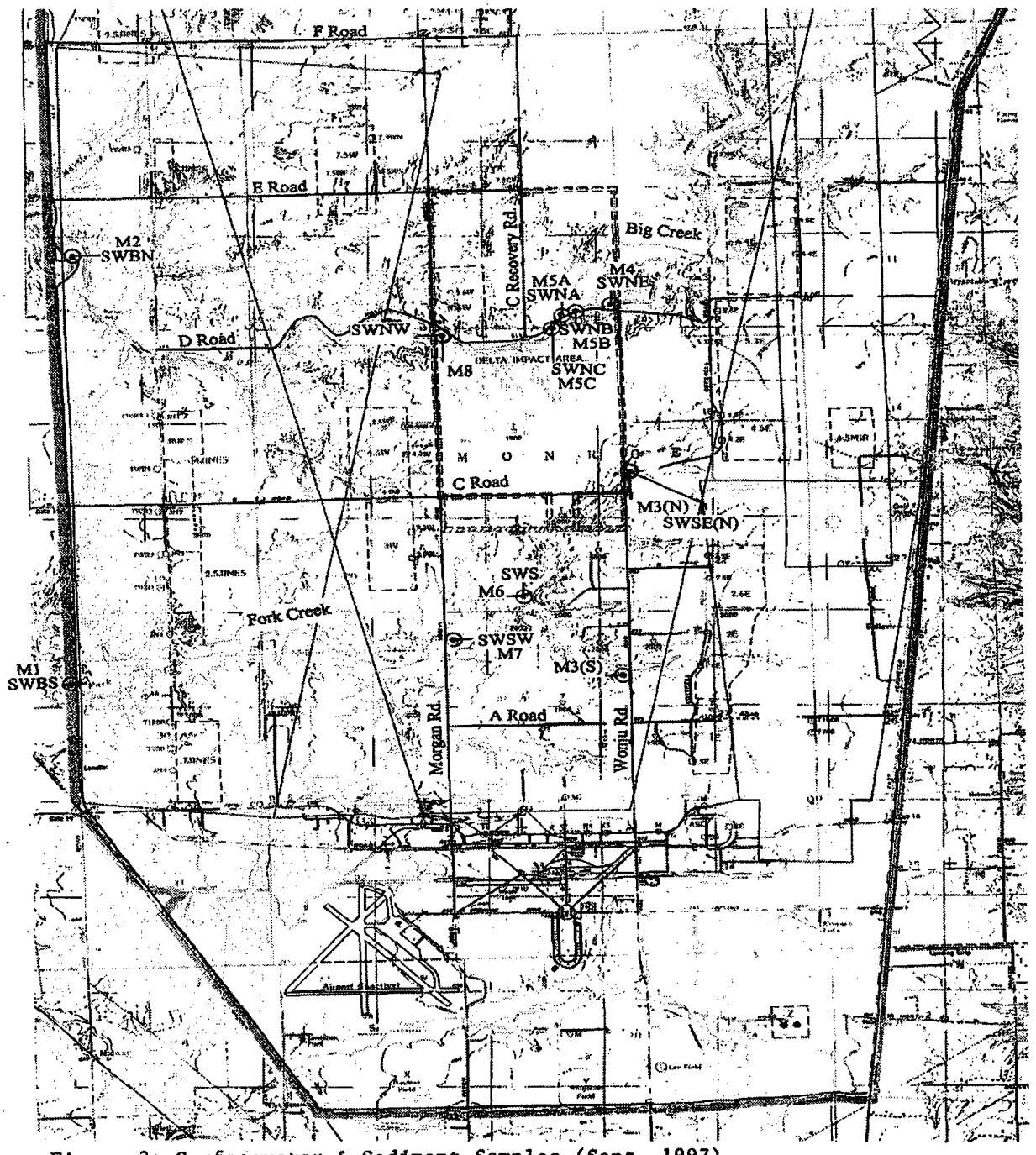

Figure 3: Surfacewater & Sediment Samples (Sept. 1997)

APPENDIX B
FIELD LOGBOOK

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SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SW/SD-DU-001 DATE COLLECTED (MM/DD/YY): 10-15-10

TIME: SD / SW
1035 / 1040

SAMPLING LOCATION CODE: Surface water / Sediment
DESCRIPTION: _____

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 dry. Pooled water at bridge, sampled. Collected mud silty clay, on N bank of creek East bridge on W perimeter.

background: 47 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	58	cpm		
TEMPERATURE:	12.1	°C		
pH:	7.15	pH units		
CONDUCTIVITY:	0.418	mS/cm		
REDOX:	217	mV		
DO:	4.72	mg/L		
ORGANIC VAPORS:	—	—		
TURBIDITY:	12.3	NTU		
OTHER Sonde:	5	ug/m		

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

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SD/SW-DU-0002 DATE COLLECTED (MM/DD/YY): 10-15-10

TIME: 1003/1010 SD/SW

SAMPLING LOCATION CODE: Surface water / sediment

DESCRIPTION: _____

SAMPLING POINT CODE: _____

DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____ : _____ TO _____ BLS

SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Sunny 55F ACTIVITIES IN AREA: _____

FIELD OBSERVATIONS: Creek dry. Collected pooled water. Collected reed silty clay E of Bridge on Big Creek

background: 34 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	73	cpm		
TEMPERATURE:	11.3	°C		
pH:	6.72	pH units		
CONDUCTIVITY:	0.546	mS/cm		
REDOX:	218	mV		
DO:	5.09	mg/L		
ORGANIC VAPORS:	—	—		
TURBIDITY:	11.1	NTU		
OTHER dose:	6	uR/h		

SAMPLE TYPE: X GRAB ☐ SPATIAL COMPOSITE ☐ TIME COMPOSITE

☐ QC TRIP BLANK ☐ QC RINSATE ☐ QC FIELD BLANK

☐ OTHER (SPECIFY) _____

SAMPLE COLLECTED: X YES ☐ NO SAP SAMPLING PROCEDURE WAS FOLLOWED: X YES ☐ NO

IF SAP WAS NOT FOLLOWED, SPECIFY WHAT DEVIATIONS WERE NECESSARY AND WHY:

Recorded By: _____ QC Checked By: _____

(Signature) (Signature)

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SW/SD-DU-0003 DATE COLLECTED (MM/DD/YY): 10-14-10
TIME: 0950

SAMPLING LOCATION CODE: Surface Waters / Sediment
DESCRIPTION: _____

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. Collected fr sandy silt and some organics, moist. E of bridge on Wash at middle fork.

background = 32 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	41	cpm		
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER dose:	8	uR/hr		

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

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SW/SD-01-004 DATE COLLECTED (MM/DD/YY): 10-14-10

TIME: SW: 1030
SD: 1025

SAMPLING LOCATION CODE: Surface water / sediment
DESCRIPTION: _____

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. Small pool at usual sampling location. Water dipped from pool. Collected in med sand, moist on S Side of Big Creek across from SGU-BC-03

background = 37 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	38	cpm		
TEMPERATURE:	11.4	°C		
pH:	6.12	std units		
CONDUCTIVITY:	0.576	mS/cm		
REDOX:	0.37	mV		
DO:	7.40	mg/L		
ORGANIC VAPORS:	N/A			
TURBIDITY:	14.9	NTU		
OTHER dose:	9	uR/hr		

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

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SW/SD-BW-005 DATE COLLECTED (MM/DD/YY): 10-14-10

TIME: SD / SW 1255 / 1300

SAMPLING LOCATION CODE: Surface water / sediment

DESCRIPTION: _____

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: Creek is dry, small pool of sample location. Collected pooled water. Wet med sand collected E of bridge on D-road, S bank of Bay Creek.

background: 36 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	36	cpm		
TEMPERATURE:	17.9	°C		
pH:	7.01	pH units		
CONDUCTIVITY:	0.527	mS/cm		
REDOX:	283	mV		
DO:	7.12	mg/L		
ORGANIC VAPORS:	—	—		
TURBIDITY:	3.2	NTU		
OTHER base:	7	pH units		

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

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SW/SD-DU-0006 DATE COLLECTED (MM/DD/YY): 10-14-10
TIME: 0845
SD-DU-006 DUP of sediment

SAMPLING LOCATION CODE: Surface Water / Sediment
DESCRIPTION: _____

SAMPLING POINT CODE: _____
DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

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

WEATHER: Cloudy 55°F ACTIVITIES IN AREA: _____
FIELD OBSERVATIONS: Creek is dry. Collected fr- med grained sand, slightly moist. Collected on S bank below convergence of 2 tributaries

background: 40 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	48	cpm		
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER dose :	8	uR/hr		

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

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SW/SD-00-007 DATE COLLECTED (MM/DD/YY): 10-15-10

TIME: SD / SW 0835 / 0840

SAMPLING LOCATION CODE: Surface water / sediment

DESCRIPTION: _____

SAMPLING POINT CODE: _____

DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____ : _____ TO _____ BLS

SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Sunny 50°F ACTIVITIES IN AREA: _____

FIELD OBSERVATIONS: Creek is dry. Pool upstream of bridge on Magee. Collected water here. Fn. med sand, most collected at bridge

background: 22 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	44.	cpm		
TEMPERATURE:	10.6	°C		
pH:	5.90	std units		
CONDUCTIVITY:	0.891	mS/cm		
REDOX:	275	mV		
DO:	3.38	mg/L		
ORGANIC VAPORS:	—	ppm		
TURBIDITY:	60.5	NTU		
OTHER dose:	7	uR/h		

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

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SWSD-DU-0008 DATE COLLECTED (MM/DD/YY): 10-14-10

TIME: SD/SW 1420/1425

SAMPLING LOCATION CODE: Surface water / sediment

DESCRIPTION: _____

SAMPLING POINT CODE: _____

DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

SAMPLE DEPTH CODE: _____ : _____ TO _____ BLS

SAMPLE MEDIA CODE: _____ DESCRIPTION: _____

WEATHER: Sunny 70s F ACTIVITIES IN AREA: _____

FIELD OBSERVATIONS: Creek dry. Pooled water ~ 30' upstream of usual location. Sample collected here. Collected in sand, dry on D side of DC, east of bridge on Morgan.

background = 31 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	42	cpm		
TEMPERATURE:	18.1	°C		
pH:	7.30	pH units		
CONDUCTIVITY:	0.633	mS/cm		
REDOX:	277	mV		
DO:	7.16	mg/L		
ORGANIC VAPORS:	—	ppm		
TURBIDITY:	9.1	NTU		
OTHER dose:	6	uR/hr		

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

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SS-OU-001 DATE COLLECTED (MM/DD/YY): 10-14-10
TIME: 0935

SAMPLING LOCATION CODE: Surface soil
DESCRIPTION:

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: Collected dry silt w/ some organic material just N of S limit of OU area on Uberuaga Rd

background = 40 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	52	cpm		
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER dose :	12	uR/hr		

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-DU-002 DATE COLLECTED (MM/DD/YY): 10.14.10
TIME: 1450

SAMPLING LOCATION CODE: Surface Soil
DESCRIPTION: _____

SAMPLING POINT CODE: _____
DESCRIPTION _____

NORTHING: _____ EASTING: _____ ELEVATION: _____

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

WEATHER: Sunny 70F ACTIVITIES IN AREA: _____
FIELD OBSERVATIONS: Collected drywash at Morgan and E Road just SE of western limit of DU area.

background = 37 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	53	cpm		
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER dose:	7	uR/hr		

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

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

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

SAMPLE LOG SHEET

PROJECT NAME: **PROJECT NO:**

SAMPLE ID NUMBER: SSDU-003 DATE COLLECTED (MM/DD/YY): 10.14.10
TIME: 1130

SAMPLING LOCATION CODE: Surface soil
DESCRIPTION:

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: Collected silt w/ organics W of DU area off of E. road (Wanju. Dry

background: 31 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	55	cpm		
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER dose:	6	uR/hr		

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-DU-004 DATE COLLECTED (MM/DD/YY): 10-15-10
TIME: 0920

SAMPLING LOCATION CODE: Surface Soil
DESCRIPTION: _____

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: Collected 1 soil sample in DU area E of Morgan Rd

background: 41 cpm

FIELD MEASUREMENTS	READING	UNITS	SERIAL NO.	LAST CALIB.
RADIOACTIVITY:	57	cpm		
TEMPERATURE:				
pH:				
CONDUCTIVITY:				
REDOX:				
DO:				
ORGANIC VAPORS:				
TURBIDITY:				
OTHER dose:	10	uR/hr		

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

Location JPC Date 10.12.10

Project / Client ERM Sampling

Partly cloudy 60°F am, cloudy 80°F pm

On site: MH, DLL, SF

0700. Mob to site. Organize equipment and check in equipment.

0830. To site to begin purging wells. SF to recode purge info.

0900. Stop and download MW-11 Apr 2010. DTW = 17.59' bpvc.

0928. Stop and download MW-9 Apr 2010. DTW 33.31' bpvc

1235. Stop and download MW-2 Apr 2010. DTW 14.25' bpvc

1430. At Bldg 125. All ERM wells purged. Prep for sampling in AM.

1530. Leaving site.

MH 10.12.10

JPG 10.13.10
ERM Sampling
Cloudy 60°F (am), 75°F (pm)

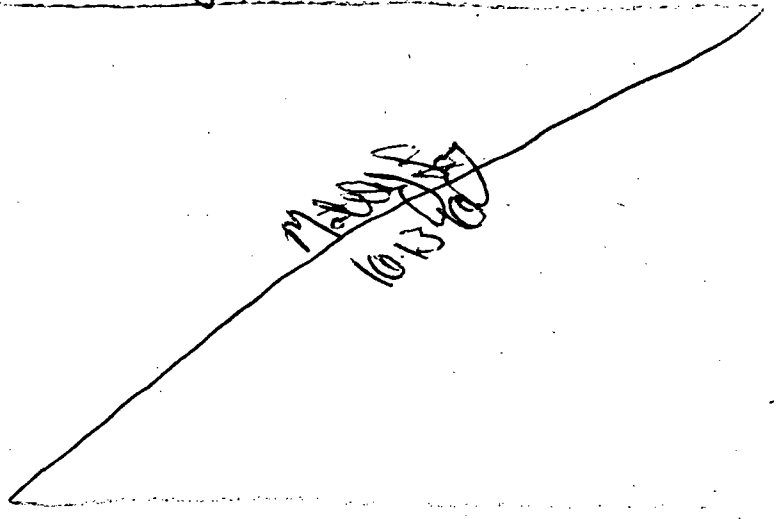
Onsite MDL DLL SF
0700 - Mob to site
0715 - Arrive onsite. Tailgate H&S meeting
Organize materials
0800 - Mob to site to sample ERM wells that have been purged from purging. SF to record sampling information. MDL to record data logger downloads
0840 Replaced desiccant at MW-? Restart logger after sealing from sampling
0847 Stop and download JPG DL 05I _ April 2010
DTW - 8.16. Replaced desiccant
0850 Start JPG DL 05I _ October 2010 to collect DTW linear, every 60 mins Ref - 8.96'
0901 - Stop and download JPG DL 06I _ April 2010
DTW: 15.60' Replaced desiccant.
0904 - Start JPG DL 06I _ October 2010 to collect DTW linear, every 60 mins Ref - 15.60'
0908 - Stop and download JPG DL 06D. April 2010.
DTW - 23.57' Replaced desiccant
0911 - Start JPG DL 06D _ October 2010 to collect DTW linear, every 60 mins Ref - 23.57'
0914 Stop and download JPG DL 06S. April 2010
DTW: 12.76' Replaced desiccant

JPG 10.13.10
ERM Sampling

0917 - Start JPG DL 06S. October 2010 to collect DTW linear, every 60 mins. Ref - 12.76'
0949 - Stop and download JPG DL 04D _ April 2010.
DTW: 37.73' Replaced desiccant
0952 - Start JPG DL 04D _ October 2010 to collect DTW linear, every 60 mins Ref - 37.73'
1003 - Stop and download JPG DL 03I _ April 2010.
DTW - 10.65' Replaced desiccant
1006 - Start JPG DL 03I _ October 2010 to collect DTW linear, every 60 mins. Ref - 10.65'
1056 - Stop and download JPG DL 02I. April 2010.
DTW: 19.74' Replaced desiccant
1059 - Start JPG DL 08I _ October 2010 to collect DTW linear, every 60 mins Ref - 19.74'
1138 - Stop and download JPG DL 08I. April 2010
DTW - 19.73' Replaced desiccant
1140 - Start JPG DL 08I _ October 2010 to collect DTW linear, every 60 mins. Ref - 19.73'
1151 - Stop and download JPG DL 09D. April 2010
DTW 38.74' Replaced desiccant
1154 - Start JPG DL 09D _ October 2010 to collect.
DTW linear, every 60 mins
1157 Stop and download JPG DL 07I. April 2010.
DTW - 17.10' Replaced desiccant

JPG 10.13.10
ERM Sampling

1200 - Start JPG DU 091 - October 2010 to collect DTW linear, every 60 mins. Ref = 17.16'
1202 - Stop and download JPG DU 096 - April 2010. DTW = 12.02'
1205 - Start JPG DU 090 - October 2010 to collect DTW linear, every 60 mins. Ref = 12.02'
1235 - Stop and download JPG DU 011 - April 2010. DTW = 3.24' Replaced desiccant.
1238 - Start JPG DU 011 - October 2010 to collect DTW linear, every 60 mins. Ref = 3.24'
1435 - At Bldg 125. ERM wells MW-9, MW-11 and MW-6 need sampled in AM.
1515 - Leaving site



JPG 10.14.10
ERM Sampling
Cloudy 50°F (am)

Onsite MJL, DLL, SF, DW
0700 - Mob to site
0715 - Arrive onsite Tailgate H&S meeting. Organize materials
0725 - Calibrate Hach U-22 # 16340 Rental pH 3.71, cond 4.14 mS/cm, turb 0.0. Auto cal meter w/ auto cal solution. Pocket pH 398, cond 4.51, turb 0.0
0806 - Stop and download SGS MF 03 04 06 10. Creek is dry. Replaced desiccant
0833 - Start SGS MF 03 10.14.10 to collect depth linear, every 10 mins.
0845 - Sample SD-01-0006 from mid stream, shallow riffle. Collected w/ plastic scoop and composited in 2 ziplock bag and transferred to sample jar. Creek is dry, no water sample. Collected dup of sediment.
0914 - Start MW-2 - October 2010 to collect DTW linear, every 60 mins. Ref = 14.24'
0919 - Stop and download SGS MF 03 04 08 10. Creek is dry. Replaced desiccant.
0925 - Start SGS MF 03 - 10.14.10 to collect depth linear, every 10 mins

VPG 10-14-10
ERM Sampling

0935 Collected SS-DU-001. Dry silt w/ some organics, collected w/ plastic scoop, composited in 2 ziplock bag and transfered to sample jar.
0950 Collected SD-DU-003. Mud silt with sand, some organics, collected w/ plastic scoop composited in 2 ziplock bag and transfered to sample jar.
1005 Unable to connect to SGS-MF-04. Will pull logger later after checking comm connection at next location.
1031 Stop and download SGS BC 03-04-06 10. Creek is dry. Replaced desiccant.
1036 - Start SGS BC 03 10-14-10 to collect depth. Interval every 10 mins.
1045 Collected SD-DU-004. Composited grab sediment collected w/ plastic scoop, composited in 2 ziplock bag and transfered to sample jar.
1050 Collected SW-DU-004. Water dipped from pooled water.
1130 Collected SS-DU-003. Silt w/ organics, dry, collected w/ plastic scoop, composited in 2 ziplock bag and transfered to sample jar.

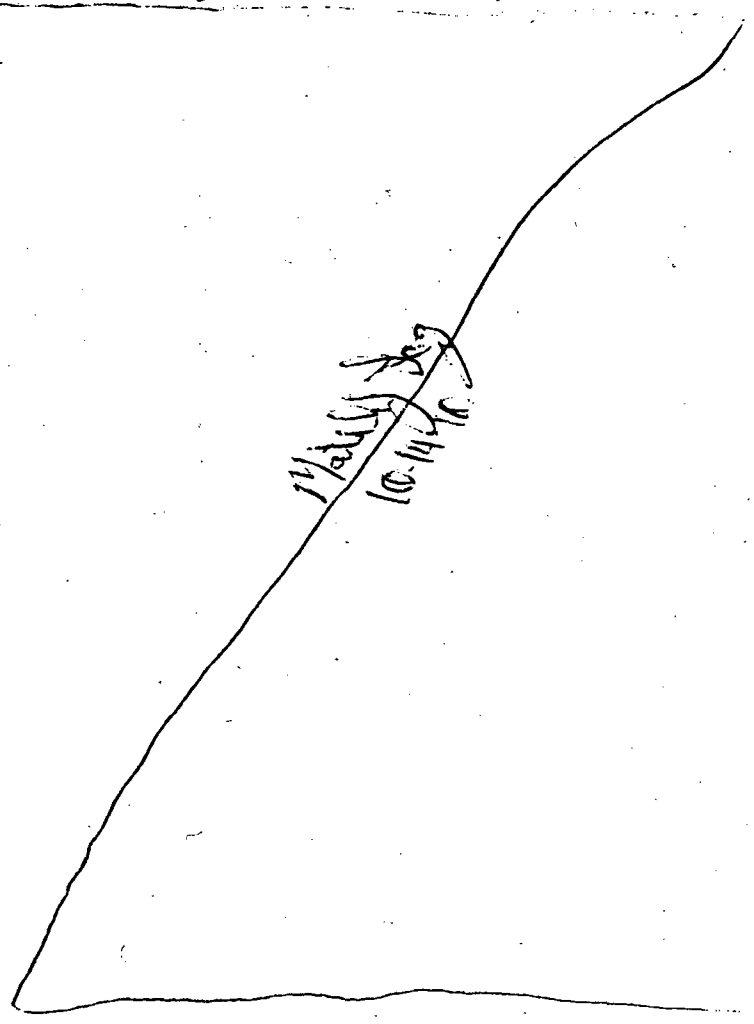
VPG 10-14-10
ERM Sampling

1255 Collected SD-DU-005. Collected wet sediment sand w/ plastic scoop, composited in 2 plastic bag and transfered to sample jar.
1300 Collected SW-DU-005 D. pest bottles from pooled water at location
1316 - Start MW 9 - October 2010 to collect DTW Interval every 60 mins. Ref = 0.000. Replaced desiccant
1335 Stop and download CGS BC 11-04-08 10. Liner is full of sediment DTW = 5.97 from ref reference
1341 - Start CGS BC 11-10-14-10 to collect depth Interval every 10 mins
1406 - Start MW 11 - October 2010 to collect DTW Interval every 60 mins. Ref = 40.80. Replaced desiccant.
1439 Stop and download SGS BC 01. Replaced desiccant DTW = 18.83 ' well lid
1457 - Start SGS BC 01 to collect depth Interval every 10 mins
1450 Collected SS-DU-002. Dry silt collected w/ plastic scoop, composited in ziplock bag and transfered to sample jar.

JPG
ERM Sampling

10.14.10

0550 AH Bldg 125 to unload materials and samples
1545 Leaving site.



JPG
ERM Sampling

10.15.10

Sunny 50°F (am),

Onsite MDL, DLL, SF
0545 Mob to site
0800 Arrive onsite Tailgate H&S meeting
Organize equipment
0855 Collected SD-DU-007 Fine-med sand, mostly collected w/ plastic scoop, composited in ziplock bag and transferred to sample jar.
0840 Collected SW-DU-007 Packet water. Sample dipped from pail.
0850 Step out decontaminated SGS-MF-01-04-10. Replaced decontaminated
0856 Start SGS-MF-01-10-15-10 to collect depth liners every 10 mins (Next 0906)
0900 Collected dry silt w/ plastic scoop, composited in ziplock bag and transferred to sample jar. SS-DU-004
0937 Pull data logger at SGS-MF-04.
1005 Sampled SD-DU-006 Collected mostly silty clay w/ plastic scoop, composited in ziplock bag and transferred to sample jar.
1010 Collected SW-DU-006 Water sample from pond water.

9 94

Location JPG Date 10.15.10

Project / Client ERM Sampling

1035 Sampled SD-DU-001. Moist silty clay collected w/ plastic scoop, composited in 2 ziplock bag and transferred to sample jar.

1040 Sampled SW-DU001. Sample) picked water.

1100 At Bldg 41 to scan out equipment/ coolers, pack samples, decon

1330 Leaving site. Arrys key in top center draw of Yvette's desk

MADLEY
10-15-10

Location: Jefferson Proving Ground (JPG) Date: 10/12/10
Project / Client: ERM Sampling

0700 Simon Fong (SAIC) arrived at Jefferson Proving Ground (JPG) Field Office. Gathering materials for bailing wells. Sun is not out yet.

0800 David Lawson (SAIC) and Matt Logan (SAIC) arrived at field office 45 minutes ago. Everyone signed safety briefing conducted by Matt. Dave is continuing setting up RAD approach.

0825 Everyone leave field office to bail monitoring wells. Weather today is dry with highs in low 80s. Currently, it is around 50s with no wind.

1125 Lunch break

1135 Continue bailing wells.

1250 Light rain encountered. Continue bailing wells.

1415 Arrived back at field office. Dave is going to finish preparing RAD instruments. Matt and Simon are going to organize field office for sampling tomorrow.

1510 Simon left field office. Meet next day at 0700.

10/12/10

Location: Jefferson Proving Ground (JPG) Date: 10/12/10
Project / Client: ERM Sampling

Well ID	Date of Purge	Purge Start Time	Purge End Time	Number of Bails	notes / weather / DTW (ft BTOC)
MW-11	10/12/10	906	917	[tally] (17)	17.59 ft BTOC / Troll / Cool, light winds, dry
MW-9	10/12/10	927	937	[tally] (10)	33.31 ft BTOC / Troll / Cool, dry
MW-10	10/12/10	949	1006	[tally] (27)	11.97 ft BTOC / Cool, light winds, dry
MW-5	10/12/10	1043	1051	[tally] (13)	17.05 ft BTOC / cool, light winds, dry
MW-6	10/12/10	1102	1111	[tally] (15)	19.96 ft BTOC / cool, light winds, dry
MW-7	10/12/10	1144	1156	[tally] (25 bails = [illegible])	13.10 ft BTOC / cool, dry / well never went dry
MW-3	10/12/10	1209	1221	[tally] (18)	13.82 ft BTOC / cool, dry, light winds
MW-2	10/12/10	1232	1243	[tally] (6)	14.25 ft BTOC / Troll / cool, dry, light winds
MW-1	10/12/10	1255	1302	[tally] (13)	14.46 ft BTOC / cool, dry, light winds
MW-4	10/12/10	1334	1337	[tally] (8)	14.20 ft BTOC / cool, dry, light rain
MW-8	10/12/10	1353	1357	[tally] (5)	23.66 ft BTOC / cool, dry, light rain, overgrown bushes around

10/12/10

54

Location: JPG Date: 10/13/10

Project / Client: ERM Sampling / Troll Downloads

0700 Simon Fong (SAIC), Matt Logan (SAIC), and David Lawson (SAIC) arrived at JPG field office (Bldg. 125). Weather today is cool with light winds. Highs in 70s. Getting items ready for sampling and waiting for sun to rise.

0800 Everyone leave field office. Going to download cards/streams data and collect groundwater samples. Download ⇒ trolls.

0807 Collect sample MW-DU-003 (at mw-3) (SAIC14E) for total/isotopic Uranium (2, 1L plastic unpreserved and unfiltered in field) using a disposable bailer. DTW=13.83 feet BTOC. Background dose = 9 uR/hr. RAD screen background = 49 cpm. RAD screen sample bottles = 187 cpm.

0830 Collect sample MW-DU-002 (at mw-2) (SAIC14E) for total/isotopic Uranium (2, 1L plastic unpreserved and unfiltered in field) using a disposable bailer. DTW= 14.26 feet BTOC. Background dose = 7 uR/hr. RAD screen background = 51 cpm. RAD screen sample bottles = 47 cpm.

10/13/10

55

Location: JPG Date: 10/13/10

Project / Client: ERM Sampling / Troll Downloads

0843 Arrived at JPG-DU-05I for download. ~~8:46 = DTW~~ 20 minutes DTW = 8.96 ft BTOC.

0858 Arrived at JPG-DU-06I for download. DTW = 15.60 ft BTOC.

0906 Arrived at JPG-DU-06D for download. DTW = 23.57 ft BTOC.

0914 Arrived at JPG-DU-06D for download. DTW = 12.76 ft BTOC.

0925 Collect sample MW-DU-001 (at MW-1) (SAIC14E) for total/isotopic Uranium (2, 1L plastic unpreserved and unfiltered in field) using a disposable bailer. DTW = 27.90 feet BTOC. Background dose = 6 uR/hr. RAD screen background = 41 cpm. RAD screen sample bottles = 37 cpm.

0945 Arrived at JPG-DU-04D for download. DTW = 27.73 ft BTOC.

1001 Arrived at JPG-DU-03I for download DTW = 10.65 ft BTOC.

1014 Collect sample MW-DU-005 (at mw-5) (SAIC14E) for total/isotopic uranium (2, 1L plastic unpreserved and unfiltered in field) using a disposable bailer. DTW = 18.00 feet BTOC. Background dose = 7 uR/hr. RAD screen background = 41 cpm. RAD screen sample bottles = 47 cpm.

10/13/10

Location: JPG Date: 10/13/10

Project / Client: ERM Sampling / Troll Downloads

1052 Arrived at JP6-DU-02I for download. DTW = 19.29 feet BTOC.

1100 Lunch break.

1130 Checked water level at MW-11. Not enough water (DTW = 37.94 ft BTOC) for sample.

1135 Arrived at JP6-DU-08I for download. DTW = 19.73 feet BTOC.

1150 Arrived at JP6-DU-09D for download. DTW = 38.29 feet BTOC.

1154 Arrived at JP6-DU-09I for download. DTW = 17.10 feet BTOC.

1158 Arrived at JP6-DU-09D for download DTW = 12.02 feet BTOC.

1214 Collect sample MW-DU-010 (at MW-10) (SA21(14E) for total/isotopic uranium (2, 1L plastic unpreserved and unfiltered in the field) using a disposable bailer. DTW = 13.20 feet BTOC. Background dose = 6 mR/hr. RAD screen background = 43 cpm. RAD screen sample bottles = 41 cpm.

1233 Arrived at JP6-DU-01I for download. DTW = 3.24 feet BTOC.

10/13/10

Location: JPG Date: 10/13/10

Project / Client: ERM Sampling / Troll Downloads

1307 Arrived at MW-6. Not enough water (DTW = 41.2 feet BTOC) for sample.

1320 Collect sample MW-DU-007 (at MW-7) (SA21(14E and SA21(NDE) for total/isotopic uranium (2, 1L plastic unpreserved and unfiltered in the field) using a disposable bailer. DTW = 13.61 feet BTOC. Background dose = 9 uR/hr. RAD screen background = 39 cpm. RAD screen sample bottles = 55 cpm.

1348 Collect sample MW-DU-004 (at MW-4) (SA21(14E) for total/isotopic uranium (2, 1L plastic unpreserved and unfiltered in the field) using a disposable bailer. DTW = 14.30 feet BTOC. Background dose = 8 uR/hr. RAD screen background = 42 cpm. RAD screen sample bottles = 56 cpm.

1410 Collect sample MW-DU-008 (at MW-8) (SA21(14E) for total/isotopic uranium (2, 1L plastic unpreserved and unfiltered in the field) using a disposable bailer. DTW = 23.68 feet BTOC. Background dose = 10 uR/hr. RAD screen background = 44 cpm. RAD screen sample bottles = 38 cpm.

10/13/10

58

Location JPG Date 10/13/10

Project / Client ERM Sampling

1431 Arrived back at field office. Finalize sample management and organize equipment for tomorrow.

1600 Simon leave field office. Meet next day at 0700.

SF 10/13/10

10/13/10

59

Location JPG Date 10/14/10

Project / Client ERM Sampling / Stream Gauge Download

0700 Simon Fong (SAIC) arrived at JPG field office Matt Logan (SAIC), Dave Lawson (SAIC), and Dana Winslow (SAIC) arrived at field office as well. Getting items ready for Sampling. Weather today is cold, dry, with mild winds. Highs in 50s.

0750 Everyone left field office. Downloading stream gauges.

0845 Collect sediment sample SD-DU-000 (SAIC14E) for Total / Isotopic uranium. No surface water sample due to creek being dry. Also collect duplicate sediment sample (SAIC14DE)

0935 Collect surface soil sample SS-DU-001 (SAIC14E) for Total / Isotopic uranium.

0950 Collect sediment sample SD-DU-003 (SAIC14E) for total / isotopic uranium. No surface water sample due to creek being dry.

1025 Collect sediment sample SD-DU-004 (SAIC14E) for total / isotopic uranium.

1030 Collect surface water sample SW-DU-004 (SAIC14E) and duplicate (SAIC14DE) for total / isotopic Uranium.

1130 Collect surface soil sample SS-DU-003 (SAIC14E) for total / isotopic uranium

10/14/10

Location: JPL Date: 10/14/15
Project / Client: ERM Sampling / Stream Gauge Download

1225 Lunch break
1255 Collect sediment sample SD-DU-005 (SA2C14B) for total / isotopic uranium
1310 Collect surface water sample SW-DU-005 (SA2C14E) for total / isotopic uranium.
1315 Simon checked water level at MW-9. It is 37.25 feet BTOC. Matt decides to collect sample.
1315 Collect sample MW-DU-009 (at MW-9) (SA2C14E) for total / isotopic uranium (1 1L plastic unpreserved and unfiltered in the field) using a disposable bailer. DTW = 37.25 feet BTOC. Background dose = 10 uR/hr. RAD screen background = 36 cpm. RAD screen sample bottles = 43 cpm.
1350 Collect sample MW-DU-011 (at MW-11) (SA2C14G) for total / isotopic uranium (1L plastic unpreserved and unfiltered in the field) using a disposable bailer. DTW = 26.47 feet BTOC. Background dose = 8 uR/hr. RAD screen background = 43 cpm RAD screen sample bottles = 51 cpm.

JH 10/14/15

Location: JPL Date: 10/14/15
Project / Client: ERM Sampling / Stream Gauge Download

1420 Collect sediment sample SD-DU-008 (SA1C14E) for total / isotopic uranium.
1425 Collect surface water sample SW-DU-008 (SA2C14E) for total / isotopic uranium.
1450 Collect surface soil SS-DU-002 (SA2C14E) for total / isotopic uranium.
1520 Arrived at field office. Sample management.
1545 Leave field office. Meet next day at 0700.

SF 10/14/15

JH 10/14/15

Location: JPG Date: 10/15/10

Project / Client: ERM Sampling / Stream Gauge Download

0745 Simon Fong (SAIC) arrived at JPG field office. David Lawson (SAIC) is here as well. Simon is organizing items needed for sampling.

1050 Simon is calibrating Horiba, U-22 (# 14852) for Equipment & Supply at Harrisburg, PA against an auto calibration solution standard (Lot # 8110). Expiration Date = 7/2/11. Matt Logan (SAIC) arrived.

	Pre-Cal Reading	AutoCal Standard	Post-Cal Reading
pH (SU)	4.03	4.000	3.99
Cond (mS/cm)	4.23	4.49	4.49
Turb (NTU)	0.0	0.0	0.0
DO (%)	9.56	NA	9.19
Temp (°C)	19.7	NA	19.7

0820 Everyone leave field office for ERM sampling. Weather is cold but dry and windy. Hydro in upper 50's lower 60's.

0835 Collect sediment sample SD-DU-007 (SAIC14E) for total / Isotopic Uranium.

0840 Collect surface water SW-DU-007 (SAIC14E) for total / Isotopic Uranium.

10/15/10

Location: JPG Date: 10/15/10

Project / Client: ERM Sampling / Stream Gauge Download

0905 Collect sample SW-DU-006 (at MW-6) (SAIC14E) for total / isotopic Uranium (1 1L plastic unpreserved and unfiltered in the field) using a disposable bailer. DTW = 48.29 feet BTOC. Background dose = 6 mR/hr. RAD screen background = 42 cpm. RAD screen sample bottle = 48 cpm.

0920 Collect surface soil SS-DU-0004 (SAIC14E) and duplicate (SAIC14DE) for total / isotopic Uranium.

1005 Collect sediment sample SD-DU-002 (SAIC14E) for total / isotopic Uranium.

1010 Collect surface water sample SW-DU-002 (SAIC14E) for total / isotopic Uranium.

1035 Collect sediment sample SD-DU-001 (SAIC14E) for total / isotopic Uranium.

1040 Collect surface water sample SW-DU-001 (SAIC14E) for total / isotopic Uranium.

1100 Arrived back at field office. Sample management.

1230 Simon leave field office for FedEx in Columbus, IN.

10/15/10

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Location JPL Date 10/15/10

Project / Client Sample Management / Demo

1345 Arrived at FedEx in Columbus, IN.
Dropping off 3 coolers for TestAmerica -
St. Louis, tracking #s
8689-7637-7717
8689-7637-7706
8689-7637-7691

1355 Leave FedEx for Madison, IN.

1455 Arrived at Madison, IN. Shaun is flying
back to Northern Virginia next day.

SF 10/15/10

10/15/10

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Location Date

Project / Client

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APPENDIX C
DATA VALIDATION SUMMARY

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C. DATA VALIDATION SUMMARY

C.1 TestAmerica SDG F0J180420

This report contains the results from the data validation technical review for the Jefferson Proving Ground (JPG) Environmental Radiation Monitoring (ERM) October 2010 samples and analyses that are associated with the above-referenced laboratory and sample delivery group (SDG) number. 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. Samples SW-DU-003 SAIC14E and SW-DU-006 SAIC14E could not be collected during the October 2010 sampling event because the creek was dry.

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 SDG. 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.

Validation Summary	Quantity
Total Number of Samples	33
Total Number of Data Points	132
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 (U.S. Department of Energy [DOE] HASL-300 Methods Compendium A-01-R). Total uranium was calculated using a published specific activity value for U-238 and assuming all the mass originates from U-238.
- All samples were analyzed with SDG F0D090538.

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.
- ***Blank Contamination***—U-234 was present in the associated soil method blank at 0.022 ± 0.018 picocuries per gram (pCi/g). This may indicate that contamination could have been introduced during the laboratory preparation. Those samples where the normalized absolute difference between the sample and the method blank was less than 2.58 were qualified as estimated, *J*, with a reason code 6 for the U-234 results via alpha spectroscopy. The method blank levels have little impact on the intended use of the data, since the detected levels in the method blank are significantly below the required reporting limit of 0.1 pCi/g.

  U-238 was present in the associated soil method blank at 0.011 ± 0.013 pCi/g. This may indicate that contamination could have been introduced during the laboratory preparation. Those samples where the normalized absolute difference between the sample and the method blank was less than 2.58 were qualified as estimated, *J*, with a reason code 6 for the U-238 results via alpha spectroscopy. The method blank levels have little impact on the intended use of the data, since the detected levels in the method blank are significantly below the required reporting limit of 0.1 pCi/g.

SAMPLE INDEX	
Laboratory: Test America Laboratories, Inc.	*SDG #:* F0J180420

Client Sample I.D.	Laboratory Sample I.D.	Date Collected	Analyses Performed
MW-DU-003_SAIC14E	F0J180420-001	10/13/2010	Total and Isotopic Uranium
MW-DU-002_SAIC14E	F0J180420-002	10/13/2010	Total and Isotopic Uranium
MW-DU-001_SAIC14E	F0J180420-003	10/13/2010	Total and Isotopic Uranium
MW-DU-005_SAIC14E	F0J180420-004	10/13/2010	Total and Isotopic Uranium
MW-DU-010_SAIC14E	F0J180420-005	10/13/2010	Total and Isotopic Uranium
MW-DU-007_SAIC14E	F0J180420-006	10/13/2010	Total and Isotopic Uranium
MW-DU-007_SAIC14DE	F0J180420-007	10/13/2010	Total and Isotopic Uranium
MW-DU-004_SAIC14E	F0J180420-008	10/13/2010	Total and Isotopic Uranium
MW-DU-008_SAIC14E	F0J180420-009	10/13/2010	Total and Isotopic Uranium
SD-DU-006_SAIC14E	F0J180420-010	10/14/2010	Total and Isotopic Uranium
SD-DU-006_SAIC14DE	F0J180420-011	10/14/2010	Total and Isotopic Uranium
SS-DU-001_SAIC14E	F0J180420-012	10/14/2010	Total and Isotopic Uranium
SD-DU-003_SAIC14E	F0J180420-013	10/14/2010	Total and Isotopic Uranium
SD-DU-004_SAIC14E	F0J180420-014	10/14/2010	Total and Isotopic Uranium
SW-DU-004_SAIC14E	F0J180420-015	10/14/2010	Total and Isotopic Uranium
SW-DU-004_SAIC14DE	F0J180420-016	10/14/2010	Total and Isotopic Uranium
SS-DU-003_SAIC14E	F0J180420-017	10/14/2010	Total and Isotopic Uranium
SD-DU-005_SAIC14E	F0J180420-018	10/14/2010	Total and Isotopic Uranium
SW-DU-005_SAIC14E	F0J180420-019	10/14/2010	Total and Isotopic Uranium
MW-DU-009_SAIC14E	F0J180420-020	10/14/2010	Total and Isotopic Uranium
MW-DU-011_SAIC14E	F0J180420-021	10/14/2010	Total and Isotopic Uranium
SD-DU-008_SAIC14E	F0J180420-022	10/14/2010	Total and Isotopic Uranium
SW-DU-008_SAIC14E	F0J180420-023	10/14/2010	Total and Isotopic Uranium
SS-DU-002_SAIC14E	F0J180420-024	10/14/2010	Total and Isotopic Uranium
SD-DU-007_SAIC14E	F0J180420-025	10/15/2010	Total and Isotopic Uranium
SW-DU-007_SAIC14E	F0J180420-026	10/15/2010	Total and Isotopic Uranium
MW-DU-006_SAIC14E	F0J180420-027	10/15/2010	Total and Isotopic Uranium
SS-DU-004_SAIC14E	F0J180420-028	10/15/2010	Total and Isotopic Uranium
SS-DU-004_SAIC14DE	F0J180420-029	10/15/2010	Total and Isotopic Uranium
SD-DU-002_SAIC14E	F0J180420-030	10/15/2010	Total and Isotopic Uranium
SW-DU-002_SAIC14E	F0J180420-031	10/15/2010	Total and Isotopic Uranium
SD-DU-001_SAIC14E	F0J180420-032	10/15/2010	Total and Isotopic Uranium
SW-DU-001_SAIC14E	F0J180420-033	10/15/2010	Total and Isotopic Uranium

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ATTACHMENT

JEFFERSON PROVING GROUND
SAMPLE DATA SUMMARY SHEETS

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SAMPLE DATA SUMMARY – WATER Isotopic Uranium A-01-R MOD							
Sample I.D.	Analyte	Result	Error	MDC	Units	Qualifier	Reason Code
MW-DU-001 SAIC14E	U	0.72	0.3	0.18	µg/L		
MW-DU-001 SAIC14E	U-234	0.226	0.0969	0.045	pci/L		
MW-DU-001 SAIC14E	U-235	0.0031	0.0062	0.056	pci/L	U	
MW-DU-001 SAIC14E	U-238	0.24	0.1	0.06	pci/L		
MW-DU-002 SAIC14E	U	2.09	0.52	0.16	µg/L		
MW-DU-002 SAIC14E	U-234	1.56	0.28	0.07	pci/L		
MW-DU-002 SAIC14E	U-235	0.021	0.035	0.055	pci/L	U	
MW-DU-002 SAIC14E	U-238	0.7	0.179	0.05	pci/L		
MW-DU-003 SAIC14E	U	1.16	0.359	0.14	µg/L		
MW-DU-003 SAIC14E	U-234	0.75	0.17	0.04	pci/L		
MW-DU-003 SAIC14E	U-235	0.027	0.0379	0.056	pci/L	U	
MW-DU-003 SAIC14E	U-238	0.39	0.12	0.05	pci/L		
MW-DU-004 SAIC14E	U	2.03	0.5	0.15	µg/L		
MW-DU-004 SAIC14E	U-234	0.59	0.16	0.08	pci/L		
MW-DU-004 SAIC14E	U-235	0.04	0.0469	0.061	pci/L	U	
MW-DU-004 SAIC14E	U-238	0.68	0.17	0.05	pci/L		
MW-DU-005 SAIC14E	U	0.4	0.21	0.12	µg/L		
MW-DU-005 SAIC14E	U-234	0.26	0.1	0.06	pci/L		
MW-DU-005 SAIC14E	U-235	0.011	0.0219	0.03	pci/L	U	
MW-DU-005 SAIC14E	U-238	0.131	0.07	0.04	pci/L	J	37
MW-DU-006 SAIC14E	U	7.9	1.2	0.1	µg/L		
MW-DU-006 SAIC14E	U-234	2.98	0.429	0.07	pci/L		
MW-DU-006 SAIC14E	U-235	0.128	0.084	0.06	pci/L	J	37
MW-DU-006 SAIC14E	U-238	2.63	0.4	0.05	pci/L		
MW-DU-007 SAIC14DE	U	1.13	0.359	0.14	µg/L		
MW-DU-007 SAIC14DE	U-234	0.79	0.179	0.06	pci/L		
MW-DU-007 SAIC14DE	U-235	0.045	0.045	0.03	pci/L	J	37
MW-DU-007 SAIC14DE	U-238	0.37	0.12	0.05	pci/L		
MW-DU-007 SAIC14E	U	1.01	0.34	0.14	µg/L		
MW-DU-007 SAIC14E	U-234	0.81	0.179	0.05	pci/L		
MW-DU-007 SAIC14E	U-235	0.008	0.0229	0.051	pci/L	U	
MW-DU-007 SAIC14E	U-238	0.34	0.11	0.05	pci/L		
MW-DU-008 SAIC14E	U	0.66	0.27	0.08	µg/L		
MW-DU-008 SAIC14E	U-234	0.33	0.11	0.05	pci/L		
MW-DU-008 SAIC14E	U-235	0.016	0.032	0.058	pci/L	U	
MW-DU-008 SAIC14E	U-238	0.219	0.09	0.024	pci/L		
MW-DU-009 SAIC14E	U	0.67	0.3	0.09	µg/L		

SAMPLE DATA SUMMARY – WATER Isotopic Uranium A-01-R MOD							
Sample I.D.	Analyte	Result	Error	MDC	Units	Qualifier	Reason Code
MW-DU-009 SAIC14E	U-234	0.63	0.17	0.06	pci/L		
MW-DU-009 SAIC14E	U-235	0	0.013	0.036	pci/L	U	
MW-DU-009 SAIC14E	U-238	0.23	0.1	0.03	pci/L		
MW-DU-010 SAIC14E	U	3.05	0.68	0.24	µg/L		
MW-DU-010 SAIC14E	U-234	2.15	0.359	0.11	pci/L		
MW-DU-010 SAIC14E	U-235	0.061	0.062	0.072	pci/L	U	
MW-DU-010 SAIC14E	U-238	1.02	0.23	0.08	pci/L		
MW-DU-011 SAIC14E	U	0.26	0.17	0.08	µg/L		
MW-DU-011 SAIC14E	U-234	0.39	0.13	0.04	pci/L		
MW-DU-011 SAIC14E	U-235	0.009	0.025	0.054	pci/L	U	
MW-DU-011 SAIC14E	U-238	0.086	0.058	0.026	pci/L	J	37
SW-DU-001 SAIC14E	U	0.38	0.22	0.18	µg/L		
SW-DU-001 SAIC14E	U-234	0.182	0.0909	0.07	pci/L		
SW-DU-001 SAIC14E	U-235	0.01	0.026	0.058	pci/L	U	
SW-DU-001 SAIC14E	U-238	0.125	0.075	0.06	pci/L	J	37
SW-DU-002 SAIC14E	U	0.57	0.26	0.12	µg/L		
SW-DU-002 SAIC14E	U-234	0.122	0.07	0.054	pci/L	J	37
SW-DU-002 SAIC14E	U-235	0	0.0109	0.031	pci/L	U	
SW-DU-002 SAIC14E	U-238	0.191	0.0859	0.042	pci/L		
SW-DU-004 SAIC14DE	U	40.6	4.1	0.09	µg/L		
SW-DU-004 SAIC14DE	U-234	2.05	0.34	0.06	pci/L		
SW-DU-004 SAIC14DE	U-235	0.33	0.14	0.04	pci/L		
SW-DU-004 SAIC14DE	U-238	13.6	1.4	0.03	pci/L		
SW-DU-004 SAIC14E	U	35.7	3.6	0.2	µg/L		
SW-DU-004 SAIC14E	U-234	1.87	0.31	0.06	pci/L		
SW-DU-004 SAIC14E	U-235	0.24	0.11	0.05	pci/L		
SW-DU-004 SAIC14E	U-238	11.9	1.2	0.07	pci/L		
SW-DU-005 SAIC14E	U	50.5	4.9	0.08	µg/L		
SW-DU-005 SAIC14E	U-234	2.17	0.34	0.05	pci/L		
SW-DU-005 SAIC14E	U-235	0.26	0.11	0.03	pci/L		
SW-DU-005 SAIC14E	U-238	16.9	1.6	0.03	pci/L		
SW-DU-007 SAIC14E	U	0.79	0.359	0.18	µg/L		
SW-DU-007 SAIC14E	U-234	0.29	0.13	0.07	pci/L		
SW-DU-007 SAIC14E	U-235	0.017	0.033	0.045	pci/L	U	
SW-DU-007 SAIC14E	U-238	0.26	0.12	0.06	pci/L		
SW-DU-008 SAIC14E	U	2.27	0.54	0.17	µg/L		
SW-DU-008 SAIC14E	U-234	0.34	0.12	0.05	pci/L		
SW-DU-008 SAIC14E	U-235	0.015	0.035	0.069	pci/L	U	
SW-DU-008 SAIC14E	U-238	0.76	0.179	0.06	pci/L		

SAMPLE DATA SUMMARY – SOILS Isotopic Uranium A-01-R MOD							
Sample I.D.	Analyte	Result	Error	MDC	Units	Qualifier	Reason Code
SD-DU-001 SAIC14E	U	2.02	0.35	0.07	mg/kg		
SD-DU-001 SAIC14E	U-234	0.59	0.11	0.02	pci/g		
SD-DU-001 SAIC14E	U-235	0.048	0.032	0.027	pci/g	J	37
SD-DU-001 SAIC14E	U-238	0.67	0.12	0.02	pci/g		
SD-DU-002 SAIC14E	U	1.08	0.239	0.07	mg/kg		
SD-DU-002 SAIC14E	U-234	0.384	0.085	0.024	pci/g		
SD-DU-002 SAIC14E	U-235	0.016	0.021	0.03	pci/g	U	
SD-DU-002 SAIC14E	U-238	0.36	0.082	0.021	pci/g		
SD-DU-003 SAIC14E	U	1.93	0.34	0.05	mg/kg		
SD-DU-003 SAIC14E	U-234	0.67	0.12	0.02	pci/g		
SD-DU-003 SAIC14E	U-235	0.051	0.032	0.022	pci/g	J	37
SD-DU-003 SAIC14E	U-238	0.64	0.11	0.02	pci/g		
SD-DU-004 SAIC14E	U	0.29	0.12	0.07	mg/kg		
SD-DU-004 SAIC14E	U-234	0.129	0.045	0.017	pci/g	J	6
SD-DU-004 SAIC14E	U-235	0	0.00459	0.012	pci/g	U	
SD-DU-004 SAIC14E	U-238	0.097	0.039	0.022	pci/g	J	6
SD-DU-005 SAIC14E	U	1.34	0.27	0.07	mg/kg		
SD-DU-005 SAIC14E	U-234	0.17	0.054	0.027	pci/g		
SD-DU-005 SAIC14E	U-235	0.007	0.014	0.026	pci/g	U	
SD-DU-005 SAIC14E	U-238	0.45	0.0919	0.025	pci/g		
SD-DU-006 SAIC14DE	U	1.42	0.28	0.07	mg/kg		
SD-DU-006 SAIC14DE	U-234	0.66	0.11	0.02	pci/g		
SD-DU-006 SAIC14DE	U-235	0.023	0.021	0.013	pci/g	J	37
SD-DU-006 SAIC14DE	U-238	0.474	0.0929	0.022	pci/g		
SD-DU-006 SAIC14E	U	1.82	0.32	0.03	mg/kg		
SD-DU-006 SAIC14E	U-234	0.76	0.12	0.02	pci/g		
SD-DU-006 SAIC14E	U-235	0.032	0.0239	0.012	pci/g	J	37
SD-DU-006 SAIC14E	U-238	0.61	0.11	0.01	pci/g		
SD-DU-007 SAIC14E	U	0.97	0.22	0.08	mg/kg		
SD-DU-007 SAIC14E	U-234	0.378	0.081	0.04	pci/g		
SD-DU-007 SAIC14E	U-235	0.012	0.0179	0.029	pci/g	U	
SD-DU-007 SAIC14E	U-238	0.325	0.0729	0.028	pci/g		
SD-DU-008 SAIC14E	U	0.62	0.179	0.08	mg/kg		
SD-DU-008 SAIC14E	U-234	0.11	0.045	0.032	pci/g	J	6
SD-DU-008 SAIC14E	U-235	0.007	0.021	0.042	pci/g	U	
SD-DU-008 SAIC14E	U-238	0.208	0.0609	0.027	pci/g		

SAMPLE DATA SUMMARY – SOILS Isotopic Uranium A-01-R MOD							
Sample I.D.	Analyte	Result	Error	MDC	Units	Qualifier	Reason Code
SS-DU-001 SAIC14E	U	2.41	0.39	0.03	mg/kg		
SS-DU-001 SAIC14E	U-234	0.66	0.11	0.02	pci/g		
SS-DU-001 SAIC14E	U-235	0.046	0.03	0.022	pci/g	J	37
SS-DU-001 SAIC14E	U-238	0.8	0.13	0.01	pci/g		
SS-DU-002 SAIC14E	U	2.4	0.39	0.05	mg/kg		
SS-DU-002 SAIC14E	U-234	0.79	0.13	0.02	pci/g		
SS-DU-002 SAIC14E	U-235	0.032	0.026	0.026	pci/g	J	37
SS-DU-002 SAIC14E	U-238	0.8	0.13	0.02	pci/g		
SS-DU-003 SAIC14E	U	1.69	0.31	0.07	mg/kg		
SS-DU-003 SAIC14E	U-234	0.43	0.0879	0.025	pci/g		
SS-DU-003 SAIC14E	U-235	0.017	0.0189	0.021	pci/g	U	
SS-DU-003 SAIC14E	U-238	0.57	0.1	0.02	pci/g		
SS-DU-004 SAIC14DE	U	1.29	0.25	0.07	mg/kg		
SS-DU-004 SAIC14DE	U-234	0.439	0.0869	0.027	pci/g		
SS-DU-004 SAIC14DE	U-235	0.008	0.012	0.02	pci/g	U	
SS-DU-004 SAIC14DE	U-238	0.431	0.0859	0.022	pci/g		
SS-DU-004 SAIC14E	U	1.58	0.3	0.07	mg/kg		
SS-DU-004 SAIC14E	U-234	0.4	0.085	0.03	pci/g		
SS-DU-004 SAIC14E	U-235	0.036	0.029	0.032	pci/g	J	37
SS-DU-004 SAIC14E	U-238	0.527	0.099	0.022	pci/g		

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.
6 Associated method blank contamination.

APPENDIX D

RELATIVE URANIUM-238/URANIUM-234 ACTIVITY RATIOS FOR MIXTURES OF DEPLETED AND NATURAL URANIUM

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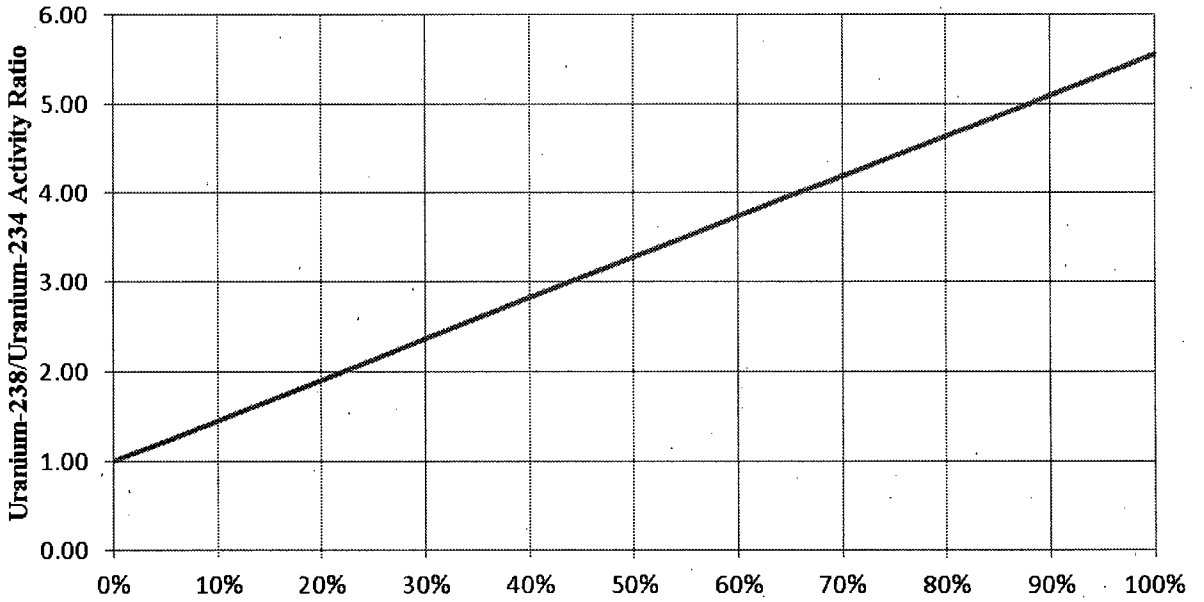
Figure D-1. Relative Uranium-238/Uranium-234 Activity Ratios for Mixtures of Depleted and Natural Uranium



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