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CONTRACT NO. DE-AC05-86OR21548

CLOSURE REPORT FOR SOIL SAMPLING AT THE FROG POND OUTLET, ADDENDUM 6 OF THE ENGINEERING SOIL SAMPLING PLAN FOR ARMY AND MDC VICINITY PROPERTIES

WELDON SPRING SITE REMEDIAL ACTION PROJECT
WELDON SPRING, MISSOURI

JANUARY 2000 **REV. 0**

U.S. Department of Energy
Oak Ridge Operations Office
Weldon Spring Site Remedial Action Project

RECORD

Prepared by MK-Ferguson Company and Jacobs Engineering Group

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MORRISON KNUDSEN CORPORATION MK-FERGUSON GROUP Weldon Spring Site Remedial Action Project Contract No. DE-AC05-86OR21548	
	Rev. No. 0
PLAN TITLE: Closure Report for Soil Sampling at the Frog Pond Outlet, Addendum 6 of the Engineering Soil Sampling Plan for Army and MDC Vicinity Properties	

APPROVALS

Quarry/Vicinity Properties Project Manager	7 Jan 00 Date
Environmental Safety and Health Manager	01/07/00 Date
Data Administration Coordinator	1/7/00 Date
Engineering Manager	1/12/2000 Date
Project Quality Manager	1/12/00 Date
Deputy Project Director	1/18/2000 Date

DOE/OR/21548-829

Weldon Spring Site Remedial Action Project

Closure Report for Soil Sampling at the Frog Pond Outlet, Addendum 6 of the Engineering Soil Sampling Plan for Army and MDC Vicinity Properties

Revision 0

January 2000

Prepared by

MK-FERGUSON COMPANY
and
JACOBS ENGINEERING GROUP
7295 Highway 94 South
St. Charles, Missouri 63304

for the

U.S. DEPARTMENT OF ENERGY
Oak Ridge Operations Office
Under Contract DE-AC05-86OR21548

ABSTRACT

The *Closure Report for Soil Sampling at the Frog Pond Outlet, Addendum 6 of the Engineering Soils Sampling Plan for Army and MDC Vicinity Properties* details the soil characterization activities performed within the Frog Pond Outlet area. The characterization activities were focused on providing informational sample results for sample locations underneath two 60-in. culverts running underneath Missouri County Highway D and exiting into the Frog Pond Outlet. This report summarizes samples collected and analyzed, field instrumentation required, quality control results, and notes deviations or modifications from the original sampling plan.

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1. INTRODUCTION

1.1 Purpose

The purpose of this report is to summarize the sampling activities conducted under *Addendum 6 of the Engineering Soil Sampling Plan for Army and MDC Vicinity Properties* (Ref. 1) in accordance with the *Sample Management Guide* (Ref. 2).

1.2 Scope

This report details the soil sampling activities performed underneath the twin 60-in. culverts running beneath County Highway D and exiting into the Missouri Department of Conservation (MDC) Frog Pond Outlet area. It summarizes samples collected and analyzed, field instrumentation required, quality control results, and notes deviations or modifications from the original sampling plan.

1.3 Background

The *Record of Decision* (ROD) *for Remedial Action at the Chemical Plant Area of the Weldon Spring Site* (Ref. 3) is a remedial action decision document selected in accordance with the *Comprehensive Environmental Response, Compensation and Liability Act of 1980* (CERCLA). It was established for the chemical plant area operable unit and addresses selected remedial actions for various sources of contamination at the chemical plant and off-site vicinity properties. Remedial actions established within the ROD for vicinity properties involve soil removal and on-site disposal within a facility designed and constructed specifically for the Weldon Spring site wastes. The ROD was signed by the Department of Energy (DOE) on September 13, 1993, and by the Environmental Protection Agency (EPA) on September 28, 1993.

Cleanup criteria for soils within the ROD were developed from the results of the site-specific risk assessment for a residential scenario. Additionally, as low as reasonably achievable (ALARA) criteria were developed to represent lower levels that the remedial actions would attempt to achieve during field excavation activities. Cleanup criteria and ALARA values are applicable to soils that will be surface soils (0 in. to 6 in.) or subsurface soils (greater than 6 in.).

In April of 1998, Frog Pond Outlet was originally sampled for radiological characterization in accordance with the *Engineering Soils Sampling Plan for Army and MDC Vicinity Properties: Addendum 4; Soil Sampling at Frog Pond Drainage Outlet and MDC-6* (Ref. 4). Discreet soil samples were collected at 1 ft intervals from the drainage surface to the original stream base (approximately 2.5 ft to 4 ft below ground surface). Analytical results

revealed numerous sample locations exceeding the ROD U-238 cleanup criteria level of 120 pCi/g.

The sample locations were re-sampled from September 29, 1998 through October 2, 1998, to obtain additional information on contaminant depth and potential chemical contaminants. Samples were collected using a power auger and a split spoon sampler at 1 ft intervals. Depths that had previously been characterized were excluded. Sample depths were determined by either auger refusal or breaching of the groundwater level. Depths typically varied from 4 ft to 7 ft. Analytical results revealed nine out of the 15 sample locations exceeded mandated cleanup criteria levels for U-238 at either one or multiple depth intervals. Every sample location also exceeded the U-238 ALARA level (30 pCi/g) at either one or multiple depth intervals. In depth details of this sampling activity can be found in the *Closure Report for Soil Sampling at Frog Pond Drainage Outlet and MDC-6: Addendum 4 of the Engineering Soil Sampling Plan for Army and MDC Vicinity Properties* (Ref. 5).

Data obtained from engineering characterization of the Frog Pond Outlet were used to assist in the engineering design of Work Package 505F (WP-505F), which encompassed remediation of the area. Remediation under WP-505F began on July 1999 and was completed by October 1999. Approximately 2,750 cu yd of contaminated material was removed and transported to the Weldon Spring Site Remedial Action Project (WSSRAP) disposal cell.

During remedial activities, it was discovered that radiologically contaminated soil continued to extend underneath the two 60-in. culverts at the eastern end of the Frog Pond Outlet. The subcontractor was directed to remove approximately 20 ft of both culverts and excavate or "chase" the contaminated soil. After the 20 ft of culvert and approximately 232 cu yd of soil had been removed, radiological measurements revealed remaining soils beneath the culverts continued to exhibit elevated radiological levels (500 to 800 counts per minute). The excavation extended well beyond the contract established excavation boundary and was within 10 ft of both underground and overhead utilities. The excavation was also within close proximity to the Missouri Department of Transportation (MDOT) right-of-way.

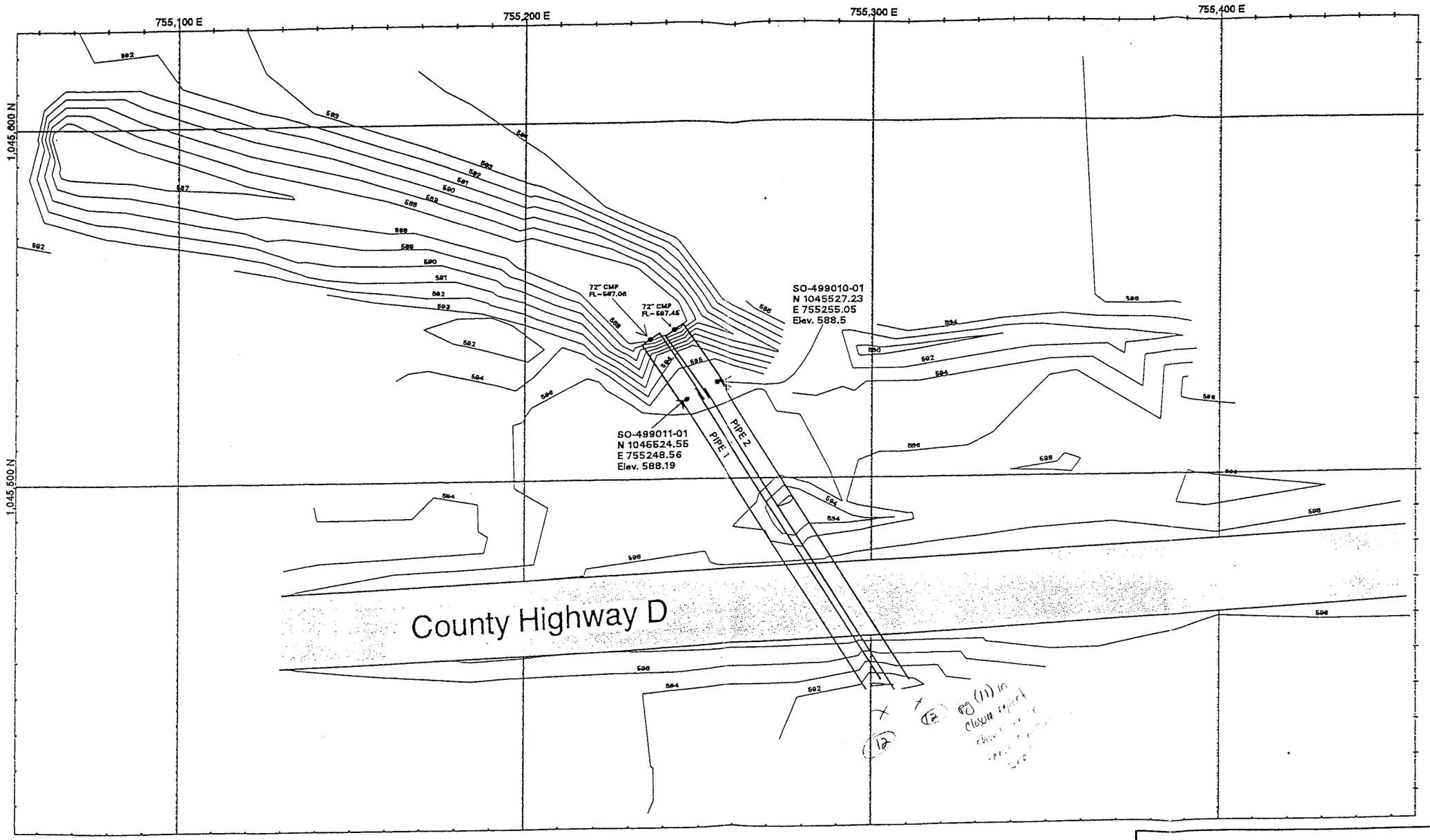
As a result of discussions with the Department of Energy on August 26, 1999, further excavation was to cease at the eastern end of the Frog Pond outlet. Samples were to be taken of the soil underneath both culverts and the edge of the excavation was to be surveyed for future reference. Soil sampling activities were conducted under Addendum 6 of the *Engineering Soils Sampling Plan for Army and MDC Vicinity Properties* (Ref. 1). The purpose of the sampling plan was to provide analytical data for informational purposes only. Sampling activities under Addendum 6 began and were completed on September 10, 1999.

2. SAMPLE LOCATIONS

The original sample locations were pre-determined coordinates based on topographical surveys of the Frog Pond Outlet excavation. Actual sample locations were biased and determined by radiological surveys of the soil underneath the twin 60 in. culverts. The entire area beneath the culverts was scanned with a Geiger Mueller (GM) 44-9 detector. Soil exhibiting the highest readings under each culvert was surveyed for horizontal and vertical control and then sampled. Sample locations were within 5 ft of the original coordinates detailed in the sampling plan and are not considered offset sample locations (Table 2-1). The locations of both sample points are displayed in Figure 2-1 and Figure 2-2. Soil beneath the culverts that exhibited elevated radiological readings are noted in white in Figure 2-2 and are approximate in scale.

Table 2-1 Frog Pond Outlet Addendum 6 Sample Location Coordinates

WSSRAP Sample ID Number	Sample Location	Culvert Location	Northing	Easting	Surface Elevation
SO-499010-01	Estimated Sample Location	Easternmost	1045527.08	755253.50	586.67
SO-499010-01	**Actual Sample Location**	**Easternmost**	**1045527.23**	**755255.05**	**588.50**
SO-499011-01	Estimated Sample Location	Westernmost	1045527.35	755245.18	586.41
SO-499011-01	**Actual Sample Location**	**Westernmost**	**1045524.55**	**755248.56**	**588.19**



30 15 0 METERS

Scale: 1 inch = 30 feet

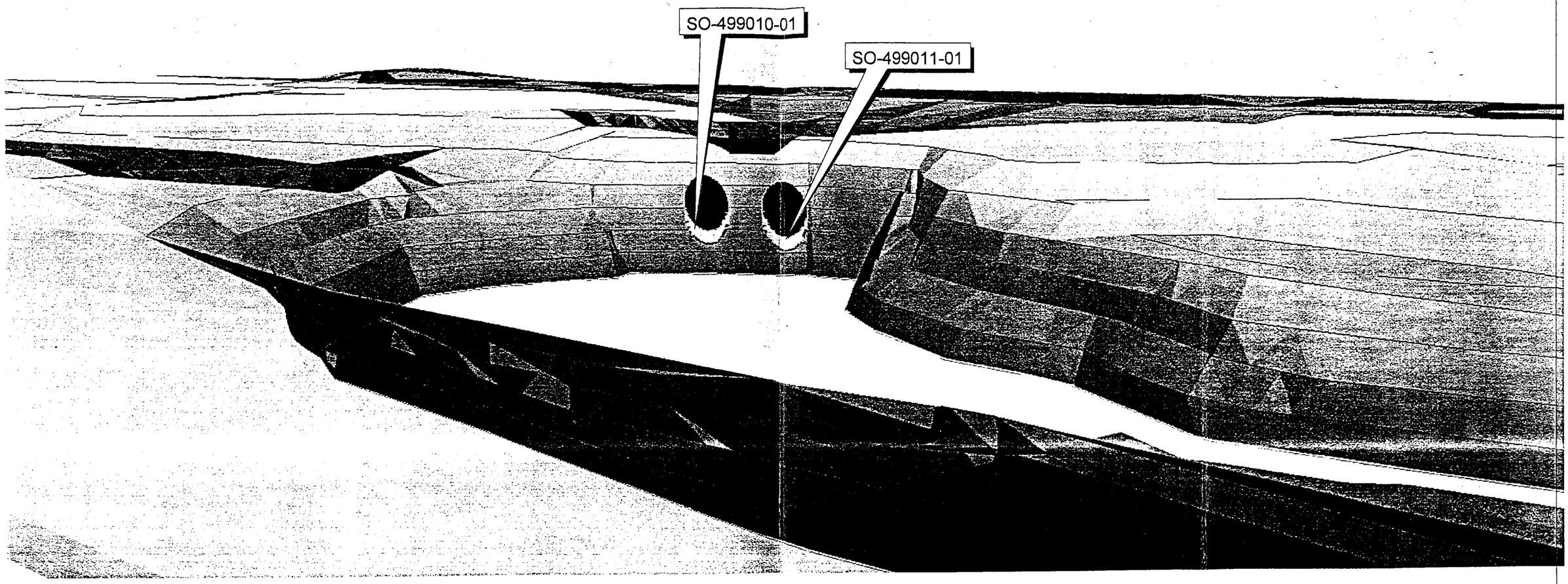
100 50 0 FEET

N W E S

Frog Pond Outlet
Twin Culvert Sample Locations

Figure: 2-1

REPORT NO.: DOE/OR/21548-829		EXHIBIT NO.: G/CP/277/1299	
ORIGINATOR: EMR	DRAWN BY: WSSRAP GIS	DATE: 12/17/99	



Sample ID #	Northing	Easting	Surface Elevation
SO-499010-01	1045527.23	755255.05	588.50
SO-499011-01	1045524.55	755248.56	588.19

Discharge Pipes Frog Pond Outlet		
Figure 2-2		
REPORT NO: DOE/OR/21549-829		EXHIBIT NO: G/VP/278/1299
ORIGINATOR: Eric M. Ripp	DRAWN BY: WSSRAP GIS	DATE: 22-Dec-1999

3. SAMPLE COLLECTION AND ANALYSIS

Samples were collected at each sample location using disposable plastic scoops. The sample intervals for both locations ranged from the sidewall surface to a depth of approximately 6 in. The samples were containerized and transported to the Weldon Spring Radiological Laboratory (WSSRAP RAD LAB). Radiological analysis consisted of Ra-226, Ra-228, Th-230 and U-238. Analysis was performed under the chain-of-custody request number WSSRAP RAD LAB 668.

It was determined that culvert extensions were to be placed on the existing 60 in. culverts after sampling. These 70 in. diameter extensions were fit over the 60 in. culverts and entombed with concrete at the culvert joints. The area was then backfilled with clean fill to the original topography. Because of this, *Record of Decision for Remedial Action at the Chemical Plant Area of the Weldon Spring Site* (ROD) (Ref. 3) cleanup criteria and as low as reasonably achievable (ALARA) values for subsurface soils will be used for comparison purposes.

Analytical results for the soil underneath easternmost culvert revealed a U-238 concentration above ROD cleanup criteria. The soil was below the Th-230 cleanup criteria levels of 16.2 pCi/g; however, it did exceed the Th-230 ALARA level of 5.0 pCi/g. Soil beneath the westernmost culvert was below U-238 cleanup criteria levels but did exceed ALARA levels (30 pCi/g). A summary of the sample results is detailed in Table 3-1 and additional analytical information can be found in Appendix A.

Table 3-1 Radionuclide Concentrations in Soil Samples

WSSRAP Sample Number	Ra-226 (pCi/g)	Ra-228 (pCi/g)	Th-230 (pCi/g)	U-238 (pCi/g)	Subsurface Th-230 Cleanup Criteria (pCi/g)	Subsurface U-238 Cleanup Criteria (pCi/g)
SO-499010-01	1.18	< 1.14	6.44	310.0	16.2	120.0
SO-499011-01	0.82	1.02	3.30	48.4	16.2	120.0

4. QUALITY ASSURANCE

Data evaluation was performed on the analytical data generated from Frog Pond Outlet culvert samples to determine whether Weldon Spring Site Remedial Action Project (WSSRAP) data quality objectives were met and to ensure overall data quality results were generated. Data evaluation was performed in accordance with the *Project Management Contractor Quality Assurance Program* (QAP) (Ref. 6) and the *Environmental Quality Assurance Project Plan* (Ref. 7). The data evaluation process was completed by data verification, data review, data validation and data management activities.

4.1 Data Verification

Data verification was conducted in accordance with Procedure ES&H 4.9.1, *Environmental Monitoring Data Verification*, to ensure that documentation and data were reported in compliance with established reporting requirements and standard operating procedures (SOPs), and to ensure that all analyses were performed. Analytical results received from the laboratory were reviewed to verify samples were properly handled according to WSSRAP protocol. The following factors were reviewed and evaluated: sample identification, chain-of-custody, holding times, sample preservation requirements, sample analysis request forms, data reviews, laboratory tracking, data reporting requirements, and the database transfer.

4.2 Data Review

Data packages were reviewed to ensure the final data were properly identified, analyzed, reported, and met data quality requirements (DQRs). The data were also reviewed to check for inconsistencies with the field quality control samples. Final analytical results were compared to the preliminary analytical results to identify any changes in data.

As mentioned previously, the sampling plan for the soil underneath the culverts at Frog Pond Outlet was to obtain analytical results for informational purposes only. One matrix duplicate quality control sample was specified within the plan. Because of safety concerns over the excavation slope stability, highway traffic was stopped along County Highway D before and during the sampling. With highway traffic backing up (5 to 10 minutes), it was estimated there was a sufficient volume of soil to run the matrix duplicate. A decision was made to terminate the sampling activity and let traffic flow resume. This estimate was incorrect and there was not enough sample volume to run a matrix duplicate.

4.3 Equipment Blanks

Equipment blanks (EB) are used to evaluate potential cross contamination from the field sampling equipment. Separate plastic scoops were used for each individual sample location

during the characterization of the soil within the Frog Pond Outlet. The disposable plastic scoops eliminate the potential for cross contamination. Because of this, sampling equipment did not have to be decontaminated between each sample and equipment blanks were not generated/analyzed.

4.4 Data Validation

Data validation is performed on 10% of the analytical data generated from all WSSRAP sampling activities. Data validation is to be conducted in accordance with ES&H 4.9.2, *Environmental Monitoring Data Validation*. Chain-of-Custody number WSSRAP RAD LAB 668 was not chosen for data validation.

5. REFERENCES

1. MK-Ferguson Company and Jacobs Engineering Group. *Engineering Soils Sampling Plan for Army and MDC Vicinity Properties: Addendum 6: Engineering Characterization Sampling at Frog Pond Outlet (Soil Beneath Twin 60-inch Culverts).* Rev. 0. DOE/OR/21548-622. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. September 1999. (Note: This document was prepared and transmitted to the DOE as an IOC.)

2. MK-Ferguson Company and Jacobs Engineering Group. *Sample Management Guide.* Rev. 1. DOE/OR/21548-499. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. August 1997.

3. U.S. Department of Energy. *Record of Decision for Remedial Action at the Chemical Plant Area of the Weldon Spring Site.* Rev. 0. DOE/OR/21548-376. Oak Ridge Field Office. St. Charles, MO. September 1993.

4. MK-Ferguson Company and Jacobs Engineering Group. *Engineering Soils Sampling Plan for Army and MDC Vicinity Properties: Addendum 4: Soil Sampling At Frog Pond Drainage Outlet And MDC-6.* Rev. 1. DOE/OR/21548-622. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. October 1998.

5. MK-Ferguson Company and Jacobs Engineering Group. *Closure Report for Soil Sampling at Frog Pond Drainage Outlet and MDC-6; Addendum 4 of the Engineering Soil Sampling Plan for Army and MDC Vicinity Properties.* Rev. 0. DOE/OR/21548-791. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. June 1999.

6. MK-Ferguson Company and Jacobs Engineering Group. *Project Management Contractor Quality Assurance Program.* Rev. 5. DOE/OR/21548-333. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. July 1999.

7. MK-Ferguson Company and Jacobs Engineering Group. *Environmental Quality Assurance Project Plan.* Rev. 4. DOE/OR/21548-352. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. October 1999.

PROCEDURES

ES&H 4.9.1 *Environmental Monitoring Data Verification*
ES&H 4.9.2 *Environmental Monitoring Data Validation*

APPENDIX A
Frog Pond Outlet Culvert Analytical Data

EDITED DISKETTE DELIVERABLE REPORT
Analyzed By: WSSRAP RAD LAB
Request No.: 668.0
PO Number: 3589-WP-RAD

EDITED
D101390

SRAP_ID: SO-499010-01 DATE_SAM: 09/10/99 MATRIX: SOIL

C#	LAB_ID	DATE_EXT	TCLPDATE	DATE_ANA	METHOD	PARAMETER	CONC	ERR	UNITS	DL	DIL FACT	LAB QUAL	VER_QUAL
TEGORY: RADIOCHEMICAL													
1	WSV2659	/ /	/ /	09/14/99	HASL300	RADIUM-226	1.18	0.27	PCI/G	0.54	1.00		
2	WSV2659	/ /	/ /	09/14/99	HASL300	RADIUM-228	ND		PCI/G	1.14	1.00		
4	WSV2659	09/14/99	/ /	09/14/99	EML TH-01	THORIUM-230	6.44	0.81	PCI/G	0.62	1.00		
3	WSV2659	/ /	/ /	09/14/99	HASL300	URANIUM-238	310	40.8	PCI/G	10.3	1.00		

LABORATORY ANALYTICAL ELECTRONIC DATA DELIVERABLE
EDITED DISKETTE DELIVERABLE REPORT
Analyzed By: WSSRAP RAD LAB
Request No.: 668.0
PO Number: 3589-WP-RAD

EDITED
D10139D

WSSRAP_ID: SO-499011-01 DATE_SAM: 09/10/99 MATRIX: SOIL

REC#	LAB_ID	DATE_EXT	TCLPDATE	DATE_ANA	METHOD	PARAMETER	CONC	ERR	UNITS	DL	DIL FACT	LAB QUAL	VER_QUAL
CATEGORY: RADIOCHEMICAL													
5	WSV2660	/ /	/ /	09/14/99	HASL300	RADIUM-226	0.82	0.19	PCI/G	0.37	1.00		
6	WSV2660	/ /	/ /	09/14/99	HASL300	RADIUM-228	1.02	0.25	PCI/G	0.56	1.00		
8	WSV2660	09/14/99	/ /	09/14/99	EML TH-01	THORIUM-230	3.30	0.54	PCI/G	0.64	1.00		
7	WSV2660	/ /	/ /	09/14/99	HASL300	URANIUM-238	48.4	9.13	PCI/G	3.77	1.00		

85975

MK-Ferguson Company
Weldon Spring Site Remedial Action Project

TRANSMITTAL OF CONTRACT DELIVERABLE

Date: **January 19, 2000** Transmittal No.: **CD-0233-00**

Title of Document: **Closure Report For Soil Sampling At The Frog Pond Outlet, Addendum 6 Of The Engineering Soil Sampling Plan For Army And MDC Vicinity Properties**

Doc. Num.: **829** Rev. No.: **0** Date of Document: **January 2000**

Purpose of Transmittal: Request for Department of Energy acceptance of contract deliverable.

In compliance with the Project Management Contract, MK-Ferguson Company hereby delivers the attached document to the U.S. Department of Energy, Weldon Spring Site Office. The document has been reviewed and approved by Project Management Contractor management.

The document will be considered accepted unless we receive written notification to the contrary within 30 days of the date of this transmittal.

Number of copies transmitted: **One**

Douglas E. Steffen
Project Director

TMP: Form Contract Deliverable