DOE/OR/21548-229

Weldon Spring Site Remedial Action Project

Agricultural Sampling Plan

Revision 0

September 1991

Prepared by

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for the

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1 INTRODUCTION

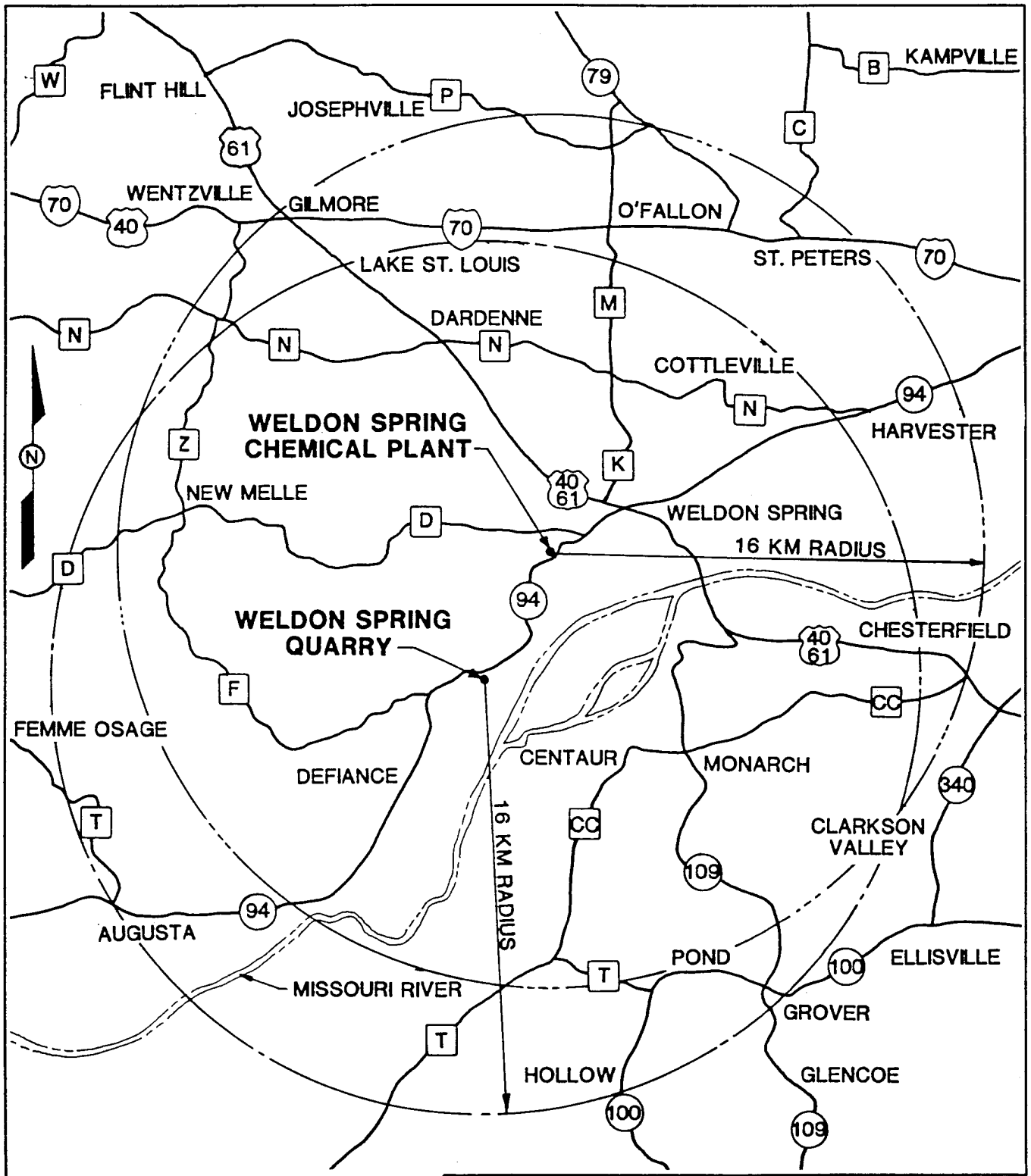
The following sampling plan is prepared in response to U.S. Department of Energy (DOE) requirements for analysis of "foodstuffs" in the *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance* (January 1991). In addition to these requirements, the plan responds to public concern about the potential for contamination of corn crops growing in the St. Charles County well field at the Weldon Spring Wildlife Area. The well field is located adjacent to the Femme Osage Slough near the Weldon Spring Quarry. Uranium concentrations in the slough have ranged from a low of ND to a high of 557 pCi/l, with an average around 54.8 pCi/l (MKF and JEG 1991).

The scope of this plan has been broadened to include agricultural grain products other than corn, such as soybeans, millet, and grain sorghum. Most of the land surrounding the Weldon Spring site and the Weldon Spring quarry consists of deciduous hardwood forest interspersed with old fields and croplands. Together, the Busch Wildlife Area, the Weldon Spring Wildlife Area, and Howell Island are comprised of approximately 64% forest, 17% cropland, and 15% old field (MDOC 1989). Portions of the Busch Wildlife Area and the Weldon Spring Wildlife Area are leased to sharecroppers for farming. In return, the farmers leave a portion of their crop for wildlife consumption. Along with surrounding Missouri Department of Conservation (MDOC) farmlands, there are numerous local farms in the vicinity of the Weldon Spring Chemical Plant and quarry.

1.1 Purpose

The purpose of this sampling plan is to characterize concentrations of radionuclides in agricultural products and to determine types of crops grown in the Weldon Spring area. This sampling plan describes the requirements for agricultural sampling to determine what environmental monitoring activities may be required in the future at the Weldon Spring Site Remedial Action Project (WSSRAP). By using this tiered approach, sampling can focus on food stuffs and feed products to determine the need for second tier sampling of milk, eggs, poultry, etc.

The areas to be sampled are within 16 km of either the Weldon Spring site boundary and the Weldon Spring quarry boundary (Figure 1-1) as designated by the guidance in Environmental Regulatory Guide (DOE 1991). The site and the quarry are approximately



SITE SURVEY RANGE

FIGURE 1-1

REPORT NO.:		EXHIBIT NO.: A/VP/097/0791	
ORIGINATOR: MGT	DRAWN BY: GLN	DATE: 7/91	

6.4 km apart. Since the sample areas overlap, samples will be taken in both the overlap and non-overlap areas. Background locations will be outside the 16 km radius of both areas.

1.2 Scope of Work

This sampling plan defines field methods for obtaining agricultural samples, sample selection, analytical requirements and methods, and quality control measures.

Sampling of agricultural products will take place just before harvesting commences. This will require close communication between the Project Management Contractor (PMC), the Missouri Department of Conservation, and farmers.

Surveying local farms will require contact with Agricultural Stabilization and Conservation Service (ASCS) to determine what crops have been planted in St. Charles County including portions of Franklin and St. Louis counties and the percentage of each. Also, local farmers will be contacted, if necessary, on the basis of sample selection.

1.3 Objectives

Sampling will be conducted to achieve the following objectives:

- Characterize background radiological levels in agricultural (foodstuffs) products.
- Determine the concentration of radionuclides in agricultural products near the site.
- Determine whether crops grown within the study area (Figure 1-1) contain significantly higher levels of radionuclides in excess of background.
- Make recommendations on environmental surveillance for agricultural products.
- Summarize agricultural practices surrounding the WSS.

1.4 Sample Collection

Sample collection will be based upon farming practices in the areas of concern. Information on farming practices is provided by the County Soil Conservation Service. There will be 20 samples taken in the overlap area, 10 samples in each nonoverlap area, and 20 samples outside the radius for a total of 50 samples, plus the quality assurance samples. Samples will be taken with consideration given to the distance from the contamination source. These locations will be representative of crop areas around the Weldon Spring Chemical Plant (WSCP), crop areas around the quarry, crops in the overlap area between the WSCP and the quarry[1], and background crops.

For agricultural products, approximately 1 kg will be sent for each sample. Only grain portions of the agricultural products gathered will be sent to the laboratory for analysis. The exception to this will be corn samples which along with grain will also include samples of (1) an entire corn stalk, excluding roots, (2) leaves only, and (3) cobs. Any soil will be removed from the samples prior to shipping. Samples will be collected and documented using the Biological Sample Collection Form (Figure A-1).

Soil samples will be collected at each location in accordance with ES&H SOP 4.4.5s, *Soil/Sediment Sampling*. These samples will be subject to the same quality control sampling as the agricultural samples. All sampling equipment will be decontaminated after each sample as specified in ES&H SOP 4.1.3s, *Sampling Equipment Decontamination*. A soil sampling form will be completed for each sample, see Figure B-1.

In addition to crop sampling, informal garden surveys will be conducted within the 16 km radii. This survey will be used to gather general information and to plan future argricultural sample plans deemed necessary from the 1992 study. Information collected will include, but not be limited to, garden size, variety of species, and final destination of the product. If livestock are present, this will be noted in the logbook as specified in Environmental, Safety and Health (ES&H) Standard Operating Procedures (SOPs) 1.1.4s, *Logbook Procedure*.

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[1] Sampling will be concentrated in locations nearest to, and downwind of, the WSCP and the quarry.

1.5 Sample Location and Identification

Exact sample locations will be chosen in the field and will be mapped and described on the field sheet. Sample locations will be at least a quarter of a mile apart.

Samples will be labelled in the format, BG-XXXX-MMDDYY, which will identify the samples by biological matrix (BG), agricultural products, and date sampled. The 3rd and 4th spaces will designate sample location. The 5th and 6th spaces will distinguish what type of agricultural product is being sampled. The last six digits will represent the date sampled. Sample identification and location will be reported on field sheets.

1.6 Background Samples

Background samples will be taken from areas outside of the 16 km radius and include crops found in the study area. Background samples will equal the total number of study samples taken. All background samples will be collected, identified, and recorded in the same manner as the study samples.

1.7 Analytical Requirements

Crop and soil samples will be analyzed for total uranium, Ra-226, Ra-228, and isotopic thorium. All samples will be field screened for radioactive contamination prior to shipment to off-site analytical laboratories. Laboratories performing radiological analyses for the WSSRAP are required to have an approved quality assurance laboratory plan and procedures. This QAPP details specific measures which the laboratory will implement to ensure data quality.

Data Quality Requirements (DQRs) are quantitative statements of selection, accuracy, and precision which specify the quality of data needed to support specified data uses. DQRs for this effort will be consistent with those established for routine environmental monitoring which are documented in the Environmental Data Administration Plan (EDAP) (MKF and JEG 1990).

Table 1-1 Requirements for Agricultural and Soil Samples

	Methods	Lower Limit of Detection	Sample Amount
Agricultural Samples:			
Total Uranium	EPA 908.1	1.0 pCi/g	500 grams
Radium-226	EPA 900.1	1.0 pCi/g	500 grams
Radium-228	EPA 904	1.0 pCi/g	500 grams
Isotopic Thorium	EPA 907	1.0 pCi/g	500 grams
Soil Samples:			
Total Uranium	EPA 908	1.0 pCi/g	500 grams
Radium-226	EPA 900.1	1.0 pCi/g	500 grams
Radium-228	EPA 904	1.0 pCi/g	500 grams
Isotopic Thorium	EPA 907	1.0 pCi/g	500 grams

1.8 Quality Assurance Samples

Quality control samples will be obtained for every 20 samples to assess laboratory performance and analytical precision. These samples will include duplicates, matrix spikes, matrix spike duplicates, and field blanks.

The labeling of QA samples will follow the same format as other samples collected with the addition of a two-character modifier at the end of the ID number.

Duplicate	XX-XXXX-XXXXXX-DU
Matrix Spike	XX-XXXX-XXXXXX-MS
Matrix Spike Duplicate	XX-XXXX-XXXXXX-MD
Field Blank	XX-XXXX-XXXXXX-FB

1.9 Sample Shipment and Chain of Custody

Samples will be shipped to off-site analytical laboratories for analysis. Sample chain of custody will comply with WSSRAP SOP ES&H 4.1.2. Shipment and packaging samples will follow Regulatory Compliance Procedures RC-11, RC-17, RC-19s, and RC-22s.

2 DATA REPORTING

Data collected during background sampling will be reported and interpretation and determinations will be made on minimum background levels of uranium, Ra-226, Ra-228, and isotopic thorium for agricultural products. These background samples will represent normal radionuclide levels in noncontaminated areas.

Data collected from study areas and from background samples will be interpreted and tested under various statistical methods. The statistical tests will determine whether concentrations found in agricultural crops within the 16 km vicinity of the Weldon Spring site (WSS) have significantly higher level of radiological concentrations than those outside the 16 km radius at a 90% confidence level.

One of two statistical tests will be used to make the determination; the Student's T-test or the Mann-Whitney U-test. The determination of which statistical test to use is based upon whether the distribution of data populations can be assumed to be normal, and whether the variances among sample populations (background and vegetative debris) are equal. Preliminary tests of variance and normality will be determined by using the W-test and F-test. For the W-test data reported as non-detects or less than the detection limit (DL) will be quantified as DL/2 per EPA guidance (EPA 1991).

Information gathered from agricultural sampling will also be compared to data results of soils taken from sample locations and the distance from source (either Weldon Spring Chemical Plant (WSCP) or Weldon Spring quarry (WSQ)). Correlation tests will be used to determine if any relationship can be drawn between soils, distance, and agricultural concentrations of radionuclides.

All data will be presented in a report prepared following the Format Guide for Formal Reports, Rev. 2 February 1991.

3 DATA ADMINISTRATION

Data will be reviewed and quality control samples compared following standard operating procedures (ES&H 4.9.1a, RC-31a) and the *Environmental Data Administration Plan* (MKF and JEG 1990).

Quality Assurance procedures will follow the guidelines established in the *Environmental Quality Assurance Program Plan* (MKF and JEG 1991).

4 REFERENCES

Missouri Department of Conservation, 1989. *Area Management Plan For the August A. Busch Complex*. Jefferson City, MO.

MK-Ferguson Company and Jacobs Engineering Group, 1991. *Environmental Quality Assurance Program Plan*. Rev. 0. DOE/OR/21548-238. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. In press.

MK-Ferguson Company and Jacobs Engineering Group, 1990. *Environmental Data Administration Plan*. Rev. 0. DOE/OR/21548-119. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. May.

MK-Ferguson Company and Jacobs Engineering Group, 1991. *Annual Site Environmental Report for Calendar Year 1990*. Rev. 1. DOE/OR/21548-193. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office, Weldon Spring Site Remedial Action Project. St. Charles, MO. August.

U.S. Department of Energy, 1991. *Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance*. DOE/EH-0173T. Washington, D.C. January.

WSSRAP Procedures

ES&H 1.1.4s - *Logbook Procedures*
ES&H 4.1.1/1 - *Numbering System For Environmental Samples and Sampling Locations*
ES&H 4.4.5s/1 - *Soil/Sediment Sampling*
ES&H 4.1.3 - *Sampling Equipment Decontamination*
ES&H 4.1.2 - *Chain of Custody*
ES&H 4.9.1a/1 - *Environmental Monitoring Data Verification*
RC-11 - *Transporation and Tracking of Material*
RC-17s/2 - *Packaging, Shipping and Receiving of Radioactive Materials*
RC-19s/1 - *Packaging, Shipping and Receiving of Non-Radioactive Hazardous Material*

RC-22s/0 - *Management of Samples Returned to WSS*
RC-31a/0 - *Environmental Monitoring Data Validation*

APPENDIX A

Sample Collection Forms

WELDON SPRING SITE REMEDIAL ACTION PROJECT
7295 Highway 94 South
St. Charles, Missouri 63304
(314) 441-8086

BIOLOGICAL SAMPLE COLLECTION FORM

SAMPLE ID: _____ Date: _____

LOCATION: _____ TIME: _____

PERSONNEL: _____

_____

LOCATION TYPE: LAKE STREAM SPRING RIFFLE POOL TERRESTRIAL

SAMPLE TYPE: BENTHOS PLANKTON FISH MAMMAL VEGETATION

SAMPLE PURPOSE: CHEMICAL RADIOLOGICAL ECOLOGICAL

VOUCHER SPECIMEN BIOMASS OTHER: _____

SAMPLING METHOD/EQUIPMENT: _____

SAMPLE SIZE/VOLUME: _____

DIAGRAM/COMMENTS: _____

_____

_____

_____

PARAMETERS TAKEN: _____

_____

_____

PRESERVATIONS: Packed in Ice (4°C) _____

Other _____

DUPLICATES TAKEN: _____

_____

Signature: _____ Date: _____

APPENDIX B

Soil/Sediment Sampling Form

100791

WELDON SPRING SITE REMEDIAL ACTION PROJECT
7295 Highway 94 South
St. Charles, Missouri 63304
(314) 441-8086

SOIL/SEDIMENT SAMPLING FORM

SAMPLE NUMBER: _____ DATE: _____

LOCATION: _____

PERSONNEL: _____

_____

SAMPLE COLLECTION METHOD: _____

SAMPLE TYPE: DEPTH COMPOSITE GRAB OTHER _____

SAMPLING EQUIPMENT DECONTAMINATION METHODS: _____

SAMPLE DESCRIPTION:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Signature _____ Date: _____