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CHEMICAL PLANT AREA CLEANUP ATTAINMENT CONFIRMATION PLAN

Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

DECEMBER 1995 **REV. 3**

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

Prepared by MK-Ferguson Company and Jacobs Engineering Group

MK-FERGUSON
A MORRISON KNUDSEN COMPANY

Weldon Spring Site Remedial Action Project
Contract No. DE-AC05-86OR21548

Rev. No. 3

PLAN TITLE: Chemical Plant Area Cleanup Attainment Confirmation Plan

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Weldon Spring Site Remedial Action Project

Chemical Plant Area Cleanup Attainment Confirmation Plan

Revision 3

December 1995

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for the

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ABSTRACT

The *Chemical Plant Area Cleanup Attainment Confirmation Plan* presents the protocol to be used to determine whether remediation efforts at the chemical plant area of the Weldon Spring Site have been completed to the extent required by the *Record of Decision for Remedial Action at the Chemical Plant Area of the Weldon Spring Site* (ROD) (Ref. 1). The plan specifies cleanup standards, sampling methods, sample frequency, analytical parameters, and the statistical evaluation to be performed to accomplish this determination. The plan follows guidance provided in *Methods for Evaluating the Attainment of Cleanup Standards Volume 1: Soils and Solid Media* (Ref. 2).

SUMMARY

This revision of the *Confirmation Plan* incorporated text changes suggested by the Missouri Department of Natural Resources (MDNR) to make the document easier to understand and to better define several technical issues. There were no changes to the technical approach presented in the previous version.

TABLE OF CONTENTS

NUMBER **PAGE**

TABLE OF CONTENTS (Continued)

NUMBER PAGE

TABLE OF CONTENTS (Continued)

NUMBER **PAGE**

TABLE OF CONTENTS (Continued)

NUMBER PAGE

LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

The chemical plant area of the Weldon Spring site (the site) is radioactively and chemically contaminated as a result of past processing and disposal activities. Explosives were produced at the site in the 1940s, and uranium and thorium materials were processed in the 1950s and 1960s. Various liquid, solid, and sludge wastes were disposed of at the site during these times. The site is currently listed on the National Priorities List (NPL) of the U.S. Environmental Protection Agency (EPA), and the U.S. Department of Energy (DOE) is conducting cleanup activities under the direction of the DOE Office of Environmental Restoration and Waste Management. The remediation program, a DOE Major System Acquisition, is known as the Weldon Spring Site Remedial Action Project (WSSRAP).

The confirmation of cleanup by evaluating a site relative to a cleanup standard is discussed in Section 121 of the *Superfund Amendments and Reauthorization Act*. This *Chemical Plant Area Cleanup Attainment Confirmation Plan* presents the sampling and analysis methods that will be used to determine whether soil radiological and chemical contaminant concentrations remaining after remediation meet the requirements established in the *Record of Decision for Remedial Action at the Chemical Plant Area of the Weldon Spring Site* (ROD) (Ref. 1). It will be implemented by the DOE Project Management Contractor (PMC), and independent verification of this confirmation sampling and analysis will be performed by the Oak Ridge Institute for Science and Education (ORISE).

1.1 Purpose

If, after remedial activities, the contaminant concentrations in the soil are statistically less than, or equal to, the cleanup standards, the site remediation can be judged to have met the requirements of the ROD. The steps involved in this evaluation include defining the attainment objectives, specifying the sample design and analysis plan, determining the number and locations of samples, collecting the samples, performing the analyses, and evaluating the results to determine whether the site has attained the cleanup standards. Procedures to be followed if it is determined that a sampled area does not attain the standards are also addressed.

This plan follows guidance provided in *Methods for Evaluating the Attainment of Cleanup Standards, Volume 1: Soils and Solid Media* (Ref. 2) and in the *Manual for Conducting Radiological Surveys in Support of License Termination* (Ref. 3), and DOE Order 5400.5.

1.2 Scope

It is within the scope of this confirmation plan to provide the following:

- Data quality objectives (DQO) to be used to support decisions regarding the success or failure of the remediation efforts.
- A plan based on the approach identified during development of the DQOs.
- Sample collection grids which show proposed sampling intervals.
- Sample collection procedures for performing sampling.
- Statistical methods for analyzing the data and determining whether cleanup standards have been attained.
- Procedures for performing and documenting required quality assurance (QA) measures.

This will be accomplished by developing specific DQOs and designing an appropriate, statistically based sampling program by which they can be achieved. The scope of this plan includes confirmation sampling at vicinity properties.

This plan designates the number and spacing of the sample locations necessary to perform the required statistical evaluation. It is anticipated that, as remediation progresses, some sample locations will be found to require additional remediation. When this occurs, after the additional remediation has been completed, new samples will be collected following the same procedures used to collect the first samples to demonstrate that the additional remediation was successful. Therefore, the total number of samples collected and analyzed will likely be greater than the number of sample locations specified.

1.3 Sampling Objective

The objective of this sampling program is to obtain the data necessary to document, with acceptable limits on uncertainty, that the soil radiological and chemical contaminant cleanup standards have been attained by the remedial efforts at the chemical plant area. To support this objective, this confirmation plan identifies the procedures to be used to:

- Identify the cleanup standards on which the plan will be based (Section 3.2.3.2).
- Identify the contaminants to be analyzed (Section 3.2.3.1).
- Define general sampling areas across the site (Sections 3.2.4 and 4).
- Identify distinct populations to be addressed (i.e., confirmation units) (Section 3.2.4.1).
- Evaluate field sampling procedures (Sections 3.2.3.3 and 8) and sample management (Section 5).
- Identify sample locations (Section 4).
- Specify the parameters to be compared to the cleanup standards (Section 3.2.5.3).
- Identify data quality requirements including precision, accuracy, representativeness, comparability, and completeness, as well as the analytical methods and levels to be met for each contaminant (Sections 3.2.6.2 and 8).
- Identify the recommended design of the sampling and analysis plan (Section 3.2.7).
- Identify the sample handling and collection procedures (Section 6 and 7).
- Evaluate procedures for determining with prescribed confidence that the concentrations of the contaminants attain the cleanup standards with acceptable limits on uncertainty (Section 8).

- Specify QA requirements including procedures for data analysis and data management (such as treatment of nondetect values, tests for outliers, etc.) (Section 9).

1.4 ALARA Concept

It is the intent of this plan to provide a framework for collecting analytical data to document that the chemical plant area of the Weldon Spring site has been remediated in accordance with the ROD. In the ROD, surface and subsurface cleanup criteria and more stringent surface and subsurface as low as reasonably achievable (ALARA) goals were established. It is important to remember that the concentrations expressed as ALARA levels have been established as goals. The ALARA concept is the process of putting forth reasonable efforts in design and in field implementation to try to achieve these goals. Implementing ALARA does not mean that these concentration goals will always be met.

Within this document, procedures are established for sampling, analysis, and statistical manipulation of data that will be used to help determine when ALARA goals have been reached. Remediation will be deemed complete either when the data indicate that the ALARA goal concentrations have been met or when it is determined that the ALARA principle has been met even though the actual goal concentrations have not. In all cases, the protective cleanup criteria will have been met to the statistical confidence specified. Throughout the remainder of this document, when it is stated that ALARA goals will be met, it includes both options of meeting either the ALARA goal concentrations or the general principle of ALARA.

1.5 Assumptions

This plan is based on the following assumptions:

1. Sufficient data are available from previous sampling programs (characterization) to adequately characterize surface (top 15 cm [6 in.]) and subsurface soils (depths below the top 15 cm). Remediation areas have already been identified by the characterization data.

2. Final confirmation sampling will be performed only on excavated areas or areas that may have been contaminated during excavation or general site activities that occurred subsequent to characterization sampling.

3. In general, final confirmation samples will be collected only from the top 15 cm (6 in.) of the excavated surface at each sample location. Since all contaminated soil identified during characterization, regardless of depth, will have been removed, samples will not be collected at depths below 15 cm (6 in.). The exception will be in cases where hot spots are identified that require additional delineation.

4. Characterization data are sufficient to identify the contaminants of concern at each proposed sampling location.

5. Soils identified through characterization to contain contaminants at levels above the ALARA goals will be designated to be removed during site remediation.

6. This plan is designed to provide methods for confirming attainment of the ROD goals.

7. The cleanup criteria and ALARA goals for soils presented in the ROD were established based on both regulations and risk assessment. The cleanup criteria are protective of human health.

8. The ALARA goals represent the lowest individual contaminant concentrations to be met through remediation. No lower standards will be developed for any combination of multiple contaminants.

9. Verification will be conducted following a plan prepared by the independent verification Contractor and approved by the DOE.

10. Subsurface standards will be applied at all sample locations designed to receive at least 15 cm (6 in.) of clean backfill (exclusive of a top dressing of suitable soil necessary to support final reclamation). Surface standards will be applied in areas designated for unrestricted access during remediation.

11. In areas where the final grading has not been established at the time of confirmation sampling, surface ALARA goals will be applied to all sample locations.

2 SITE DESCRIPTION AND HISTORY

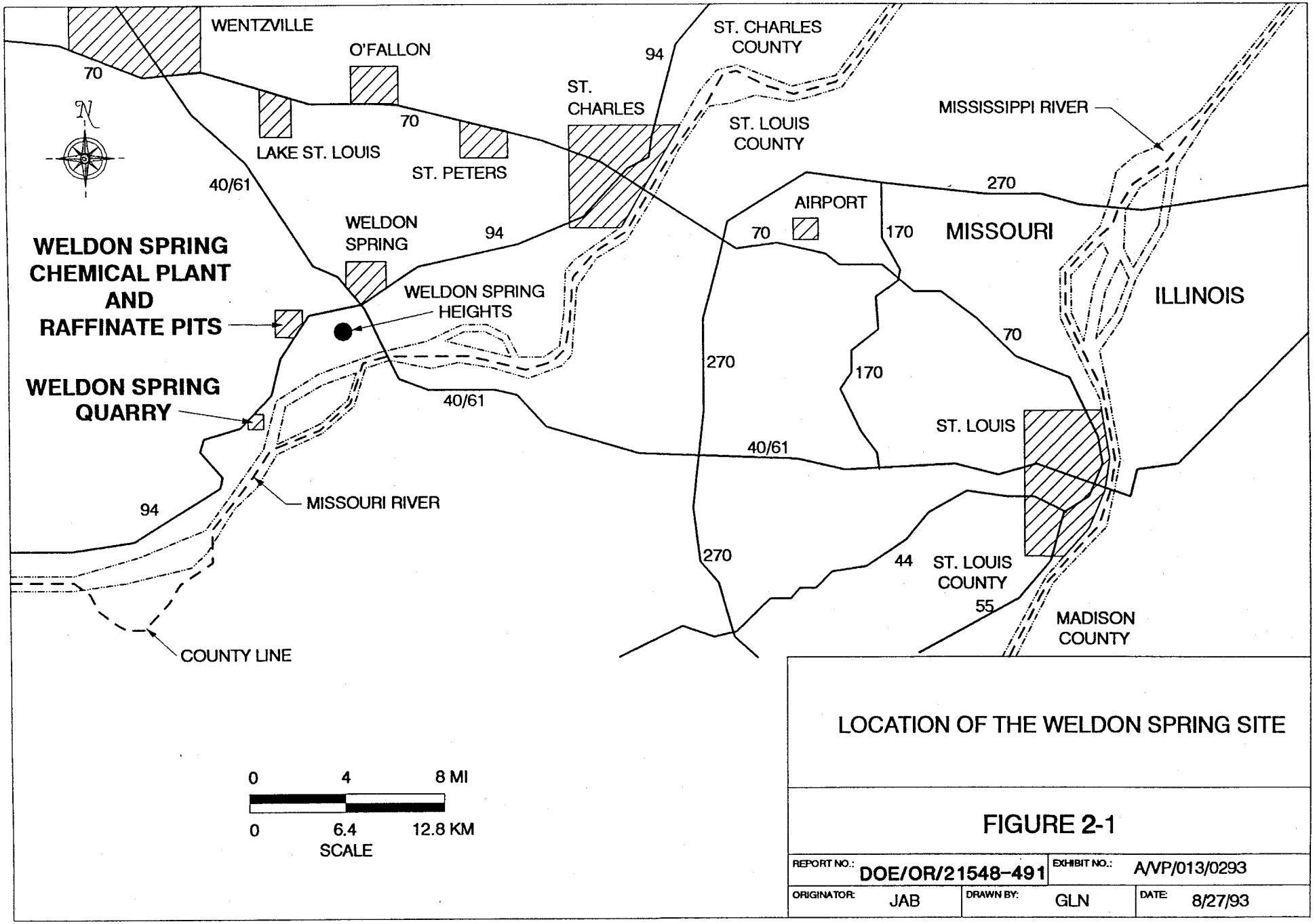
2.1 Site Description

The Weldon Spring site is located in St. Charles County, Missouri, about 48 km (30 mi) west of St. Louis (Figure 2-1). The 88-ha (217-acre) chemical plant area is located about 3.2 km (2 mi) southwest of the junction of Missouri (State) Route 94 and U.S. route 40/61. The site is accessible from State Route 94 and is fenced and closed to the public.

The site was initially used by the Army during the 1940s to produce the explosives trinitrotoluene (TNT) and dinitrotoluene (DNT). After extensive demolition, decontamination, and regrading, the chemical plant was built by the U.S. Atomic Energy Commission (AEC) to process uranium and thorium ore concentrates during the 1950s and 1960s. Radioactively and chemically contaminated waste was disposed of at the site during this period. Radioactive contaminants are primarily radionuclides of the natural uranium and Th-232 decay series; chemical contaminants include heavy metals and inorganic anions in excess of naturally occurring background levels, as well as organic compounds such as polychlorinated biphenyls (PCBs), nitroaromatic compounds, and polynuclear aromatic hydrocarbons (PAHs).

Site features (Figure 2-2) include approximately 40 buildings that have been, or are scheduled to be, dismantled; four raffinate pits; two ponds (Ash Pond and Frog Pond), and two former dump areas (North Dump and South Dump). Soil in the two dump areas and at scattered locations throughout the chemical plant is radioactively contaminated; discrete locations also contain elevated concentrations of certain metals and a few organic compounds. Several contaminated vicinity properties have been identified.

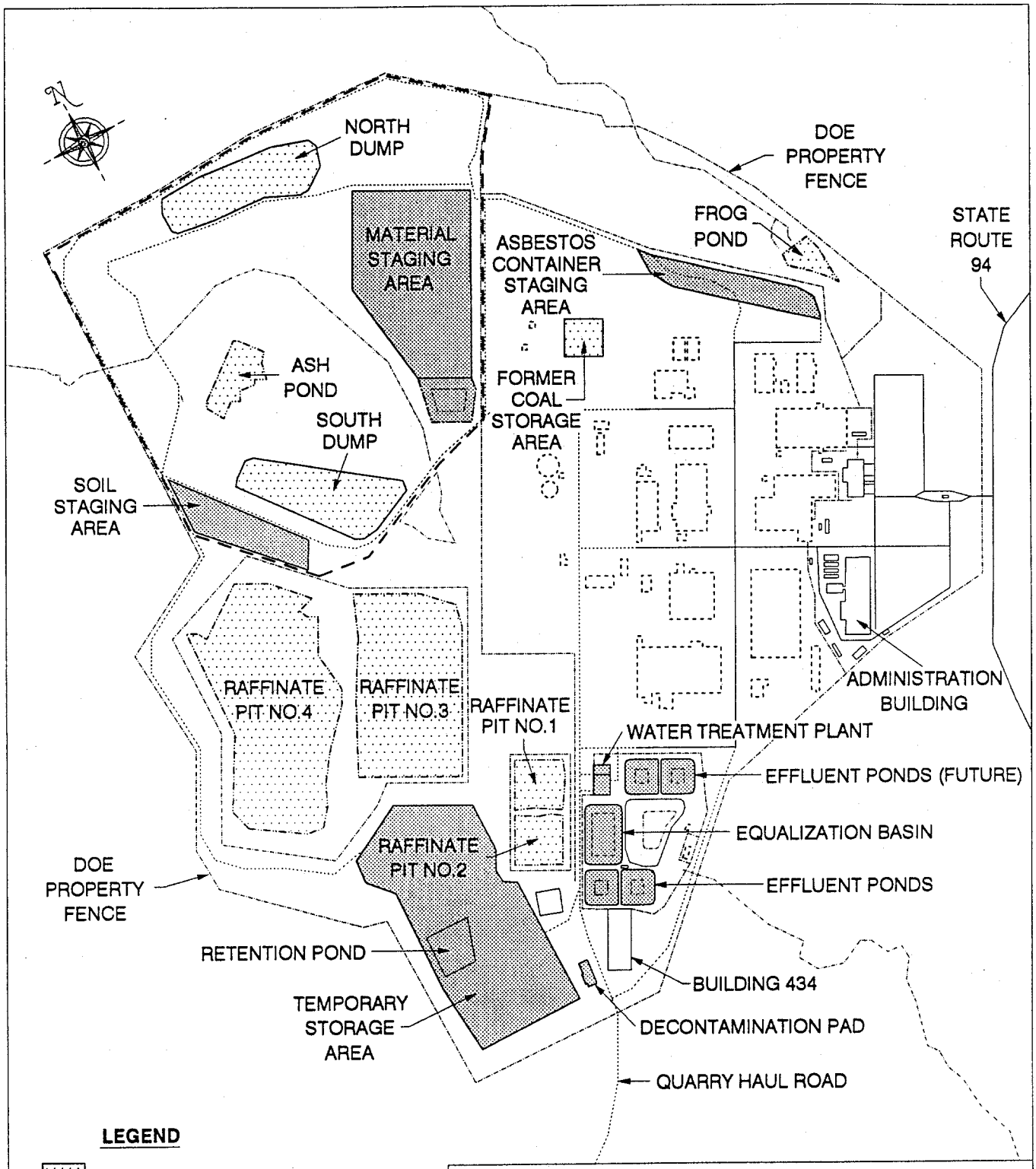
The raffinate pits cover about 10 ha (25 acres) in the southwestern portion of the site. They were excavated from existing soil during the operational period of the chemical plant to receive waste slurry from processing operations. They also received some drums and rubble from earlier decontamination activities. Ash Pond, covering about 4.5 ha (11 acres) in the northwestern portion of the site, received fly ash from the steam plant during its operational period. Frog Pond, covering about 0.3 ha (0.7 acres) in the northeastern part of the site, was constructed over TNT processing areas and is thought to have been installed as a catch basin for fire suppression water from the uranium processing buildings.



LOCATION OF THE WELDON SPRING SITE

FIGURE 2-1

REPORT NO.:	DOE/OR/21548-491	EXHIBIT NO.:	A/VP/013/0293		
ORIGINATOR:	JAB	DRAWN BY:	GLN	DATE:	8/27/93



GENERAL LAYOUT OF THE CHEMICAL PLANT AREA

FIGURE 2-2

REPORT NO.:	DOE/OR/21548-491	EXHIBIT NO.:	A/CP/017/0293		
ORIGINATOR:	JAB	DRAWN BY:	GLN	DATE:	8/27/93

The two closest communities to the site are Weldon Spring and Weldon Spring Heights; they are located approximately 3.2 km (2 mi) east of the site and have a combined population of about 850. The Francis Howell High School is located about 1 km (0.6 mi) east of the site on State Route 94. An estimated 1,770 persons are on the school campus daily during the school year. The largest city in St. Charles County is St. Charles, which is located approximately 24 km (15 mi) northeast of the site and has a population of more than 50,000.

2.2 Site History

In April 1941, the U.S. Department of the Army acquired about 7,000 ha (17,000 acres) of land in St. Charles County, Missouri, to construct the Weldon Spring Ordnance Works--a production facility for trinitrotoluene and dinitrotoluene explosives. The facility began operations in 1941 and closed in 1946. By 1949, all but about 810 ha (2,000 acres) of the ordnance works property had been transferred to the state of Missouri and the University of Missouri for use as a wildlife area and for agriculture. Except for several small parcels transferred to St. Charles County, the remaining property became the chemical plant area of the Weldon Spring site and the adjacent U.S. Army Reserve and National Guard Training Area.

In May 1955, the Atomic Energy Commission (a predecessor of U.S. Department of Energy [DOE]) acquired 83 ha (205 acres) of the property from the Army to construct a uranium feed material plant. About 6 ha (15 acres) were later transferred to the AEC for expansion of waste storage capacity by construction of the fourth raffinate pit. Considerable explosives decontamination and regrading activities were conducted before the chemical plant was constructed. Uranium and thorium ore concentrates were processed at the plant from 1957 to 1966.

Plant operations generated several chemical and radioactive waste streams, including raffinates from the refinery operation and washed slag from the uranium recovery process. Waste slurries were piped to the raffinate pits where the solids settled to the bottom, and the supernatant liquids were decanted to the plant process sewer. This sewer drained off site to the Missouri River via a 2.4-km (1.5-mi) natural drainage channel termed the Southeast Drainage. Some solid waste was also disposed of on site during the operational period of the plant.

The Army reacquired the chemical plant property in 1967 and began decontamination and dismantling operations to prepare the facility for herbicide production. Some of the resultant debris was placed in the fourth raffinate pit. The project was cancelled in 1969 before production was initiated, and the plant has remained essentially unused and in caretaker status since that time. The Army returned the raffinate pits portion of the chemical plant area to the AEC in 1971. As successor to the AEC, the DOE inherited responsibility for the raffinate pits. In 1985, the Army transferred custody of the remainder of the property to the DOE, having conducted some additional decontamination activities in the buildings during the previous year. The DOE established a project office at the site in 1986 to support cleanup activities, and a series of interim response actions were developed and implemented to control and mitigate releases to the environment.

The chemical plant area was included in the National Priorities List (NPL) in 1989. As a superfund project, the Weldon Spring site has been required to comply with the requirements of the *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA). The resulting RI/FS effort performed for the chemical plant area culminated in a *Record of Decision* (ROD) (Ref. 1) which was signed in 1993. The remedial action addressed in this ROD is the third of five major response actions planned for the area. The five response actions include:

- Decontamination and dismantlement of site structures.
- Treatment of impounded surface water.
- Removal, treatment, and disposal of site wastes (chemical plant area ROD).
- Remediation of vicinity properties.
- Mitigation of contamination in site groundwater.

The remedy selected in the chemical plant area ROD entails removal of approximately 675,000 m^3 (883,000 cu yd) of contaminated sludge, soil, sediment, structural material, vegetation, and process waste; treatment by chemical stabilization/solidification or volume reduction of approximately 342,000 m^3 (447,000 cu yd) of that material; and placement of approximately 772,000 m^3 (1,010,000 cu yd) of material in an engineered disposal facility on site.

3 DATA QUALITY OBJECTIVES

3.1 Summary

Development of this *Weldon Spring Site Chemical Plant Area Cleanup Attainment Confirmation Plan* (the plan) involves implementation of the Data Quality Objectives (DQOs) process. DQOs are qualitative and quantitative statements which specify the quality of the data required to support decisions during remedial response activities (Ref. 4).

The DQO process is a step-by-step planning tool developed by the U.S. Environmental Protection Agency (EPA) which, when implemented, is expected to result in specification of the optimum, statistically based sampling plan that will accomplish established objectives. In this case, the objectives are to develop a confirmation plan that will identify:

- Procedures for sampling and analyzing soils for remediated and remediation impacted areas of the chemical plant area.

- Methods for evaluating the data to make statistically defensible decisions regarding attainment of cleanup standards.

This approach involves statistical comparisons of contaminant concentrations with *Record of Decision* (ROD) (Ref. 1) cleanup standards. The plan is designed to document that the data collected will be of sufficient quality and quantity to support the specified decisions.

The DQO development process for confirmation sampling at the chemical plant area requires the completion of seven steps (Ref. 4). These steps are summarized below. Sections 3.2.1 through 3.2.7 contain a detailed discussion of each step of the DQO development process.

1. *State the problem.* Specific actions must be taken to confirm, with acceptable limits on uncertainty, that various site locations have been successfully remediated.

2. *Identify the decision.* The final decision resulting from implementation of this plan will be whether the data demonstrate that the cleanup meets the requirements of the *Record of Decision* (Ref. 1).

3. *Identify inputs to the decision.* This step involves identifying the environmental variables or characteristics that need to be measured to provide sufficient information to make the decision. The contaminants to be measured at each sample location are selected, and the cleanup standards on which confirmation of successful remediation is based are established.

4. *Define the study boundaries.* The purpose of this step is to clearly define the set of circumstances (boundaries) that will be covered by the decision. These include:

   - Spatial boundaries that define which areas require confirmation and from where the samples should be taken.

   - Temporal boundaries that describe when samples should be taken and what time frame the study data should represent.

5. *Develop the decision rule.* The recommended method of statistical analysis and the final decision rules resulting from implementation of the plan are outlined.

6. *Specify limits on decision errors.* This step identifies the acceptable limits on decision errors and the data quality requirements for the survey data used.

7. *Optimize the design for obtaining data.* The optimal approach is determined after consolidating results from the previous steps.

3.2 The DQO Development Process

Project managers and Federal and State regulators are integrated into the DQO development process so that a consensus may be established with regard to decision rules before the confirmation plan is designed. By obtaining decision-maker consensus during DQO development, the following is accomplished:

- Decisions regarding the attainment of cleanup standards are established.
- Acceptable probabilities of decision errors are identified.
- Data collection efforts are streamlined.

- Contingencies are identified.

The U.S. Department of Energy (DOE) process for this plan was implemented by the Project Management Contractor (PMC). However, several meetings were held with regulators (both State and EPA) and other DOE contractors to discuss the basic elements of the plan.

The DQO development process for confirmation sampling at the chemical plant area follows.

3.2.1 Statement of the Problem

Specific actions must be taken to confirm that various site locations have been successfully remediated. The following problem statement addresses this goal:

- The activities specified by this plan will confirm and document that the remedial excavation efforts at the chemical plant area have attained, with acceptable limits on uncertainity, the soil contaminant cleanup standards established in the ROD (Ref. 1).

This *Weldon Spring Site Chemical Plant Area Cleanup Attainment Confirmation Plan* identifies the measures that will be used to document attainment of the applicable cleanup standards. The plan presents a specific sampling approach for each area of concern based on existing characterization data and the proposed plan for remediation.

3.2.2 Decision Identification

The final decision resulting from implementation of this confirmation plan will answer the following question:

- Do the data demonstrate, with acceptable limits on uncertainty, that the surveyed sampling areas do not contain contaminant concentrations that exceed the cleanup standards established in the ROD?

The decision will be based on the following parameters:

- *Data* - the number of samples, sampling and analytical procedures, and data quality requirements that contribute to the quality of data used in making the decision.

- *Acceptable limits on uncertainty* - prespecified maximum allowable decision error rates that contribute to a level of confidence that has been determined to be acceptable for making the decision.

- *Concentrations of contaminants* - a statistically determined concentration value used in making the decision is preselected.

- *Statistically less* - a statistical analysis performed on the data that is compared to the null hypothesis (i.e., the site is contaminated) to determine whether sufficient contaminant concentration data exist to refute the null hypothesis.

- *Cleanup standards* - the standards to which the concentration of the contaminant of concern within the survey area is compared.

The formal process of decision making is detailed in Section 3.2.5.3.

Actions resulting from this decision will include:

- Confirming that the area has been remediated;

  or

- Requiring the collection of additional samples or the implementation of further remediation.

3.2.3 Study Inputs

This step of the DQO development process involves identifying the informational inputs required to resolve the decision discussed in Section 3.2.2. To identify which inputs require new environmental measurements, the following activities will be performed:

- Identify the information that will be required to resolve the decision.
- Determine the sources for each item of information.
- Identify the cleanup standards and describe how the standards will be used in the decision.
- Confirm that appropriate field techniques and analytical methods exist to provide the necessary data.

3.2.3.1 Information. The chemical plant ROD established two different sets of cleanup standards, protective risk-based cleanup criteria and more restrictive ALARA (As Low As Reasonably Achievable) goals. It is the intent of remediation to meet the ALARA goals. As such, remediation has been designed to remove all soils (and sludges) where contaminant concentrations are in excess of the ALARA goals established in the ROD.

Excavation will continue until the concept of ALARA is achieved; contaminant concentrations remaining in the final surface configuration of either backfill or in-place material will be compared to the surface goals. Subsurface contaminant ALARA goals will be used in areas designated to receive at least 15 cm (6 in.) of clean backfill for final grading purposes. Surface soil is defined as ground level to 15 cm (6 in.) below ground level. Subsurface is defined as soil deeper than 15 cm (6 in.) below the surface (Ref. 1; Ref. 5).

Immediately following soil excavation, the PMC will perform gamma field scanning and then collect and analyze soil samples for contaminants that have been determined through characterization to be above the ALARA goals in the area of each sample. Confirmation samples will be analyzed only for the contaminants that are known to exist in the area of each sample, not for all contaminants of concern over the entire site. The radiological and chemical contaminants of concern, cleanup criteria, and ALARA goals for the chemical plant area are identified in Table 3-1. This plan is based on collected confirmation samples being analyzed in a laboratory using approved analytical methods. The plan also includes gamma radiation field surface scanning of confirmation areas for radiological contaminants before laboratory samples are collected. Scanning shall be performed according to Procedure ES&H 2.6.2s. If field scanning techniques for contaminants can be demonstrated to achieve the same level of

confidence as laboratory samples (that remediation is complete), field scanning will be used to reduce the number of samples analyzed in a laboratory. Any such change in confirmation sampling will not be implemented without regulatory approval.

For radiological contaminants, surface scans for gamma activity will be performed over each 100 m^2 grid within all confirmation units (CUs) after soil excavation has been completed. Any locations of elevated direct gamma radiation exceeding 1.5 times ambient site background levels will be marked for further evaluation. Initially, localized gamma scans will be performed to bound the lateral extent of the elevated activity. If the area is determined to exceed 25 m^2, then additional remediation will be performed. Should the area be less than 25 m^2, one of two options will be selected. The area will be excavated if gamma levels are significantly in excess of background or samples will be collected from the anomalous area in order to characterize the activity levels of residual radionuclides. The size of the anomaly, together with analytical data, will then be used to determine whether hot-spot cleanup goals have been met based on a maximum concentration of the cleanup criteria times $(100/A)^{1/2}$. Any location with radionuclide concentrations greater than three times the cleanup criteria will be remediated, regardless of the size of the hot spot. Any area remediated based on field scanning will be re-scanned prior to collection of confirmation samples.

For chemical contaminants, there is no method to detect hot-spots using surface scans. Chemical hot-spots will be identified from the results of laboratory analysis of confirmation samples. To determine the aerial extent of a chemical hot-spot additional sampling and laboratory analysis may be necessary. These samples will not enter into the calculation for determining whether or not a CU has met the cleanup standards, only to define the hot-spot size.

If any chemical hot-spot is to be left unremediated, sampling will be sufficient to define the size of the area. The radiological hot-spot guidelines of maximum size of 25 m^2, maximum concentration of criteria times $(100/A)^{1/2}$, and nothing over three times criteria, will also apply to chemical hot-spots. In most cases, it is likely that chemical hot-spots will be remediated and reconfirmed, rather than sampled to define their size, in an effort to use the hot-spot guidelines. No more than five hot-spots will be left in any single CU.

TABLE 3-1 Radionuclide and Chemical Contaminant Cleanup Standards

	SURFACE[c]		SUBSURFACE[d]	
Radionuclide (pCi/g)	**ALARA**	**Criteria**	**ALARA**	**Criteria**
Radium-226[a,b]	5.0	6.2	5.0	16.2
Radium-228[a,b]	5.0	6.2	5.0	16.2
Thorium-230[a]	5.0	6.2	5.0	16.2
Thorium-232[a]	5.0	6.2	5.0	16.2
Uranium-238	30.0	120	30	120
Chemical (mg/kg)				
Arsenic	45	75	75	750
Chromium (total)	90	110	110	1,110
Chromium (VI)	90	100	100	1,000
Lead	240	450	450	4,500
Thallium	16	20	20	200
PAHs[e]	0.44	5.6	5.6	56
PCBs[f]	0.65	8	8	80
TNT	14	140	140	1,400

(a) If both Th-230 and Ra-226, or both Th-232 and Ra-228, are present and not in secular equilibrium, the cleanup criterion applies for the radionuclide with the higher concentration.

(b) At locations where both Ra-226 and Ra-228 are present, the cleanup criterion of 6.2 pCi/g (including background) in the top 15 cm (6 in.) of soil, and 16.2 pCi/g (including background) in each 15-cm (6-in.) layer of soil more than 15 cm (6-in.) below the surface, applies to the sum of the concentrations of these two radionuclides.

(c) Values listed for surface soils apply to contamination within the upper 15 cm (6 in.) of the soil column.

(d) Values for subsurface apply to contamination in soils below 15 cm (6 in.) unless otherwise noted.

(e) Benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, and ideno(1,2,3-cd)pyrene.

(f) Aroclor 1248, Aroclor 1254, Aroclor 1260.

Source: *Record of Decision for Remedial Action at the Chemical Plant Area of the Weldon Spring Site* (Ref. 1)

Data used in the decision to determine whether an area of the site has attained the cleanup standards will originate exclusively from confirmation samples collected and radiological screening performed under the procedures specified in this sampling plan.

The cleanup criteria and ALARA goals for key contaminants in site soil for the chemical plant area are specified in the ROD (Ref. 1). A detailed discussion of cleanup criteria and ALARA goal development is presented in Section 2 of the *Feasibility Study* (Ref. 5).

3.2.3.2 Definition of Cleanup Standards.

Definition of ALARA

The goal of the DOE ALARA process is to reduce exposures and risks associated with residual contamination as far below protective criteria as can reasonably be achieved based on technical, economic, and public policy considerations. This process includes both design and field activities. ALARA goals have been established in the ROD for residual soil contamination across the site on the basis of hypothetical exposures and technical feasibility. This analysis is supported by implementation of ALARA in the field during excavation.

Definition of Cleanup Criteria

Two main factors were addressed in developing the cleanup criteria specified in the ROD for the Weldon Spring Chemical Plant:

1. Long-term protection of human health and the environment.
2. Compliance with applicable or relevant and appropriate requirements (ARARs).

As a result, cleanup criteria for key contaminants in chemical plant (the site) soils were developed from available environmental regulations and guidelines in combination with the results of the site-specific risk assessments.

The risk assessments developed for the site were used to identify areas for remediation and to develop contaminant-specific criteria. In addition, the risk assessments addressed proposed (and subsequently withdrawn) Missouri Department of Health cleanup levels for some of the chemical contaminants. The risk assessments hypothetically assumed that institutional controls would be lost in the future and two likely land use scenarios could result, residential (including a farmer) and recreational (including a conservation area ranger and recreational user).

As a result of the risk assessments, the following principles were applied to the site in the *Feasibility Study* (Ref. 5) to identify general risk-based objectives for remedial action:

- Exposure to radionuclides should be reduced to levels as far below health-based criteria as can reasonably be achieved, given the constraints associated with natural variability in background levels.

- Exposure to carcinogenic chemicals should result in a total incremental lifetime risk in the range 1×10^{-6} to 1×10^{-4}.

- Exposure to noncarcinogenic chemicals should not result in significant adverse health effects as indicated by a segregated hazard index above 1.

- Exposure to biota should be limited to levels less than those associated with significant adverse ecological effects.

Cleanup criteria developed for the site soils address occurrences of surface and subsurface contamination. Because most site soil contaminants are at or near the surface and these contaminants offer the greatest potential for exposure to receptors, cleanup criteria values are more stringent for remediation of contamination within the upper 15 cm (6 in.) of site soils. Cleanup criteria levels for subsurface occurrences (below 6 inches) of chemical contaminants have been established at 10 times the surface levels.

3.2.3.3 Sampling and Analytical Methods. Soil samples will be collected and analyzed according to the Standard Operating Procedures (SOPs) for the WSSRAP and the *Environmental Quality Assurance Project Plan* (EQAPjP) (Ref. 6). See Section 9 for additional information on the specific SOPs and EQAPjP requirements. These specified procedures and requirements have been selected based on an assessment of their applicability to the confirmation sampling objectives and activities.

3.2.4 Definition of Study Boundaries

The purpose of this step is to clearly define the set of circumstances (boundaries) that will be covered by the decisions. These include:

- Spatial boundaries that define what should be studied and from where the samples should be taken.

- Temporal boundaries that describe when samples should be taken and what time frame the study data should represent.

3.2.4.1 Spatial Boundaries.

Domain or Geographic Area

The general boundary for development of the confirmation plan is the chemical plant area (within the fence), adjacent areas within a 30-m (100-ft) extension of the site boundary along the entire perimeter of the chemical plant area, and vicinity properties. The total area potentially to be sampled is approximately 101.5 ha (247 acres), composed of the 88-ha (217 acres) site, the 12-ha (30 acres) perimeter area, and 1.5 ha (3.7 acres) of vicinity properties.

Final confirmation samples will be collected from the top 15 cm (6 in.) at each sample location in remediated areas or areas potentially contaminated by remediation activities. The existing surface will be sampled in potentially impacted areas and the new surface following excavation in remediated areas. Except for hot spot characterization, no samples will be collected at depths below 15 cm (6 in.). Contaminant levels identified in samples from the top 15 cm (6 in.) will be considered to be representative of the subsurface. It is not the intent of this sampling to provide additional characterization data. This data was presented in the *Remedial Investigation for the Chemical Plant Area of the Weldon Spring Site* (RI) (Ref. 11). Since all soils characterized as contaminated above cleanup standards will have been excavated, no samples below 15 cm (6 in.) will be taken.

Scale of Decision Making

The ultimate goal of remedial action activities at the chemical plant area is to release the site for unrestricted use to the extent practicable. Data collected via implementation of the confirmation plan will be used to assess the residual risks associated with actual site conditions.

For the purpose of this plan, the site has been divided into discrete areas called confirmation units (CUs). A CU is a 2,000 m^2 (approximately 0.5 acres) remediated (or potentially contaminated) area for which a decision will be made as to whether or not remediation is complete (or needed). Decisions with regard to each CU will be based on the

data collected via implementation of this confirmation plan. The 2,000 m^2 size of each CU was based on the principle of providing decisions for areas approximately the same size as those used in the risk assessment (future residential lot) and at the same time supporting the construction schedule by establishing manageable areas that might require excavations to be left open while attainment of remediation goals is being confirmed.

Additionally, construction schedules may make it necessary to make decisions regarding cleanup attainment on individual areas smaller than a CU. This would be the case for a small excavation that will require backfilling prior to remediation of an entire CU. This plan establishes the same cleanup standards for these smaller areas.

3.2.4.2 Temporal Boundaries.

Data Collection Schedule

To expedite decision making, deadlines must be placed on sampling and reporting. Samples should be collected from remediated areas within 24 hours of completion of soil excavation activities. To minimize potential photolytic degradation, samples to be analyzed for TNT should be collected from remediated areas within 24 hours of initial exposure of the surface. Samples collected for laboratory analysis will be tested within 36 hours of sampling. The laboratory analytical results from each sampling round should be completed and reported within 48 hours of analysis, where practical, based on the method. Statistical analysis should begin within 24 hours of receipt of the results. The goal is to make a decision as to whether or not an excavated area has met the ALARA concept within one week of excavation. Data validation should be performed within one month of receiving the validation package from the laboratory, thereby enabling corrective action if necessary.

Study Time Frame

It will be assumed that the sampling data represent both the current and future concentrations of the contaminants of concern. If for any reason an area is contaminated or suspected to have become contaminated, additional sampling and remediation may be required. Any additional sampling will also follow the procedures established in this plan with the grid shifted. Where practical constraints hinder collection of a specific sample or necessitate

reconsideration of proposed steps, this plan will be followed to the maximum extent practicable. Any deviations will be duly recorded.

3.2.5 Decision Rule Development

The objectives and requirements identified in the previous steps will be specified as single statements specifying how the environmental data will be summarized and used in the decision. The decision rules will then be formulated into standard statistical terms for direct application to the data during statistical analysis. This section provides detailed information on the development of the final decision rules.

3.2.5.1 Characterization Parameter. The characteristics of the contaminant concentrations (i.e., median, or 95th percentile) to be compared to the cleanup standards must be specified in order to define a statistical test to determine whether a sample area (confirmation unit) attains the cleanup standards. Considerations for selecting the parameters to use in statistical assessments include (Ref. 2):

- The likelihood of concentrations below the cleanup criteria.
- The relative spread of the data.
- The reasoning used to develop the risk-based criteria, if known.
- The toxicological effect of the contaminant being measured (e.g., carcinogenic, systemic toxicant, developmental toxicant).

The recommended parameter for the confirmation sampling is the mean of the measured concentrations within each confirmation unit, since:

- It is the value that will be used in the post remediation risk assessment where average exposure is the guiding principle.
- There should be little spread in the data after remediation.

- It is a well understood characteristic that lends itself well to the ALARA concept.

3.2.5.2 Action Levels. The action levels will be the ALARA goals and cleanup criteria, as applicable, for each contaminant of concern shown in Table 3-1, using the analytical methods identified in Section 7 of this plan.

3.2.5.3 Development of Decision Rules. Decision rules are used to evaluate whether an area has been remediated to the extent required by the ROD. Two rules will be used in this plan. One is based on a statistic (mean concentration of a given contaminant in a CU) to evaluate whether the area is in compliance with the cleanup standard. The other is based on determining whether each 100 m^2 area has mean radiological contaminant concentrations less than the cleanup criteria. Thus, each average contaminant concentration within a CU will be compared to the ALARA goal, and the average radiological contaminant concentration in each 100 m^2 area will be compared to cleanup criteria. The maximum allowable "hot spot" will be defined by the following.

$$Maximum\ Concentration = (cleanup\ criteria) \times (100/A)^{1/2}$$

where A is the area of the "hot spot" in square meters.

Additional remediation and/or further sampling and analysis will be performed where CU average values exceed the ALARA concept or cannot be demonstrated to have met the standards to the specified level of confidence, or 100 m^2 areas exceed the radiological cleanup criteria.

3.2.6 Specification of Acceptable Limits on Decision Errors

This step will identify the acceptable limits on decision errors and the data quality requirements for the data to be used in making decisions regarding attainment of the cleanup standards.

3.2.6.1 Uncertainty Limitations. The validity of the decision that a site meets a cleanup standard depends on how well the samples represent the site, how accurately the

samples are analyzed, and other factors, all of which are subject to variation. Different sampling patterns will yield different results and repeated measurements on individual samples will yield different concentrations. These variations introduce uncertainty into decisions concerning the attainment of cleanup standards.

As a result of this uncertainty, one may decide that a site is clean when it is not. In the context of this plan, this mistaken conclusion is referred to as a false positive finding. From an environmental and health protection perspective, it is imperative to reduce the chances that false positives will occur, that is, deciding a site is clean when it still poses a health or environmental threat.

In order to design a statistical test for deciding whether a sample area attains a cleanup standard, a false positive rate for testing the site must be specified. This rate is the maximum probability that the sample area will be declared clean by mistake when it is actually contaminated. DQO guidance suggests starting with a false positive rate (alpha) of 0.01 and increasing it as conditions allow. Since this site is being remediated to ALARA goals, which are much lower than the risk-based cleanup criteria, and since risk assessment science is at best only accurate to an order of magnitude, the false positive rate for this plan is 0.05. This means that statistically there is only a 5% chance that the site will be incorrectly designated as remediated or clean.

Although less critical from a health and safety standpoint, a false negative rate must also be established to control remediating when the area is actually clean. EPA guidance (Ref. 2) suggests a false negative rate of 0.10 or 0.20 when trying to detect a difference between the mean and the cleanup standard. The false negative rate (beta) for this plan is 0.20.

3.2.6.2 Data Quality Requirements. Performance requirements for data quality and reliability include specifications for precision, accuracy, representativeness, comparability, completeness and detection limit. This sampling will follow the guidelines in the WSSRAP *Environmental Data Administration Plan* (Ref. 7) and *Analytical Support Services Specification* (Ref. 8).

3.2.7 Sampling Plan Design

The objective of this step is to identify the most effective sampling design that will generate data that satisfy the DQOs specified in the preceding steps. Statistical methods discussed in *Methods for Evaluating Attainment of Cleanup Standards* (Ref. 2) were evaluated for application to this plan. The following sampling plan designs were considered:

- *Random*. Random selection of sample points. Each sample point is selected independent of the location of all other sample points. Selection of sample points may be on a site-wide basis (simple random) or by predetermined subareas (stratified random).

- *Systematic*. Distribution of the samples more uniformly over the area. Sample points follow a simple pattern and are separated by a fixed distance. The starting point for the pattern is usually selected randomly.

This plan uses a systematic approach for several reasons. Establishing a grid across areas to be sampled based on CUs lends itself to a systematic sampling program. Systematic sampling is also usually easier to implement under field conditions. Systematic sampling provides for uniform coverage of CUs which may allow a more accurate estimate of mean concentrations. And finally, systematic sampling can support a remediation plan which requires diligent attention to excavation and backfill sequences in order to prevent costly schedule delays.

4 SAMPLE FREQUENCY AND PARAMETERS

4.1 Sampling Frequency

The size of the sampling grid to be applied to a confirmation unit (CU) is dictated by the sampling frequency needed to achieve statistically defensible data. *Methods for Evaluating the Attainment of Cleanup Standards, Volume 1, Solid Media* (Ref. 2) provides a formula for calculating the number of samples needed to ensure the mean concentration of a CU is less than the ALARA goal at the specified level of confidence. The required number of samples is computed using three parameters: alpha (α) (the desired false positive rate), beta (ß) (the desired false negative rate), and tau (τ) (an expression of difference in units of standard deviation). Table A.6 of the EPA guide provides a summary of sample size requirements for various values of α, ß, and τ.

α and ß have been established at 0.05 and 0.20, respectively. τ is calculated as follows:

$$\tau = (C_s - \mu_1)/\sigma$$

where C_s is the cleanup standard relevant to the sample area and the contaminant being tested, μ_1 is the value of the mean contaminant concentration across the sample area for which a specified false negative rate is to be controlled, and σ is an estimate of the standard deviation of the individual contaminant concentrations within the CU.

Table 4-1 lists the number of required samples per CU to confirm to surface ALARA goals based on Table A.6 in the EPA guide cited above. In the table, C_s is established as the most restrictive cleanup standard to be used, namely the surface ALARA goals. The mean contaminant concentration for which a false negative rate is to be controlled is established as two thirds of the cleanup goal for metals and zero for organics. The metals μ value is based on allowing some variation below the cleanup standard while still ensuring remediation will be stopped before natural background concentrations are approached. The idea is to develop as steep a power curve as reasonable (see Figure A-2, Ref. 2), without driving analytical costs too high. As long as μ is below ALARA, the intent of the ROD is met. Since the organics are not naturally occurring, a nondetect or zero value is set to control the lower limit for their remediation. Since no post-remediation data exists to calculate a standard deviation, it is

TABLE 4-1 Estimated Sample Size Needed to Confirm to Surface ALARA

CONTAMINANT OF CONCERN	C_s[a]	μ_1	σ	τ	NO. OF SAMPLES[b] PER CU
Arsenic	45	30	12.5	1.20	6
Chromium	90	60	18.3	1.64	6
Lead	240	160	75	1.07	6
Thallium	16	10.7	3.3	1.61	6
PAHs	0.44	0	0.93	.47	28
PCBs	0.65	0	1.33	.49	26
TNT	14	0	23.3	0.60	17
RA-226	5	3.33	1.03	1.62	6
RA-228	5	3.33	1.03	1.62	6
TH-230	5	3.33	1.03	1.62	6
TH-232	5	3.33	1.03	1.62	6
U-238	30	20	20	0.50	25

(a) C_s by definition is the ALARA goal

(b) From TABLE A.6 in *Methods for Evaluating the Attainment of Superfund Cleanup Standards, Volume 1, Soils and Solid Media* (Ref. 2)

estimated as the range (the average maximum concentration remaining after remediation will not exceed the cleanup criteria) divided by six (Ref. 2).

The required number of samples per CU for each contaminant ranges from 6 to 28. Since U-238 is the most common contaminant on site, at least 25 samples must be collected in each CU. To simplify the sampling program and to ensure that the statistical confidence for

polychlorinated biphenyls (PCBs) and polycyclic (or polynuclear) aromatic hydrocarbons (PAHs) meets the requirements of this plan, 28 samples will be collected in each 2000 m^2 where a contaminant is being measured. The sampling pattern shown in Section 8 will be followed in each CU and each contaminant will be sampled at the minimum rate of 28 samples per 2000 m^2.

4.2 Analysis Parameters

Figure 4-1 shows the general areas where sampling for confirmation of cleanup attainment will be performed and the analyses to be performed for each sample.

4-1 Conceptual Representation of Areas Requiring Confirmation Sampling

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5 SAMPLE DESIGNATION, DOCUMENTATION, AND CUSTODY

5.1 Sample Designation

Sample identification and sample numbering will follow Weldon Spring Site Remedial Action Project (WSSRAP) Procedure ES&H 4.1.1a, *Numbering System for Environmental Samples and Sample Locations*. Sample forms from WSSRAP Procedure ES&H 4.4.5s, *Soil/Sediment Sampling*, will be completed for each sample, with the following information recorded:

- Organization name.
- Sample ID No.
- Location.
- Date.
- Time of collection.
- Sample collection method.
- Preservation.
- Names of samplers.

5.2 Sample Documentation and Management

Documentation of the confirmation sampling will be an integral part of the quality assurance/quality control (QA/QC) program. Data obtained from sample collection and analysis operations will be recorded on standardized report forms and log books in accordance with WSSRAP Procedure ES&H 1.1.4s, *Logbook Procedure*. Data validation techniques will require that standard operating procedures; sample tracking methods; validation procedures; QC checks on the data quality requirements of precision, accuracy, representativeness, completeness, and comparability (PARCC); and all sampling and laboratory activities be documented in accordance with WSSRAP Procedure ES&H 4.9.2a, *Environmental Monitoring Data Validation*.

The required documents, including standardized WSSRAP Forms, are listed below:

- Contract Laboratory Program (CLP) report forms (or CLP like report forms).
- Chain-of-custody forms.

- Sample analysis request forms.
- PARCC objectives summary forms.
- QA/QC report forms for laboratory.
- Equipment calibration report forms.
- Standard field and laboratory log forms.

Documents used to record confirmation sampling and analysis activities will be, where practicable, numbered and assigned to individuals designated to perform specific tasks. These documents will include:

- Field log books.
- Field data record forms (e.g., well inventory forms, pumping test data sheets).
- Copies of analytical log books.
- Laboratory data, calculations, graphs, etc.
- Location maps, photos, selected drawings, as-builts.
- Checklists of equipment performance.
- Equipment maintenance logs including repair and calibration information.
- Photographic logs.
- Engineering calculations.

QA records will be monitored as specified in WSSRAP Procedure SQP-7, *Quality Assurance Records*, and will be stored in locked and secure facilities. Dual document storage facilities will be maintained at locations sufficiently remote from each other to eliminate the chance of simultaneous exposure to a hazard. Access to both facilities will be controlled. This applies to both computer-generated data and hard-copy documents. Copy-protected software will be replaceable from the supplier.

Documents will be reviewed for technical adequacy by the responsible managers before they are submitted to the Project Quality Department for retention as QA records. Appropriate documents will become QA records upon their completion following Procedure SQP-7.

5.3 Chain-of-Custody Requirements

The Chain-of-Custody Form will require, at a minimum, the following:

- Sample identification.
- Sample location.
- Sample date.
- Time of collection.
- Sample matrix.
- Sample preservation.
- Analysis required.
- Release and acceptance information (i.e., date, location, technician's signature).

Chain-of-custody forms for laboratory samples will be completed and placed in the sample coolers. Sample coolers prepared for shipment will be sealed with chain-of-custody control seals signed and dated by the shipper. Chain-of-custody forms and seals will be prepared in accordance with WSSRAP Procedure ES&H 4.1.2s, *Initiation, Generation, and Transfer of Chain of Custody*.

6 SAMPLING EQUIPMENT AND COLLECTION PROCEDURES

6.1 Field Identification of Sample Locations

Identification of the sample locations in the field will be accomplished using a detailed site map that shows the reference (or grid) system. Sample locations will be identified based on north and east coordinates relative to an established grid baseline or other unique grid identifier, such as the southwest corner of each confirmation unit (CU). The boundaries of CUs for which separate attainment decisions are to be made will be shown on the map.

6.2 Sample Collection Procedures for Laboratory Analyses

Samples will be collected from the surface soil (0 cm to 15 cm) using hand tools. Samples will be placed in new glass or plastic sample containers as specified by the applicable analytical method, and then placed immediately on ice in sample coolers in the field. Sample labels will be completed and attached to all containers prior to placement in the coolers. Sample collection and labeling of containers will be in accordance with WSSRAP Procedures ES&H 4.4.5s, *Soil/Sediment Sampling*, and ES&H 4.1.1a, *Numbering System for Environmental Samples and Sample Locations*. Sample locations, samples collected, and related data will be recorded at the time of collection in a bound logbook in accordance with WSSRAP Procedure ES&H 1.1.4s, *Logbook Procedure*, and the soil sampling data sheet (ES&H 4.4.5.1, *Soil/Sediment Sampling*).

6.3 Sampling Procedures for Field Analyses

If field analyses are performed, sample locations, samples collected, and related data will be recorded at the time of sampling in a bound logbook in accordance with WSSRAP Procedure ES&H 1.1.4s, *Logbook Procedure*, and the soil sampling data sheet (ES&H 4.4.5.1, *Soil/Sediment Sampling*).

6.4 Equipment Decontamination

Tools used to collect or transfer samples will be cleaned and decontaminated between each sample. Decontamination will be performed in accordance with WSSRAP Procedure ES&H 4.1.3s, *Sampling Equipment Decontamination.*

7 SAMPLE HANDLING AND ANALYSIS

7.1 Analytical Methods

The analytical methods selected for analyzing the confirmation samples will be consistent with the methodologies used during the Remedial Investigation/Feasibility Study for the chemical plant area to ensure that qualitative QA parameters of comparability are met. Also, the analytical methods will conform to the quantitative QA parameters of precision, accuracy, and detection limit as specified in Section 9.1 of this plan. Field surveys for radiological contaminants will follow Procedure ES&H 2.6.2s.

7.2 Preservation Methods

Preservation methods for survey samples will be in accordance with the requirements specified by the selected analytical methods.

7.3 Sample Containers

Sample containers used for the storage and transportation of survey samples to the laboratory will conform to the requirements stipulated by the selected analytical methods.

7.4 Packaging Samples for Shipment and Transportation of Samples

When an off-site laboratory is used, samples will be packaged and transported to the laboratory in accordance with U.S. Department of Transportation Requirements, the *Site Consolidation Transportation Activity Manual* (Ref. 9), and WSSRAP procedures with a separate custody record accompanying each sample cooler or package (Ref. 6), including RC-17s, *Off-Site Transportation of Hazardous Materials*: RC-19s, *Hazardous Material/Sample Transportation Activity (HMSTA) Procedure*; and RC-22s, *Sample Disposal*, as appropriate.

7.5 Sample Custody

A major required component of the final status survey plan will be maintaining sample integrity from collection to data reporting. To maintain and document sample possession, chain-of-custody procedures will be implemented. Custody elements will include at a minimum:

- Sample seals.
- Labels with identification numbers to allow for sample tracking.
- Field log books.
- Field data record forms.
- Chain-of-custody records.
- Sample analysis request sheets.
- Bills of lading and air bills.
- Field and laboratory tracking forms.

Field and laboratory sample custodians or their designated representatives will be responsible for maintaining custody of samples. A sample will be considered to be under a person's custody if one or more of the following conditions are met:

- It is in the person's physical possession.
- It is in view of the person.
- It is secured by the person so that no one can tamper with the sample without being detected.
- It is secured by the person in an area that is restricted to authorized personnel.

Sample custody activities for final status survey sampling will be conducted in accordance with the sample custody program for the Weldon Spring site which includes documentation of procedures for the preservation of samples, sample identification, recording sample collection location, and specific considerations associated with sample acquisition. Applicable forms for recording these data, and the tracking of samples as required by chain-of-custody procedures, are specified in WSSRAP Procedures ES&H 4.1.1a, *Numbering System for Environmental*

Samples and Sampling Locations; 4.1.2s, *Chain of Custody*; 4.1.4s, *Quality Control Samples for Aqueous and Solid Matrices: Definitions, Identification Codes, and Collection Procedures*; and 4.4.5s, *Soil/Sediment Sampling*.

Samples will be accompanied by chain-of-custody records. Completed chain-of-custody documents will be retained as Quality Assurance (QA) records and maintained in accordance with the WSSRAP Quality Assurance Program.

Authorized sample custodians at the laboratory will sign for incoming samples, obtain documents of shipment, and verify data entered onto the sample custody records. The laboratory will be required to inform the PMC of receipt of samples within one working day. If any damage or shipping discrepancy is noted upon receipt of samples, the laboratories will be required to inform the PMC immediately.

7.6 Data Evaluation and Reduction

Survey sample data packages received from the subcontracted laboratory will undergo several processes to evaluate the quality of the data. When the data are first received, copies will be distributed to the Project Quality Department for storage as QA records, the Verification Group, and data users for review. If validation of sample analysis has been requested, a copy will be forwarded to the Validation Group for data qualification.

7.6.1 Data Verification

All sample analytical results received from the laboratory will be reviewed in accordance with ES&H 4.9.1a, *Environmental Monitoring Data Verification*. The following factors will be evaluated to verify if a sample has been properly handled according to WSSRAP protocol:

- Chain-of-custody.
- Holding times.
- Sample preservation requirements.
- Laboratory chain-of-custody.
- Sample analysis request form.

- Quality Control samples.
- Laboratory receipt forms.

7.6.2 Data Review

Copies of the data packages will be distributed to the data users for their review. The data will be reviewed to identify discrepancies in the field QC samples, inconsistencies with characterization data, and apparent abnormalities. Deficiencies reported by data users will be reported to the Verification Group. Data users may request validation of any data that appear to be of questionable quality.

7.6.3 Data Validation

Randomly selected laboratory data and data selected by verification or data users will undergo thorough reviews of the analytical process in accordance with ES&H 4.9.2a, *Environmental Monitoring Data Validation*. These reviews will be conducted by the Validation Group. Ten percent of laboratory data associated with this plan will be validated.

The purpose of this validation procedure will be to specify a consistent means for reviewing and evaluating the data resulting from laboratory analyses and for providing a consistent means of documenting the evaluations, and reporting the usefulness of the data to the data users. This will be accomplished through a thorough review of the analytical data utilizing laboratory analytical records to assess laboratory conformance to quality control criteria, data quality requirements for data quality objectives, and procedural requirements.

7.6.4 Data Reduction

The survey sampling data will be reduced for input into the WSSRAP computerized database. These data may include logs, tracking forms, and results of laboratory analyses. Computer software will be managed in accordance with SQP-13a, *Computer Software Quality Assurance Qualifications*.

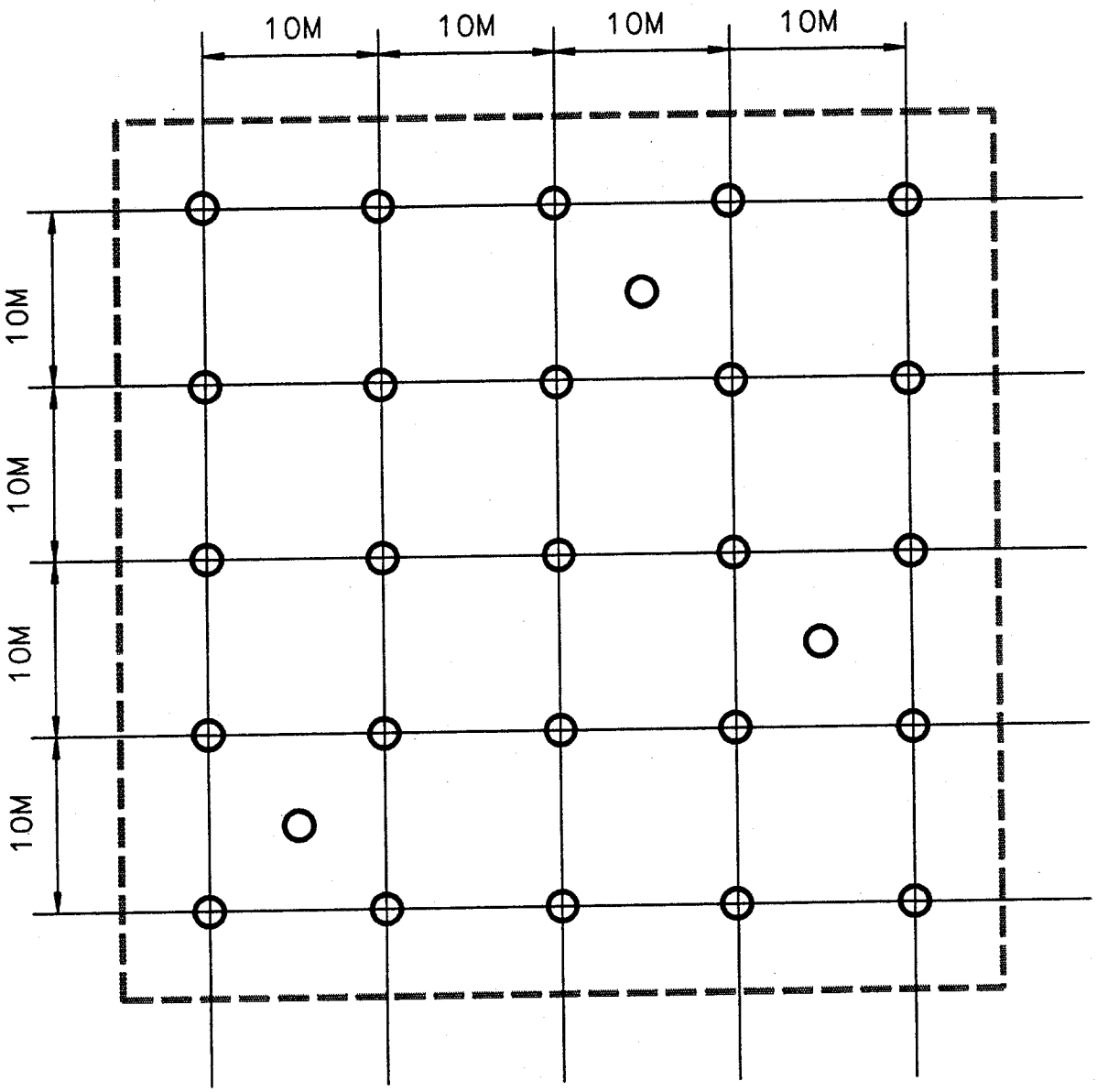
8 STATISTICAL ANALYSIS TO VERIFY ATTAINMENT

The methods described in this section will be used to determine whether specified portions of the chemical plant area meet the cleanup standards established in the ROD. Procedures are provided for evaluating the data for confirmation units (CUs) and for areas smaller than a CU.

8.1 Evaluating the Data

The procedure described below will be used to test whether a CU meets the cleanup standards:

- Each 100 m^2 grid area will be field screened for radioactive contaminants.
- Within CUs, samples will be collected using the grid shown in Figure 8-1.
- For each contaminant of concern measured in a 2000 m^2 CU, the mean contaminant concentration will be calculated and compared to its ALARA goal. The CU will be deemed remediated when the mean is less than, or equal to, the cleanup standard.
- The mean radiological contaminant concentration of the four (or five) samples from each 100 m^2 grid area will be compared to the cleanup criteria.
- Areas smaller than a CU may be confirmed in the same manner, as schedule or circumstances dictate. This will result in a more conservative confirmation since it will reduce the area over which the mean will be calculated.
- For PCBs and PAHs, where several species are measured, and the sum of the detection limits can exceed the cleanup standard, nondetect values will be assumed to be zero for purposes of calculating means. For all other contaminants nondetects will be assumed to be one-half of the detection limit for purposes of calculating the mean.



WITHIN EACH cu THREE OF THE 10M x 10M UNITS WILL BE RANDOMLY PICKED TO BE SAMPLED IN THE CENTER.

LEGEND

O - SAMPLING POINT

HYPOTHETICAL CONFIRMATION UNIT

NOT TO SCALE

CONFIGURATION SAMPLING GRID FOR 2000 M^2 cu

FIGURE 8-1

REPORT NO.	EXHIBIT NO.	
DOE/OR/21548-491	A/PI/033/0395	
ORIGINATOR	DRAWN BY	DATE
SDW	SRS	5/9/95

- All reasonable efforts will be implemented to achieve compliance with the rules above.

8.2 Evaluating Samples with Multiple Contaminants

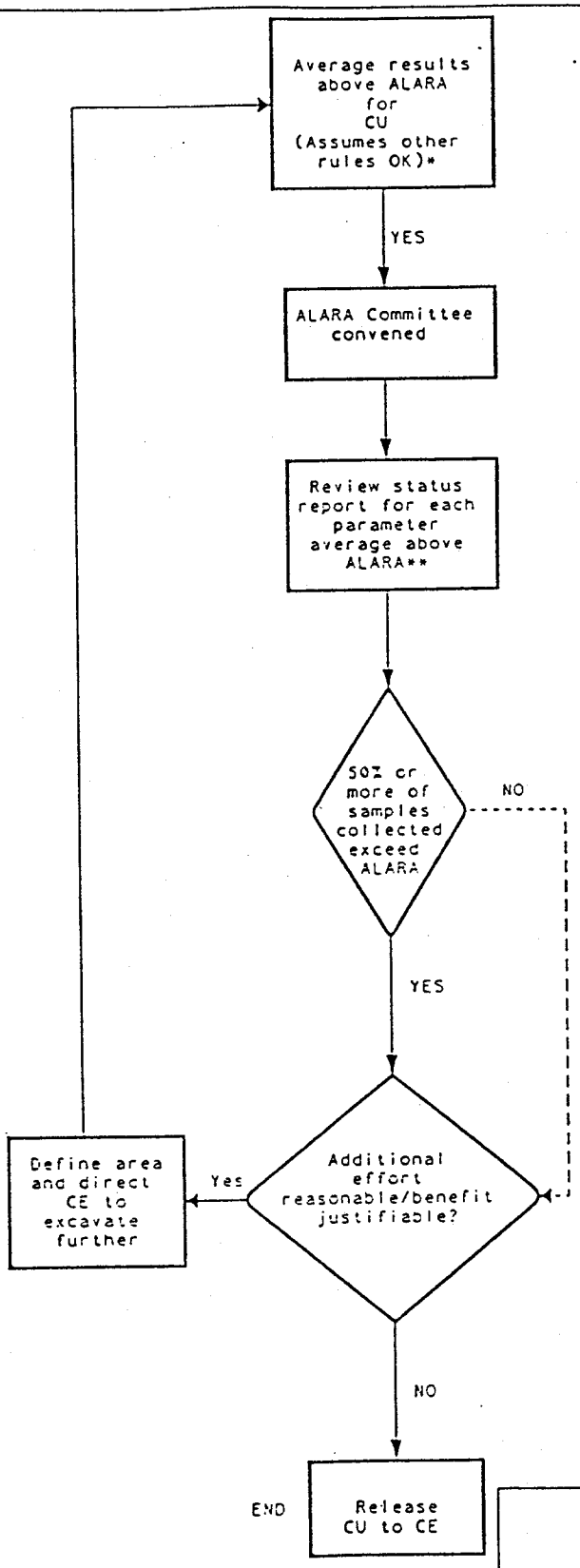
For areas with multiple contaminants, each contaminant will be compared to its cleanup standard. Radioactive contaminants will be compared to the cleanup standards following the procedures outlined in Section 9.2.1 of the ROD. The area will be deemed remediated, or clean, when all mean contaminant concentrations are less than or equal to their cleanup standards.

8.3 Meeting the ALARA Concept

In addition to meeting the ALARA goal concentrations in the statistical manner prescribed above, there may be instances when the spirit of ALARA will be deemed to have been met in a CU when the goal concentrations have not. This decision will be made and documented by the following committee or their designees.

- The PMC Environmental, Health and Safety Manager (Committee Chairman)
- The PMC Deputy Project Director for Operations
- The PMC Deputy Project Director for the ES&H Department
- The PMC Environmental Protection Manager
- A DOE Project Manager

This committee is responsible for ensuring that contaminant levels remaining in soil across the site after remediation range between the cleanup criteria and the ALARA goals, reaching the goals in most cases. The ALARA committee decision flow chart and CU disposition form are included as Figures 8-2 and 8-3.



* 1) Hotspot rule.
2) No sample exceeds 3x criteria.

** The goal is that more than 50% of the samples collected will ≤ ALARA.

ALARA COMMITTEE DECISION FLOWCHART

FIGURE 8-2

REPORT NO.:	DOE/OR/21548-491	EXHIBIT NO.:	A/PI/096/0995		
ORIGINATOR:	MGL	DRAWN BY:	GLN	DATE:	9/14/95

SOIL REMEDIATION DISPOSITION FORM

SECTION I

1. Work Package Number:_____ 2. Date:_____ 3. Review Form #:_____

4. Remediation Unit Number:_____ 5. Confirmation Unit Number:_____(map attached)

6. Contaminants of Concern:_____U-238 _____Th-230 _____Th-232 _____Ra-226 _____Ra-228
_____TNT _____PCB _____PAH _____As _____Cr _____Pb _____Tl

7. Results average below ALARA goal(s)?	____Yes ____No
8. All results below cleanup criteria?	____Yes ____No
9. Any results greater than 3X criteria?	____Yes ____No
10. Hotspots present (less than 3X criteria)?	____Yes ____No

Parameter	Size	Concentration	Complies with Plan?
			____Yes ____No
			____Yes ____No
			____Yes ____No
			____Yes ____No

11. Reviewer:_____ Date:_____

12. Reviewer Disposition Recommendation: ____ Release for Unrestricted Use (Section II)
____ Additional Excavation Required (Section IV)
____ ALARA Committee Required (Section III)

SECTION II *Results are ALARA. CU is released for unrestricted use.*

14. ES&H Manager:_____ Date:_____

15. DOE Project Manager/Engineer:_____ Date:_____

16. Project Manager:_____ Date:_____

17. Construction Engineer:_____ Date:_____

ATTACH RESULTS AND MAP

SOIL REMEDIATION DISPOSITION FORM

FIGURE 8-3A

REPORT NO.:	DOE/OR/21548-491	EXHIBIT NO.:	A/PI/094/0995		
ORIGINATOR:	MGL	DRAWN BY:	GLN	DATE:	9/20/95

SOIL REMEDIATION DISPOSITION FORM

SECTION III *ALARA Committee (Average above ALARA)*

Confirmation unit status reports have been attached for the following contaminants of concern:

_____ U-238 _____ Th-230 _____ Th-232 _____ Ra-226 _____ RA-228 _____ TNT
_____ PAH _____ As _____ Cr _____ Pb _____ Tl _____ PCB

Disposition Input:_____

Disposition Decision:
_____ Backfill/Release for Unrestricted Use.
_____ Additional Excavation Required.
_____ Additional Samples to be Collected.

Vote ES&H Manager _____ Date

Vote DOE Project Manager/Engineer _____ Date

Vote Deputy Project Director - Operations _____ Date

Vote Environmental Protection Manager _____ Date

Vote Deputy Project Director - Environmental _____ Date

Construction Engineer _____ Date

Project Director _____ Date

Section IV *Results greater than 3X criteria or > hotspot rule, additional excavation automatically required or as determined by the ALARA Committee.*

Project Manager:_____ Date:_____

Construction Engineer:_____ Date:_____

SOIL REMEDIATION DISPOSITION FORM

FIGURE 8-3B

REPORT NO.:	DOE/OR/21548-491	EXHIBIT NO.:	A/PI/095/0995		
ORIGINATOR:	MGL	DRAWN BY:	GLN	DATE:	9/8/95

9 QUALITY ASSURANCE

MK-Ferguson Company, the Project Management Contractor (PMC) at the Weldon Spring Site Remedial Action Project (WSSRAP), has developed the *Project Management Contractor Quality Assurance Program* (QAP) in accordance with DOE Order 5700.6C. The PMC QAP applies a graded approach to ensure that activities performed at the WSSRAP are of documented quality. The QAP details the 10-point criteria described in DOE Order 5700.6C to ensure that site-wide activities are performed in a quality manner. The QAP has been approved by the DOE WSSRAP Project Office.

The QAP is supported by site quality procedures which direct the evaluation of quality-affecting activities by implementing independent assessments and processes to identify nonconforming conditions and ensure corrective actions.

The PMC has developed the *Environmental Quality Assurance Project Plan* (EQAPjP) (Ref. 7) to ensure that all environmental activities conducted at the WSSRAP will be performed in accordance with EPA QAMS-005/80 (Ref. 10). The QAP and EQAPJP address the 16 quality assurance elements specified for environmentally related measurements by the EPA QAMS-005/80 (Table 9-1).

9.1 Quality Assurance Objectives for Measurement Data

As applied in this plan, QA is a management system for ensuring that the information collected for decision-making during the final survey is of adequate quality, statistically accurate, and properly documented. The quantitative QA parameters for the this plan are precision, accuracy, detection limit, completeness, and sample size. The qualitative QA parameters are comparability and representativeness. A discussion of quantitative and qualitative QA parameters and analytical levels is presented below.

TABLE 9-1 Environmental Quality Assurance Program Plan Elements

QA ELEMENTS		INFORMATION PROVIDED IN
1.	Title Page	EQAPjP[a]
2.	Table of Contents	EQAPjP
3.	Project Description	EQAPjP RI/FS
4.	Project Organization and Responsibility	EQAPjP Quality Assurance Program Manual
5.	Quality Assurance Objectives for Data Measurement	EQAPjP WSSRAP Sampling Plans WSSRAP Monitoring Plans Quality Assurance Program Manual
6.	Sampling Procedures	EQAPjP SOPs[b]
7.	Sampling and Document Custody	EQAPjP WSSRAP Sampling Plans SOPs Laboratory QA Procedures[c] WSSRAP Monitoring Plans
8.	Calibration Procedures	EQAPjP SOPs Laboratory QA Procedures
9.	Analytical Procedures	EQAPjP SOPs Laboratory SOPs
10.	Data Validation, Confirmation, Reduction, and Reporting	EQAPjP WSSRAP Sampling Plans SOPs WSSRAP Monitoring Plans
11.	Internal Quality Control	EQAPjP WSSRAP Sampling Plans SOPs Laboratory QA Procedures WSSRAP Monitoring Plans
12.	Performance and System Audits	Quality Assurance Program Manual EQAPjP

TABLE 9-1 Environmental Quality Assurance Program Plan Elements (Continued)

QA ELEMENTS		INFORMATION PROVIDED IN
13.	Preventative Maintenance	EQAPjP SOPs Laboratory QA Procedures
14.	Specific Routine Measures Used to Assess Data (Precision, Accuracy, Representativeness, Comparability, and Completeness).	EQAPjP WSSRAP Sampling Plans SOPs WSSRAP Monitoring Plans Laboratory QA Procedures
15	Corrective Action	Quality Assurance Program Manual EQAPjP SOPs
16.	Quality Assurance Reports to Management	EQAPjP

(a) *Environmental Quality Assurance Project Plan* (Ref. 6)
(b) SOPs: Standard Operating Procedures for WSSRAP
(c) Individual Laboratory Quality Assurance Manuals

9.2 Standard Operating Procedures

Data reviewed or generated by this *Weldon Spring Site Chemical Plant Area Cleanup Attainment Confirmation Plan* are to be of such quality that they can be used to verify, with acceptable limits on uncertainty, that the soil contaminant cleanup standards have been attained by the remedial efforts at the chemical plant area. Quality assurance objectives for measurement data are achieved through the implementation of Standard Operating Procedures (SOPs) for the following:

- Document control
- Field activities, including sample collection
- Chain of custody
- Equipment calibration
- Laboratory analyses
- Data validation, confirmation, reduction, and reporting
- Internal quality control checks
- Audits and surveillances

- Preventive maintenance
- Corrective actions
- Document hierarchy

These SOPs, which have been developed for activities associated with environmental characterization, also apply to final survey sampling at the Weldon Spring site (the site). Procedures applicable to final survey sampling are listed in Table 9-2. These procedures have been developed from U.S. Environmental Protection Agency (EPA) and U.S. Department of Energy (DOE) guidance and from standard industry practices and are specific to the site. WSSRAP procedures are prepared, reviewed, and approved by cognizant department managers, the Project Quality Manager, and project management. Controlled copies of procedures are maintained in accordance with the document control requirements of PS-5a, *Document Control.* Procedures are reviewed at least annually and revised as appropriate.

All sample identification, collection, and documentation will be performed in accordance with Environmental Safety and Health (ES&H) Department Procedures. All documentation will be written on field sheets and/or kept in a logbook according to procedures. Completed field sheets and logbooks are identified and retained as QA records upon completion of the field work.

9.3 Sample Custody

Sample custody requirements, in accordance with the WSSRAP EQAPjP are described in Sections 5.3 and 7.5.

9.4 Calibration Procedures and Frequency

Calibration procedures and requirements will be in accordance with the WSSRAP EQAPjP (Ref. 7).

Table 9-2 Procedures Applicable to Final Survey Sampling Activities

PROCEDURE NUMBER	PROCEDURE TITLE
CM&O 15a	Task-Specific Safety Assessments
ES&H 1.1.4s	Logbook Procedure
ES&H 2.5.1s	Radiological Soil Sampling
ES&H 4.1.1a	Numbering System for Environmental Samples and Sampling Locations
ES&H 4.1.2s	Initiation, Generation, and Transfer of Environmental Chain of Custody
ES&H 4.1.3s	Sampling Equipment Decontamination
ES&H 4.1.4s	Quality Control Samples for Aqueous and Solid Matrices: Definitions, Identification Codes, and Collection Procedures
ES&H 4.4.5s	Soil/Sediment Sampling
ES&H 4.6.1s	Environmental TLD Deployment
ES&H 4.9.1a	Environmental Monitoring Data Verification
ES&H 4.9.2a	Environmental Monitoring Data Validation
RC-17s	Off-Site Transportation of Hazardous Materials
RC-19s	Hazardous Material/Sample Transportation Activity (HMSTA) Operations
RC-22s	Management of Samples Returned to the Weldon Spring Site

9.5 Analytical Procedures

The on-site or off-site quantitative laboratory conducting radiological and chemical analysis for the final status survey samples will be required to submit controlled copies of its site-specific Quality Assurance Project Plans (QAPjP) and SOPs to be reviewed and accepted by the Project Management Contractor (PMC). The WSSRAP and contract laboratory SOPs will direct operations, analyses, and activities which will be thoroughly prescribed, documented, and performed in accordance with accepted standards and methodologies. Any changes to controlled SOPs and the QAPjP must be approved by the PMC. The laboratory QAPjP and SOPs will

specify quality control requirements to demonstrate the precision and accuracy of methods and procedures.

All data generated by analytical activities (i.e., calculations, chromatographs, calibration curves, QA analyses) are QA records and will be maintained in accordance with the Quality Assurance Program.

Maintenance and storage of completed records, charts, and logs of all pertinent calibrations, analyses, QC activities, and data generated by the laboratory will be kept in a WSSRAP-specific project file. Both electronic and hard-copy data reports must be available at the laboratory's facilities for three years after termination or expiration of any contract. Storage areas must keep records safe from damage by moisture or fire.

Routine audits and surveillances of laboratory performance will be conducted by the Project Quality Department to verify conformance to their QA programs, WSSRAP contract specifications, and appropriate regulatory requirements.

9.6 Data Reduction, Validation, and Reporting

Data reduction, validation, and reporting procedures and requirements will be in accordance with the WSSRAP EQAPjP.

9.7 Internal Quality Control Checks

Quality control samples will be collected to ensure consistent and accurate performance of sample collection and laboratory analysis. Table 9-3 provides a summary list of the quality control samples that will be collected to support the final survey.

9.8 Independent Assessments (Audits)

Independent assessments and surveillances of the final survey activities will be routinely conducted by the Project Quality Department. These activities will include analytical services, data management, sample management, and programmatic procedures. Nonconforming

TABLE 9-3 Field Quality Control Sample Summary

QUALITY CONTROL SAMPLE TYPE	FREQUENCY	PURPOSE
Matrix Spike/Matrix Spike Duplicate or Matrix Duplicate	1 per 20 or 1 per 14 days[a]	Assess matrix and possible interlaboratory variability
Blind Duplicate/Secondary Duplicate	1 per 20	Assess matrix and interlaboratory variability
Replicate	1 per 20	Assess matrix and interlaboratory variability
Equipment Blank (non-dedicated equipment only)	1 per 20	Assess effectiveness of decontamination
Deionized Water Blank[b]	1 per month	Assess quality of deionized water
Trip Blank[c]	1 per shipment	Assess potential cross-contamination during shipping
Field Blank[b]	1 per month	Assess impact of ambient conditions on samples

(a) Whichever is of higher frequency.
(b) Collected together on the same day.
(c) N/A for on-site analyses.

conditions identified in independent assessments and surveillances will be tracked by the Site Wide Audit Tracking System (SWATS) until corrective actions have been implemented.

The laboratory performing analyses for the survey samples will be audited routinely. The audits will be directed by a lead auditor from the Project Quality Department with support provided by a select team of site personnel who have knowledge of analytical methods and procedures. These audits will focus on compliance with the project-specific Quality Assurance Project Plan (QAPjP) prepared by the laboratory prior to performing sample analysis and with laboratory-specific procedures and policies. An audit report will be generated and corrective actions tracked by the SWATS.

9.9 Quality Assurance Records

Records generated as a result of this plan will be maintained as QA records. Field sampling forms, analytical data, equipment calibration records, and confirmation and validation documentation records will all be considered QA records and will be maintained in accordance with the requirements of SQP-7, *Quality Assurance Records*. This will provide both security and protection to critical records.

10 REFERENCES

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

2. Westat, Inc. *Draft Final, Statistical Methods for Evaluating the Attainment of Superfund Cleanup Standards Volume I : Soils and Solid Media*. Prepared for the U.S. Environmental Protection Agency. June 1988.

3. Berger, J.D. *Manual for Conducting Radiological Surveys in Support of License Termination*, Draft Report for Comment, NUREG/CR-5849. Prepared for the U.S. Nuclear Regulatory Commission, by Oak Ridge Associated Universities, Oak Ridge, TN. June 1992.

4. U.S. Environmental Protection Agency. *Data Quality Objectives Process for Superfund*, EPA/540/G-93/071, Publication 9355.9-01. Prepared by Office of Emergency and Remedial Response, Washington, DC. September 1993.

5. U.S. Department of Energy. *Feasibility Study for Remedial Action at the Chemical Plant Area of the Weldon Spring Site*, 2 Vols. DOE/OR/21548-148. Oak Ridge Field Office, Weldon Spring Site Remedial Action Project. St. Charles, MO. November 1992.

6. MK-Ferguson Company and Jacobs Engineering Group. *Environmental Quality Assurance Project Plan*, Rev. 1. DOE/OR/21548-352. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. July 1993.

7. MK-Ferguson Company and Jacobs Engineering Group. *Environmental Data Administration Plan*, Rev. 3. DOE/OR/21548-119. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. August 1993.

8. U.S. Department of Energy. *Analytical Support Services Specification*. Rev. 0. Contract No. DE-AC05-86OR21548. Weldon Spring Remedial Action Project. Weldon Spring, Missouri. July 1992.

9. MK-Ferguson Company and Jacobs Engineering Group. *Site Consolidated Transportation Activity Manual*, Rev. 0. DOE/OR/21548-309. Prepared for the U.S. Department of Energy, Oak Ridge Field Office. St. Charles, MO. October 1992.

10. MK-Ferguson Company and Jacobs Engineering Group. *Project Management Contractor Quality Assurance Program*, Rev. 0. DOE/OR/21548-333. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. September 1992.

11. MK-Ferguson Company and Jacobs Engineering Group. *Remedial Investigation for the Chemical Plant Area of the Weldon Spring Site*, Rev. 0, 2 Vols. DOE/OR/21548-074. Prepared for the U.S. Department of Energy, Oak Ridge Field Office, Weldon Spring Site Remedial Action Project. St. Charles, MO. November 1992.

DOE ORDERS

5400.5, *Radiological Protection of the Public and the Environment*
5700.6c, *Quaity Assurance Program A Total Management System*
ASME NQA-1 1989, *American Society of Mechanical Engineers, Nuclear Quality Assurance*

PROCEDURES

ES&H 1.1.4, *Logbook Procedure*

ES&H 2.6.2, *Calibration and Use of Ludlum Model 44-10 (2x2 NaI) Detector*
ES&H 4.1.1, *Numbering System for Environmental Samples and Sample Locations*

ES&H 4.1.2, *Initiation, Generation, and Transfer of Environmental Chain of Custody*
ES&H 4.1.3, *Sampling Equipment Decontamination*

ES&H 4.1.4, *Quality Control Samples for Aqueous and Solid Matrices: Definitions, Identification Codes, and Collection Procedures*

ES&H 4.9.2, *Environmental Monitoring Data Validation*

RC-17, *Off-Site Transportation of Hazardous Materials*

RC-19, *Hazardous Material/Sample Transportation Activity (HMSTA) Operations*

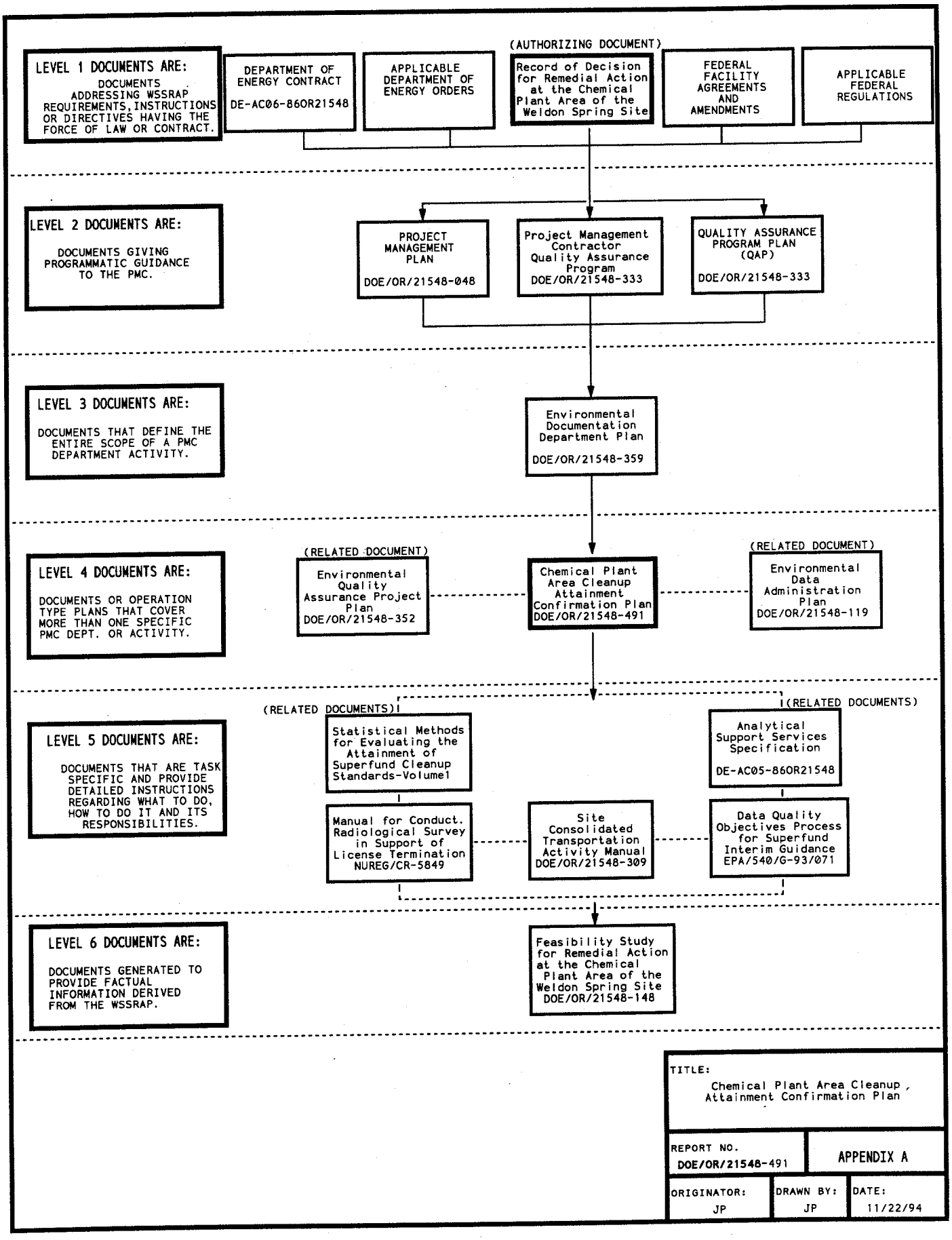
RC-22, *Management of Samples Returned to the Weldon Spring Site*

SQP-7, *Quality Assurance Records*

11 ACRONYMS

AEC	U.S. Atomic Energy Commission
ALARA	as low as reasonably achievable
ARARs	applicable and/or relevant and appropriate requirements
ASME	American Society of Mechanical Engineers
CERCLA	*Comprehensive Environmental Response, Compensation and Liability Act*
CU	confirmation unit
DNT	dinitrotoluene
DOE	U.S. Department of Energy
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
EQAPjP	Environmental Quality Assurance Project Plan
ES&H	Environmental Safety and Health
HMSTA	Hazardous Material Sample Transportation Activity
NPL	National Priorities List
NQA-1	Nuclear Quality Assurance Program
NUREG	Nuclear Regulatory Commission
ORISE	Oak Ridge Institute for Science and Education
PAH	polycyclic (or polynuclear) aromatic hydrocarbons
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
PMC	Project Management Contractor
QA/QC	quality assurance/quality control
QAMS	Quality Assurance Management Staff
QAP	Quality Assurance Plan
QAPjP	Quality Assurance Project Plan
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SOPs	standard operating procedures
SWATS	Site Wide Audit Tracking System
TNT	trinitrotoluene
WSSRAP	Weldon Spring Site Remedial Action Project

APPENDIX A
Document Hierarchy


LEVEL 1 DOCUMENTS ARE:
DOCUMENTS ADDRESSING WSSRAP REQUIREMENTS, INSTRUCTIONS OR DIRECTIVES HAVING THE FORCE OF LAW OR CONTRACT.
DEPARTMENT OF ENERGY CONTRACT
DE-AC06-86OR21548
APPLICABLE DEPARTMENT OF ENERGY ORDERS
(AUTHORIZING DOCUMENT)
Record of Decision for Remedial Action at the Chemical Plant Area of the Weldon Spring Site
FEDERAL FACILITY AGREEMENTS AND AMENDMENTS
APPLICABLE FEDERAL REGULATIONS
LEVEL 2 DOCUMENTS ARE:
DOCUMENTS GIVING PROGRAMMATIC GUIDANCE TO THE PMC.
PROJECT MANAGEMENT PLAN
DOE/OR/21548-048
Project Management Contractor Quality Assurance Program
DOE/OR/21548-333
QUALITY ASSURANCE PROGRAM PLAN (QAP)
DOE/OR/21548-333
LEVEL 3 DOCUMENTS ARE:
DOCUMENTS THAT DEFINE THE ENTIRE SCOPE OF A PMC DEPARTMENT ACTIVITY.
Environmental Documentation Department Plan
DOE/OR/21548-359
LEVEL 4 DOCUMENTS ARE:
DOCUMENTS OR OPERATION TYPE PLANS THAT COVER MORE THAN ONE SPECIFIC PMC DEPT. OR ACTIVITY.
(RELATED DOCUMENT)
Environmental Quality Assurance Project Plan
DOE/OR/21548-352
Chemical Plant Area Cleanup Attainment Confirmation Plan
DOE/OR/21548-491
(RELATED DOCUMENT)
Environmental Data Administration Plan
DOE/OR/21548-119
LEVEL 5 DOCUMENTS ARE:
DOCUMENTS THAT ARE TASK SPECIFIC AND PROVIDE DETAILED INSTRUCTIONS REGARDING WHAT TO DO, HOW TO DO IT AND ITS RESPONSIBILITIES.
(RELATED DOCUMENTS)
Statistical Methods for Evaluating the Attainment of Superfund Cleanup Standards-Volume1
(RELATED DOCUMENTS)
Analytical Support Services Specification
DE-AC05-86OR21548
Manual for Conduct. Radiological Survey in Support of License Termination
NUREG/CR-5849
Site Consolidated Transportation Activity Manual
DOE/OR/21548-309
Data Quality Objectives Process for Superfund Interim Guidance
EPA/540/G-93/071
LEVEL 6 DOCUMENTS ARE:
DOCUMENTS GENERATED TO PROVIDE FACTUAL INFORMATION DERIVED FROM THE WSSRAP.
Feasibility Study for Remedial Action at the Chemical Plant Area of the Weldon Spring Site
DOE/OR/21548-148
TITLE:
Chemical Plant Area Cleanup, Attainment Confirmation Plan
REPORT NO.
DOE/OR/21548-491
APPENDIX A
ORIGINATOR:
JP
DRAWN BY:
JP
DATE:
11/22/94