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# QUARRY RESIDUALS RI/FS SCOPING DOCUMENT

Weldon Spring Site Remedial Action Project  
Weldon Spring, Missouri

OCTOBER 1991

REV. 0

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

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Weldon Spring Site Remedial Action Project

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Quarry Residuals RI/FS Scoping Document

Revision 0

October 1991

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## 1 INTRODUCTION

### 1.1 Background

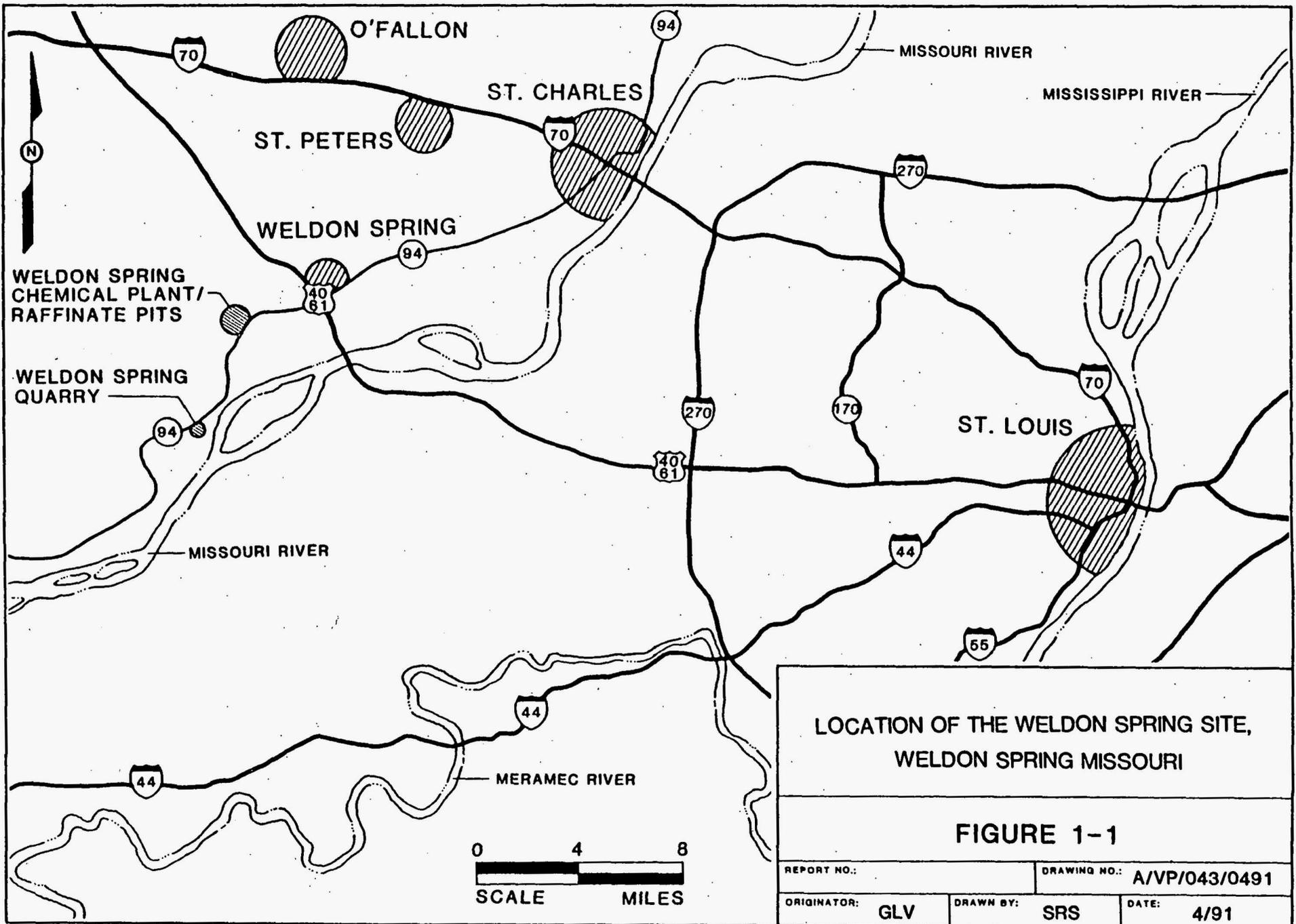
The Weldon Spring quarry (WSQ) is located near Weldon Spring, Missouri, about 48 km (30 mi) west of St. Louis on Route 94 (Figure 1-1). ~~The 3.6-ha (9-acre) site is~~ situated about 1.61 km (1 mi) northwest of the Missouri River and about 915 m (3,000 ft) north of the St. Charles County Municipal Well Field (Figure 1-2). The quarry residual activity work area encompasses the quarry and surrounding land including the Femme Osage Slough. The exact boundaries are to be determined during the remedial investigation studies. However, a proposed area of interest for the residual activity is shown in Figure 1-3.

Prior to 1942, the quarry was mined for limestone aggregate in construction of the Weldon Spring Ordnance Works. The Department of the Army utilized the quarry for disposal of trinitrotoluene/dinitrotoluene (TNT/DNT) contaminated residues between 1942 and 1957. Subsequently, under the ownership of the Atomic Energy Commission, natural series uranium and thorium residues were added until about 1969. Table 1-1 summarizes the known disposal activities at the quarry.

The Weldon Spring quarry was listed by the Environmental Protection Agency (EPA) on the National Priorities List (NPL) on July 30, 1987. Site cleanup is being conducted as a major system acquisition under the Surplus Facilities Management Program (SFMP) of the U.S. Department of Energy (DOE). The 1988 Work Plan (Peterson et al. 1988) identified three separate operable units at the Weldon Spring Site Remedial Action Project (WSSRAP); (1) chemical plant and raffinate pits, (2) quarry bulk waste and the focus of this document, the (3) quarry residuals. Another unit has since been added; the chemical plant site groundwater.

### 1.2 Purpose

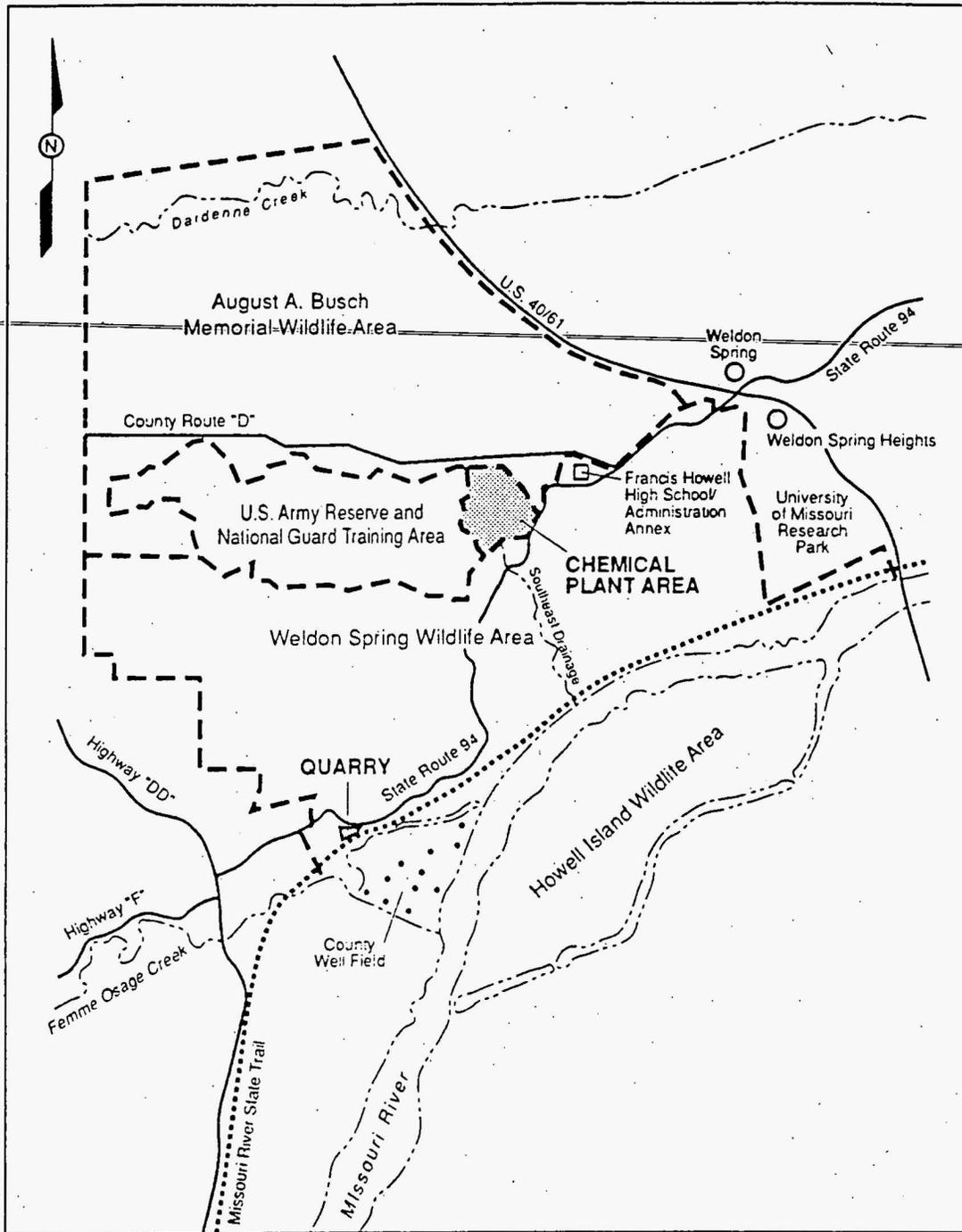
The purpose of this document is to serve as a planning tool for the implementation of the *Quarry Residual Remedial Investigation/Feasibility Study* (RI/FS) process and to provide



LOCATION OF THE WELDON SPRING SITE,  
WELDON SPRING MISSOURI

FIGURE 1-1

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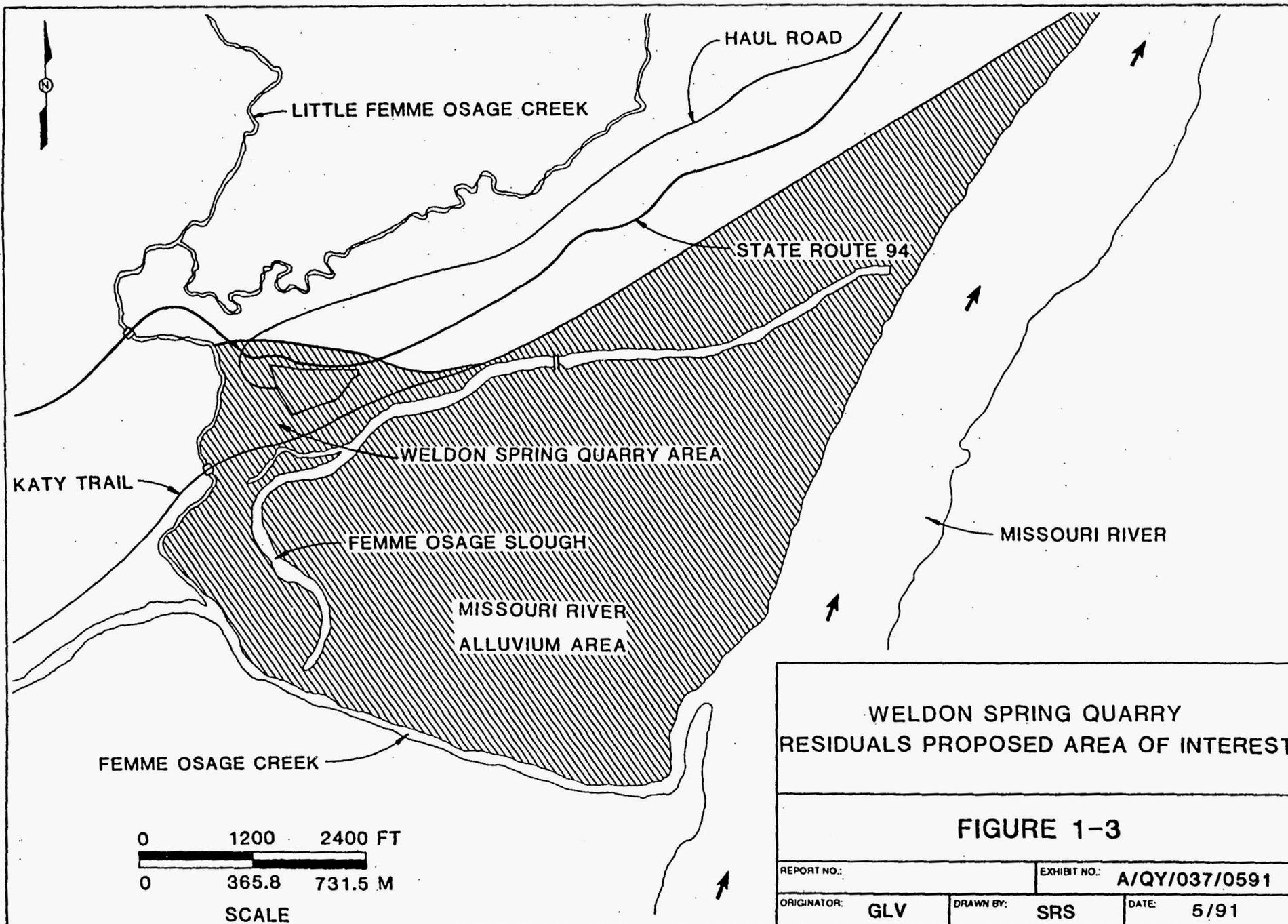


**MAP OF THE WELDON SPRING  
SITE AND VICINITY**

**FIGURE 1-2**

0 1/2 1 MI  
0 .8 1.6 KM  
SCALE

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0      1200      2400 FT  
 0      365.8      731.5 M  
 SCALE

TABLE 1-1 History of Disposal Activities at the Weldon Spring Quarry

TIME PERIOD	WASTE TYPE	ESTIMATED VOLUME <sup>(a)</sup>	
		m <sup>3</sup>	yd <sup>3</sup>
1942 - 1945	TNT and DNT waste		
1946	TNT and DNT waste	(b)	(b)
1946 - 1957	TNT and DNT residues and contaminated rubble from cleanup of the ordnance works (in deepest part and in northeast corner of quarry)	---	---
1959	3.8% thorium residues (drummed, currently below water level)	150	200
1960 - 1963	Uranium- and radium-contaminated rubble from demolition of the St. Louis Destrehan Street feed plant (covering 0.4 ha [1 acre] to a 9-m [30 ft] depth in deepest part of quarry)	38,000	50,000
1963 - 1966	High-thorium-content waste (in northeast corner of quarry) <sup>(c)</sup>	760	1,000
1963 - 1966	Uranium and thorium residues from the chemical plant and off-site facilities; building rubble and process equipment (both drummed and uncontained)	---	---
1966	3.0% thorium residues (drummed, placed above water level in northeast corner of quarry); TNT residues from cleanup of the ordnance works (placed to cover the drums)	460	600
1968 - 1969	Uranium- and thorium-contaminated rubble and equipment from interiors of some chemical plant buildings (101, 103, and 105)	4,600	6,000

(a) A hyphen indicates that the waste volume estimate is not available.

(b) An estimated 90 tons of TNT/DNT waste was disposed of in 1946.

(c) This was a portion of the waste originally stored at the Army arsenal in Granite City, Illinois; most of this material was subsequently removed from the quarry for the purpose of recovering rare earth elements.

direct input to revising and updating the 1988 *Work Plan for the Weldon Spring Site Remedial Action Project (WSSRAP) Remedial Investigation/Feasibility Study-Environmental Impact Statement for the Weldon Spring Site (RI/FS-EIS)* (Peterson et al. 1988) for this effort. The scoping process is intended to outline the tasks necessary to develop and implement activities in compliance with the Comprehensive Environmental Response, Compensation and Liability Act-National Environmental Policy Act (CERCLA-NEPA) process from detailed planning through the appropriate decision document. In addition to scoping the entire process, this document will serve as the primary tool for planning and accomplishing all activities to be developed in the *Quarry Residual RI/FS Work Plan*. Subsequent tasks are difficult to plan at this time.

### 1.3 Project Status

Waste cleanup at the WSQ has been divided into logical units. Each unit has been scoped according to a logical sequence of activities.

The first step in remediation is the management of ponded water in the quarry sump and the interstitial water dispersed throughout the bulk waste. The drawdown may reduce the hydraulic head and reverse the downstream groundwater flow toward the sump. A water treatment plant and associated engineering facilities have been designed and are currently being constructed. The environmental documentation for the water treatment plant was addressed in an *Engineering Evaluation/Cost Analysis (EE/CA)* (MacDonnel et al. 1989) report. This document and associated *Responsiveness Summary* (ANL 1989) were completed in January 1989 and June 1989, respectively. A Finding of No Significant Impact (FONSI) was issued for this action by the DOE on February 6, 1990. Operation of the water treatment plant is scheduled to begin in September 1991 and continue throughout residual remediation.

The next step involves removal of the bulk wastes present in the quarry. Bulk waste removal will alleviate the primary source of contamination in the area and will permit characterization of the quarry floor for residual contamination. The RI/FS to support bulk waste removal is complete and a *Record of Decision (ROD)* was signed by the U.S. Environmental Protection Agency (EPA) and DOE on September 28, 1990 and March 7, 1991, respectively. A FONSI was issued for this action by the DOE on November 15, 1990. Conceptual design for the excavation, transportation and temporary storage of the

waste is complete and will be followed by detailed design. Bulk waste removal is scheduled to begin in May 1992, and be concluded by November of 1994.

The final step in accomplishing long-term remediation of the quarry and surrounding area is the residual RI/FS effort addressed in this scoping document. This process includes ~~characterization and environmental documentation to reach ultimate remedial action~~ decisions with respect to groundwater, residual quarry contamination, and vicinity properties. While the residual RI/FS process cannot be completed until the bulk wastes have been removed, a substantial portion can be accomplished in parallel with the excavation activities.

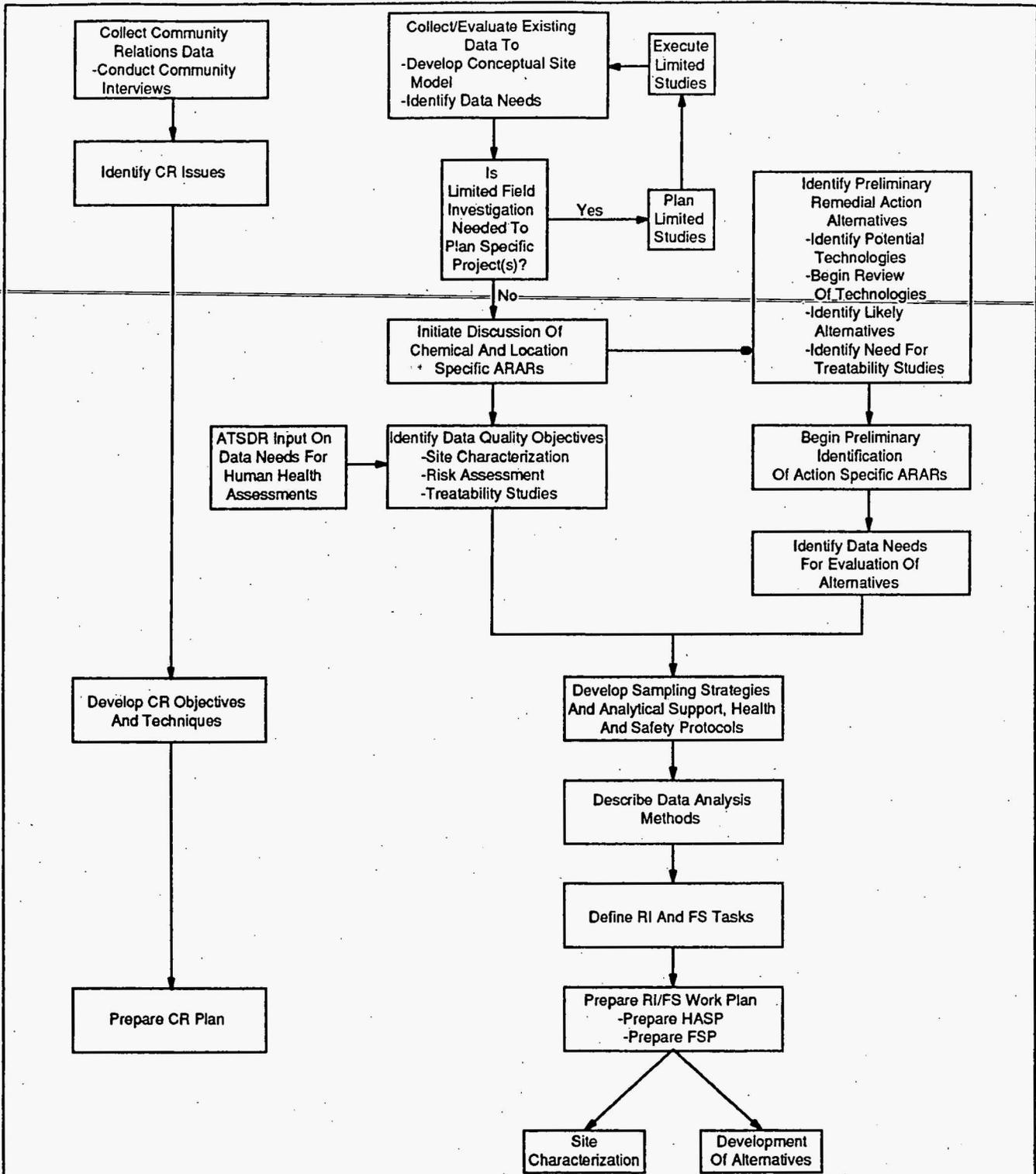
## 2 SITE MANAGEMENT STRATEGY

### 2.1 Activity Sequence

The sequence of activities necessary to reach a decision for residual remedial action and the type of action, if required, will follow the traditional approach outlined in *Environmental Protection Agency Guidance* (EPA 1988). This approach was used to obtain the *Quarry Bulk Waste Record of Decision (ROD)* and is currently being utilized for the *Chemical Plant Remedial Investigation/Feasibility Study (RI/FS)*. Details of the activities required to obtain the residual ROD will be described in the RI/FS work plan.

Scoping represents the first step in the process (Figure 2-1). Existing data are being collected and analyzed to develop a conceptual site model. From this information, additional data needs and data quality objectives will be identified. The *Quarry Residual RI/FS Work Plan* will be developed based on these needs and objectives and will also include preliminary remedial action objectives and a preliminary applicable or relevant and appropriate requirement (ARAR) analysis. Detailed field sampling plans will be prepared for each characterization activity required to address data needs. Data quality objectives will be defined within the sampling plans and data quality assured through implementation of the *Environmental Quality Assurance Program Plan (EQAPP)* (MKF and JEG 1991c) requirements. Health and safety plans will also be prepared. The *Community Relations Plan* (MKF and JEG 1991) for the Weldon Spring Site Remedial Action Project (WSSRAP) will be updated to encompass the residuals activity.

Site characterization follows the planning activities and will support a phased RI report. Phase I of this report will focus on the area surrounding the Weldon Spring Quarry. Characterization studies for this phase will be conducted during removal of bulk waste from the quarry. Phase II activities will be conducted within the quarry area after the bulk waste has been removed. Phase II characterization will also address data gaps uncovered during Phase I. Characterization is designed to further define the physical characteristics of the site, the chemical and radiological characteristics of the contaminants, and the nature and extent of contamination. Based on the results of these additional characterization activities, it may be necessary to refine a specific work activity such as the groundwater monitoring network. The need for additional information will be addressed as characterization data are evaluated.



**SCOPING AND WORK PLAN PROCESS  
FLOW CHART**

**FIGURE 2-1**

**SOURCE: REVISED FROM  
EPA 1988**

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As the characterization effort nears completion, the data will be utilized to develop a comprehensive Baseline Risk Assessment (BRA). The BRA will serve as the no-action alternative to satisfy National Environmental Policy Act (NEPA) requirements. The BRA will identify the contaminants of concern, environmental fate and transport mechanisms, and potential exposure pathways and receptors. From this information, associated risks will be calculated and impacts to the environment in addition to human health risks will be addressed. The BRA results will assist in determining the need for remedial action and will then be used to guide the selection of protective alternatives in the *Feasibility Study* (FS).

Parallel with the RI and BRA, remedial alternatives will be developed and screened. The screening process will be refined as more data on the nature and extent of contamination becomes available. Remedial action options which warrant further consideration will undergo detailed analysis to select the appropriate technology for remediation of each affected medium. Environmental documentation satisfying the requirements of the NEPA will be integrated into the residual RI/FS documentation process.

The residual RI/FS process will culminate in a ROD describing the remedial action activity as agreed upon by the U.S. Department of Energy (DOE) and the Environmental Protection Agency (EPA). A schedule for the proposed RI/FS environmental documentation activities is shown in Section 5.

## 2.2 Interim Actions

Although the 1988 *RI/FS-Environmental Impact Statement (EIS)* work plan established various interim actions and separate operable units, it is important to refine the need for interim actions within the scope of the residual RI/FS process. These interim actions may affect groundwater, residual contamination, and/or vicinity properties. The need for interim actions will be assessed by evaluating data from characterization activities and groundwater monitoring. Because bulk waste removal will be in progress concurrent with much of the residual RI/FS characterization activity, priorities must be established such that additional monitoring or characterization data are available to support removal of the bulk waste and to allow timely decisions for interim actions that may be necessary based on new data.

Hydrogeologic characterization will provide four separate but overlapping functions: (1) data necessary to ensure the adequacy of the groundwater monitoring system designed

to assess the safety of the St. Charles County well field; (2) data necessary to establish the adequacy of the system to monitor groundwater elevations and concentrations during bulk waste removal; (3) data necessary to define the extent of groundwater contamination; and (4) data necessary to establish potential long term effects on the environment due to contaminant migration within the residual area after bulk waste removal. Additional groundwater information may be needed to support bulk waste removal. An interim characterization effort may be required to address these data needs if the overall residual RI characterization can not be accomplished in the necessary time frame.

The need for interim actions to address groundwater contamination will be continually analyzed as more information becomes available. One alternative to be evaluated during bulk waste removal is the excavation of the sump below the original quarry floor. This may be required if removal of the ponded water has not been effective in reversing groundwater flow toward the sump, and it becomes necessary to increase the radius of influence for groundwater gradient reversal. Under worst-case conditions, i.e., significant contamination in the well field, interim actions could include the identification of water resource replacement for the volume of water currently being provided by the St. Charles County well field. Treatment of contaminated groundwater could be accomplished by utilizing the existing water treatment plant at the quarry if pumping and treating were determined to be a feasible alternative. This plant has been designed to treat ponded water from the sump and interstitial bulk waste water. The contaminants of concern identified in the quarry pond water (manganese, arsenic, uranium, and 2,4-dinitrotoluene) are likely to be similar to the residual contaminants of concern since the bulk waste is the common source.

Interim actions may be required for the vicinity properties if sites are identified which pose a threat to human health or the environment. Interim actions may also be necessary to minimize health and safety risks to on-site personnel. These will be evaluated as characterization studies progress.

Interim action requiring environmental documentation will be addressed using the Engineering Evaluation/Cost Analysis (EE/CA) report format. This report will describe the specific removal action objectives and alternatives along with a description of the proposed action and an analysis of the potential impacts of implementing the proposal action. Approval of this report by the regulatory agencies will allow the removal action to commence prior to issuance of the *Residual Record of Decision*.

### 2.3 Streamlining Techniques

Development of the residual RI/FS documents will proceed in a manner which will minimize the amount of time spent developing and revising formal interim review deliverables. The RI/FS and BRA reports will not be considered as final stand-alone documents at the time of completion. Rather, all reports must be read jointly to present a complete picture of the RI/FS process and of the proposed remedial action program.

Interim progress reports, including results of field characterization activities, risk assessment studies, and evaluation of remedial alternatives, will be provided as the information becomes available. The interim progress reports will also assist in identifying additional data needs. As each need is identified, a work assignment will be developed to address the need. Each work assignment will have a definite scope and schedule, and a work assignment manager will be designated. Each work assignment will result in a report or paper that will be made available to all organizational units working on the project. This approach will produce needed information in the most timely manner.

A senior level review team will be assembled to assist in scoping, trouble-shooting, and to provide quality overviews. This review team will also help identify data needs and ensure that the completed reports fully support the remedial action decision.

Value Engineering (VE) studies may be utilized at various stages throughout the residual RI/FS process. VE studies can be used as a streamlining technique because sound, logical, and viable alternatives can be developed in a short period of time.

The observational approach will be utilized to provide a structural plan for handling uncertain conditions. The observational approach identifies probable conditions when uncertainty exists along with potential deviations and associated contingency plans while observations continue. This approach can be integrated into the residual characterization and environmental documentation.

The various progress and work assignment reports will serve to meet the open communications requirement of the RI/FS process. These reports will fulfill two purposes. The first is to keep the regulatory agencies abreast of progress on the project. Second, the public must be informed and involved as findings are made and conclusions developed. A

community relations plan will be developed to address specific requirements of the quarry residuals effort. A brief discussion of the community relations plan can be found in Section 4.4 of this document.

## 2.4 Concurrence

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The residual *RI/FS Work Plan* and associated field sampling plans will be submitted to EPA Region VII, DOE-Headquarters, and the Missouri Department of Natural Resources (MDNR) for their review, comment, and approval for a 60 day review prior to issuing the document to the public for comment.

The work plan will provide the framework for initiating the quarry residuals environmental remediation documentation. EPA Region VII, DOE-Headquarters, and the MDNR will be involved in the review and approval process of all appropriate documents throughout the residual RI/FS process in accordance with the provisions of the Federal Facilities Agreement.

### 3 PRELIMINARY DATA ANALYSIS

This section discusses the various tasks completed during the preliminary stages of the scoping process in preparation for the residual work plan. These analyses establish a management baseline and will be revisited and updated throughout the data gathering process.

#### 3.1 Compilation of Existing Data

Data pertaining to the Weldon Spring quarry and the surrounding residual activity area have been reviewed and entered into a computerized data management system. Currently, the data file consists of documents pertaining to the general quarry area. It will be updated as additional relevant data are encountered. A current list of the file contents can be found in Appendix A. Each item in the list includes the following information, if available.

- Type of data.
- Title.
- Date issued or published.
- Document number.
- Author.
- Keywords.
- Whether or not it is Project Management Contractor (PMC) generated data.
- Sequential file number.

#### 3.2 Data Analysis

The existing data was reviewed to determine the quality and quantity of the existing residual information. Specific topics targeted for review were:

- Pumping test locations and results.
- Aquifer characteristics.
- Vertical head distribution.
- Water table maps.
- Stratigraphy.

- Groundwater flow data.
  - Contaminant distribution.
  - Recharge/discharge.
  - Geochemistry.
  - Biological studies.
- 
- Surface water data.
  - Soils data.
  - Slough sediments.
  - Creek sediments.
  - Rock contaminants.
  - Air quality.
  - Land use.

Nearly every topic was found to have a lack of quality and/or quantity to various degrees regarding the residual *Remedial Investigation/Feasibility Study (RI/FS)* effort. Details of these findings are addressed in Section 3.4, Data Needs.

### 3.3 Conceptual Site Model

A preliminary conceptual site model was developed based upon the available data. The physical properties and concepts will be evaluated and revised as data collection and interpretation activities yield additional information from the quarry residuals characterization efforts. The model identifies contaminant sources, release mechanisms, migration pathways, exposure routes and receptors. Figure 3-1 is a graphic representation of the quarry residual conceptual site model.

Receptors consist of humans and biota. Human receptor scenarios are classified as individuals who live within an 8 km (5 mi) radius of the project area (resident), those who temporarily visit the wildlife area within the project area (visitor) and individuals who might climb over or under the fence surrounding the quarry and enter the contaminated area (trespasser). Biota receptors include plants and animals including avian receptors, land (terrestrial), and those within creeks, sloughs, and rivers (aquatic).

Primary Sources	Primary Release Mechanism	Secondary Sources	Secondary Release Mechanism	Pathway	Exposure Route	Human		Biota						
						Resident Visitor	Tresspass	Aquatic Terrest.						
Residual Material	Particulate Or Gaseous Emissions			Wind	Ingestion									
					Inhalation	●	●	●	●					
					Dermal Contact									
	Direct Contact					Ingestion			●	●				
						Inhalation			●	●				
						Dermal Contact			●	●				
Infiltration		Not Applicable-Water Collected And Treated												
Contaminated Soil	Infiltration/ Percolation	Groundwater		Pumping	Groundwater	Ingestion	●	●						
				Disch. to SW	Surface Water	Inhalation								
						Dermal Contact	●	●	●	●	●			
				Ingestion					Ingestion	●	●	●	●	
	Dermal Contact	●	●						●	●	●			
	Runoff	S. Water/Sed.			S. Water/Sed.	Inhalation								
						Dermal Contact	●	●	●	●	●			
	Particulate Or Gaseous Emissions				Wind	Inhalation	●	●	●	●				
						Dermal Contact								
						Ingestion					Ingestion	●	●	●
Dermal Contact											●	●	●	●
Direct Contact										Inhalation				
										Dermal Contact	●	●	●	●
Groundwater	Pumping	Groundwater			Ingestion	●	●							
					Inhalation									
					Dermal Contact	●	●							
	Disch. To SW	Surface Water				Ingestion	●	●	●	●				
						Inhalation								
						Dermal Contact	●	●	●	●				

GRAPHIC REPRESENTATION OF THE QUARRY RESIDUAL CONCEPTUAL SITE MODEL

FIGURE 3-1

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### 3.4 Data Needs

Data analysis and the development of a preliminary conceptual site model have led to the establishment of various data needs for the quarry residual area of interest. These needs are outlined below.

- The horizontal and vertical extent of groundwater contamination within the Kimmswick, Decorah, and Platin formations needs to be determined.
- Water quality measurements north and west of the quarry.
- Several aquifer characteristics need to be verified or determined within the bedrock and overburden.
- Additional elevation, recharge, and discharge information is needed to understand the hydrology of the area.
- Additional geological and geochemical data are needed, including the location of contacts between the alluvial deposits and Kimmswick Limestone and Decorah shale.
- Additional biological data are required.
- Additional chemical, radiological, and physical data on slough and creek sediments are required.
- Data pertaining to rock and soil contaminants are required.
- Air quality data for the area between the quarry bluff and the slough are needed.
- Additional data on Weldon Spring Wildlife Area land use, especially Katy Trail usage, population densities, and a local well survey.

These data needs must be reviewed in detail and appropriate data to support the BRA and RI must be obtained. Programs designed to satisfy the data needs will be outlined

in the residual work plan with details developed during Phase I and Phase II characterization planning.

Data analysis efforts and the development of the conceptual site model uncovered the need for a limited field study prior to public and agency approval of the residual work plan. The completion of several slug tests will be required prior to the initiation of quarry dewatering activities to provide an actual measurement of hydraulic conductivity values prior to pumping, i.e., while the aquifer is at equilibrium. Sampling and Quality Assurance (QA) plans are currently being developed along with the scoping and scheduling of this activity. Field work to obtain the necessary data should begin in August 1991, prior to the dewatering currently scheduled for September 1991. A sampling plan will be transmitted to the Environmental Protection Agency (EPA) Region VII and the Missouri Department of Natural Resources (MDNR) for review prior to initiating the limited field study.

### **3.5 Media of Concern**

The following media of concern have been identified as a result of the limited data analysis and preliminary development of the conceptual site model.

- Groundwater.
- Soil.
- Surface water.
- Sediment.
- Structures (water treatment plant facilities).
- Sludges (water treatment plant facilities and quarry sump).

Air is not listed as a media of concern, although the data analysis indicated that air quality data are not available. It is assumed that the removal of bulk wastes eliminates air as a media of concern because the major source of particulate contamination and radon will be removed. Characterization studies will be conducted prior to completion of the RI and baseline risk assessment (BRA). These studies may identify air as a media of concern, and will therefore be analyzed at that time. However, air quality will be monitored during the bulk waste and residual remedial actions.

### 3.6 Preliminary Remedial Action Objectives and Response Actions

Remedial action objectives, general response actions, technology types and process options will be determined by media of concern as previously identified in Section 3.5. Specific remedial action objectives will be identified as a result of characterization studies. ~~These objectives and corresponding actions will be finalized in the Feasibility Study, but~~ developed through the RI/FS process.

### 3.7 Preliminary Identification of Applicable or Relevant and Appropriate Requirements

Remedial actions for the Weldon Spring quarry residual activity will be undertaken in accordance with all applicable or relevant and appropriate requirements (ARARs). The identification of ARARs is an iterative process. As the remedial action planning process moves from data gathering in the RI phase to selection of a remedial action alternative in the FS phase, the list of ARARs will be finalized to those required for implementation of the selected alternative.

Any regulation, standard, requirement, criterion, or limitation under any Federal or State environmental law may be either *applicable* or *relevant and appropriate* to a remedial action, but not both. A regulation, standard, requirement, criterion, or limitation is *applicable* if it legally applies to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance. A regulation, standard, requirement, criterion, or limitation is *relevant and appropriate* if it addresses problems or situations sufficiently similar to those encountered at the site and its use is well suited to the particular site. A requirement determined to be relevant and appropriate must be complied with to the same extent as an applicable requirement. However, a determination of relevance and appropriateness may be applied only to portions of a requirement; whereas applicability can be determined only for the requirement as a whole. Only those State laws that are more stringent than Federal laws may become ARARs.

The ARARs may be classified into three general categories:

- Contaminant-specific -- related to the level of contamination allowed for a specific pollutant in various environmental media (i.e., soil, water, and air).

- Location-specific -- related to the presence of a special geographical (e.g., floodplain or wetland) or archeological area at or near the site.
- Action-specific -- related to a method of remedial action identified as an alternative for the site (e.g., disposal requirements or incineration standards).

The ARARs are identified on a project-specific basis, i.e., site-specific contamination, proposed remedial action alternatives, and site characteristics influence the selection of ARARs. The selection of ARARs will be addressed at various stages in the RI/FS process as additional information becomes available:

- RI/FS work plan -- potential ARARs identified (contaminant-and location-specific).
- Completion of RI phase -- ARARs used to identify cleanup goals (contaminant-and location-specific).
- Development of alternatives -- alternatives evaluated with respect to ARARs (action-, contaminant- and location-specific).

For an alternative to be selected, it must meet the associated ARARs -- unless waiver conditions identified in Superfund Amendments and Reauthorization (SARA), Section 121(d)(4), are met.

Potential ARARs for the Weldon Spring quarry residuals activity are listed in Table 3-1. Additional Federal and State requirements may also be ARARs, depending upon the alternatives identified during the RI/FS process or as a result of changes in Federal or State laws. A complete list of ARARs identified for the various remedial action alternatives will be provided in the FS.

### **3.8 Initial Data Quality Objectives**

Data quality objectives (DQOs) are qualitative and quantitative statements which specify the quality of the data required to support decisions during response activities.

**TABLE 3-1 Laws and Orders Potentially Applicable or Relevant and Appropriate to the Weldon Spring Site Quarry Residuals Activity**

Federal Laws

Archeological and Historic Preservation Act of 1974  
 Archeological Resources Protection Act of 1979  
~~Atomic Energy Act of 1954, as amended~~  
 Clean Air Act of 1963, as amended  
 Clean Water Act, as amended (also referred to as Federal Water Pollution Control Act of 1972, as amended)  
 Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended  
 Department of Energy Organization Act of 1977  
 Endangered Species Act of 1973, as amended  
 Fish and Wildlife Coordination Act of 1934, as amended  
 Hazardous Materials Transportation Act of 1974, as amended  
 National Environmental Policy Act of 1969, as amended  
 National Historic Preservation Act of 1966, as amended  
 Noise Control Act of 1972  
 Noise Pollution and Abatement Act of 1970  
 Occupational Safety and Health Act of 1970  
 Safe Drinking Water Act of 1974  
 Soil and Water Resources Conservation Act of 1977  
 Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, as amended by the Hazardous and Solid Waste Amendments of 1984  
 Superfund Amendments and Reauthorization Act of 1986  
 Toxic Substances Control Act of 1976  
 Uranium Mill Tailings Radiation Control Act of 1978

Executive Orders

Executive Order 11490, Assigning Emergency Preparedness Functions to Federal Departments and Agencies  
 Executive Order 11514, Protection and Enhancement of Environmental Quality  
 Executive Order 11543, Protection and Enhancement of the Cultural Environment  
 Executive Order 11738, Providing for Administration of the Clean Air Act and the Federal Water Pollution Control Act with Respect to Federal Contracts, Grants, or Loans  
 Executive Order 11807, Occupational Safety and Health Programs for Federal Employees  
 Executive Order 11988, Floodplain Management  
 Executive Order 11990, Protection of Wetlands  
 Executive Order 11991, Relating to the Protection and Enhancement of Environmental Quality  
 Executive Order 12088, Federal Compliance with Pollution Control Standards  
 Executive Order 12146, Management of Federal Legal Resources  
 Executive Order 12580, Superfund Implementation

Department of Energy Orders

Order 1540.1	Materials Transportation and Traffic Management
Order 4240.1H	Designation of Major System Acquisition and Major Projects
Order 4320.1A	Site Development and Facility Utilization Planning
Order 4700.1	Project Management System
Order 5000.3	Unusual Occurrence Reporting System
Order 5400.1	General Environmental Protection Program
Order 5400.4	Integration of Environmental Compliance Process
Order 5400.5	Radiation Protection of Public and the Environment
Order 5440.1C	Implementation of the National Environmental Policy Act
Order 5480.1B	Environment, Safety, and Health Program for Department of Energy Operations – Note: Chapter XI of Order 5480.1B has been amended (see Vaughan [1985] and subsequent updates of Derived Concentration Guides)
Order 5480.4	Environmental Protection, Safety, and Health Protection Standards

**TABLE 3-1 Laws and Orders Potentially Applicable or Relevant and Appropriate to the Weldon Spring Site Quarry Residuals Activity (Continued)**

Order 5480.11	Radiation Protection for Occupational Workers
Order 5480.14	Comprehensive Environmental Response, Compensation, and Liability Act Program
Order 5481.1	Environmental Protection, Safety, and Health Protection Information Reporting Requirements
Order 5481.1B	Safety Analysis Review System
Order 5482.1B	Environmental Protection, Safety, and Health Protection Appraisal Program
Order 5483.1A	Occupational Safety and Health Program for Government-Owned Contractor-Operated Facilities
Order 5500.2	Emergency Planning, Preparedness, and Response for Operations
Order 5700.6B	Quality Assurance
Order 5820.2	Radioactive Waste Management

**Missouri State Environmental Laws**

Missouri Clean Water Act  
 Missouri Clean Air Act  
 Missouri Hazardous Waste Management Law  
 Missouri Solid Waste Management Law  
 Missouri Land Reclamation Act  
 Governor's Executive Order 82-19 on Flood Plain Management  
 Missouri 401 Water Quality Certification  
 Missouri Wildlife Code  
 Missouri Radiation Regulations  
 Missouri Air Conservation Law; Public Health and Welfare

DQOs are determined based on the end uses of the data to be collected and are applicable to all data collection activities.

Each sampling and analysis plan will implement the Data Quality Objective process as presented in the *Environmental Data Administration Plan* (EDAP) (MKF and JEG 1991b), to address the data quality requirements for the quarry residual activities.

The U.S. Department of Energy (DOE) and EPA will review the DQOs when evaluating each sampling and analysis plan. Objectives for the residual work plan will include parameters presently anticipated, updated, and/or revised during the preparation of the sampling plans for characterization and possibly again during the treatability studies for the feasibility studies.

## 4 FIELD PLANNING DOCUMENTS

The preparation of several documents will be required prior to initiating field activities during the residual activities. These plans ensure proper guidance when obtaining field data, quality assurance and quality control protocols necessary to achieve data quality objectives, and to clearly define potential health and safety problems that may be encountered during characterization activities. The documents that address these issues are the field sampling plan (FSP), the *Environmental Quality Assurance Program Plan (EQAPP)* (MKF and JEG 1991), the *Health and Safety Plan (HASP)*, and the *Community Relations Plan*.

### 4.1 Field Sampling Plan

The purpose of the field sampling activities is to obtain data to confirm the presence or absence of contaminants, the contaminant sources, modes of transport, direction of contaminant migration, and the effect of the contaminants on public health and the environment. Field sampling plans include a description of objectives, work tasks, specific quality assurance procedures, and level of effort required for site characterization. They provide a detailed sampling rationale--including the sampling locations and the types and number of samples--which, coupled with standard operating procedures and analytical methods/detection limits, will offer a well-defined approach. These plans are designed to permit detailed characterization of the wastes, soil, groundwater, surface water, and sediments at the quarry residuals area. Remedial measures can be identified, evaluated, and selected from these investigations. Details of the required field sampling plans will be presented in the residual work plan.

### 4.2 Quality Assurance Program Plan Update

The *Quality Assurance Program Plan (QAPP)* establishes the quality program for those activities performed by the Project Management Contractor (PMC) during the Weldon Spring Site Remedial Action Project (WSSRAP). This QAPP requires compliance with the criteria of ANSI/ASME NQA-1 1986, and U.S. Department of Energy (DOE) Order 5700.6C, which are required by the PMC and DOE contract document DE-AC05-86OR21548 and the MK-Environmental Services NQA-1 *Quality Assurance Manual*. The purpose of this QAPP is to assure compliance with these documents.

All criteria of NQA-1 are applicable to WSSRAP. The MK-Environmental Services NQA-1 Quality Assurance program provides guidance for the development of requisites to implement quality at WSSRAP. However, not all criteria are addressed within this QAPP; only criteria that describe Quality Assurance (QA) departmental actions are described. Compliance with the criteria not described by this QAPP is assured through performance of QA Audits, QA surveillances, and by implementation of the WSSRAP self-assessment program.

The QAPP shall be used as the generic working document to control and document the quality of work at the WSSRAP. This document requires that specific procedures and plans be generated to address Quality Level 1 and Quality Level 2 work activities and inspection criteria. These specific procedures shall detail the requirements of all applicable documents, codes, standards, and regulations.

Certain environmental compliance issues are addressed in the *WSSRAP Environmental Assurance Program Plan (EQAPP)* (MKF and JEG 1991) which addresses the specific EPA/QAMS 005-80 Quality Assurance requirements for the characterization of the WSSRAP. The EQAPP does not supersede the QAPP, but rather it expands on specific requirements required by DOE Order 5700.6C.

#### **4.3 Health and Safety Plans**

Subcontractor health and safety plans will be developed to ensure the health and safety of personnel during the performance of site characterization and response action activities. The plans include the safety standards that must be met by subcontractors during the performance of their assignments. Addressing the health and safety of on-site personnel will also serve to minimize any potential impacts to the general public and the nearby environment. Key elements of these plans are the use of appropriate protective equipment and safeguards and the performance of specific tasks under the supervision of trained technicians and safety specialists. On-site personnel are trained to be cognizant of all appropriate safety equipment and procedures, locations and types of on-site hazards, standard operating procedures, and procedures to be followed in emergency situations. Health and safety training and medical surveillance of all potentially exposed personnel are required elements of these plans.

#### 4.4 Community Relations Plan

The *Community Relations Plan* (MKF and JEG 1991) describes the policy and procedures guiding interaction of personnel responsible for implementing the WSSRAP activities with the general public. The plan will be reviewed and revised accordingly to reflect the quarry residuals activity. The purpose of the community relations program is to ensure meaningful exchanges of information on such matters as potential health impacts, environmental issues, response action construction plans, project costs, and specific site activities.

## 5 ENVIRONMENTAL DOCUMENTATION SCHEDULE

### 5.1 Schedule and Responsibilities

Table 5-1 shows the planning schedule for completing the quarry residuals environmental documentation. ~~The schedule indicates that the work plan begins in April of 1991 and ends with a Record of Decision in January of 1998.~~ The table also shows the lead organization that will have the responsibility for completing each document along with the required support agencies. Document review will be required by the organizations listed in the table. The initial project schedule showing activity durations by task is shown on Table 5-2. Detailed schedules and manpower requirements will be developed as the documentation process proceeds. For example, Table 5-3 indicates the current schedule developed to show accelerated sampling plan development for input into the work plan prior to agency review.

TABLE 5-1 Quarry Residuals Environmental Documentation Schedule and Responsibilities

DOCUMENT/TASK	BEGIN	END	LEAD	SUPPORT	REVIEW
Work Plan	April 1991	December 1991	PMC	MK/JEG/ANL	ANL/DOE/Agency
Phase I Characterization Plans	November 1991	June 1992	PMC	MK/JEG	ANL/DOE/Agency
Phase I Characterization Procurement	June 1992	December 1992	PMC	PMC	PMC
Phase I Characterization	December 1992	August 1993	PMC	MK/JEG/SC	PMC
Phase I RI	August 1993	May 1994	PMC	MK/JEG	ANL/DOE/Agency
Phase I BRA	November 1993	November 1994	ANL	PMC/MK/JEG	PMC/DOE/Agency
Phase I/II FS-NEPA	April 1994	December 1994	ANL	PMC/MK/JEG	PMC/DOE/Agency
Phase II Characterization Plan	January 1994	July 1994	PMC	MK/JEG	ANL/DOE/Agency
Phase II Characterization Procurement	June 1994	September 1994	PMC	PMC	PMC
Phase II Characterization	November 1994	April 1995	PMC	MK/JEG/SC	PMC
Phase I/II RI	April 1995	October 1995	PMC	MK/JEG	ANL/DOE/Agency
Phase I/II BRA	June 1995	February 1996	ANL	PMC/MK/JEG	PMC/DOE/Agency
FS Engineering Studies	June 1995	January 1996	PMC	MK/JEG	ANL/DOE
FS-NEPA/Proposed Plan	January 1996	December 1996	ANL	PMC/MK/JEG	PMC/DOE/Agency
RS/ROD	January 1997	January 1998	ANL	PMC/MK/JEG	PMC/DOE/Agency

## Acronyms/Definitions

- Document/Task
  - RI; Remedial Investigation
  - BRA; Baseline Risk Assessment
  - FS; Feasibility Study
  - NEPA; National Environmental Policy Act of 1969, as amended
  - RS; Responsiveness Summary
  - ROD; Record of Decision
- Lead/Support/Review
  - PMC; Project Management Contractor
  - ANL; Argonne National Laboratories
  - MK; Morrison-Knudsen Environmental Services (Boise/San Francisco)
  - JEG; Jacobs Engineering Group (Pasadena/Denver)
  - SC; Subcontractor (as selected by procurement process)
  - DOE; Department of Energy representatives at WSSRAP
  - Agency; EPA - Environmental Protection Agency  
MDNR - Missouri Department of Natural Resources  
DOE - Oak Ridge and Headquarters (Washington, D.C.)



TABLE 5-2 Quarry Residuals Detailed Planning Schedule (Continued)

WSSRAP DE-AC05-860R21548 MK-Ferguson CONTRACT: 3589			QUARRY RESIDUAL ENVIRONMENTAL DOCUMENTATION PROCESS PLANNING SCHEDULE																													
ACTIVITY DESCRIPTION	TARGET START	TARGET FINISH	1991			1992			1993			1994			1995			1996			1997			1998								
			O	C	J	O	C	J	O	C	J	O	C	J	O	C	J	O	C	J	O	C	J	O	C	J						
<b>PHASE I CHARACTERIZATION - GEOPHYSICAL INVESTIGATIONS</b>																																
27	INCORP/REVISE GEOPHYSICAL INVESTIGATIONS SPECIFICATIONS	16SEP92 13OCT92																														
28	GEOPHYSICAL INVESTIGATIONS : BID/AWARD	14OCT92 15DEC92																														
29	GEOPHYSICAL INVESTIGATIONS	16DEC92 19MAY93																														
30	GEOPHYSICAL INVESTIGATIONS ANALYSIS/REPORT	20MAY93 1AUG93																														
<b>PHASE I CHARACTERIZATION - PUMP WELL/PUMP TEST</b>																																
31	DEVELOP DRAFT PUMP WELL/PUMP TEST SPECIFICATIONS	16JUN92 14AUG92																														
32	PMC REVIEW OF DRAFT PUMP WELL/PUMP TEST SPECIFICATIONS	15AUG92 15SEP92																														
33	INCORP/REVISE PUMP WELL/PUMP TEST SPECIFICATION	16SEP92 13OCT92																														
34	PUMP WELL/PUMP TESTS : BID/AWARD	14OCT92 15DEC92																														
35	PERFORM PUMP WELL/PUMP TESTS	16DEC92 19MAY93																														
36	PUMP WELL/PUMP TESTS : ANALYSIS/REPORT	20MAY93 1AUG93																														
<b>CONTAMINANTS SAMPLING PLAN</b>																																
37	WRITE CONTAMINANTS SAMPLING PLAN	17NOV91 15JAN92																														
38	REVISE/FINAL DRAFT OF CONTAMINANTS SAMPLING PLAN	15JAN92 15MAR92																														
39	PMC/DOE REVIEW OF CONTAMINANTS SAMPLING PLAN	16JAN92 14JAN92																														
40	EPA/DNR REVIEW OF CONTAMINANTS SAMPLING PLAN	16MAR92 15MAY92																														
41	REVISE-INCORP COMMENTS FINALIZE PLAN	16MAY92 14JUN92																														
42	ISSUE FINAL PLAN TO EPA/DNR	15JUN92 15JUN92																														
<b>PHASE I CHARACTERIZATION - MONITORING WELL INSTALLATION</b>																																
43	DEVELOP DRAFT DRILLING/MONITORING WELL SPECIFICATIONS	16JUN92 14AUG92																														
44	PMC REVIEW OF DRILLING/MONITORING WELL SPECIFICATIONS	15AUG92 15SEP92																														
45	INCORP/REVISE DRILLING/MONITORING WELL SPECIFICATIONS	16SEP92 13OCT92																														
46	DRILLING/MONITORING WELL : BID/AWARD	14OCT92 15DEC92																														
47	DRILLING/INSTALL MONITORING WELLS	16DEC92 19MAY93																														
48	DRILLING/MONITORING WELL : ANALYSIS/REPORT	20MAY93 1AUG93																														
<b>PHASE I CHARACTERIZATION - SOILS DRILLING</b>																																
49	DEVELOP DRAFT SOILS-DRILLING SPECIFICATIONS	16JUN92 14AUG92																														
50	PMC REVIEW OF SOILS-DRILLING SPECIFICATIONS	15AUG92 15SEP92																														
51	INCORP/REVISE SOILS-DRILLING SPECIFICATIONS	16SEP92 13OCT92																														
52	SOILS-DRILLING: BID/AWARD	14OCT92 15DEC92																														
53	DRILLING - SOILS	16DEC92 19MAY93																														
54	DRILLING-SOILS : ANALYSIS/REPORT	20MAY93 1AUG93																														
			O	C	J	O	C	J	O	C	J	O	C	J	O	C	J	O	C	J	O	C	J	O	C	J	O	C	J	O	C	J
			1991	1992	1993	1994	1995	1996	1997	1998																						



TABLE 5-2 Quarry Residuals Detailed Planning Schedule (Continued)

WSSRAP DE-AC05-860R21548 MK-Ferguson CONTRACT: 3589			QUARRY RESIDUAL ENVIRONMENTAL DOCUMENTATION PROCESS PLANNING SCHEDULE																	
ACTIVITY DESCRIPTION	TARGET START	TARGET FINISH	1991		1992		1993		1994		1995		1996		1997		1998			
			O	C	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A
<b>TASK 7 - PHASE I BASELINE RISK ASSESSMENT</b>																				
80	DRAFT BASELINE RISK ASSESSMENT REPORT - PHASE I	1NOV93 3APR94																		
81	PMC/ANL REVIEW OF DRAFT BASELINE RISK ASSESSMENT REPORT - PHASE I	4APR94 18MAY94																		
82	INCRP COMMENTS/REVISE DRAFT BASELINE RISK ASSESSMENT REPORT - PHASE I	19MAY94 17JUL94																		
83	EPA/DNR REVIEW OF DRAFT BASELINE RISK ASSESSMENT REPORT - PHASE I	18JUL94 15SEP94																		
84	INCRP COMMENTS/PREPARE RESPONSIVENESS SUMMARY ON BASELINE RISK ASSESSMENT - PHASE I	16SEP94 14NOV94																		
<b>TASK 8 - PHASE I/II FS-NEPA</b>																				
85	DRAFT QUARRY RESIDUAL FEASIBILITY STUDY - PHASE I/II	2APR94 4JUL94																		
86	PMC/ANL REVIEW OF QUARRY RESIDUAL FEASIBILITY STUDY - PHASE I/II	5JUL94 3AUG94																		
87	INCRP COMMENTS/REVISE QUARRY RESIDUAL FEASIBILITY STUDY - PHASE I/II	4AUG94 2SEP94																		
88	EPA/DOE-HQ REVIEW OF QUARRY RESIDUAL FEASIBILITY STUDY - PHASE I/II	3SEP94 1NOV94																		
89	INCRP COMMENTS/ PREPARE RESPONSIVENESS SUMMARY ON QUARRY FEASIBILITY - PHASE I/II	2NOV94 31DEC94																		
<b>TASK 9 - PHASE II CHARACTERIZATION PLANS</b>																				
90	DRAFT QUARRY RESIDUAL CHARACTERIZATION-PHASE II SAMPLING PLANS	31JAN94 31MAR94																		
91	PMC/ANL REVIEW OF QUARRY RESIDUAL CHARACTERIZATION - PHASE II SAMPLING PLANS	1APR94 30APR94																		
92	INCRP COMMENTS/REVISE QUARRY RESIDUAL CHARACTERIZATION - PHASE II SAMPLING PLANS	1MAY94 30MAY94																		
93	EPA/DNR REVIEW OF QUARRY RESIDUAL CHARACTERIZATION - PHASE II SAMPLING PLANS	31MAY94 29JUL94																		
<b>TASK 10 - PHASE II CHARACTERIZATION PROCUREMENT</b>																				
94	DEVELOP SPECIFICATIONS FOR QUARRY RESIDUAL CHARACTERIZATION - PHASE II	3JUN94 1AUG94																		
95	QUARRY RESIDUAL CHARACTERIZATION - PHASE II : BID/AWARD	2AUG94 30SEP94																		
<b>TASK 11 - PHASE II CHARACTERIZATION</b>																				
96	QUARRY RESIDUAL CHARACTERIZATION-PHASE II : FIELD WORK	14NOV94 12JAN95																		
97	QUARRY RESIDUAL CHARACTERIZATION-PHASE II : LAB ANALYSIS	13JAN95 2MAR95																		
98	QUARRY RESIDUAL CHARACTERIZATION-PHASE II : DATA INTERPETATIONS	3MAR95 16APR95																		
			O	C	J	A	J	A	J	A	J	A	J	A	J	A	J	A	J	A
			1991	1992	1993	1994	1995	1996	1997	1998										







TABLE 5-3 Quarry Residuals Environmental Documentation Process (Continued)

WSSRAP DE-AC05-B60R21548 MK-Ferguson CONTRACT: 3589						QUARRY RESIDUAL ENVIRONMENTAL DOCUMENTATION PROCESS																					
						SCHEDULE																					
ACTIVITY DESCRIPTION		TARGET START	TARGET FINISH	ACTUAL/ FORECAST START	ACTUAL/ FORECAST FINISH	DUR	1991		1992		1993		1994		1995		1996		1997		1998						
							O	J	J	A	J	O	J	A	J	O	J	A	J	O	J	A	J	O	J	A	
<b>HYDROGEOLOGICAL SAMPLING PLAN</b>																											
21	REVISE/FINAL DRAFT OF HYDROGEOLOGICAL SAMPLING PLAN	15FEB92	15MAR92	22OCT91	20NOV91	30			□	▽																	
22	EPA/DNR REVIEW OF HYDROGEOLOGICAL SAMPLING PLAN	16MAR92	14MAY92	15DEC91	12FEB92	60			□	▽																	
23	REVISE/INCRP COMMENTS FINALIZE PLAN	15MAY92	14JUN92	13FEB92	13MAR92	30			□	▽																	
24	ISSUE FINAL PLAN TO EPA/DNR	15JUN92	15JUN92	14MAR92	14MAR92	1			□	▽																	
<b>GEOPHYSICAL INVESTIGATIONS</b>																											
25	DEVELOP DRAFT GEOPHYSICAL INVESTIGATIONS SPECIFICATIONS	16JUN92	14AUG92	15DEC91	12FEB92	60			□	▽																	
26	PMC REVIEW OF DRAFT GEOPHYSICAL INVESTGATIONS SPECS	15AUG92	15SEP92	13FEB92	26FEB92	14			□	▽																	
27	INCRP/REVISE GEOPHYSICAL INVESTIGATIONS SPECIFICATIONS	16SEP92	13OCT92	27FEB92	11MAR92	14			□	▽																	
28	GEOPHYSICAL INVESTIGATIONS : BID/AWARD	14OCT92	15DEC92	15MAR92	18APR92	35			□	▽																	
29	GEOPHYSICAL INVESTIGATIONS	16DEC92	19MAY93	19APR92	17JUL92	90			□	▽																	
30	GEOPHYSICAL INVESTIGATIONS ANALYSIS/REPORT	20MAY93	1AUG93	18JUL92	14NOV92	120			□	▽																	
<b>PUMP WELL/PUMP TESTS</b>																											
31	DEVELOP DRAFT PUMP WELL/PUMP TEST SPECIFICATIONS	16JUN92	14AUG92	13FEB92	12APR92	60			□	▽																	
32	PMC REVIEW OF DRAFT PUMP WELL/PUMP TEST SPECIFICATIONS	15AUG92	15SEP92	13APR92	26APR92	14			□	▽																	
33	INCRP/REVISE PUMP WELL/PUMP TEST SPECIFICATION	16SEP92	13OCT92	27APR92	10MAY92	14			□	▽																	
34	PUMP WELL/PUMP TESTS : BID/AWARD	14OCT92	15DEC92	11MAY92	2JUL92	53			□	▽																	
35	PERFORM PUMP WELL/PUMP TESTS	16DEC92	19MAY93	3JUL92	30OCT92	120			□	▽																	
36	PUMP WELL/PUMP TESTS : ANALYSIS/REPORT	20MAY93	1AUG93	31OCT92	27FEB93	120			□	▽																	
<b>CONTAMINANTS SAMPLING PLAN</b>																											
37	WRITE CONTAMINANTS SAMPLING PLAN	17NOV91	15JAN92	26AUG91	15OCT91	51			□	▽																	
38	PMC/DOE REVIEW OF CONTAMINANTS SAMPLING PLAN	15FEB92	15MAR92	16OCT91	14NOV91	30			□	▽																	
39	REVISE/FINAL DRAFT OF CONTAMINANTS SAMPLING PLAN	16JAN92	14FEB92	15NOV91	14DEC91	30			□	▽																	
							O	J	J	A	J	O	J	A	J	O	J	A	J	O	J	A	J	O	J	A	J
							1991	1992		1993		1994		1995		1996		1997		1998							
TIMENOW: 11SEP91		▽ ORIGINAL DURATION		□ WORK FORECAST		■ WORK COMPLETED		▤ PRIORITY WORK		▥ CRITICAL WORK																	
MONTH ENDING: 30SEP91																											
METRART/EMIS		Barchart Drawing System										10:22 am 18-SEP-91					Page 2 of 7										

TABLE 5-3 Quarry Residuals Environmental Documentation Process (Continued)

WSSRAP DE-AC05-B60R21548 MK-Ferguson CONTRACT: 3589						QUARRY RESIDUAL ENVIRONMENTAL DOCUMENTATION PROCESS SCHEDULE																		
ACTIVITY DESCRIPTION	TARGET START	TARGET FINISH	ACTUAL/ FORECST START	ACTUAL/ FORECST FINISH	DUR	1991		1992		1993		1994		1995		1996		1997		1998				
						O	J	A	J	O	J	A	J	O	J	A	J	O	J	A	J	O	J	A
<b>CONTAMINANTS SAMPLING PLAN</b>																								
40	EPA/DNR REVIEW OF CONTAMINANTS SAMPLING PLAN	16MAR92	15MAY92	15DEC91	12FEB92	60																		
41	REVISE-INCORP COMMENTS FINALIZE PLAN	16MAY92	14JUN92	13FEB92	13MAR92	30																		
42	ISSUE FINAL PLAN TO EPA/DNR	15JUN92	15JUN92	14MAR92	14MAR92	1																		
<b>MONITORING WELL INSTALLATION</b>																								
43	DEVELOP DRAFT DRILLING/MONITORING WELL SPECIFICATIONS	16JUN92	14AUG92	15DEC91	12FEB92	60																		
44	PMC REVIEW OF DRILLING/MONITORING WELL SPECIFICATIONS	15AUG92	15SEP92	13FEB92	26FEB92	14																		
45	INCORP/REVISE DRILLING/MONITORING WELL SPECIFICATIONS	16SEP92	13OCT92	27FEB92	11MAR92	14																		
46	DRILLING/MONITORING WELL : BID/ANWARD	14OCT92	15DEC92	12MAR92	3MAY92	53																		
47	DRILLING/INSTALL MONITORING WELLS	16DEC92	19MAY93	4MAY92	31AUG92	120																		
48	DRILLING/MONITORING WELL : ANALYSIS/REPORT	20MAY93	1AUG93	1SEP92	29DEC92	120																		
<b>SOILS- DRILLING</b>																								
49	DEVELOP DRAFT SOILS-DRILLING SPECIFICATIONS	16JUN92	14AUG92	13FEB92	12APR92	60																		
50	PMC REVIEW OF SOILS-DRILLING SPECIFICATIONS	15AUG92	15SEP92	13APR92	26APR92	14																		
51	INCORP/REVISE SOILS-DRILLING SPECIFICATIONS	16SEP92	13OCT92	27APR92	10MAY92	14																		
52	SOILS-DRILLING: BID/ANWARD	14OCT92	15DEC92	11MAY92	14JUN92	35																		
53	DRILLING - SOILS	16DEC92	19MAY93	15JUN92	29JUL92	45																		
54	DRILLING-SOILS : ANALYSIS/REPORT	20MAY93	1AUG93	30JUL92	26NOV92	120																		
<b>ECOLOGICAL SAMPLING PLAN</b>																								
55	WRITE ECOLOGICAL SAMPLING PLAN	17NOV91	15JAN92	8JUL91	21SEP91	76																		
56	PMC/DOE REVIEW OF ECOLOGICAL SAMPLING PLAN	16JAN92	14FEB92	22SEP91	21OCT91	30																		
57	REVISE/FINAL DRAFT OF SAMPLING PLAN	15FEB92	15MAR92	22OCT91	20NOV91	30																		
58	EPA/DNR REVIEW OF ECOLOGICAL SAMPLING PLAN	16MAR92	14MAY92	15DEC91	12FEB92	60																		
59	REVISE-INCORP COMMENTS/FINALIZE PLAN	15MAY92	14JUN92	13FEB92	13MAR92	30																		

TIMENDW: 11SEP91  
MONTH ENDING: 30SEP91

▽ ORIGINAL DURATION

▭ WORK FORECAST

■ WORK COMPLETED

▨ PRIORITY WORK

▩ CRITICAL WORK

MEDARTIEMIS





TABLE 5-3 Quarry Residuals Environmental Documentation Process (Continued)

WSSRAP DE-AC05-860R21548 MK-Ferguson CONTRACT: 3589						QUARRY RESIDUAL ENVIRONMENTAL DOCUMENTATION PROCESS SCHEDULE															
ACTIVITY DESCRIPTION	TARGET START	TARGET FINISH	ACTUAL/ FORECAST START	ACTUAL/ FORECAST FINISH	DUR	1991		1992		1993		1994		1995		1996		1997		1998	
						O	J	J	A	J	O	J	A	J	O	J	A	J	O	J	A
<b>PHASE II CHARACTERIZATION PROCUREMENT</b>																					
95	QUARRY RESIDUAL CHARACTERIZATION - PHASE II : BID/AMARD	2AUG94	30SEP94	2AUG94	30SEP94	60															
<b>PHASE II CHARACTERIZATION</b>																					
96	QUARRY RESIDUAL CHARACTERIZATION-PHASE II : FIELD WORK	14NOV94	12JAN95	14NOV94	12JAN95	60															
97	QUARRY RESIDUAL CHARACTERIZATION-PHASE II : LAB ANALYSIS	13JAN95	2MAR95	13JAN95	2MAR95	49															
98	QUARRY RESIDUAL CHARACTERIZATION-PHASE II : DATA INTERPETATIONS	3MAR95	16APR95	3MAR95	16APR95	45															
<b>PHASE II REMEDIAL INVESTIGATIONS</b>																					
99	DRAFT QUARRY RESIDUAL REMEDIAL INVESTIGATIONS (RI) REPORT - PHASE II	17APR95	18JUN95	17APR95	18JUN95	63															
100	PMC/ANL REVIEW OF QUARRY RESIDUAL RI REPORT - PHASE II	19JUN95	18JUL95	19JUN95	18JUL95	30															
101	REVISE QUARRY RESIDUAL RI REPORT - PHASE II	19JUL95	17AUG95	19JUL95	17AUG95	30															
102	EPA/DNR REVIEW OF QUARRY RESIDUAL RI REPORT - PHASE II	18AUG95	16OCT95	18AUG95	16OCT95	60															
103	INCRP COMMENTS/PREPARE RESPONSIVENESS SUMMARY ON RI REPORT - PHASE II	17OCT95	15DEC95	17OCT95	15DEC95	60															
<b>PHASE II BASELINE RISK ASSESSMENT</b>																					
104	DRAFT QUARRY RESIDUAL BASELINE RISK ASSESSMENT - PHASE II	17JUN95	20AUG95	17JUN95	20AUG95	65															
105	PMC/ANL REVIEW OF QUARRY RESIDUAL BASELINE RISK ASSESSMENT - PHASE II	21AUG95	19SEP95	21AUG95	19SEP95	30															
106	INCRP COMMENTS/REVISE QUARRY RESIDUAL BASELINE RISK ASSESSMENT - PHASE II	20SEP95	19OCT95	20SEP95	19OCT95	30															
107	EPA/DNR REVIEW OF QUARRY RESIDUAL BASELINE RISK ASSESSMENT - PHASE II	20OCT95	18DEC95	20OCT95	18DEC95	60															
108	INCRP COMMENTS/PREPARE RESPONSIVENESS SUMMARY ON BASELINE RISK ASSESSMENT - PHASE II	19DEC95	16FEB96	19DEC95	16FEB96	60															
<b>FS ENGINEERING STUDIES</b>																					
109	BEGIN SCOPING FOR QUARRY RESIDUAL ENGINEERING STUDIES	17JUN95	16JUL95	17JUN95	16JUL95	30															
110	PMC/ANL REVIEW OF QUARRY RESIDUAL ENGINEERING SCOPING STUDIES	17JUL95	15AUG95	17JUL95	15AUG95	30															
111	INCRP COMMENTS/PERFORM QUARRY RESIDUAL ENGINEERING STUDIES	16AUG95	16JAN96	16AUG95	16JAN96	154															



## 6 REFERENCES

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Argonne National Laboratory, 1989. *Responsiveness Summary for the Engineering Evaluation/Cost Analysis for the Proposed Management of Contaminated Water in the Weldon Spring Quarry*. DOE/OR/21548-146. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. Oak Ridge, TN. June.

EPA, see U.S. Environmental Protection Agency.

MacDonell, M.M., J.M. Peterson, and I.E. Joya, 1989. *Engineering Evaluation/Cost Analysis for the Proposed Management of Contaminated Water in the Weldon Spring Quarry*. DOE/OR/21548-039. Prepared for U.S. Department of Energy, Oak Ridge Operations Office, Weldon Spring Site Remedial Action Project, by Argonne National Laboratory, Energy and Environmental systems Division. San Francisco, CA. January.

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**APPENDIX A**  
**CURRENT CONTENTS OF THE RESIDUALS**  
**COMPUTERIZED DATA MANAGEMENT SYSTEM**

TYPE | DOCUMENT  
 TITLE | NOTEBOOK II  
 DATE\_ISSUED/PUBLISHED | 00/00/89  
 DOCUMENT\_NUMBER |  
 AUTHOR | PRO/TEM  
 KEYWORDS | SOFTWARE MANUAL  
 PMC? | N  
 FILE\_NUMBER | 1

TYPE | DOCUMENT  
 TITLE | NOTEBOOK II PLUS WORKBOOK: A TUTORIAL  
 DATE\_ISSUED/PUBLISHED | 00/00/90  
 DOCUMENT\_NUMBER |  
 AUTHOR | OBERON RESOURCES  
 KEYWORDS | SOFTWARE MANUAL  
 PMC? | N  
 FILE\_NUMBER | 2

TYPE | DOCUMENT  
 TITLE | REMEDIAL INVESTIGATIONS FOR QUARRY BULK WASTES  
 DATE\_ISSUED/PUBLISHED | 12/00/89  
 DOCUMENT\_NUMBER | DOE/OR/21548-066  
 AUTHOR | MKF - JEG  
 KEYWORDS | GEOLOGY -- FRACTURES/JOINTING, GEOLOGY -- LITHOLOGY, HYDROGEOLOGY,  
 CHEMISTRY -- GROUNDWATER, CHEMISTRY -- SEDIMENT, CHEMISTRY -- SOIL,  
 CHEMISTRY -- SURFACE WATER, RADIOLOGICAL -- AIR, RADIOLOGICAL --  
 GROUNDWATER, RADIOLOGICAL -- SEDIMENT, RADIOLOGICAL -- SOIL,  
 RADIOLOGICAL -- SURFACE WATER, TOPOGRAPHY  
 PMC? | Y  
 FILE\_NUMBER | 3

TYPE | DOCUMENT  
 TITLE | ANNUAL SITE ENVIRONMENTAL REPORT 1989  
 | REV. 1  
 DATE\_ISSUED/PUBLISHED | 11/00/90  
 DOCUMENT\_NUMBER | DOE/OR/21548-129  
 AUTHOR | MKF - JEG  
 KEYWORDS | CHEMISTRY -- SURFACE WATER, CHEMISTRY -- GROUNDWATER, RADIOLOGICAL --  
 GROUNDWATER, RADIOLOGICAL -- SURFACE WATER, RADIOLOGICAL -- AIR,  
 GEOLOGY -- FRACTURES/JOINTING, GEOLOGY -- LITHOLOGY, HISTORY,  
 METEOROLOGY, TOPOGRAPHY  
 PMC? | Y  
 FILE\_NUMBER | 4

TYPE | DOCUMENT  
 TITLE | QUARRY DETECTION MONITORING WELLS  
 | SUBCONTRACT DOCUMENTS WP-166  
 | REV. 0  
 DATE\_ISSUED/PUBLISHED | 08/00/90  
 DOCUMENT\_NUMBER |

AUTHOR |MKF - JEG  
KEYWORDS |GEOLOGY -- LITHOLOGY  
PMC? |Y  
FILE\_NUMBER |5

TYPE |DOCUMENT  
TITLE |WSSRAP QUARRY  
|FOCUSED REMEDIAL INVESTIGATION/FEASIBILITY STUDIES  
|DRAFT  
DATE\_ISSUED/PUBLISHED |07/08/88  
DOCUMENT\_NUMBER |5121R-302-B  
AUTHOR |MORRISON-KNUDSEN ENGINEERS, INC.  
|SAN FRANCISCO  
KEYWORDS |BIOLOGY -- ECOLOGY, CHEMISTRY -- GROUNDWATER, CHEMISTRY -- SEDIMENT,  
|CHEMISTRY -- SOIL, CHEMISTRY -- SURFACE WATER, CONTAMINANT  
|TRANSPORT/MIGRATION, GEOLOGY -- FRACTURES/JOINTING, GEOLOGY --  
|LITHOLOGY, HISTORY, HYDROGEOLOGY -- AQUIFER PROPERTIES, HYDROGEOLOGY  
|-- LOCAL, HYDROGEOLOGY -- WATER LEVELS, METEOROLOGY, RADIOLOGICAL --  
|AIR, RADIOLOGICAL -- GROUNDWATER, RADIOLOGICAL -- SEDIMENT,  
|RADIOLOGICAL -- SOIL, RADIOLOGICAL -- SURFACE WATER, SOIL -- SCS  
|TYPE, TOPOGRAPHY  
PMC? |Y  
FILE\_NUMBER |6

TYPE |DOCUMENT  
TITLE |ANNUAL ENVIRONMENTAL MONITORING REPORT 1988  
DATE\_ISSUED/PUBLISHED |06/00/89  
DOCUMENT\_NUMBER |DOE/OR/21548-079  
AUTHOR |MKF - JEG  
KEYWORDS |CHEMISTRY -- GROUNDWATER, CHEMISTRY -- SEDIMENT, CHEMISTRY -- SURFACE  
|WATER, GEOLOGY -- FRACTURES/JOINTING, GEOLOGY -- LITHOLOGY, HISTORY,  
|METEOROLOGY, RADIOLOGICAL -- AIR, RADIOLOGICAL -- GROUNDWATER,  
|RADIOLOGICAL -- SEDIMENT, RADIOLOGICAL -- SURFACE WATER, TOPOGRAPHY  
PMC? |Y  
FILE\_NUMBER |7

TYPE |DOCUMENT  
TITLE |ANNUAL ENVIRONMENTAL MONITORING REPORT  
|WELDON SPRING, MISSOURI  
|CALENDAR YEAR 1987  
DATE\_ISSUED/PUBLISHED |00/00/88  
DOCUMENT\_NUMBER |DOE/OR/21548-015  
AUTHOR |MKF - JEG  
KEYWORDS |CHEMISTRY -- GROUNDWATER, CHEMISTRY -- SURFACE WATER, GEOLOGY --  
|FRACTURES/JOINTING, GEOLOGY -- LITHOLOGY, HISTORY, METEOROLOGY,  
|RADIOLOGICAL -- AIR, RADIOLOGICAL -- GROUNDWATER, RADIOLOGICAL --  
|SURFACE WATER, TOPOGRAPHY  
PMC? |Y  
FILE\_NUMBER |8

TYPE | DOCUMENT  
 TITLE | REPORT ON GROUND-WATER MONITORING WELL REHABILITATION AND  
 | RADIOLOGICAL CHARACTERIZATION DRILLING, WELDON SPRING QUARRY  
 DATE\_ISSUED/PUBLISHED | 12/00/85  
 DOCUMENT\_NUMBER | DOE/OR/20722-63  
 AUTHOR | BECHTEL NATIONAL, INC.  
 KEYWORDS | GEOLOGY -- LITHOLOGY  
 PMC? | N

FILE\_NUMBER | 9

TYPE | DOCUMENT  
 TITLE | CHEMICAL CHARACTERIZATION REPORT FOR THE WELDON SPRING QUARRY  
 DATE\_ISSUED/PUBLISHED | 08/00/87  
 DOCUMENT\_NUMBER | DOE/OR/20722-176  
 AUTHOR | BECHTEL NATIONAL, INC.  
 KEYWORDS | CHEMISTRY -- SOIL, CHEMISTRY -- SEDIMENT  
 PMC? | N  
 FILE\_NUMBER | 10

TYPE | DOCUMENT  
 TITLE | RESPONSIVENESS SUMMARY FOR THE ENGINEERING EVALUATION/COST ANALYSIS  
 | FOR THE PROPOSED MANAGEMENT OF CONTAMINATED WATER IN THE WELDON  
 | SPRING QUARRY  
 DATE\_ISSUED/PUBLISHED | 06/00/89  
 DOCUMENT\_NUMBER | NOT APPLICABLE  
 AUTHOR | ENERGY AND ENVIRONMENTAL SYSTEMS DIVISION  
 KEYWORDS | BIOLOGY -- RISK ANALYSIS, ENGINEERING  
 PMC? | N  
 FILE\_NUMBER | 11

TYPE | DOCUMENT  
 TITLE | REPORT ON PRELIMINARY GEOLOGICAL, HYDROLOGICAL AND RADIOLOGICAL  
 | SURVEY AT THE WELDON SPRING QUARRY DURING 1976 AND 1977  
 DATE\_ISSUED/PUBLISHED | 12/14/78  
 DOCUMENT\_NUMBER | NOT APPLICABLE  
 AUTHOR | E. A. HUEY (NATIONAL LEAD COMPANY OF OHIO)  
 KEYWORDS | GEOLOGY -- LITHOLOGY, CHEMICAL -- GROUNDWATER, RADIOLOGICAL --  
 | GROUNDWATER  
 PMC? | N  
 FILE\_NUMBER | 12

TYPE | DOCUMENT  
 TITLE | CHARACTERIZATION AND ASSESSMENT FOR THE WELDON SPRING QUARRY  
 | LOW-LEVEL RADIOACTIVE WASTE STORAGE SITE  
 DATE\_ISSUED/PUBLISHED | 09/00/84  
 DOCUMENT\_NUMBER | DOE/OR-853 (DE85005424)  
 AUTHOR | BERKELEY GEOSCIENCES ASSOCIATES  
 KEYWORDS | GEOLOGY, HYDROGEOLOGY, RADIOLOGICAL -- AIR, RADIOLOGICAL -- SOIL,  
 | RADIOLOGICAL -- SEDIMENT, GEOCHEMICAL  
 PMC? | N

FILE\_NUMBER |13

TYPE |IOC  
TITLE |IOC, MONITORING WELL AND BENCHMARK VALIDATION  
|\*\*\* (SUPERCEDES ALL PRIOR TO 12/17/90) \*\*\*

DATE\_ISSUED/PUBLISHED |12/17/90  
DOCUMENT\_NUMBER |NOT APPLICABLE  
AUTHOR |MKF (FRED FRY)  
KEYWORDS |TOPOGRAPHY  
PMC? |Y  
FILE\_NUMBER |14

TYPE |IOC  
TITLE |TRIP REPORT  
DATE\_ISSUED/PUBLISHED |04/25/88  
DOCUMENT\_NUMBER |NOT APPLICABLE  
AUTHOR |MARVIN V. DAMM (MKF-BOISE)  
KEYWORDS |RADIOLOGICAL -- GROUNDWATER  
PMC? |Y  
FILE\_NUMBER |15

TYPE |DOCUMENT  
TITLE |WELDON SPRING SITE (WSS) ENVIRONMENTAL MONITORING REPORT  
|CALENDAR YEAR 1981  
DATE\_ISSUED/PUBLISHED |05/00/83  
DOCUMENT\_NUMBER |EV-0005  
AUTHOR |BECHTEL NATIONAL, INC.  
KEYWORDS |CHEMISTRY -- SURFACE WATER, HISTORY, RADIOLOGICAL -- SOIL,  
|RADIOLOGICAL -- SURFACE WATER  
PMC? |N  
FILE\_NUMBER |16

TYPE |DOCUMENT  
TITLE |WELDON SPRING SITE (WSS) ENVIRONMENTAL MONITORING REPORT  
|CALENDAR YEAR 1982  
DATE\_ISSUED/PUBLISHED |06/00/83  
DOCUMENT\_NUMBER |EV-0008  
AUTHOR |BECHTEL NATIONAL, INC.  
KEYWORDS |CHEMISTRY -- GROUNDWATER, CHEMISTRY -- SURFACE WATER, HISTORY,  
|METEOROLOGY, RADIOLOGICAL -- AIR, RADIOLOGICAL -- GROUNDWATER,  
|RADIOLOGICAL -- SURFACE WATER  
PMC? |N  
FILE\_NUMBER |17

TYPE |DOCUMENT  
TITLE |WELDON SPRING SITE ENVIRONMENTAL MONITORING REPORT CALENDAR YEAR 1984  
DATE\_ISSUED/PUBLISHED |07/00/85  
DOCUMENT\_NUMBER |DOE/OR/20722-58  
AUTHOR |BECHTEL NATIONAL, INC.  
KEYWORDS |CHEMISTRY -- SURFACE WATER, HISTORY, METEOROLOGY, RADIOLOGICAL --

PMC? |AIR, RADIOLOGICAL -- GROUNDWATER, RADIOLOGICAL -- SURFACE WATER  
 FILE\_NUMBER |18

TYPE |DOCUMENT  
 TITLE |WELDON SPRING SITE ANNUAL SITE ENVIRONMENTAL MONITORING REPORT  
 |CALENDER YEAR 1985  
 DATE\_ISSUED/PUBLISHED |09/00/86

DOCUMENT\_NUMBER |DOE/OR/20722-101  
 AUTHOR |BECHTEL NATIONAL, INC.  
 KEYWORDS |HISTORY, RADIOLOGICAL -- AIR, RADIOLOGICAL -- GROUNDWATER,  
 |RADIOLOGICAL -- SEDIMENT, RADIOLOGICAL -- SURFACE WATER  
 PMC? |N  
 FILE\_NUMBER |19

TYPE |DOCUMENT  
 TITLE |THE CONTAMINATION OF GROUND AND SURFACE WATERS BY LIQUID WASTES FROM  
 |THE WELDON SPRING ORDNANCE WORKS, MISSOURI  
 DATE\_ISSUED/PUBLISHED |01/00/44

DOCUMENT\_NUMBER |23-17  
 AUTHOR |U.S. DEPT. OF INTERIOR, GEOLOGICAL SURVEY  
 KEYWORDS |GEOLOGY -- LITHOLOGY, HISTORY, HYDROGEOLOGY -- REGIONAL, HYDROGEOLOGY  
 |-- WATER LEVELS  
 PMC? |N  
 FILE\_NUMBER |20

TYPE |DOCUMENT  
 TITLE |WELDON SPRING SITE ENVIRONMENTAL MONITORING REPORT,  
 |CALENDER YEAR 1983

DATE\_ISSUED/PUBLISHED |06/00/84  
 DOCUMENT\_NUMBER |DOE/OR/20722-16  
 AUTHOR |BECHTEL NATIONAL, INC.  
 KEYWORDS |HISTORY, RADIOLOGICAL -- AIR, RADIOLOGICAL -- GROUNDWATER,  
 |RADIOLOGICAL -- SURFACE WATER  
 PMC? |N  
 FILE\_NUMBER |21

TYPE |DOCUMENT  
 TITLE |ANNUAL ENVIRONMENTAL MONITORING REPORT,  
 |WELDON SPRING, MISSOURI,  
 |CAL. YEAR 1986

DATE\_ISSUED/PUBLISHED |00/00/87  
 DOCUMENT\_NUMBER |  
 AUTHOR |MKF - JEG  
 KEYWORDS |HISTORY, RADIOLOGICAL -- AIR, RADIOLOGICAL -- GROUNDWATER,  
 |RADIOLOGICAL -- SURFACE WATER  
 PMC? |Y  
 FILE\_NUMBER |22

TYPE |DOCUMENT

TITLE |PRELIMINARY INVESTIGATIONS OF GROUND-WATER OCCURRENCES IN THE WELDON  
|SPRING AREA, ST. CHARLES COUNTY, MISSOURI  
DATE\_ISSUED/PUBLISHED |12/00/51  
DOCUMENT\_NUMBER |00102  
AUTHOR |US DEPT. OF THE INTERIOR, GEOLOGICAL SURVEY  
KEYWORDS |GEOLOGY -- FRACTURES/JOINTING, GEOLOGY -- LITHOLOGY, HYDROGEOLOGY --  
|WATER LEVELS  
PMC? |N  
FILE\_NUMBER |23

TYPE |DOCUMENT  
TITLE |A PHASE I SURVEY AND EVALUATION OF THE WELDON SPRING QUARRY POTABLE  
|WATERLINE PROJECT AND PHASE II TESTING OF ARCHAEOLOGICAL SITES  
|23SC80, 23SC81, AND 23SC83, ST. CHARLES COUNTY, MISSOURI  
DATE\_ISSUED/PUBLISHED |10/05/89  
DOCUMENT\_NUMBER |  
AUTHOR |TRIAD RESEARCH SERVICES, GARY REX WALTERS  
KEYWORDS |ARCHAEOLOGICAL  
PMC? |N  
FILE\_NUMBER |24

TYPE |DOCUMENT  
TITLE |WELDON SPRING EEA ADDENDUM ALTERNATIVE #3A (REV 2)  
DATE\_ISSUED/PUBLISHED |08/29/84  
DOCUMENT\_NUMBER |21745  
AUTHOR |BECHTEL  
KEYWORDS |ENGINEERING  
PMC? |N  
FILE\_NUMBER |25

TYPE |DOCUMENT  
TITLE |FATE AND TRANSPORT OF CONTAMINANTS IN THE VADOSE ZONE  
DATE\_ISSUED/PUBLISHED |08/24/89  
DOCUMENT\_NUMBER |GE-0028  
AUTHOR |MICHAEL E. BEDAN  
KEYWORDS |CHEMISTRY -- SOIL, CONTAMINANT TRANSPORT/MIGRATION, GEOCHEMICAL  
PMC? |N  
FILE\_NUMBER |26

TYPE |DOCUMENT  
TITLE |PRELIMINARY DRAFT: RADIOLOGICAL, HYDROGEOLOGICAL, GEOCHEMICAL AND  
|GEOPHYSICAL ASSESSMENT OF THE WELDON SPRING QUARRY, MISSOURI  
|DISPOSAL SITE  
DATE\_ISSUED/PUBLISHED |01/00/80  
DOCUMENT\_NUMBER |LBID-152  
AUTHOR |EARTH SCIENCES DIVISION, LAWRENCE BERKELEY LAB.  
KEYWORDS |BULK WASTE, CHEMISTRY -- GROUNDWATER, GEOLOGY -- FRACTURE/JOINTING,  
|GEOLOGY -- LITHOLOGY, HISTORY, HYDROGEOLOGY -- REGIONAL,  
|HYDROGEOLOGY -- WATER LEVELS, RADIOLOGICAL -- GROUNDWATER,  
|RADIOLOGICAL -- SOIL

PMC? |N  
FILE\_NUMBER |27

TYPE |DOCUMENT  
TITLE |POSSIBLE USE OF QUARRY AT MALLINCKRODT CHEMICAL WORKS, WELDON SPRING,  
|MISSOURI, FOR THE DISPOSAL OF URANIUM CONTAMINATED BUILDING DEBRIS  
|AND RUBBLE AND RESIDUES CONTAINING THORIUM AND URANIUM  
DATE\_ISSUED/PUBLISHED |06/00/60

DOCUMENT\_NUMBER |4887  
AUTHOR |U. S. GEOLOGICAL SURVEY, OAK RIDGE, TENN.  
KEYWORDS |BULK WASTE, HISTORY, HYDROGEOLOGY -- WATER LEVELS  
PMC? |N  
FILE\_NUMBER |28

TYPE |DOCUMENT  
TITLE |HYDROLOGIC DATA FOR THE WELDON SPRING RADIOACTIVE WASTE-DISPOSAL  
|SITES, ST. CHARLES COUNTY, MISSOURI  
|1984-1986

DATE\_ISSUED/PUBLISHED |00/00/86

DOCUMENT\_NUMBER |OPEN FILE REPORT 86-488  
AUTHOR |U. S. GEOLOGICAL SURVEY, OPEN-FILE REPORT 86-488  
KEYWORDS |CHEMISTRY -- GROUNDWATER, CHEMISTRY -- SURFACE WATER, RADIOLOGICAL --  
|GROUNDWATER, RADIOLOGICAL -- SURFACE WATER  
PMC? |N  
FILE\_NUMBER |29

TYPE |DOCUMENT  
TITLE |CHEMICAL CHARACTERIZATION REPORT FOR THE WELDON SPRING QUARRY, ST.  
|CHARLES COUNTY, MISSOURI

DATE\_ISSUED/PUBLISHED |08/00/87

DOCUMENT\_NUMBER |DOE/OR/20722-176  
AUTHOR |BECHTEL NATIONAL, INC.  
KEYWORDS |CHEMISTRY -- SOIL, GEOLOGY -- LITHOLOGY  
PMC? |N  
FILE\_NUMBER |30

TYPE |DOCUMENT  
TITLE |HYDROLOGY AND WATER QUALITY AT THE WELDON SPRING RADIOACTIVE  
|WASTE-DISPOSAL SITES, ST. CHARLES COUNTY, MISSOURI

DATE\_ISSUED/PUBLISHED |00/00/87

DOCUMENT\_NUMBER |REPORT 87-4169  
AUTHOR |U. S. GEOLOGICAL SURVEY  
KEYWORDS |GEOLOGY -- LITHOLOGY, HYDROGEOLOGY -- AQUIFER PROPERTIES,  
|HYDROGEOLOGY -- POTENTIOMETRIC SURFACE RADIOLOGICAL -- SURFACE WATER  
PMC? |N  
FILE\_NUMBER |31

TYPE |DOCUMENT  
TITLE |COMPILATION AND PRELIMINARY INTERPRETATION OF HYDROLOGIC DATA FOR THE  
|WELDON SPRING RADIOACTIVE WASTE-DISPOSAL SITES, ST. CHARLES

|COUNTY, MISSOURI A PROGRESS REPORT  
DATE\_ISSUED/PUBLISHED|00/00/86  
DOCUMENT\_NUMBER      |REPORT 85-4272  
AUTHOR               |U. S. GEOLOGICAL SURVEY  
KEYWORDS             |BULK WASTE, CHEMISTRY -- GROUNDWATER, GEOLOGY -- LITHOLOGY, HISTORY,  
                      |HYDROGEOLOGY -- AQUIFER PROPERTIES, HYDROGEOLOGY -- REGIONAL,  
                      |RADIOLOGICAL -- SURFACE WATER  
PMC?                  |N  
FILE\_NUMBER          |32

TYPE                  |DOCUMENT  
TITLE                 |RESPONSIVENESS SUMMARY FOR THE REMEDIAL INVESTIGATION/FEASIBILITY  
                      |STUDY FOR MANAGEMENT OF THE BULK WASTES AT THE WELDON SPRING QUARRY,  
                      |WELDON SPRING, MISSOURI  
DATE\_ISSUED/PUBLISHED|08/00/90  
DOCUMENT\_NUMBER      |DOE/OR/21548-135  
AUTHOR               |ARGONNE NATIONAL LABORATORY  
KEYWORDS             |SUPPORTING DOCUMENTATION -- RI, SUPPORTING DOCUMENTATION -- FS  
PMC?                  |N  
FILE\_NUMBER          |33

TYPE                  |DOCUMENT  
TITLE                 |RECORD OF DECISION FOR THE MANAGEMENT OF THE BULK WASTES AT THE  
                      |WELDON SPRING QUARRY  
DATE\_ISSUED/PUBLISHED|09/00/90  
DOCUMENT\_NUMBER      |  
AUTHOR               |MKF - JEG  
KEYWORDS             |SUPPORTING DOCUMENTATION -- RI, SUPPORTING DOCUMENTATION -- FS  
PMC?                  |Y  
FILE\_NUMBER          |34

TYPE                  |DOCUMENT  
TITLE                 |GROUNDWATER HYDROLOGY INVESTIGATION, WELDON SPRING, MO, VOLUME 1  
DATE\_ISSUED/PUBLISHED|01/08/86  
DOCUMENT\_NUMBER      |  
AUTHOR               |LAYNE WESTERN COMPANY, INC.  
KEYWORDS             |CHEMISTRY -- GROUNDWATER, GEOLOGY -- LITHOLOGY, HYDROGEOLOGY --  
                      |AQUIFER PROPERTIES, HYDROGEOLOGY -- LOCAL, HYDROGEOLOGY --  
                      |POTENTIOMETRIC SURFACE, HYDROGEOLOGY -- RECHARGE/DISCHARGE,  
                      |HYDROGEOLOGY -- WATER LEVELS, RADIOLOGICAL -- GROUNDWATER  
PMC?                  |N  
FILE\_NUMBER          |35

TYPE                  |DOCUMENT  
TITLE                 |THE MCW URANIUM DIVISION 1959 ANNUAL OFF-SITE ENVIRONMENTAL  
                      |MONITORING REPORT  
DATE\_ISSUED/PUBLISHED|00/00/60  
DOCUMENT\_NUMBER      |24388  
AUTHOR               |MALLINCKRODT CHEMICAL WORKS, URANIUM DIV.  
KEYWORDS             |RADIOLOGICAL -- AIR, RADIOLOGICAL -- GROUNDWATER, RADIOLOGICAL --

PMC? |SURFACE WATER, RADIOLOGICAL -- SOIL, RADIOLOGICAL -- SEDIMENT  
 FILE\_NUMBER |36

TYPE |DOCUMENT  
 TITLE |INITIAL ASSESSMENT OF THE EFFECT OF DROUGHT CONDITIONS ON  
 |CONTAMINATION MIGRATION FROM THE WELDON SPRING QUARRY, REV 0  
 DATE\_ISSUED/PUBLISHED |11/00/88

DOCUMENT\_NUMBER |DOE/OR/21548-036  
 AUTHOR |MKF - JEG  
 KEYWORDS |RADIOLOGICAL -- GROUNDWATER, HYDROGEOLOGY -- WATER LEVELS  
 PMC? |Y  
 FILE\_NUMBER |37

TYPE |DOCUMENT  
 TITLE |THE EFFECT OF A ZERO-CONCENTRATION SINK ON CONTAMINANT TRANSPORT AND  
 |REMEDIAL-ACTION DESIGNS FOR THE WELDON SPRING QUARRY, WELDON SPRING,  
 |MO (DRAFT)  
 DATE\_ISSUED/PUBLISHED |04/00/88

DOCUMENT\_NUMBER |  
 AUTHOR |U. S. DOE, OAK RIDGE  
 KEYWORDS |HYDROGEOLOGY -- AQUIFER PROPERTIES  
 PMC? |N  
 FILE\_NUMBER |38

TYPE |DOCUMENT  
 TITLE |THE RESOURCES OF ST. CHARLES COUNTY, MISSOURI LAND, WATER, AND  
 |MINERALS

DATE\_ISSUED/PUBLISHED |04/00/77  
 DOCUMENT\_NUMBER |GR-51  
 AUTHOR |MISSOURI GEOLOGICAL SURVEY, DEPT. OF NAT. RESOURCES  
 KEYWORDS |GEOLOGY -- LITHOLOGY, HYDROGEOLOGY -- REGIONAL  
 PMC? |N  
 FILE\_NUMBER |39

TYPE |DOCUMENT  
 TITLE |RADIOLOGIC CHARACTERIZATION OF THE WELDON SPRING, MISSOURI, REMEDIAL  
 |ACTION SITE

DATE\_ISSUED/PUBLISHED |02/00/88  
 DOCUMENT\_NUMBER |DOE/ID/12584-22  
 AUTHOR |UNC GEOTECH, INC.  
 KEYWORDS |RADIOLOGICAL --SOIL  
 PMC? |N  
 FILE\_NUMBER |40

TYPE |DOCUMENT  
 TITLE |WELDON SPRING SITE REMEDIAL ACTION PROJECT VICINITY PROPERTIES, FEMME  
 |OSAGE SLOUGH SPECIAL STUDY

DATE\_ISSUED/PUBLISHED |06/09/89  
 DOCUMENT\_NUMBER |5121-VP:EN-R-01-0064-A

AUTHOR |MK-F, SAN FRANCISCO  
KEYWORDS |HYDROGEOLOGY - WATER LEVELS, HYDROGEOLOGY - AQUIFER CHARACTERISTICS,  
|RADIOLOGICAL - SOIL, RADIOLOGICAL - SEDIMENT, RADIOLOGICAL - SURFACE  
|WATER, CHEMISTRY - GROUNDWATER, RADIOLOGICAL - GROUNDWATER  
PMC? |Y  
FILE\_NUMBER |41

TYPE |MEMORANDUM  
TITLE |REGARDING QUARRY AS DISPOSAL OF RADIOLOGICAL WASTE FOR MALLINCKRODT  
DATE\_ISSUED/PUBLISHED |11/07/60  
DOCUMENT\_NUMBER |  
AUTHOR |R.M. RICHARDSON, U.S. DEPT. OF THE INTERIOR GEOLOGICAL SURVEY  
KEYWORDS |HYDROGEOLOGICAL - AQUIFER CHARACTERISTICS  
PMC? |N  
FILE\_NUMBER |42

TYPE |MEMORANDUM  
TITLE |POSSIBLE USE OF QUARRY AT MALLINCKRODT CHEMICAL WORKS, WELDON SPRING,  
|MISSOURI, FOR THE DISPOSAL OF URANIUM CONTAMINATED BUILDING DEBRIS  
|AND RUBBLE AND RESIDUALS CONTAINING THORIUM AND URANIUM  
DATE\_ISSUED/PUBLISHED |06/00/60  
DOCUMENT\_NUMBER |  
AUTHOR |R.M. RICHARDSON, U.S. GEOLOGICAL SURVEY  
KEYWORDS |HYDROGEOLOGY - REGIONAL, GEOLOGY, TOPOGRAPHY  
PMC? |N  
FILE\_NUMBER |43

TYPE |DOCUMENT  
TITLE |WELDON SPRINGS QUARRY ENGINEERING EVALUATION PROGRAM PLAN  
DATE\_ISSUED/PUBLISHED |07/17/81  
DOCUMENT\_NUMBER |SAI-148-055  
AUTHOR |HUGH E. COTHRAN, JR., AND ROBERT G. LEBO  
KEYWORDS |HISTORY, ENGINEERING  
PMC? |N  
FILE\_NUMBER |44

TYPE |DOCUMENT  
TITLE |EXPLOSIVE HAZARD REVIEW FOR THE WELDON SPRING SITE REMEDIAL ACTION  
|PROJECT QUARRY EXCAVATION  
DATE\_ISSUED/PUBLISHED |06/00/90  
DOCUMENT\_NUMBER |A08300-520-03  
AUTHOR |MK-F  
KEYWORDS |HISTORY, ENGINEERING  
PMC? |Y  
FILE\_NUMBER |45

TYPE |DOCUMENT  
TITLE |PHASE II TESTING AND EVALUATION OF ARCHAEOLOGICAL SITE 23SC21, ST.  
|CHARLES COUNTY, MISSOURI  
DATE\_ISSUED/PUBLISHED |07/31/89

DOCUMENT\_NUMBER | GR-0054  
 AUTHOR | TRIAD RESEARCH SERVICES  
 KEYWORDS | ARCHAEOLOGICAL  
 PMC? | N  
 FILE\_NUMBER | 46

TYPE | DOCUMENT  
 TITLE | PRELIMINARY RISK ASSESSMENT OF THE WELDON SPRING ROCK QUARRY

DATE\_ISSUED/PUBLISHED | 09/00/79  
 DOCUMENT\_NUMBER | SAI-OR-79-135-01  
 AUTHOR | SCIENCE APPLICATIONS, INC  
 KEYWORDS | RADIOLOGICAL - GROUNDWATER, HYDROGEOLOGICAL - REGIONAL, RADIOLOGICAL  
 | - AIR, ENGINEERING  
 PMC? | N  
 FILE\_NUMBER | 47

TYPE | DOCUMENT  
 TITLE | AN ENGINEERING EVALUATION OF WASTE DISPOSAL OPTIONS AT WELDON SPRING  
 | QUARRY

DATE\_ISSUED/PUBLISHED | 12/01/81  
 DOCUMENT\_NUMBER | SAI-148-WSQ  
 AUTHOR | HUGH E. COTHRAN  
 KEYWORDS | HISTORY, ENGINEERING, SUPPORTING DOCUMENTATION -- FS  
 PMC? | N  
 FILE\_NUMBER | 48

TYPE | DOCUMENT  
 TITLE | WORK PLAN FOR THE REMEDIAL INVESTIGATION/FEASIBILITY  
 | STUDY-ENVIRONMENTAL IMPACT STATEMENT FOR THE WELDON SPRING SITE,  
 | WELDON SPRING, MISSOURI

DATE\_ISSUED/PUBLISHED | 08/00/88  
 DOCUMENT\_NUMBER | DOE/OR/21548-033  
 AUTHOR | MK-F, JEG  
 KEYWORDS | HISTORY, ENGINEERING, SUPPORTING DOCUMENT -- RI, SUPPORTING DOCUMENT  
 | -- FS, RADIOLOGICAL -- GROUNDWATER, RADIOLOGICAL -- SURFACE WATER,  
 | CHEMISTRY -- GROUNDWATER, CHEMISTRY -- SURFACE WATER  
 PMC? | Y  
 FILE\_NUMBER | 49

TYPE | DOCUMENT  
 TITLE | WELDON SPRING ORDNANCE WORKS COMPLETION REPORT  
 DATE\_ISSUED/PUBLISHED | NOT AVAILABLE  
 DOCUMENT\_NUMBER |  
 AUTHOR | WELDON SPRING ORDNANCE WORKS  
 KEYWORDS | HISTORY  
 PMC? | N  
 FILE\_NUMBER | 50

TYPE | MEMORANDUM  
 TITLE | STATUS REPORT ON SURVEYS OF WELDON SPRINGS VICINITY PROPERTIES

DATE\_ISSUED/PUBLISHED | 09/27/84

DOCUMENT\_NUMBER |

AUTHOR | ORAU

KEYWORDS | RADIOLOGICAL -- SOILS

PMC? | N

FILE\_NUMBER | 51

TYPE | DOCUMENT

TITLE | RADIOLOGICAL SURVEY, US ARMY RESERVE PROPERTY, WELDON SPRING SITE,  
ST. CHARLES COUNTY, MISSOURI

DATE\_ISSUED/PUBLISHED | JANUARY, 1986

DOCUMENT\_NUMBER |

AUTHOR | ORAU

KEYWORDS | RADIOLOGICAL -- SOIL, RADIOLOGICAL -- SURFACE WATER, RADIOLOGICAL --  
GROUNDWATER, RADIOLOGICAL -- SEDIMENT

PMC? | N

FILE\_NUMBER | 52

TYPE | DOCUMENT

TITLE | RADIOLOGICAL SURVEY OF THE AUGUST A. BUSCH AND WELDON SPRING WILDLIFE  
AREAS, WELDON SPRING SITE, ST. CHARLES COUNTY, MISSOURI

DATE\_ISSUED/PUBLISHED | APRIL, 1986

DOCUMENT\_NUMBER |

AUTHOR | ORAU

KEYWORDS | RADIOLOGICAL -- SOIL, RADIOLOGICAL -- SURFACE WATER, RADIOLOGICAL --  
GROUNDWATER, RADIOLOGICAL -- SEDIMENT

PMC? | N

FILE\_NUMBER | 53

TYPE | DOCUMENT

TITLE | RADIOLOGICAL SURVEY REPORT FOR THE WELDON SPRING QUARRY

DATE\_ISSUED/PUBLISHED | 09/85

DOCUMENT\_NUMBER | DOE/OR/20722-70

AUTHOR | BECHTEL NATIONAL, INC

KEYWORDS | RADIOLOGICAL -- GROUNDWATER, RADIOLOGICAL -- SURFACE WATER,  
RADIOLOGICAL -- SOIL, RADIOLOGICAL -- SEDIMENT

PMC? | N

FILE\_NUMBER | 54

TYPE | DOCUMENT

TITLE | RECREATIONAL USE OF WELDON SPRING WILDLIFE AREA 1989-1990

DATE\_ISSUED/PUBLISHED | JUNE 1991

DOCUMENT\_NUMBER |

AUTHOR | MISSOURI DEPARTMENT OF CONSERVATION

KEYWORDS | HISTORY

PMC? | NO

FILE\_NUMBER | 55

TYPE | DOCUMENT

TITLE | WELDON SPRING STORAGE SITE ENVIRONMENTAL MONITORING REPORT, 1979 AND

DATE\_ISSUED/PUBLISHED | 1980  
APRIL 19, 1982  
DOCUMENT\_NUMBER |  
AUTHOR | R.B. WEIDNER & M. W. BOBACK  
KEYWORDS | HISTORY, RADIOLOGICAL -- SURFACE WATER, CHEMICAL -- SURFACE WATER  
PMC? | NO  
FILE\_NUMBER | 56

TYPE | DOCUMENT  
TITLE | QUARTERLY REPORT, ST. CHARLES COUNTY WELL FIELD MONITORING PROJECT  
DATE\_ISSUED/PUBLISHED | APRIL, MAY AND JUNE, 1991  
DOCUMENT\_NUMBER |  
AUTHOR | STANLEY M. REMINGTON  
KEYWORDS | RADIOLOGICAL -- GROUNDWATER, CHEMICAL -- GROUNDWATER  
PMC? | NO  
FILE\_NUMBER | 57

TYPE | DOCUMENT  
TITLE | STUDY OF RADIOACTIVE WASTE STORAGE AREAS AT ERDA-WELDON SPRING SITE  
DATE\_ISSUED/PUBLISHED | AUGUST, 1981  
DOCUMENT\_NUMBER |  
AUTHOR | NATIONAL LEAD COMPANY OF OHIO  
KEYWORDS | RADIOLOGICAL -- SURFACE WATER, CHEMICAL -- SURFACE WATER, GEOLOGY  
PMC? | NO  
FILE\_NUMBER | 58

TYPE | DOCUMENT  
TITLE | ERDA-WELDON SPRING DECOMMISSIONING STUDY  
DATE\_ISSUED/PUBLISHED | JUNE 20, 1975  
DOCUMENT\_NUMBER |  
AUTHOR | NATIONAL LEAD COMPANY OF OHIO  
KEYWORDS | HISTORY, ENGINEERING  
PMC? | NO  
FILE\_NUMBER | 59

TYPE | DOCUMENT  
TITLE | ERDA-WELDON SPRING DECOMMISSIONING STUDY, QUARRY SUPPLEMENT  
DATE\_ISSUED/PUBLISHED | SEPTEMBER 10, 1975  
DOCUMENT\_NUMBER |  
AUTHOR | NATIONAL LEAD COMPANY OF OHIO  
KEYWORDS | HISTORY, ENGINEERING  
PMC? | NO  
FILE\_NUMBER | 60

TYPE | DOCUMENT  
TITLE | ECONOMICAL AND SAFE DISPOSAL OF T.N.T. WASTE WATERS AT WELDON SPRING  
ORDNANCE WORKS  
DATE\_ISSUED/PUBLISHED | JULY, 1942  
DOCUMENT\_NUMBER |  
AUTHOR | DR. F.W. MOHLMAN

KEYWORDS | HISTORY, ENGINEERING  
PMC? | NO  
FILE\_NUMBER | 61

TYPE | DOCUMENT  
TITLE | DRAFT: VICINITY PROPERTIES CONCEPTUAL DESIGN REPORT  
DATE\_ISSUED/PUBLISHED | APRIL, 1989  
DOCUMENT\_NUMBER | DOE/OR/21548-001  
AUTHOR | MKF-JEG  
KEYWORDS | ENGINEERING  
PMC? | YES  
FILE\_NUMBER | 62

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