GWOU ADMINISTRATIVE RECORD
SECTION TITLE:
GW-300-301-1.01

DOE/OR/21548-735
CONTRACT NO. DE-AC05-86OR21548

SAMPLING PLAN FOR TRACER TESTING IN SUPPORT OF THE GROUNDWATER OPERABLE UNIT

WELDON SPRING SITE REMEDIAL ACTION PROJECT
WELDON SPRING, MISSOURI

MARCH 1998 **REV. 0**

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

Prepared by MK-Ferguson Company and Jacobs Engineering Group

031698

MORRISON KNUDSEN CORPORATION Environmental/Government Group Weldon Spring Site Remedial Action Project Contract No. DE-AC05-86OR21548	Rev. No. 0
PLAN TITLE: Sampling Plan For Tracer Testing In Support Of The Groundwater Operable Unit	

APPROVALS

Compliance Manager — Date: 3-19-98

ES&H Manager — Date: 3/20/98

Engineering Manager — Date: 3-20-98

Data Administration Coordinator — Date: 3/20/98

Disposal Cell Project Manager — Date: 3-20-98

Project Quality Manager — Date: 03/23/98

Deputy Project Director — Date: 3/23/98

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DOE/OR/21548-735

Weldon Spring Site Remedial Action Project

Sampling Plan for Tracer Testing in Support of the Groundwater Operable Unit

Revision 0

March 1998

Prepared by

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

for the

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

3/24/98

ABSTRACT

The Groundwater Operable Unit is one of four operable units comprising the Weldon Spring Site Remedial Action Project (WSSRAP). This sampling plan describes hydrological characterization that will be conducted at the Weldon Spring Chemical Plant to provide data of flow directions and discharge points (springs) for groundwater originating from the southern portion of the raffinate pits area. The chlorinated solvent trichloroethylene (TCE) has been detected in monitoring wells on both the chemical plant and the adjacent Weldon Spring Training Area, with the highest levels observed in wells located southwest of the raffinate pits. Injection of a tracer dye into the subsurface in the vicinity of the highest TCE contamination will be used to identify the flow paths and discharge points. This plan will outline the injection and monitoring methods, locations, and analysis to be performed. Quality control and standard operating procedures will also be discussed.

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1. INTRODUCTION

This plan describes the hydrogeologic testing that will be conducted at the Weldon Spring Chemical Plant to provide data for the determination of a subsurface connection between the area south of the raffinate pits and springs in the Weldon Spring area. The purpose and methodology for this testing are outlined in this plan.

The chlorinated solvent trichloroethylene (also known as trichloroethene or TCE) has been detected in monitoring wells screened in the weathered Burlington-Keokuk Limestone at the Weldon Spring Chemical Plant and Weldon Spring Training Area. Concentrations of TCE ranging from 0.5 µg/l to 1,300 µg/l have been measured. The regulatory limit for groundwater quality (maximum contaminant level [MCL]) for TCE is 5 µg/l. The higher concentrations have been detected in wells located southwest of the raffinate pits.

A groundwater divide is present along the southern part of the training area and extends through the southern portion of the chemical plant. In general the shallow groundwater mimics the topography. The understanding of where groundwater flows in the area of TCE impact is complicated by the presence of this divide extending through this area.

1.1 Purpose and Scope

The purpose of this plan is to outline the objectives for tracer testing that will be performed in support of the Groundwater Operable Unit (GWOU), mainly the *Feasibility Study* (Ref. 1). This plan will outline the methodology, monitoring locations, and sampling analyses for tracer testing. Quality control and standard operating procedures will also be discussed.

The scope of this task is to monitor specific springs in the Weldon Spring area for the resurgence of tracer dye which will be injected at a predetermined location at the chemical plant. Detection of this tracer dye at the specific springs will aid in establishing the direction of groundwater movement with respect to the groundwater divide. Several groundwater monitoring wells will also be monitored for the presence of the tracer dye to establish whether these wells lie along the flow path to these springs. Detection of the dye in this capacity will aid in determining the direction of groundwater flow from the area of TCE impact.

Information obtained from this testing will be utilized to determine the applicability of any ex situ or in situ groundwater treatment alternatives. Understanding the flow path of the groundwater is necessary to optimize treatment alternatives in regards to the location of extraction of groundwater or injection of chemicals for the removal or degradation of TCE. This information will also be used to assist in selecting well locations for the long-term monitoring program for the GWOU. This information will be summarized in a report to be made available at a later date.

1.2 Objectives

The objectives established for the tracer test study at the chemical plant are to determine:

- Whether a connection exists between the weathered zone in the Burlington-Keokuk Limestone in the southwestern portion of the chemical plant and Drainages 5300 (Southeast Drainage), 5500, and 6300 (Burgermeister Spring Branch).

- Relative travel times to these springs, if connections are identified.

- If monitoring wells MWS-021, MWS-003, and MWS-112 are located along the flow path.

2. BACKGROUND

The Missouri Department of Natural Resources, Division of Geology and Land Survey (MDNR-DGLS), conducted a 3-year investigation of the shallow groundwater system in the Weldon Spring area (Ref. 1). As part of the shallow groundwater investigation, a survey was performed in 1987 to locate springs and seeps that might be affected by groundwater or surface water discharges from the chemical plant area, the training area, and the ordnance works area. A total of 75 springs and seeps (Figure 2-1) were located in the ordnance works area (Ref. 1).

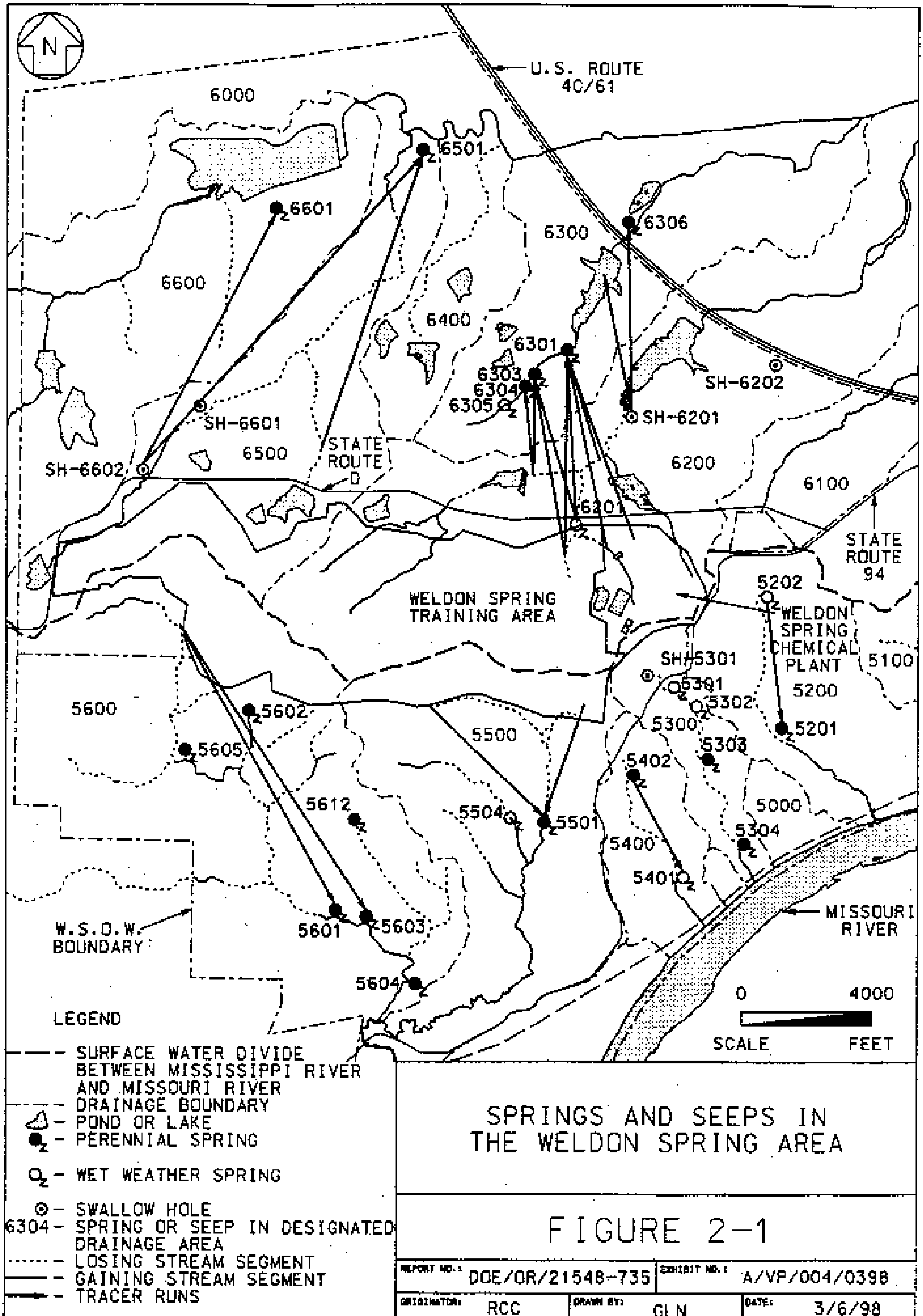
Twelve stream tracer injections were made during the final two years of the study, and 11 of these indicated at least one subsurface hydrologic connection. The dye test showed two general patterns of subsurface drainage:

- Groundwater in drainages of the Missouri River watershed (south of the groundwater divide) does not cross into other adjacent drainages.
- Groundwater in drainages of the Mississippi River watershed (north of the groundwater divide) can cross surface water divides and emerge in other drainages.

The results of the MDNR-DGLS investigations (MDNR 1991; Price 1991) indicated that the shallow aquifer beneath the chemical plant area and the ordnance works area has characteristics typical of a carbonate groundwater system (e.g., weathered bedrock and solution-enlarged joints, fractures, and bedding planes).

As part of the remedial investigation for the groundwater operable unit (GWOU) (Ref. 1) dye tracing was conducted to determine whether a subsurface hydraulic connection could be detected between Burgermeister Spring and the northern and western portions of the chemical plant area. On the basis of data from the previous aquifer testing (high values of hydraulic conductivity), the location of bedrock lows presumed to be pre-glacial drainages, and the presence of specific contaminants detected at Burgermeister Spring, it was suspected that these sections of the chemical plant area connected directly with the conduit system that discharges to Burgermeister Spring. Two angled borings and one monitoring well were selected for injection of dye. Three springs in the 6300 Drainage were monitored for resurgence of the dye; however, the dye was only detected in Burgermeister Spring. Tracer was detected in Burgermeister Spring as soon as 2 to 3 days after injection (Figure 2-1).

Comparison of the geology in the area of the successful tracer tests indicates that the lower section of the residuum near the bedrock contact has been identified as more permeable



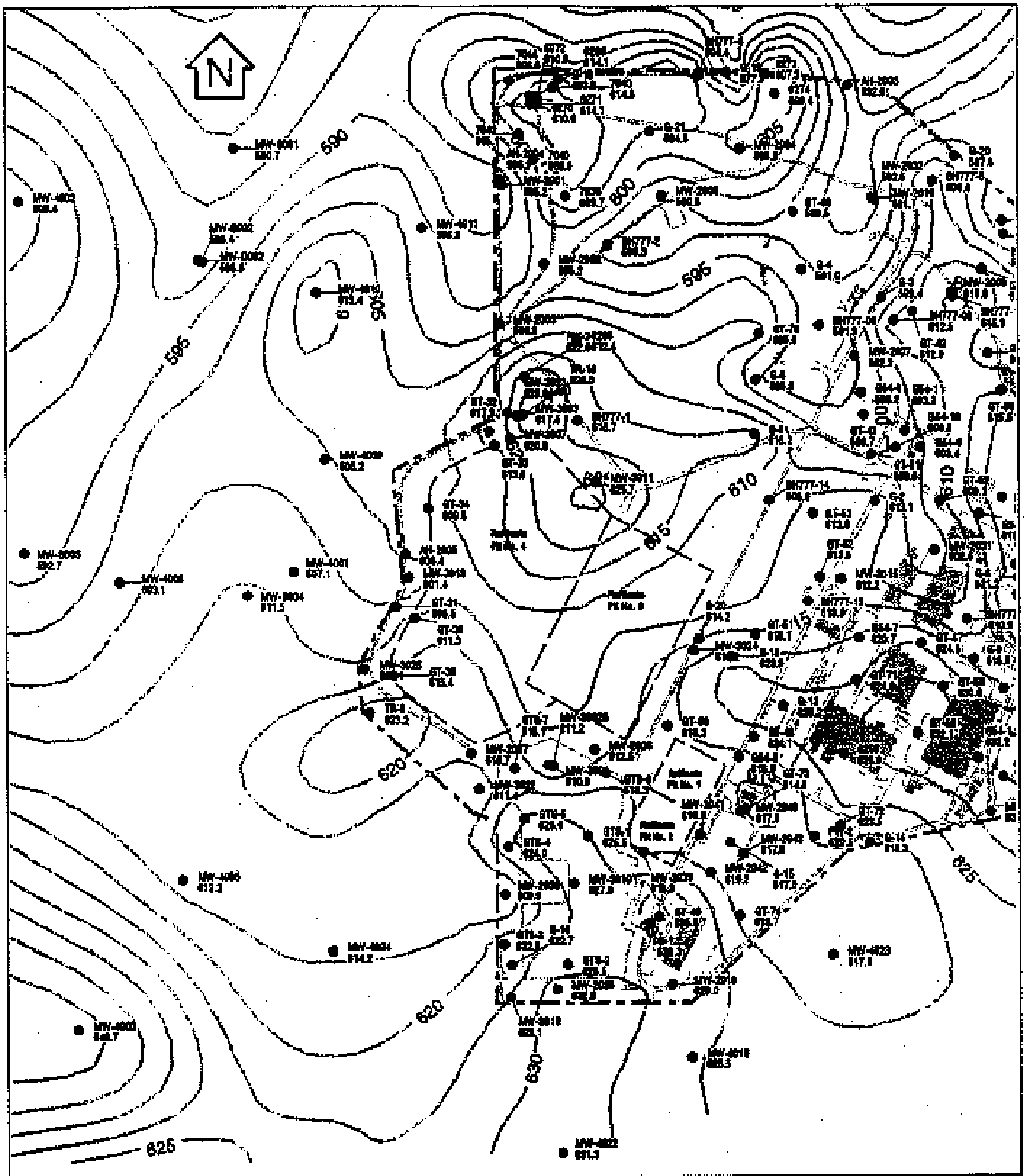
SPRINGS AND SEEPS IN
THE WELDON SPRING AREA

FIGURE 2-1

REPORT NO.: DOE/OR/21548-735	EXHIBIT NO.: A/VP/004/0398		
ORIGINATOR: RCC	DRAWN BY: GLN	DATE: 3/6/98	

because of the presence of relic chert beds, gravels, and weathered limestone. Preferential horizontal groundwater flow occurs along the contact of the saturated residuum with the underlying weathered limestone.

Based on the present understanding of the hydrogeology in the chemical plant area, it is expected that similar conditions occur in the area of TCE impact. Based on the bedrock topography (Figure 2-2), a pre-glacial drainage is present in the southwestern corner of the chemical plant that extends westward into the training area. This drainage is coincident with a low in the groundwater surface (Figure 2-3). This low connects with a larger groundwater trough that is directed toward the Burgermeister Spring Branch (Ref. 2).



LEGEND

● - BORING LOCATION

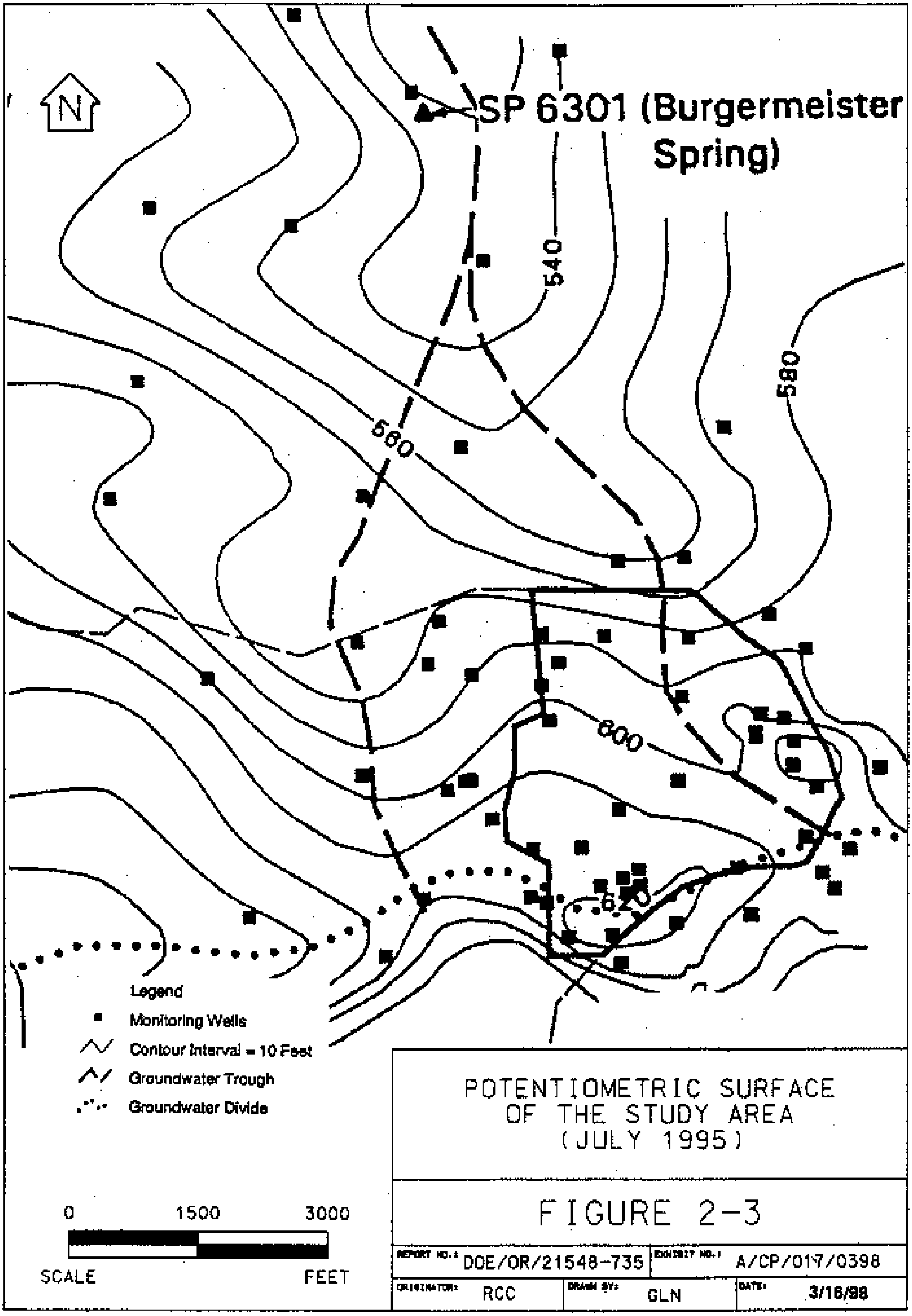
~ - CONTOUR INTERVAL = 5 FEET

NOT TO SCALE

BEDROCK TOPOGRAPHY OF THE STUDY AREA

FIGURE 2-2

REPORT NO.: DOE/OR/21548-735		EXHIBIT NO.: A/CP/016/0398
ORIGINATOR: RCC	DRAWN BY: GLN	DATE: 3/16/98



POTENTIOMETRIC SURFACE OF THE STUDY AREA (JULY 1995)

FIGURE 2-3

3. TESTING METHODOLOGY

This section outlines the testing methodology and locations for this task. The outline for the performance of the tests and analyses for tracer are summarized in this section.

3.1 Testing Locations

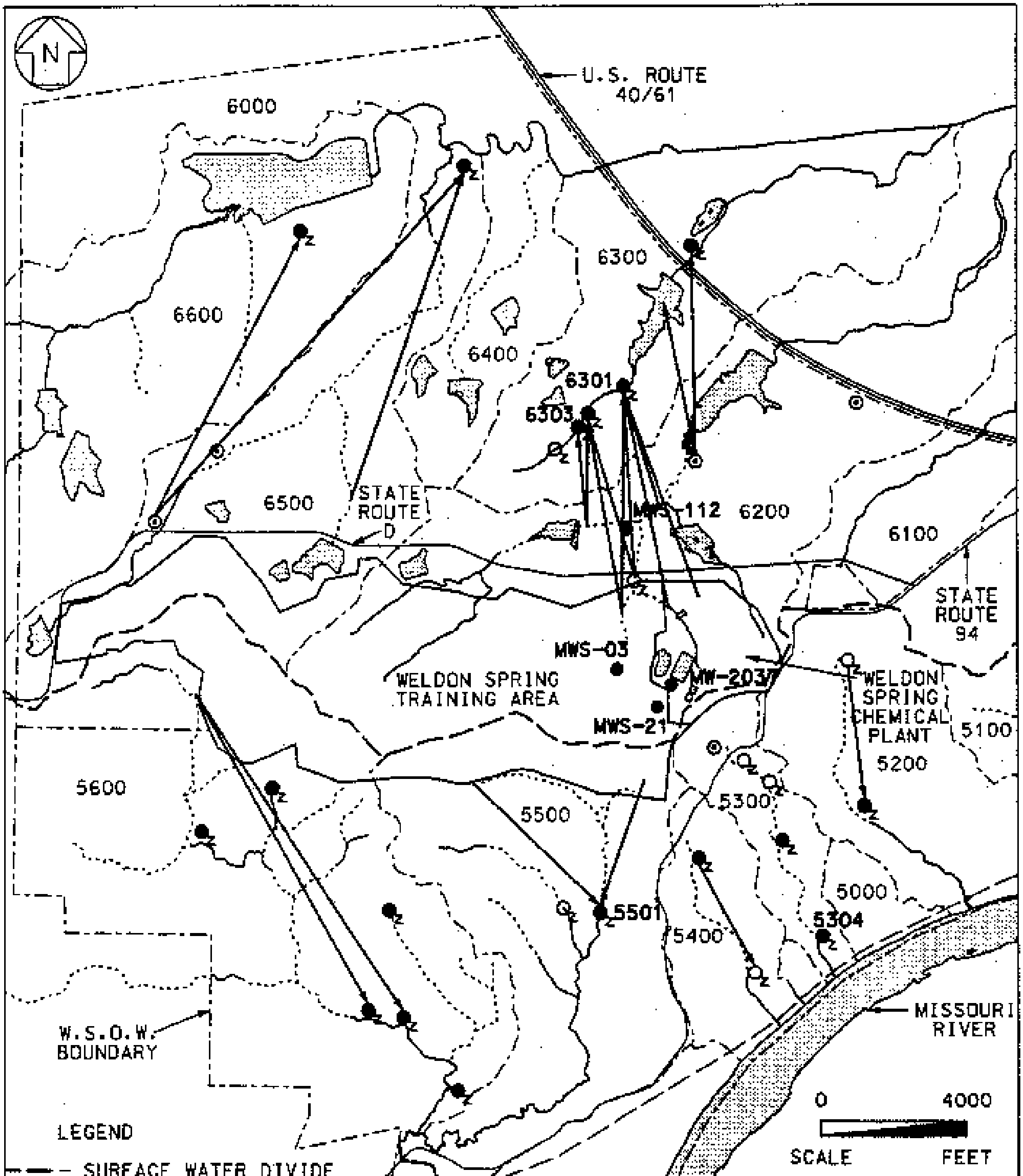
Monitoring well MW-2037 has been selected for the introduction of a tracer to the groundwater in the weathered Burlington-Keokuk Limestone (Figure 3-1). This well was selected for the following reasons:

- The well monitors the highest concentrations of trichloroethene (TCE) in the groundwater at the chemical plant.
- The well is within the area of TCE impact.
- The well is situated in a bedrock low or paleochannel feature.
- The well is screened at the contact of the residuum and the weathered limestone. This contact has been identified through previous geologic characterizations to be a location of preferential groundwater movement when coincident with a bedrock low.
- The hydraulic conductivity of the saturated weathered bedrock of this well is 2×10^{-2} cm/s, which is favorable for injection.
- The fluctuations of the static water levels at this location and in the area are typically less than 1 ft, which indicates rapid movement of groundwater through these materials.

3.2 Monitoring Locations

Four springs have been selected for monitoring of dye tracers in this study. The springs are: SP-6301 (Burgermeister Spring), SP-6303, SP-5304 (Southeast Drainage), and SP-5501. These springs have been selected to determine whether:

- SP-6301 is a resurgence point for groundwater in the weathered bedrock originating from the southwestern portion of the chemical plant since it has been identified as a discharge point for groundwater from the northern and northwestern portions of the chemical plant.



LEGEND

- SURFACE WATER DIVIDE BETWEEN MISSISSIPPI RIVER AND MISSOURI RIVER
- DRAINAGE BOUNDARY
- POND OR LAKE
- PERENNIAL SPRING
- WET WEATHER SPRING
- SWALLOW HOLE
- 6304 - SPRING OR SEEP IN DESIGNATED DRAINAGE AREA
- LOSING STREAM SEGMENT
- GAINING STREAM SEGMENT
- PREVIOUS TRACER RUNS

TRACER INJECTION AND MONITORING LOCATIONS

FIGURE 3-1

REPORT NO.:	DOE/OR/21548-735	EXHIBIT NO.:	A/VP/005/0398
ORIGINATOR:	RCC	DRAWN BY:	GLN	DATE:	3/24/98

- SP-6303 is a resurgence point for groundwater in the weathered bedrock originating from the southwestern portion of the chemical plant, although it has not been identified as a resurgence point for groundwater originating from the northern and northwestern portions of the chemical plant.

- SP-5304, located southeast of the chemical plant on the opposite side of the divide, is hydraulically connected with the southwestern portion of the chemical plant. This spring was selected because it typically has flow year round.

- SP-5501, located southwest of the chemical plant on the opposite side of the groundwater divide, is hydraulically connected with the southwestern portion of the chemical plant. This spring was selected because it typically has flow year round.

Three monitoring wells have been selected for monitoring of dye tracers in this study (Figure 3-1). The wells are: MWS-021, MWS-003, and MWS-112. These wells have been selected because they are situated within the bedrock low and/or groundwater trough extending from the southwestern portion of the chemical plant to Burgermeister Spring. These wells are also screened near or at the residuum/bedrock contact where it is assumed that the bulk of the groundwater movement occurs.

3.3 Baseline Determination

Baseline fluorescence must be determined to adequately evaluate the levels observed at each spring. Fluorescence at a location prior to injection of a tracer can be caused by natural fluorescence and suspended sediment. The presence of organic materials and suspended sediment can raise apparent background fluorescence and reduce the effective dye fluorescence due to light absorption and scattering of light by the particles. Also, dye trace studies have been performed periodically in the drainage system; therefore, some fluorescence may still be present, which may be mistaken as a positive result if not quantified prior to the injection of more dyes.

Baseline packets will be placed at all springs and wells to be monitored during the study period and allowed to remain at this location for 48-hours. Monitoring will be performed for two sampling periods. Monitoring shall be performed as outlined in Section 3.5.

3.4 Test Methodology

3.4.1 Dye Injection

The tracer dye will be introduced into the monitoring well followed by a minimum of 1000 gal of potable water to promote movement of the tracer slug into the groundwater system. This water will be gravity fed from the well head under atmospheric conditions (i.e., no pressurized injection). Injection of the tracer will be performed in accordance with *The Water Well Drillers Act*, Section 256.621.

3.4.2 Dye Types

Several dye types have previously been utilized at the chemical plant; therefore, baseline at each of the springs and monitoring wells will have to be determined before a dye can be selected (Section 3.3). Fluorescein, Rhodamine WT, Tinopal, and Pyranine dyes have been used previously by both the Missouri Department of Natural Resources (MDNR) and Project Management Contractor (PMC). Based on the results of the baseline monitoring, one of the previously used or a new dye will be selected for this test.

3.4.3 Amount

Most tracer testing is performed in stream tracing projects that typically require the introduction of about 1 gal or less of the tracer into the subsurface system. Since the tracer dye is to be injected into the subsurface, it is expected that the amount of tracer dye required will be greater than that which is required for an open channel because of dilution of the dye and slower travel time in the subsurface. It is proposed that 2 gal to 3 gal of dye will be injected into the monitoring well based on the amount utilized during previous successful tracer tests at the chemical plant (Ref. 1).

3.4.4 Handling

To minimize the potential for contamination of equipment that may come in contact with the charcoal packet detectors, the dye handling will not occur on the same day as packet placement, or if this is to occur, the dye should not be handled by the same person who will be placing or collecting the packets. The dye should be sealed in a secondary container during transportation to the injection site to minimize potential for contamination. The dye will not be stored in the same location as the charcoal packets, sampling equipment, and sample containers.

3.5 Monitoring

Monitoring for the dye will be done through the use of charcoal or cotton packets, depending on the dye selected for this activity. These detectors will indicate break-through of the tracer at the spring. More frequent analysis of the packets can be used to determine the duration of tracer passage at the spring resulting in a more precise time of travel determination. Samples will be numbered in accordance with Procedure ES&H 4.1.1 - *Numbering System for Environmental Samples and Sampling Locations*. Sample numbers for each location are provided below:

- SP-6301 - date
- SP-6303 - date
- SP-5501 - date
- SP-5304 - date
- MWS-003 - date
- MWS-021 - date
- MWS-112 - date

Packets for this study will be supplied by MDNR-DGLS. Packets are made by folding an 8-in.by 8-in. piece of nylon screen in half and sealing the three cut edges. About 2 cu in. of activated charcoal is used in charcoal packets. A 2-in. x 2-in. piece of cotton material is used in the cotton packets. Dye is absorbed onto the charcoal or cotton as the tracer flows through the detector.

3.5.1 Placement

Packets will be placed near the resurgence points of the springs (Figure 3-1) where flow can be determined visually. The packets will be staked in place to prevent movement into the stream channel and to allow for placement of subsequent packets at the same location in each spring.

Packets will be placed in the monitoring wells (Figure 3-1) to allow for complete submergence in the well column. Packets will be placed near the mid-point of the screened portion of the well. Weights will be utilized to prevent the packets from floating on the top of the groundwater surface.

3.5.2 Sampling Frequency

Packets will be changed out every 48-hours throughout the first 10 days of the study and weekly for the duration of the test at all sampling locations. Monitoring for the tracer will continue until detection has been established in a spring or for 3 months after injection, whichever period is shorter.

3.5.3 Sampling Procedure

Samples will be retrieved from the spring and placed directly into clean, resealable plastic bags using clean, disposable gloves. New gloves will be used at each sampling location to prevent cross contamination between packets.

The following sampling information shall be written directly onto the sample bag using a permanent marker: sample ID, date and time of collection, personnel, and water clarity (turbidity, color, etc.). No preservation is required for the detectors. It is recommended that the detectors be protected from direct sunlight after collection and during transport to Missouri Department of Natural Resources, Division of Geology and Land Survey (MDNR-DGLS).

3.5.4 Sample Transfer

Samples will be transferred to the MDNR-DGLS using the Environmental Sample Chain-of-Custody form (Appendix B). Each transfer of custody will be documented on the Chain-of-Custody. Samples will be shipped from the site shipping group to MDNR-DGLS. Copies of the Chain-of-Custody forms will be kept for reference.

3.5.5 Sample Shipment

All samples will be shipped in accordance with applicable Department of Transportation regulations and Weldon Spring Site Remedial Action Project standard operating procedures.

4. ANALYSIS

4.1 Method

Analysis for the presence of dye is done with a synchronous scanning spectrofluorometer. This analysis will be performed by Missouri Department of Natural Resources, Division of Geology and Land Survey. For charcoal packets, the dye is elutriated from the charcoal using a solution of 5% ammonium hydroxide and 95% ethyl alcohol. The elutriant is analyzed using the spectrofluorometer.

The synchronous scanning spectrofluorometer shines an excitation light beam through a sample. When a fluorescent material is present and excited by light of the proper wavelength, the material will emit light at a longer wavelength. The wavelength of both the excitation light and the light being measured by the detection system are varied simultaneously over a range that includes the known characteristic excitation and emission wavelengths of the fluorescent material being investigated. For each sample the emission wavelength and intensity data are recorded and plotted on an emission spectra. Peaks in the emission spectra can be correlated to the known wavelength peaks for the individual dyes. The peak intensity can be correlated with the dye concentration. The spectrofluorometer results can identify a specific dye type or types in the sample. In the case of charcoal packet elutriant samples, the intensity of the peak only yields a qualitative estimate of the dye concentration emerging from the resurgence point because of variables associated with adsorption and release of dye from the charcoal, the length of the sampling interval, the potentially changing concentration of dye in the water during the sampling interval, and the elutriant the sample is selected for testing.

4.2 Analysis

All packets will be analyzed for the presence of tracer dyes. Tracer dyes will be identified and their respective concentrations reported by MDNR-DGLS on Monitoring Point Water Tracing Information Sheets (Appendix C).

4.3 Quality Control Samples

Standard concentrations of dye are periodically tested to calibrate the spectrofluorometer. Results from the calibrations performed in conjunction with these samples will be reported. Duplicate analysis of samples will be performed on 5% of the samples submitted for analysis.

5. DOCUMENTATION

5.1 Logbook

All field activities will be documented by field personnel in accordance with Procedure ES&H 1.1.4, *Logbook Procedure*. Entries will include, but not limited to, sample location, date and time of sample collection, water clarity, flow conditions at springs, weather conditions, and any other pertinent information.

5.2 Completion Report

A completion report will be generated which presents the findings of this investigation. The report will include summaries of field procedures and tracer analyses for each location. Discussions of the results will accompany the summaries.

6. REFERENCES

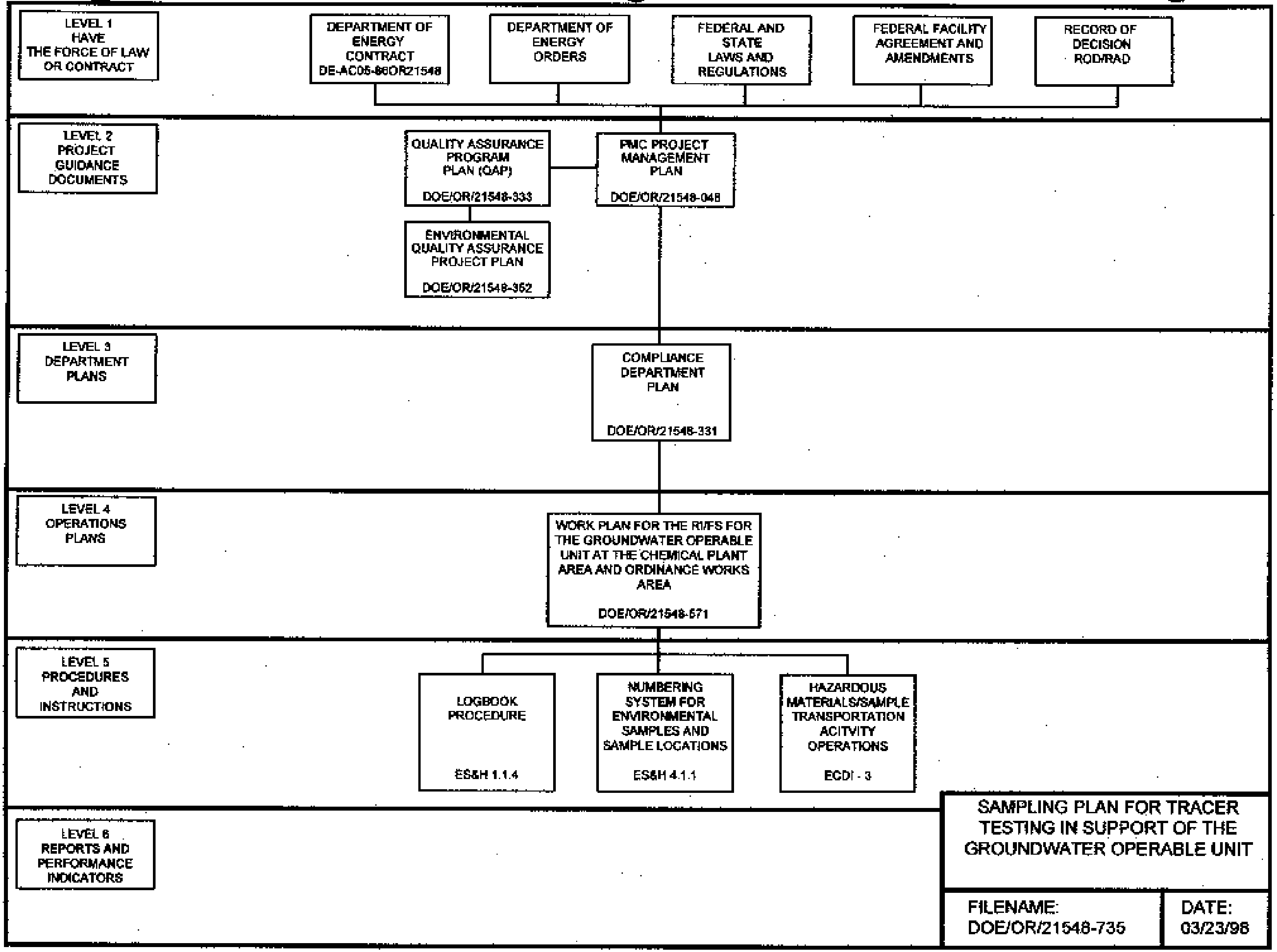
1. Argonne National Laboratory. *Remedial Investigation for the Groundwater Operable Units at the Chemical Plant Area and the Ordnance Works Area, Weldon Spring, Missouri.* Rev. 0. DOE/OR/21548-571. Prepared for the U.S. Department of Energy, Oak Ridge Operations. St. Charles, MO. July 1997.

2. Argonne National Laboratory. *Draft Final Feasibility Study for Remedial Action for the Groundwater Operable Units at the Chemical Plant Area and the Ordnance Works Area, Weldon Spring, Missouri.* DOE/OR/21548-569. Prepared for the U.S. Department of Energy, Oak Ridge Operations. St. Charles, MO. March 1998.

PROCEDURES

ES&H 1.1.4, *Logbook Procedure*
ES&H 4.1.1, *Numbering System for Environmental Samples and Sampling Locations*

APPENDIX A
Document Hierarchy


LEVEL 1 HAVE THE FORCE OF LAW OR CONTRACT
DEPARTMENT OF ENERGY CONTRACT DE-AC05-86OR21548
DEPARTMENT OF ENERGY ORDERS
FEDERAL AND STATE LAWS AND REGULATIONS
FEDERAL FACILITY AGREEMENT AND AMENDMENTS
RECORD OF DECISION ROD/RAD
LEVEL 2 PROJECT GUIDANCE DOCUMENTS
QUALITY ASSURANCE PROGRAM PLAN (QAP) DOE/OR/21548-333
PMC PROJECT MANAGEMENT PLAN DOE/OR/21548-048
ENVIRONMENTAL QUALITY ASSURANCE PROJECT PLAN DOE/OR/21548-352
LEVEL 3 DEPARTMENT PLANS
COMPLIANCE DEPARTMENT PLAN DOE/OR/21548-331
LEVEL 4 OPERATIONS PLANS
WORK PLAN FOR THE RI/FS FOR THE GROUNDWATER OPERABLE UNIT AT THE CHEMICAL PLANT AREA AND ORDINANCE WORKS AREA DOE/OR/21548-571
LEVEL 5 PROCEDURES AND INSTRUCTIONS
LOGBOOK PROCEDURE ES&H 1.1.4
NUMBERING SYSTEM FOR ENVIRONMENTAL SAMPLES AND SAMPLE LOCATIONS ES&H 4.1.1
HAZARDOUS MATERIALS/SAMPLE TRANSPORTATION ACITVITY OPERATIONS ECDI - 3
LEVEL 6 REPORTS AND PERFORMANCE INDICATORS
SAMPLING PLAN FOR TRACER TESTING IN SUPPORT OF THE GROUNDWATER OPERABLE UNIT
FILENAME: DOE/OR/21548-735
DATE: 03/23/98

APPENDIX B
Environmental Sample Chain-of-Custody Form

ENVIRONMENTAL SAMPLE CHAIN-OF-CUSTODY / AUTHORIZATION FORM

WELDON SPRING SITE REMEDIAL ACTION PROJECT (WSSRAP)
7295 HIGHWAY 94 SOUTH, ST. CHARLES, MO 63304
TELEPHONE (314)441-8086 FAX (314)926-7072

ESTESSH 4.1.2.1,Rev.8,Effective 07/11/94

WSSRAP Contact:	Lab/PO#:
Phone Number: (314)441-8086 ext.	Turnaround Time:
Request Number:	Shipped By:
ES&H Lab Coordinator:	Technical Reviewer______ CAM______

#	Sample ID	QC*	Date Sampled	Medium	Container Size	Container Type	Preserv.	Parameter	Arc
1									No
									No

Relinquished By	Received By	Date	Time	Reason For Transfer	Seal Intact? (Y/N)	Cooler Temp
Sampler:						

Checked By ______ Date ______ Site Shipping Officer ______ Date ______

APPENDIX C
Monitoring Point Water Tracing Information Sheets

MONITORING POINT

WATER TRACING INFORMATION SHEET

Missouri Department of Natural Resources, Division of Geology and Land Survey
P.O. Box 250, Rolla, MO 65401 (314) 368-2133 FAX: (314) 368-2111

FOR OFFICE USE ONLY
Monitoring Point No. ____
Date Received ____
Checked by ____ Date ____
Plotted by ____ Date ____

THE INFORMATION BELOW PERTAINS TO THE MONITORING POINT

Monitoring Point Description SP-6301 (Burgermeister Spring)
☒ Spring ☐ Well ☐ Stream ☐ Other: ____ Monitoring Point Number (Optional) SP-6301
Please enclose a copy of a map with all monitoring points indicated. Describe legal location to nearest 1/4, 1/4, 1/4 section.
Legal Location SW¼ , NW¼ , NW¼ , Sec. 30 , T. 46N , R. 3E , Quad Name Weldon Spring
(Additional Location Information) Busch Conservation Area
County St. Charles Latitude/Longitude ____ Elevation 530' (approx)
Access Description Located approximately 1000 feet upstream (southwest) from Lake 34.

Background Flow Conditions Not determined

Property Owner:
Name: August A Busch Cons. Area
Mr. Michael Schroer
Wildlife District Supervisor
Address: 2360 Higway D
St. Charles, MO 63304

Phone Number: (314) 441-4554

Describe Background Data and Monitoring Data Below (Attach Documentation if Available)

Sample(r) No.	Sampler Placement Date	Sampler Placement Time	Sample(r) Recovery Date	Sample(r) Recovery Time	Collected by (Initials)	Analyzed by (Initials)	Fluorescein Quantity Water	Fluorescein Quantity Carbon	Rhodamine WT Quantity Water	Rhodamine WT Quantity Carbon	Eosine Quantity Water	Eosine Quantity Carbon	Tinopal CBS-X Quantity Water	Tinopal CBS-X Quantity Cotton	Tinopal CBS-X Quantity Eluted	** Remarks/Flow Conditions, or Other Tracers
* Analysis Method Used →																

* S = Spectrofluorometer
F = Fluorometer
V = Visual
O = Other ____

** D = Dry
P = Pool
L = Low Flow
H = High Flow

I hereby certify that the above information is accurate and complete to the best of my knowledge.

Registrant's Signature [signature] Date 3-5-98
Registrant's Name (please type or print) Rebecca Cato Registration # ____