Department of Energy
Oak Ridge Operations
Weldon Spring Site
Remedial Action Project Office
7295 Highway 94 South
St. Charles, Missouri 63303

June 19, 1991

ADDRESSEES:

QUARTERLY ENVIRONMENTAL DATA SUMMARY FOR THE FIRST QUARTER, 1991 FOR THE WELDON SPRING SITE REMEDIAL ACTION PROJECT

Enclosed for your information and use is a copy of the Quarterly Environmental Data Summary Report. The document summarizes the environmental monitoring data for the first quarter, highlights any potentially significant findings, and offers preliminary interpretations. Final interpretations will appear in the 1991 Annual Site Environmental Report.

The report concludes that no significant differences or changes in off-site exposures resulting from Weldon Spring Site contaminates have occurred during this reporting period.

If you have any questions please call Ken Lawver at (314)441-8978.

Sincerely,

Stephen H. McCracken
Project Manager
Weldon Spring Site
Remedial Action Project

Enclosure:
As stated

Administration Record (2 copies)
MK-Ferguson Company
Mary Gilbert
7295 Highway 94 South
St. Charles, Missouri 63303

DISTRIBUTION LIST

Mr. Dan Wall (6 copies)
Superfund Branch
U.S. Environmental Protection Agency
Region VII
726 Minnesota Avenue
Kansas City, Kansas 66101

Dr. David E. Bedan (3 copies)
Division of Environmental Quality
Missouri Department of Natural Resources
Post Office Box 176
Jefferson City, Missouri 65102

Dr. Margaret MacDonell (4 copies)
Energy and Environmental Systems Division
Argonne National Laboratory
9700 South Cass Avenue, Building 362
Argonne, Illinois 60439

Mr. Peter J. Gross, SE-31
Director of Environmental Protection Division
DOE Field Office, Oak Ridge
Post Office Box 2001
Oak Ridge, Tennessee 37831-8738

Mr. William Adams, EW-90 (w/o enclosure)
Assistant Manager for Environmental Restoration &
Waste Management
DOE Field Office, Oak Ridge
Post Office Box 2001
Oak Ridge, Tennessee 37831-8541

Mr. Stanley Remington
Consulting Hydrologist
2524 Westminster Drive
St. Charles, Missouri 63301

The Honorable Eugene Schendemann
Presiding Commissioner
St. Charles County Courthouse
118 North Second Street
St. Charles, Missouri 63301

Mr. Steve Iverson, Project Manager
Program and Project Management Division
U.S. Army Corps of Engineers
Kansas City District
601 East 12th Street
Kansas City, Missouri 64106
ATTN: CEMRKED-TD

Mr. Ali Avali
Project Manager
U.S. Army Toxic & Hazardous Materials Agency
ATTN: CETHA-IR-A
Building E4435
Aberdeen Proving Ground, Maryland 21010-5401

Mr. Karl J. Daubel
Environmental Coordinator
Weldon Spring Training Area
7301 Highway 94 South
St. Charles, Missouri 63303

Mr. Dan Bauer
U.S. Department of Interior
Geological Survey, Mail Stop 200
1400 Independence Road
Rolla, Missouri 65401

Mr. J.D. Berger
Oak Ridge Associated Universities
230 Warehouse Road
Building 1916-T2
Oak Ridge, Tennessee 37830

Francis Howell High School
Dr. John Oldani
7001 Highway 94 South
St. Charles, Missouri 63303

Administration Record (2 copies)
MK-Ferguson Company
Mary Gilbert
7295 Highway 94 South
St. Charles, Missouri 63303

Kisker Road Branch
St. Charles City/County Library
1000 Kisker Road
St. Charles, Missouri 63303

Spencer Road Branch
St. Charles City/County Library
425 Spencer Road
St. Peters, Missouri 63376

Mr. Robert Shoewe, Principal
Francis Howell High School
7001 Highway 94 South
St. Charles, Missouri 63303

Kathryn M. Linneman Branch
St. Charles City/County Library
2323 Elm Street
St. Charles, Missouri 63301

Mr. Donald J. McQueen
Francis Howell High School Consultant
Shannon & Wilson, Inc.
11500 Olive Blvd, Suite 3276
St. Louis, Missouri 63141

Ms. Meredith Hunter
258 Cedar Groves
St. Charles, Missouri 63303

Ms. Mary Halliday
3655 Highway D
Defiance, Missouri 63303

Mr. George Fahrner
892 California Trail
St. Charles, Missouri 63303

Mr. Kenneth Gronewald
804 Birdie Hills Road
St. Peters, Missouri 63376

DOE/ORO/21548-202
CONTRACT NO. DE-AC05-86OR21548

QUARTERLY ENVIRONMENTAL DATA SUMMARY FIRST QUARTER 1991

Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

JUNE 1991 **REV. 0**

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

MK-FERGUSON A MORRISON KNUDSEN COMPANY	Rev. No. 0
	Issue Date:
Weldon Spring Site Remedial Action Project Contract No. DE-AC05-86OR21548	Page 1 of 1

PLAN TITLE: Quarterly Environmental Data Summary - First Quarter 1991

APPROVALS

Environmental Safety & Health Manager	6/14/91 Date
Quality Assurance Manager	6/14/91 Date
Environmental Compliance Manager	6/14/91 Date
Deputy Project Director	6/14/91 Date
Project Director	6/14/91 Date

061491

DOE/OR/21548-202

Weldon Spring Site Remedial Action Project

Quarterly Environmental Data Summary First Quarter 1991

Revision 0

June 1991

Prepared by

MK-FERGUSON COMPANY
and
JACOBS ENGINEERING GROUP
7295 Highway 94 South
St. Charles, Missouri 63303

for the

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

061491

Printed in the United States of America. Available from the National Technical Information Service, NTIS, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161

NTIS Price Codes - Printed copy: A03
Microfiche: A01

ABSTRACT AND WELDON SPRING SITE QUARTERLY SELF ASSESSMENT FIRST QUARTER 1991

The purpose of this Quarterly Environmental Data Summary is to provide preliminary data acquired as part of the Weldon Spring Site Remedial Action Project (WSSRAP) environmental monitoring program. The document summarizes the environmental data, highlights any potentially significant findings, and offers tentative interpretations. Validated data and final interpretations will appear in the 1991 Annual Site Environmental Report.

This report includes data from environmental monitoring activities at the Weldon Spring site (WSS) during the first quarter of 1991. Groundwater, surface water, and air were sampled in order to monitor potential exposure pathways. Analytical parameters included radionuclides, nitroaromatic compounds, inorganic anions, and direct gamma exposure. The results are used to calculate exposure doses (where applicable) and assess the impact of the contaminants at the site on potentially exposed populations.

In summary, significant differences were observed in off-site exposures during the first quarter of 1991 relative to exposures calculated in previous quarters. Contaminated groundwater did not affect private water supplies or the St. Charles County well field. Surface water containing elevated uranium activity continued to impact the Femme Osage Slough and several lakes in the August A. Busch Memorial Wildlife Area. Off-site gamma, radon and air particulate exposures remained indistinguishable from background. Off-site monitoring demonstrated that exposure levels at the Francis Howell High School, the Busch Wildlife Area Headquarters, and the Weldon Spring Training Area remain indistinguishable from background levels.

TABLE OF CONTENTS

SECTION		PAGE
1	INTRODUCTION	1
2	GROUNDWATER MONITORING	1
2.1	Chemical Plant/Raffinate Pits/Vicinity Properties	2
2.1.1	Nitroaromatic Results	2
2.1.2	Radiological Results	2
2.1.3	Geochemical Results	6
2.1.4	Inorganic Anion Results	6
2.2	Weldon Spring Quarry	6
2.2.1	Radiological Results	10
2.2.2	Nitroaromatic Compounds Results	14
2.2.3	Inorganic Anions Results	14
2.2.4	Metals Results	14
3	SURFACE WATER MONITORING	19
3.1	Chemical Plant/Raffinate Pits/Vicinity Properties	19
3.2	Weldon Spring Quarry	19
3.3	Springs	26
3.4	National Pollutant Discharge Elimination System Data Review	26
4	AIR MONITORING	34
4.1	Radon Gas	34
4.2	Gamma Radiation Exposure	39
4.3	Radioactive Air Particulates	39
4.4	Asbestos	41

LIST OF FIGURES

FIGURE		PAGE
2-1	Weldon Spring Site WSCP/WSRP/WSVP Groundwater Monitoring Well Network	3
2-2	Weldon Spring Quarry and Femme Osage Slough Monitoring Well Locations	8
2-3	Weldon Spring Quarry, Femme Osage Slough, and St. Charles County Well Field Monitoring Locations	9
3-1	Surface Water Sampling Locations Within or Near the WSCP and WSRP Areas of the Weldon Spring Site	20
3-2	Surface Water Sampling Locations Near the Weldon Spring Quarry	22
3-3	Preoperational Monitoring Locations on the Missouri River	23
3-4	Springs and Seeps in the Vicinity of the WSS	27
3-5	NPDES Monitoring Locations	31
4-1	Radon-222, TLD, and Air Particulate Measurement Locations at the WSCP/WSRP Area	35
4-2	Off-Site Radon and Gamma Monitoring Locations	36
4-3	Radon-222, Thermo Luminescent Dosimeter (TLD) and Air Particulate Measurement Locations at the WSQ	37

LIST OF TABLES

TABLE		PAGE
2-1	First Quarter Nitroaromatic Data for Groundwater at the WSCP/RP/VP	4
2-2	First Quarter Uranium and Inorganic Anion Data in Groundwater at the WSCP/RP/VP	5
2-3	First Quarter Geochemical Data For Groundwater at the WSCP/RP/VP	7
2-4	First Bimonthly (Jan/Feb) Inorganic Anions and Radiological Results in Groundwater for the WSQ	11
2-5	First Quarter Inorganic Anions and Radiological Results for the WSQ	12
2-5A	First Quarter Inorganic Anions and Radiological Results for the St. Charles County Wellfield	13
2-6	First Bimonthly (Jan/Feb) Nitroaromatic Data for Groundwater at the WSQ	15
2-7	First Quarter Nitroaromatic Data for Groundwater at the WSQ	16
2-8	First Bimonthly (Jan/Feb) Results for Metals in Groundwater at the WSQ	17
2-9	First Quarter Results for Metals in Groundwater at the WSQ	18
3-1	First Quarter Uranium Results in Surface water at the WSCP/RP/VP	21
3-2	First Quarter Results for Uranium in Surface Water at the WSQ	24
3-3	First Quarter Metal Results in Surface Water At the WSQ (μg/l)	25
3-4	First Quarter Uranium Results in Springs Near the WSS	28
3-5	First Quarter Nitroaromatic Results in Springs Near the WSS (μg/l)	28
3-6	First Quarter Inorganic Anion Results in Springs Near the WSS	28
3-7	First Quarter Metals Results in Springs Near the WSS	29
3-8	Results of Monthly NPDES Monitoring for NP-0001 through NP-0006	32
4-1	1991 Track Etch Radon Results	38
4-2	1991 Environmental TLD Results	40
4-3	Radiological Air Particulate First Quarter 1991	42
4-4	Asbestos Analyses Results	43

1 INTRODUCTION

This document is the fourth in a series of documents designed to provide a summary of the findings from the routine environmental monitoring programs at the Weldon Spring Site Remedial Action Project (WSSRAP). These documents supplement the *Annual Site Environmental Report* (ASER) by providing interested outside agencies and organizations with more frequent access to WSSRAP data. They provide data resulting from routine environmental sampling as described in the WSSRAP Environmental Monitoring Plan and a brief interpretation of that data.

It is the goal of this document to summarize and briefly discuss the data, highlighting data that differ significantly from observations made in previous reports. The full interpretation of these data (as well as data in other quarterly summaries) will be undertaken in the 1991 ASER. It is recommended that interested readers refer to previous Environmental Monitoring Plans (EMPs), ASERs, and project documents for more information on existing site conditions, site history, transport mechanisms, and quantified contaminant levels. The monitoring scheme for every calendar year is established prior to that year in the annual EMP. Each sampling location to be monitored during the upcoming year is identified in the EMP and the schedule of analytical parameters are tabulated for easy reference. These reports may be obtained by visiting the WSSRAP reading room or contacting the WSSRAP Community Relations Manager at 314-441-8086.

These quarterly reports are intended to include data from all quarterly environmental monitoring programs conducted at the WSSRAP including groundwater, surface water, National Pollutant Discharge Elimination System (NPDES), radon gas, gamma radiation, and air particulates (including asbestos and radioactive particulates). However, because of delays in data delivery from the analytical laboratories, some of the data that was expected to be included in this report are not yet available for reporting. The unavailability of data is due to a nationwide shortage in analytical services. The WSSRAP is taking corrective action to ensure more timely availability of data in the future. These data will be reported in the 1991 ASER. Sludges, soils, and biological specimens are not sampled on a routine basis; therefore, analytical results for these parameters are not included in this report. Trend analyses are being prepared from historical data for surface water, groundwater and air pathways. These analyses will be presented in the 1991 ASER.

2 GROUNDWATER MONITORING

The groundwater is sampled regularly at both the Weldon Spring Chemical Plant/raffinate pits/vicinity properties (WSCP/RP/VP) and the Weldon Spring quarry (WSQ). Due to differences in the environmental settings and sources of contaminants, separate monitoring schedules are followed. Therefore, results of groundwater monitoring at the WSCP/RP/VP and WSQ will be discussed separately.

2.1 Chemical Plant/Raffinate Pits/Vicinity Properties

The groundwater at the chemical plant/raffinate pits/vicinity properties area is monitored on a semi-annual basis with the exception of MW-2001, MW-2002, MW-2003, MW-3003, MW-3006, MW-3008, MW-3009, MW-3023, MW-4012 and MW-4013 which are monitored quarterly. Monitoring well locations are shown in Figure 2-1. Data from the semiannual groundwater monitoring for the first half of 1991 will be presented in the second quarter data summary, however, data from the quarterly monitored wells are presented in each QEDS.

2.1.1 Nitroaromatic Results

Table 2-1 contains nitroaromatic data from samples collected from the quarterly monitored groundwater wells at the CP/RP/VP area. Nitroaromatic compounds were detected in seven samples. However, the data continue to reflect levels historically found and documented in previous environmental reports.

2.1.2 Radiological Results

The radiological results for samples from quarterly monitored wells at the WSCP/RP/VP are presented in Table 2-2. The upper bound for natural uranium background concentrations in groundwater at the WSCP/RP/VP has been determined to be 3.4 pCi/l. The EPA has not yet established drinking water standards for uranium; however, studies leading to proposed rulemaking are using uranium in the 10 pCi/l to 40 pCi/l range. The U.S. Department of Energy (DOE) has a health based derived concentration guideline (DCG) of 600 pCi/l in surface water effluent.

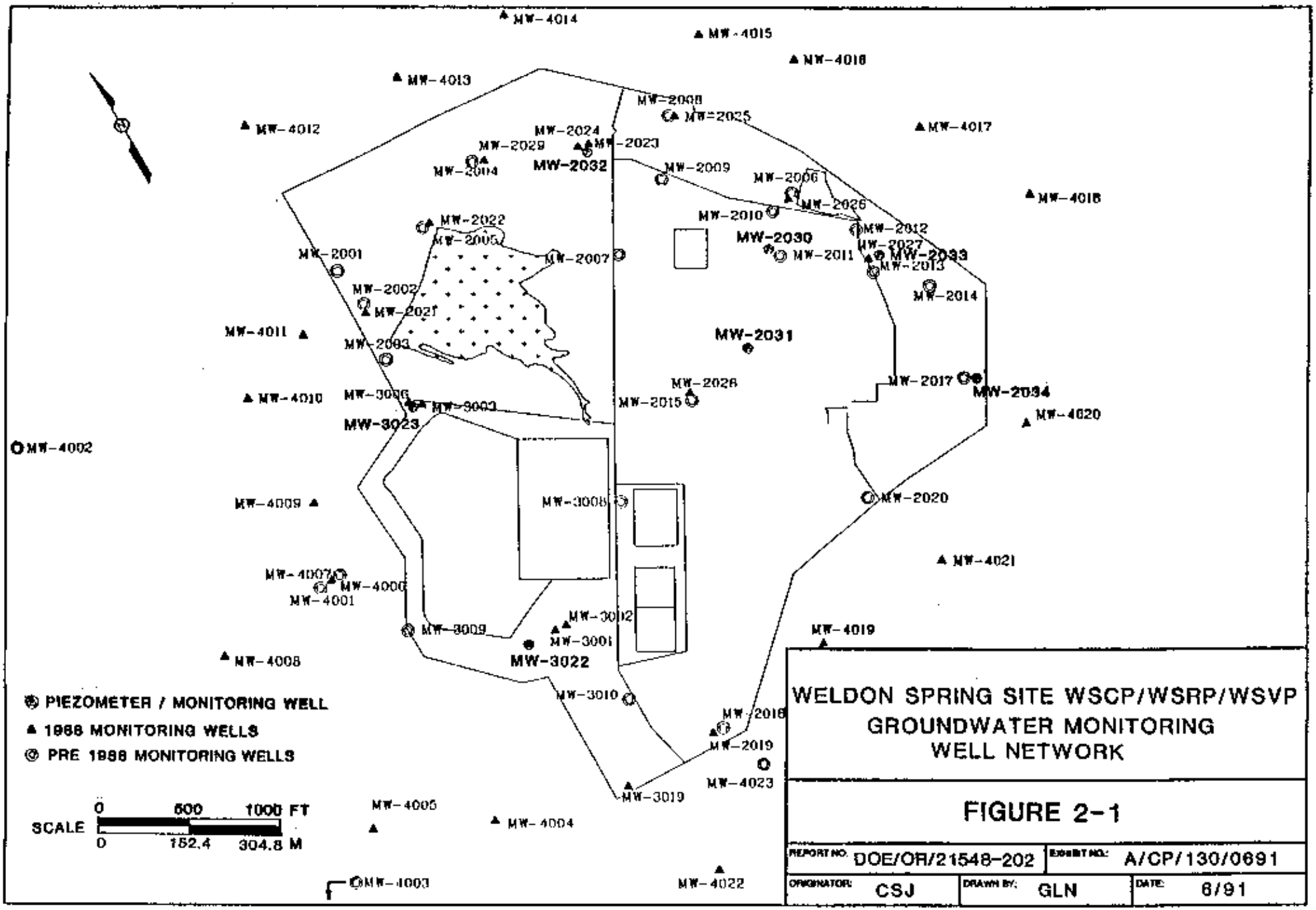

MW-4014
MW-4015
MW-4016
MW-4013
MW-4012
MW-4017
MW-4018
MW-2008
MW-2025
MW-2024
MW-2029
MW-2023
MW-2032
MW-2014
MW-2009
MW-2006
MW-2026
MW-2010
MW-2012
MW-2030
MW-2027
MW-2011
MW-2033
MW-2013
MW-2022
MW-2005
MW-2007
MW-2001
MW-2002
MW-2021
MW-2014
MW-4011
MW-2003
MW-2031
MW-2028
MW-2017
MW-2034
MW-4010
MW-3006
MW-3003
MW-2015
MW-3023
MW-4020
MW-4002
MW-3008
MW-2020
MW-4009
MW-4021
MW-4007
MW-4000
MW-4001
MW-3012
MW-3009
MW-3001
MW-4019
MW-4008
MW-3022
MW-3010
MW-2018
MW-2019
MW-4023
MW-3019
MW-4005
MW-4004
MW-4003
MW-4022
PIEZOMETER / MONITORING WELL
1988 MONITORING WELLS
PRE 1988 MONITORING WELLS
SCALE
0 500 1000 FT
0 152.4 304.8 M
WELDON SPRING SITE WSCP/WSRP/WSVP
GROUNDWATER MONITORING
WELL NETWORK
FIGURE 2-1
REPORT NO. DOE/OR/21548-202
EXHIBIT NO. A/CP/130/0691
ORIGINATOR: CSJ
DRAWN BY: GLN
DATE: 6/91

TABLE 2-1 First Quarter Nitroaromatic Data for Groundwater at the WSCP/RP/VP

Sample ID	NB (µg/l)	1,3-DNB (µg/l)	2,4-DNT (µg/l)	2,6-DNT (µg/l)	2,4,6-TNT (µg/l)	1,3,5-TNB (µg/l)
GW-2001-Q191	ND	ND	0.073	0.049	ND	ND
GW-2002-Q191	ND	ND	0.063	0.34	ND	ND
GW-2003-Q191	ND	ND	0.15	0.65	ND	ND
GW-3003-031891	ND	ND	0.059	0.085	ND	ND
GW-3006-031991	ND	ND	ND	ND	ND	ND
GW-3008-Q191	ND	ND	0.08	0.16	ND	ND
GW-3009-Q191	ND	ND	ND	ND	ND	ND
GW-3023-031991	ND	ND	2.6	4.5	ND	ND
GW-4012-Q191	ND	ND	ND	ND	ND	ND
GW-4013-Q191	ND	ND	0.049	1.1	0.55	34

ND - Not Detected

Table 2-2 First Quarter Uranium and Inorganic Anion Data in Groundwater at the WSCP/RP/VP

Sample ID	Nitrate as (N) (mg/l)	Sulfate (mg/l)	Uranium (pCi/l)
GW-2001-Q191	20.7	5.4	ND
GW-2002-Q191	23	109	ND
GW-2003-Q191	414	114	0.7
GW-3003-Q191	4	149	19
GW-3006-Q191	1	24.2	ND
GW-3008-Q191	1050	51.6	4.1
GW-3009-Q191	89	39.8	49.6
GW-3023-Q191	275	558	7.5
GW-4012-Q191	ND	54	4.1
GW-4013-Q191	84.1	42	1.4

ND – Not Detected

The highest uranium level detected was 49.6 pCi/l from a sample obtained from Monitoring Well 3009 adjacent to raffinate pit No. 4. The other concentrations reported in Table 2-2 continue to indicate levels below the proposed drinking water standard for uranium.

2.1.3 Geochemical Results

Geochemical results for samples from quarterly monitored wells at the WSCP/RP/VP are presented in Table 2-3. Geochemical parameters were added to the *Environmental Monitoring Plan* for the 1991 monitoring year.

2.1.4 Inorganic Anion Results

Inorganic anion results for the quarterly monitored WSCP/RP/VP wells are shown in Table 2-2. The results reflect levels historically found in these wells.

2.2 Weldon Spring Quarry

Chemical and radiological wastes at the quarry are of particular concern because of their proximity to the St. Charles County well field. The well field is located approximately 0.8 km (0.5 mile) to the south of the Weldon Spring quarry. Monitoring of contaminants in groundwater and the protection of the well field is a top WSSRAP priority.

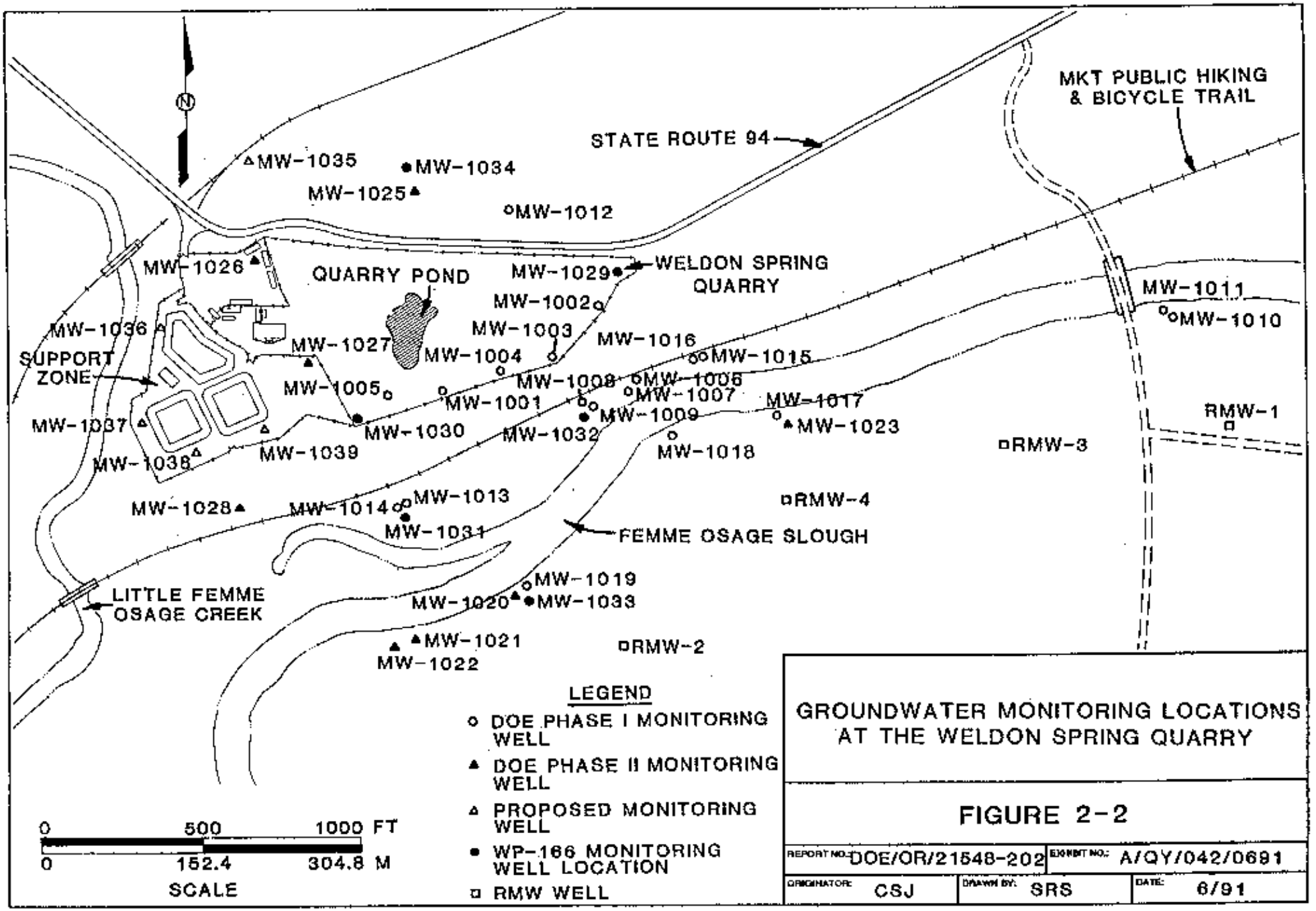
Groundwater is currently being monitored in 35 wells in and around the quarry. Thirty-one monitoring wells installed by the U.S. Department of Energy (DOE) currently exist in or near the quarry, with the addition of wells MW-1035 through MW-1039 to be included in the monitoring program beginning in the second quarter, 1991. Four monitoring wells were installed by St. Charles County in 1986 and are currently included in the DOE's monitoring program. All monitoring well locations are shown in Figures 2-2 and 2-3. These wells draw water from both bedrock and alluvial aquifers.

Two separate groundwater monitoring programs have been developed for the quarry. The first program is a bimonthly sampling of all wells north of the Femme Osage Slough. The second program is a quarterly sampling of all wells south of the Femme Osage Slough,

TABLE 2-3 First Quarter Geochemical Data For Groundwater at the WSCP/RP/VP

	As (µg/l)	Ba (µg/l)	Ca (µg/l)	Cr (µg/l)	Co (µg/l)	Fe (µg/l)	Li (µg/l)	Mg (µg/l)	Mn (µg/l)	Ni (µg/l)	K (µg/l)	Na (µg/l)	Sn (µg/l)	Nitrite (µg/l)	Bromide (µg/l)	Chloride (µg/l)	Phosphorus, Total (µg/l)	Silica, Dissolved (µg/l)	Alkalinity (µg/l)
GW-2001-Q191	ND	200	75200	ND	ND	ND	ND	39200	ND	ND	1670	9050	91.4	ND	682	5070	47.4	9860	343000
GW-2002-Q191	ND	161	244000	ND	ND	ND	362	82600	ND	ND	8720	96300	319	ND	881	10700	35.1	13200	303000
GW-2003-Q191	ND	112	268000	ND	ND	ND	433	97100	ND	ND	7660	127000	463	ND	764	8970	38.6	6670	281000
GW-3003-Q191	ND	150	258000	ND	ND	ND	518	90800	155	ND	10200	177000	620	ND	226	9430	64.4	9800	281000
GW-3006-Q191	4	109	47300	ND	ND	133	ND	43800	90.3	ND	1490	16800	200	625	557	ND	ND	10900	374000
GW-3008-Q191	ND	343	736000	ND	ND	ND	177	87400	ND	ND	2610	231000	620	ND	531	17000	60	12400	242000
GW-3009-Q191	ND	1400	80300	ND	10.3	90	ND	49600	18.8	ND	1060	18900	620	203	ND	3.6	14.7	8680	122000
GW-3023-031991	ND	39.9	344000	ND	ND	36	768	87400	18.4	ND	4630	231000	630	225	ND	15.1	65	11900	247000
GW-4012-Q191	ND	90.9	49400	ND	ND	38	ND	32100	5.1	ND	13200	33200	172	ND	605	3510	74.5	11400	297000
GW-4013-Q191	4	124	125000	ND	ND	ND	52.5	43800	ND	ND	6350	33300	200	ND	453	1040	53.4	9510	315000

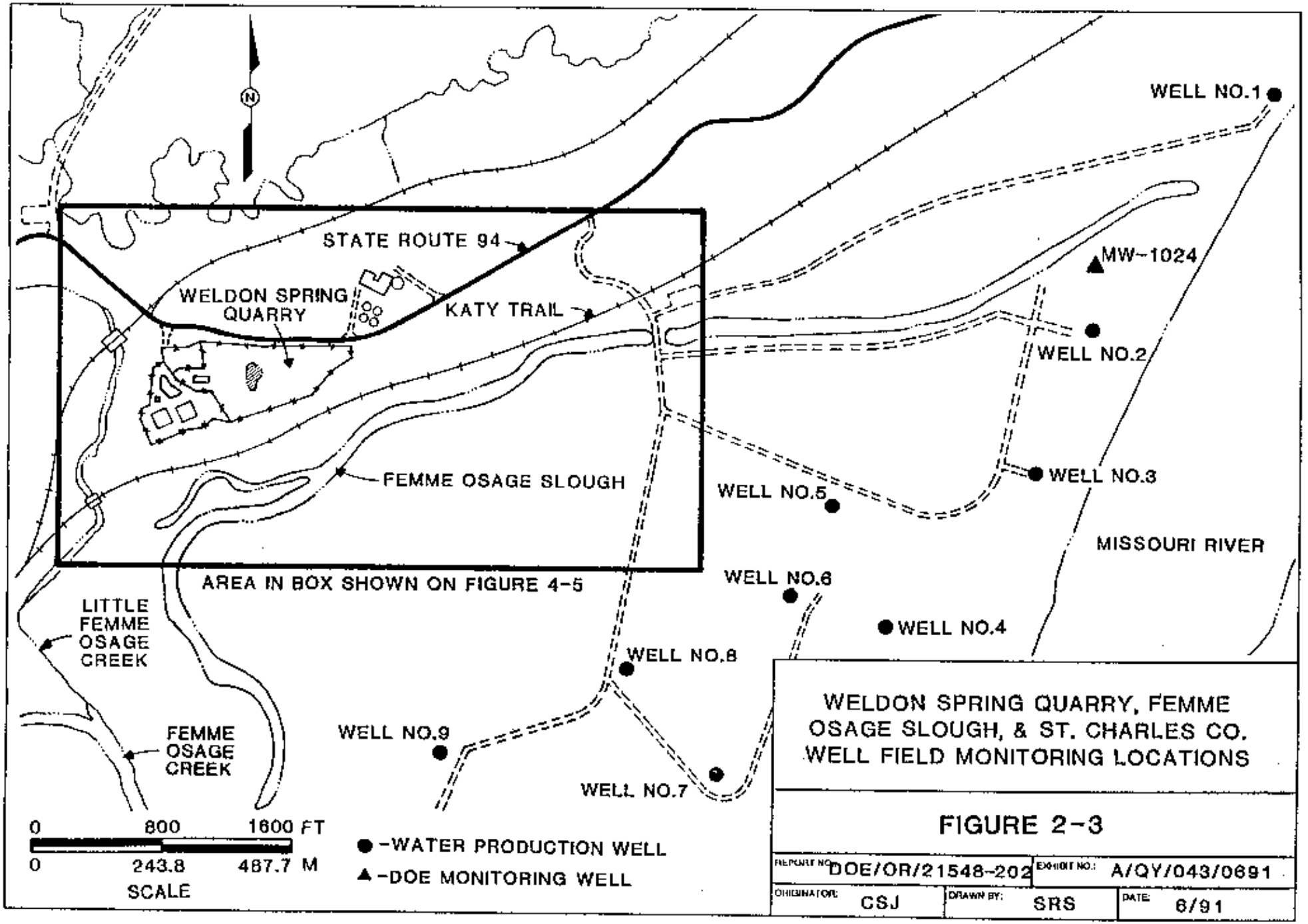
ND - Not Detected



GROUNDWATER MONITORING LOCATIONS AT THE WELDON SPRING QUARRY

FIGURE 2-2

REPORT NO.: DOE/OR/21548-202	EXHIBIT NO.: A/QY/042/0691		
ORIGINATOR: CSJ	DRAWN BY: SRS	DATE: 6/91	


N
STATE ROUTE 94
WELDON SPRING QUARRY
KATY TRAIL
FEMME OSAGE SLOUGH
AREA IN BOX SHOWN ON FIGURE 4-5
LITTLE FEMME OSAGE CREEK
FEMME OSAGE CREEK
WELL NO.1
MW-1024
WELL NO.2
WELL NO.3
WELL NO.5
MISSOURI RIVER
WELL NO.6
WELL NO.4
WELL NO.8
WELL NO.9
WELL NO.7
0 800 1600 FT
0 243.8 487.7 M
SCALE
● -WATER PRODUCTION WELL
▲ -DOE MONITORING WELL
WELDON SPRING QUARRY, FEMME OSAGE SLOUGH, & ST. CHARLES CO. WELL FIELD MONITORING LOCATIONS
FIGURE 2-3
REPORT NO. DOE/OR/21548-202
EXHIBIT NO.: A/QY/043/0691
ORIGINATOR: CSJ
DRAWN BY: SRS
DATE: 6/91

including the St. Charles County well field. Both the raw and treated waters from the St. Charles County water treatment plant are also sampled. This second portion of the quarry groundwater monitoring program has been jointly developed by representatives of the DOE, the Missouri Department of Natural Resources (MDNR), and St. Charles County.

2.2.1 Radiological Results

Radiological data are presented in Tables 2-4, 2-5, and 2-5A for samples collected on a bimonthly and quarterly bases. The results show fluctuations around the average levels in the WSQ area with no dramatic increases evident except in MW-1028 and MW-1011. MW-1028 had a level of 88.4 pCi/l during the January and February bimonthly sampling event. Previous results from this monitoring location have indicated levels less than 10 pCi/l of uranium, therefore the result of 88.4 pCi/l appears unusual. All pertinent analytical QC data has been requested from the analytical laboratory performing the analysis so that the analytical results can be validated. MW-1011 (located immediately south of the slough) indicated an unusually elevated concentration of uranium (20.4 pCi/l) during the first quarter, 1991. Through a meeting with representatives of St. Charles County and MDNR, it was decided that the DOE would pursue weekly sampling of MW-1011 and adjacent well MW-1010 and expedited analysis of the samples from that well for one month. The results of that sampling are provided in Table 2-4. The results of the weekly sampling indicate that there is no continuing, upward trend to the concentrations of uranium in the groundwater monitored by MW-1011. In fact, the last three data points represent successively lower concentrations. Throughout this incident, the uranium level in the adjacent, deeper-nested well (MW-1010) remained less than 1 pCi/l. The St. Charles County Wellfield remains safe and is not under any imminent threat from WSQ-related contamination.

The WSSRAP has increased the sampling schedule for these wells from semiannually to monthly for three months. Upon receipt of the monthly sampling results, the DOE/PMC may then assess the appropriateness of resuming the sampling schedule prescribed in the WSSRAP 1991 *Environmental Monitoring Plan*. Trend analyses for radiological results will be presented in the 1991 ASER.

TABLE 2-4 First Bimonthly (Jan/Feb) Inorganic Anions and Radiological Results in Groundwater for the WSQ

SAMPLE ID	Nitrate (mg/l)	Sulfate (mg/l)	Uranium (pCi/l)	Gross Alpha (pCi/l)
GW-1002-022691	0.8	51	2	NS
GW-1004-012991	0.3	283	6324	NS
GW-1005-012991	ND	218	2516	NS
GW-1006-012991	1.7	375	2720	NS
GW-1007-012991	ND	50.6	129.2	NS
GW-1008-013191	ND	271	4692	NS
GW-1009-013191	ND	218	11.6	NS
GW-1010-022691*	NS	NS	ND	0 +/- 3
GW-1011-022691*	ND	11.7	30.6	NS
GW-1010-030591*	NS	NS	ND	-4 +/- 4
GW-1011-030591*	NS	NS	19	8 +/- 9
GW-1010-031391*	NS	NS	ND	NS
GW-1011-031391*	NS	NS	23.1	NS
GW-1010-031891*	NS	NS	ND	2 +/- 3
GW-1011-031891*	NS	NS	18.4	23 +/- 9
GW-1010-032691*	NS	NS	ND	NS
GW-1011-032691*	NS	NS	13.6	NS
GW-1012-020691	1.7	69.5	4.1	NS
GW-1013-022091	0.3	95	884	NS
GW-1014-022091	ND	101	1156	NS
GW-1015-021191	2.2	221	605	NS
GW-1016-021191	0.5	168	163	NS
GW-1026-020691	ND	ND	ND	NS
GW-1027-020491	ND	153	496.4	NS
GW-1028-020491	ND	64	88.4	NS

* 1010, 1011 Special Study (radiological only)
ND Not Detected
NS Not Sampled

TABLE 2-5 First Quarter Inorganic Anions and Radiological Results for the WSQ

SAMPLE ID	Nitrate (mg/l)	Sulfate (mg/l)	Uranium (pCi/l)
GW-1010-Q191	ND	ND	ND
GW-1011-Q191	ND	16.7	20.4
GW-1017-Q191	ND	1.3	2.7
GW-1018-Q191	ND	29	ND
GW-1019-Q191	ND	ND	0.7
GW-1020-Q191	ND	ND	1.4
GW-1021-Q191	ND	4.4	0.7
GW-1022-Q191	ND	3.2	1.4
GW-1023-Q191	ND	8.1	ND
GW-1034-042291			ND

ND Not Detected

TABLE 2-5A First Quarter Inorganic Anions and Radiological Results for the St. Charles County Wellfield

SAMPLE ID	Nitrate (mg/l)	Sulfate (mg/l)	Total Uranium (pCi/l)	Gross Alpha (pCi/l)	Gross Beta (pCi/l)	Ra-226 (pCi/l)	Ra-228 (pCi/l)	Th-230 (pCi/l)	Th-232 (pCi/l)
GW-1024-Q191	ND	ND	0.7	2 +/- 4	4 +/- 4	.4 +/- .3	2.3 +/- 1.2	.1 +/- .1	0 +/- .1
GW-RMW1-030591	NA	NA	ND	NS	NS	NS	NS	NS	NS
GW-RMW1-Q191	ND	4.9	ND	-1 +/- 4	3 +/- 4	.8 +/- .3	1.2 +/- 1.1	0 +/- .1	0 +/- .1
GW-RMW2-Q191	ND	19.4	6.8	8 +/- 5	7 +/- 3	.4 +/- .4	-.1 +/- .5	0 +/- .1	0 +/- .1
GW-RMW3-Q191	ND	ND	ND	3 +/- 5	4 +/- 4	.7 +/- .3	2.2 +/- 1.1	.1 +/- .1	0 +/- .1
GW-RMW4-Q191	0.5	27.3	5.4	1 +/- 4	2 +/- 3	.1 +/- .2	.3 +/- 1.1	.1 +/- .1	0 +/- .1
GW-RAWW-Q191	ND	57.5	ND	0 +/- 3	6 +/- 3	.6 +/- .3	1.3 +/- .8	0 +/- .1	0 +/- .1
GW-FINW-Q191	0.2	84	ND	-1 +/- 2	6 +/- 2	.5 +/- .3	.4 +/- .5	0 +/- .1	0 +/- .1
GW-PW02-Q191	ND	95.6	0.7	-1 +/- 3	6 +/- 2	.7 +/- .3	1.8 +/- .8	0 +/- .1	0 +/- .1
GW-PW03-Q191	ND	82	ND	1 +/- 3	6 +/- 2	.4 +/- .4	1.7 +/- .7	0 +/- .1	0 +/- .1
GW-PW04-Q191	ND	89.5	ND	0 +/- 3	6 +/- 3	.5 +/- .3	1.6 +/- .8	0 +/- .1	0 +/- .1
GW-PW05-Q191	ND	49.8	ND	0 +/- 3	5 +/- 2	.6 +/- .3	1.2 +/- .7	0 +/- .1	0 +/- .1
GW-PW06-Q191	ND	59	ND	2 +/- 3	6 +/- 3	.4 +/- .3	2.1 +/- .8	0 +/- .1	0 +/- .1
GW-PW07-Q191	ND	13.4	2.7	0 +/- 4	7 +/- 4	.5 +/- .4	2.6 +/- .8	.1 +/- .1	0 +/- .1
GW-PW08-Q191	ND	12	ND	2 +/- 4	5 +/- 3	.5 +/- .3	1.8 +/- .8	0 +/- .1	0 +/- .1
GW-PW09-	NOT ON LINE IN FIRST QUARTER 1991								
GW-PW09-Q291*	ND	49.6	ND	0 +/- .1	4 +/- 3	.5 +/- .4	1.1 +/- .8	-.1 +/- .1	0 +/- .1

* Annual sampling for PW09 took place 2nd quarter
ND Not Detected
NS Not Sampled

2.2.2 Nitroaromatic Compounds Results

Analytical results for nitroaromatic compounds are presented in Tables 2-6 and 2-7. No monitoring wells south of the Femme Osage Slough showed detectable concentrations of nitroaromatic compounds during the first quarter 1991. The distribution and magnitude of nitroaromatic contamination near the quarry remains unchanged.

2.2.3 Inorganic Anions Results

Two inorganic anions--nitrate and sulfate--were measured in quarry wells. Tables 2-4, 2-5, and 2-5A display the analytical results for the first quarter of 1991, which are consistent with data reported in the previous environmental monitoring reports. The WSQ groundwater samples continue to indicate no significant groundwater contamination by nitrate. The groundwater samples continue to indicate background concentrations of sulfate in wells south of the Femme Osage Slough.

2.2.4 Metals Results

A selected group of quarry wells located south of the Femme Osage Slough were sampled for cadmium, lead, and mercury in addition to arsenic and barium. Analytical results for these metals are presented in Tables 2-8 and 2-9. Results from the first bimonthly and first quarter analyses of arsenic and barium continue to indicate elevated concentrations in selected wells. The highest levels reported are 153 μg/l for arsenic in MW–1017 and 950 μg/l for barium also detected in MW-1017.

TABLE 2-6 First Bimonthly (Jan/Feb) Nitroaromatic Data for Groundwater at the WSQ

SAMPLE ID	NB (µg/l)	1,3-DNB (µg/l)	2,4-DNT (µg/l)	2,6-DNT (µg/l)	2,4,6-TNT (µg/l)	1,3,5-TNB (µg/l)
GW-1002-022691	ND	0.12	ND	6.5	14	75
GW-1004-012991	ND	ND	2	3.8	8.5	2.8
GW-1005-012991	ND	ND	0.14	0.05	ND	ND
GW-1006-012991	ND	ND	0.15	3	15	92
GW-1007-012991	ND	ND	ND	ND	ND	ND
GW-1008-013191	ND	ND	ND	0.22	0.44	0.15
GW-1009-013191	ND	ND	ND	ND	ND	ND
GW-1012-020691	ND	ND	ND	ND	ND	ND
GW-1013-022091	ND	ND	0.15	0.04	ND	ND
GW-1014-022091	ND	ND	ND	ND	ND	ND
GW-1015-021191	ND	ND	ND	0.4	5.4	34
GW-1016-021191	ND	ND	ND	0.07	0.46	1.6
GW-1026-020691	ND	ND	ND	ND	ND	ND
GW-1027-020491	ND	ND	12	6.6	19	0.11
GW-1028-020491	ND	ND	ND	ND	ND	ND

ND Not Detected

TABLE 2-7 First Quarter Nitroaromatic Data for Groundwater at the WSQ

SAMPLE ID	NB (µg/l)	1,3-DNB (µg/l)	2,4-DNT (µg/l)	2,6-DNT (µg/l)	2,4,6-TNT (µg/l)	1,3,5-TNB (µg/l)
GW-1010-Q191	ND	ND	ND	ND	ND	ND
GW-1011-Q191	ND	ND	ND	ND	ND	ND
GW-1011-022691	ND	ND	ND	ND	ND	ND
GW-1017-Q191	ND	ND	ND	ND	ND	ND
GW-1018-Q191	ND	ND	ND	ND	ND	ND
GW-1019-Q191	ND	ND	ND	ND	ND	ND
GW-1020-Q191	ND	ND	ND	ND	ND	ND
GW-1021-Q191	ND	ND	ND	ND	ND	ND
GW-1022-Q191	ND	ND	ND	ND	ND	ND
GW-1023-Q191	ND	ND	ND	ND	ND	ND
GW-1024-Q191	ND	ND	ND	ND	ND	ND
GW-RMW1-Q191	ND	ND	ND	ND	ND	ND
GW-RMW2-Q191	ND	ND	ND	ND	ND	ND
GW-RMW3-Q191	ND	ND	ND	ND	ND	ND
GW-RMW4-Q191	ND	ND	ND	ND	ND	ND
GW-RAWW-Q191	ND	ND	ND	ND	ND	ND
GW-FINW-Q191	ND	ND	ND	ND	ND	ND
GW-PW02-Q191	ND	ND	ND	ND	ND	ND
GW-PW03-Q191	ND	ND	ND	ND	ND	ND
GW-PW04-Q191	ND	ND	ND	ND	ND	ND
GW-PW05-Q191	ND	ND	ND	ND	ND	ND
GW-PW06-Q191	ND	ND	ND	ND	ND	ND
GW-PW07-Q191	ND	ND	ND	ND	ND	ND
GW-PW08-Q191	ND	ND	ND	ND	ND	ND
GW-PW09-	NOT ON LINE IN FIRST QUARTER 1991					

ND Not Detected

TABLE 2-8 First Bimonthly (Jan/Feb) Results for Metals in Groundwater at the WSQ

	Arsenic (µg/l)	Barium (µg/l)
GW-1002-022691	ND	118
GW-1004-012991	ND	31
GW-1005-012991	ND	43.3
GW-1006-012991	ND	22.3
GW-1007-012991	18.7	243
GW-1008-013191	ND	38.6
GW-1009-013191	5.7	333
GW-1012-020691	ND	118
GW-1013-022091	5.5	153
GW-1014-022091	ND	123
GW-1015-021191	ND	97.2
GW-1016-021191	4.4	101
GW-1026-020691	26.2	389
GW-1027-020491	ND	111
GW-1028-020491	ND	288

ND Not Detected

TABLE 2-9 First Quarter Results for Metals in Groundwater at the WSQ

	Arsenic (µg/l)	Barium (µg/l)	Cadmium (µg/l)	Lead (µg/l)	Mercury (µg/l)
GW-1010-Q191	92.8	376	NS	NS	NS
GW-1011-Q191	4.7	216	NS	NS	NS
GW-1017-Q191	153	950	NS	NS	NS
GW-1018-Q191	123	550	NS	NS	NS
GW-1019-Q191	2	9.4	NS	NS	NS
GW-1020-Q191	2	9.4	NS	NS	NS
GW-1021-Q191	4	9.4	NS	NS	NS
GW-1022-Q191	8	9.4	NS	NS	NS
GW-1023-Q191	71.6	276	NS	NS	NS
GW-1024-Q191	8.3	478	NS	NS	NS
GW-RMW1-Q191	6.3	511	NS	NS	NS
GW-RMW2-Q191	9.2	204	NS	NS	NS
GW-RMW3-Q191	45.3	516	NS	NS	NS
GW-RMW4-Q191	10.2	134	NS	NS	NS
GW-RAWW-Q191	ND	345	ND	ND	ND
GW-FINW-Q191	ND	104	ND	ND	ND
GW-PW02-Q191	ND	288	ND	ND	ND
GW-PW03-Q191	ND	238	ND	ND	ND
GW-PW04-Q191	ND	253	ND	ND	ND
GW-PW05-Q191	ND	300	ND	ND	0.33
GW-PW06-Q191	ND	304	ND	2.9	ND
GW-PW07-Q191	ND	478	ND	ND	ND
GW-PW08-Q191	4.2	385	ND	ND	0.26
GW-PW09-	NOT ON LINE QUARTER ONE				

ND Not Detected
NS Not Sampled

3 SURFACE WATER MONITORING

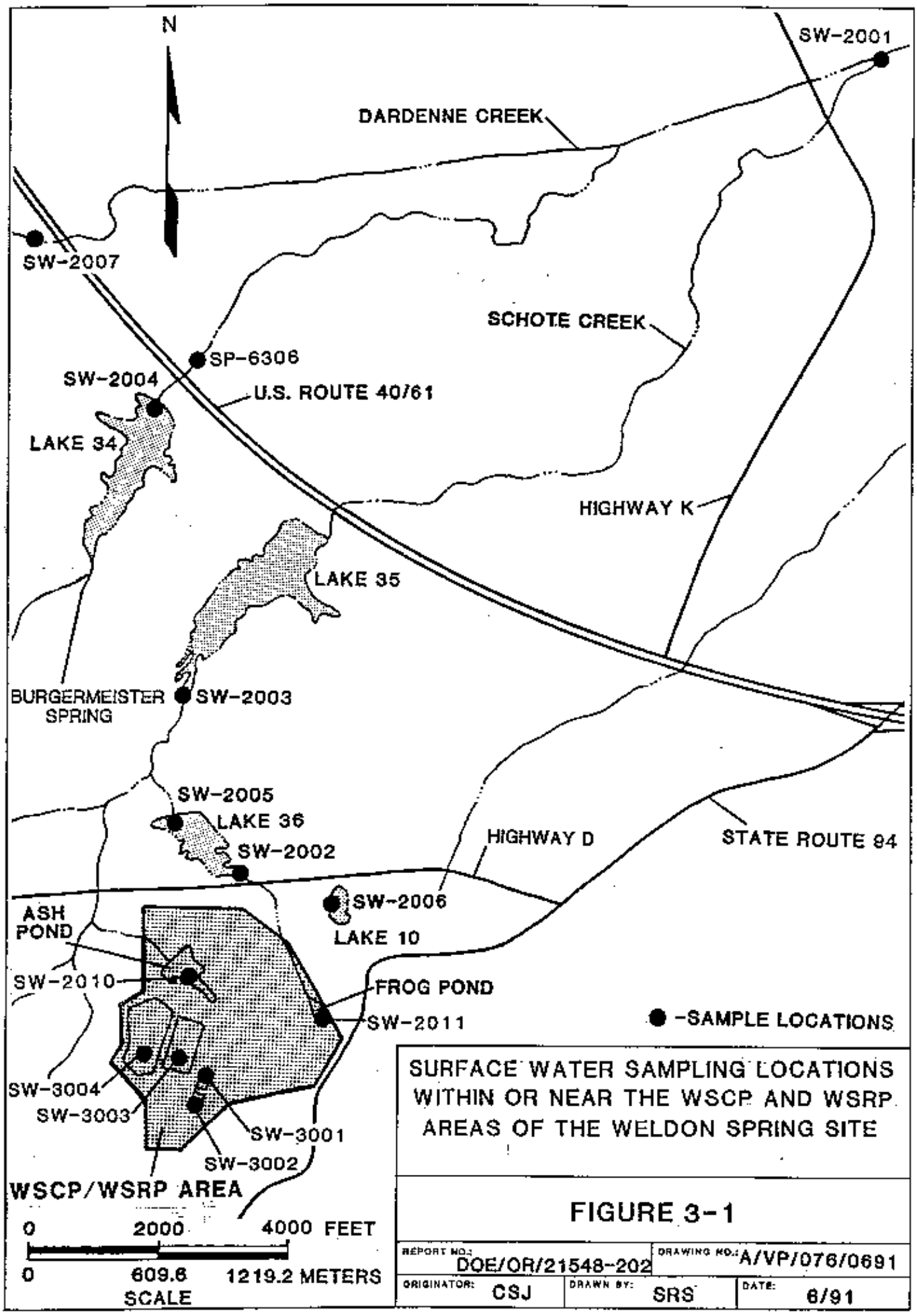
Routine samples were collected during the first quarter of 1991 from both on-site and off-site surface water and spring locations. All surface water samples were analyzed without filtering, unless a specific comparison of dissolved versus total contaminant concentrations was desired. Some analytical results are not available at this time; however, they will be presented in the 1991 ASER.

3.1 Chemical Plant/Raffinate Pits/Vicinity Properties

During the first quarter, surface water samples were collected from the 13 surface water sampling locations shown in Figure 3-1 and analyzed for uranium. The available results, presented in Table 3-1, indicate that conditions remain similar with values within the range measured historically with the highest level (197.2 pCi/l) detected at Frog Pond. All other values at off-site locations remain relatively low and consistent with historical values.

3.2 Weldon Spring Quarry

Surface water samples were collected from the 10 locations shown in Figure 3-2 and three locations in Figure 3-3. Samples were analyzed for uranium, arsenic, and barium and the results are presented in Tables 3-2 and 3-3. The results of all samples indicate no apparent changes in environmental conditions, although as seen in previous first quarters, the uranium levels within the slough were higher than in previous quarters. The highest measured level was 326.4 pCi/l detected at sampling location SW-1004. However, elevated levels of uranium in the slough have been observed in previous years during March, April, and May. This phenomenon is thought to be the result of the annual spring thaw. As the ground thaws, usually during February and March, an increase in groundwater movement transports uranium to the slough. The effect may be enhanced by the fact that more uranium is dissolved from the soil during the freeze/thaw process due to longer soil/water contact times. The elevated levels in the slough are not detected until March, April, or May because of the time required for uranium to reach the slough via groundwater transport. To better understand uranium concentrations in the slough, the frequency of sampling and analysis is being increased from quarterly to monthly.



SURFACE WATER SAMPLING LOCATIONS WITHIN OR NEAR THE WSCP AND WSRP AREAS OF THE WELDON SPRING SITE

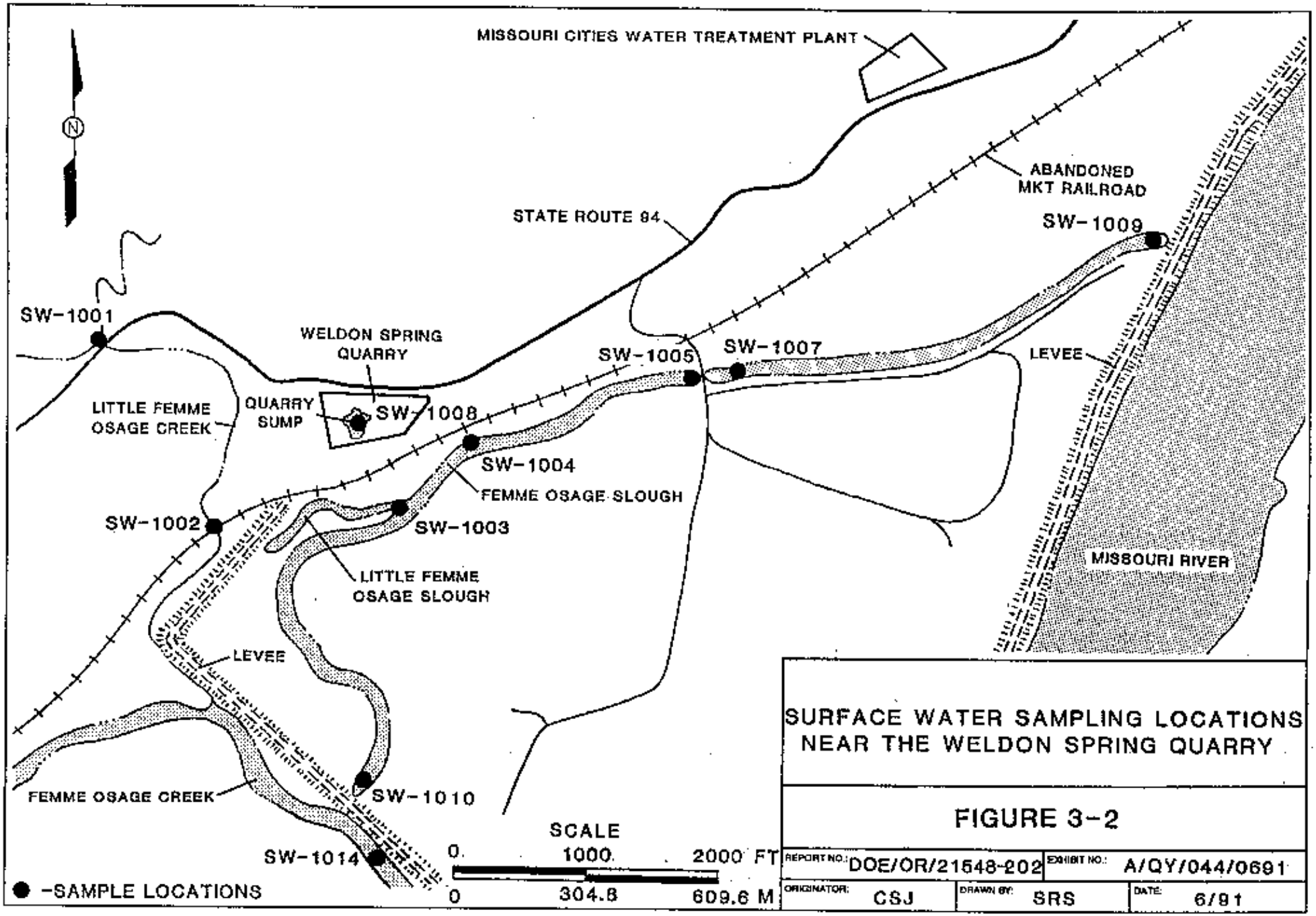
FIGURE 3-1

REPORT NO.: DOE/OR/21548-202	DRAWING NO.: A/VP/076/0691	
ORIGINATOR: CSJ	DRAWN BY: SRS	DATE: 6/91

TABLE 3-1 First Quarter Uranium Results in Surface water at the WSCP/RP/VP

SITE ID	URANIUM, TOTAL (pCi/l)
SW-2001	2.0
SW-2002	43.5
SW-2003	7.5
SW-2004	16.3
SW-2005	2.7
SW-2007	2.0
SW-2010	106.6
SW-2011	197.2
SW-3001	NA
SW-3002	NA
SW-3003	NA
SW-3004	NA

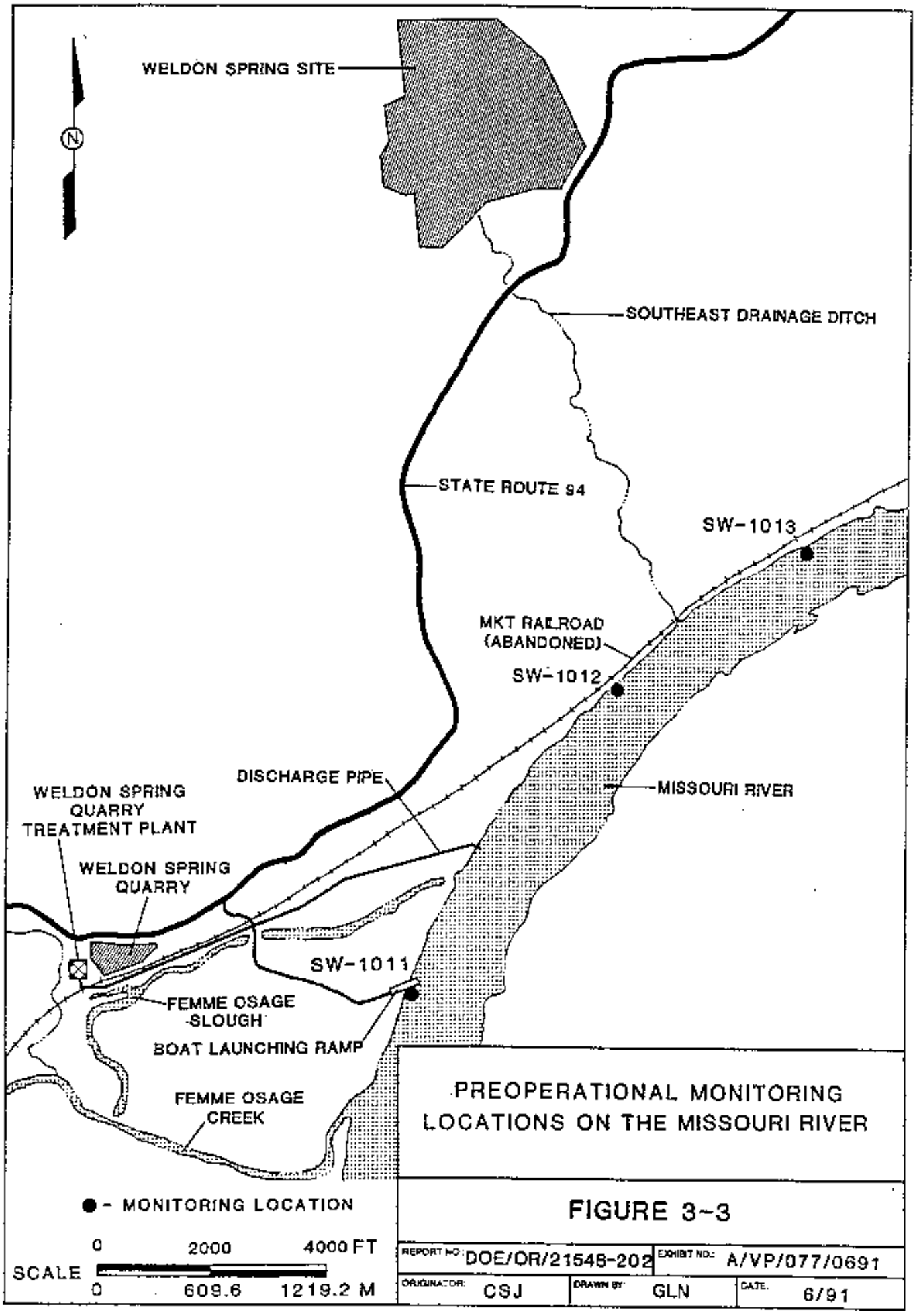
NA Not Available



SURFACE WATER SAMPLING LOCATIONS
NEAR THE WELDON SPRING QUARRY

FIGURE 3-2

REPORT NO.: DOE/OR/21548-202		EXHIBIT NO.: A/QY/044/0691	
ORIGINATOR: CSJ	DRAWN BY: SRS	DATE: 6/91	



PREOPERATIONAL MONITORING LOCATIONS ON THE MISSOURI RIVER

FIGURE 3-3

REPORT NO: DOE/OR/21548-202		EXHIBIT NO.: A/VP/077/0691	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 6/91	

TABLE 3-2 First Quarter Results for Uranium in Surface Water at the WSQ

SITE ID	URANIUM (pCi/l)
SW-1001	0.68
SW-1002	6.8
SW-1003	156.4
SW-1004	326.4
SW-1005	81.6
SW-1007	11.6
SW-1008	NA
SW-1009	28.6
SW-1010	74.8
SW-1011	4.8
SW-1012	4.8
SW-1013	3.4

NA Not Available

TABLE 3-3 First Quarter Metal Results in Surface Water At the WSQ (µg/l)

SITE ID	ARSENIC	BARIUM
SW-1001	ND	54.1
SW-1002	ND	56.1
SW-1003	ND	123.0
SW-1004	NA	NA
SW-1005	NA	NA
SW-1007	NA	NA
SW-1008	NA	NA
SW-1009	ND	ND
SW-1010	ND	126.0
SW-1011	3.7	143.0
SW-1012	3.0	137.0
SW-1013	3.3	139.0
SW-1014	ND	61.7

ND Not Detected
NA Not Available

The first quarter uranium values measured in the Missouri River were lower than the values detected during the previous quarter. Historically, the levels of uranium at these locations have fluctuated (due to either natural fluctuations or analytical variability) such that uranium concentrations have been higher at upstream locations than downstream, and vice versa. The U.S. Department of Energy (DOE) has increased monitoring of the Missouri River prior to the operation of the Weldon Spring Site Remedial Action Project (WSSRAP) quarry water treatment plant to ascertain the preoperational (background) levels in the river. In addition, the National Pollution Discharge Elimination System (NPDES) permit for the quarry water treatment plant requires additional monitoring of the river. This monitoring increases the DOEs capability to ensure the safety of the public and the environment.

Arsenic and barium results indicate that arsenic within the Missouri River is at levels well below the National Primary Drinking Water Standards (slightly above the detection limit) and barium found in all samples is within the background range and well below the National Primary Drinking Water Standard.

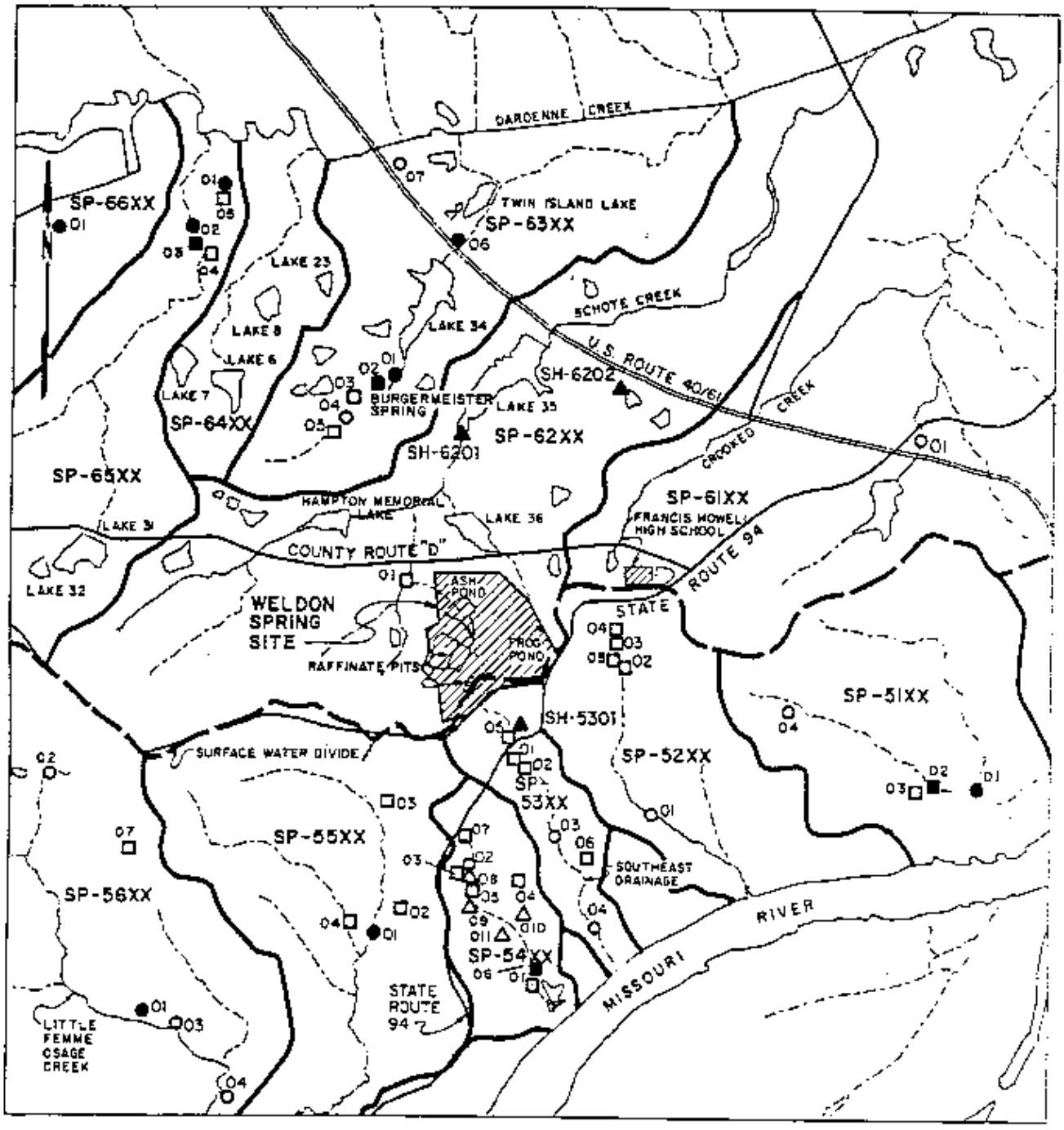
The analytical results for the six nitroaromatic compounds within the quarry slump were not available at the time of this report. The ponded water is to be treated for nitroaromatic compounds and other organics upon completion of the quarry water treatment plant.

3.3 Springs

Eleven springs around the Weldon Spring site (WSS) are sampled quarterly (see Figure 3-4 for spring locations). Previous spring monitoring indicated that waters from six perennial springs and one wet-weather spring are measurably influenced by site-related contaminants. These springs are SP-6301, SP-6302, SP-6306, and SP-5301 through SP-5304. All spring samples are analyzed for uranium with a select few analyzed for nitroaromatics, inorganics and metals. Analytical results for these parameters are listed in Tables 3-4, 3-5, 3-6, and 3-7. Values for these parameters remain consistent with their historical values.

3.4 National Pollutant Discharge Elimination System Data Review

Surface water and effluent samples were collected and analyzed in compliance with the Weldon Spring Site National Pollutant Discharge Elimination System (NPDES) permit.



LEGEND:

- SURFACE WATER DIVIDE BETWEEN MISSISSIPPI RIVER AND MISSOURI RIVER
- DRAINAGE BOUNDARY
- CREEK OR SURFACE DRAINAGE
- POND OR LAKE
- PERENNIAL SPRING WITH LARGE MAXIMUM FLOW
- PERENNIAL SPRING WITH SMALL MAXIMUM FLOW
- WET WEATHER SPRING WITH LARGE MAXIMUM FLOW
- WET WEATHER SPRING WITH SMALL MAXIMUM FLOW
- SHALLOW HOLE (SH)
- SEEP
- SP-63XX — SPRING OR SEEP IN DESIGNATED DRAINAGE AREA NUMBER 63. XX REPRESENTS THE DESIGNATED SPRING NUMBER IN DRAINAGE 63.

SCALE 0 3200 6400 FT
0 975.4 1950.7 M

SOURCE: MDNR, 1989

SPRINGS AND SEEPS IN THE VICINITY OF THE WSS

FIGURE 3-4

REPORT NO: DOE/OR/21548-202		EXHIBIT NO.: A/VP/078/0691	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 6/91	

TABLE 3-4 First Quarter Uranium Results in Springs Near the WSS

Site ID	Uranium (pCi/l)
SP-5201	NA
SP-5203	NA
SP-5301	176.8
SP-5302	156.4
SP-5303	NA
SP-5304	NA
SP-6301	49.0
SP-6303	2.0
SP-6306	6.1
SP-5503	NA
SP-6302	63.2

NA Not Available

TABLE 3-5 First Quarter Nitroaromatic Results in Springs Near the WSS (µg/l)

SITE ID	1,3,5-TNB	1,3-DNB	2,4,6-TNT	2,4-DNT	2,6-DNT	NITROBENZENE
SP-6301	ND	ND	0.052	ND	0.19	ND
SP-6303	0.053	ND	0.36	0.05	0.83	ND
SP-6306	ND	ND	ND	ND	ND	ND
SP-6302	ND	ND	ND	ND	0.021	ND

ND Not Detected

TABLE 3-6 First Quarter Inorganic Anion Results in Springs Near the WSS

Site ID	Nitrate (mg/l)	Sulfate (mg/l)
SP-6301	8.7	31.8

TABLE 3-7 First Quarter Metals Results in Springs Near the WSS (µg/l)

METAL	SP-6301	SP-6306
LITHIUM	ND	15.6
MOLYBDENUM	ND	ND
ALUMINUM	143	153.0
ANTIMONY	ND	ND
BARIUM	76.8	308.0
BERYLLIUM	ND	ND
CADMIUM	ND	ND
CALCIUM	43100	33600
CHROMIUM	ND	ND
COBALT	ND	ND
COPPER	ND	ND
IRON	156.0	4150
MAGNESIUM	9290	7870
MANGANESE	4.8	6710.0
NICKEL	ND	ND
POTASSIUM	1570	1710.0
SILVER	ND	ND
SODIUM	14700	10200
VANADIUM	ND	ND
ZINC	8.5	ND
ARSENIC	ND	6.7
LEAD	ND	ND
SELENIUM	ND	ND
THALLIUM	ND	ND
MERCURY	ND	ND

ND Not Detected

This permit (Number MO-0107701) was issued in November 1988 and addresses storm water and wastewater discharges. The six discharge points or outfalls included in this permit are shown in Figure 3-5. Outfalls NP-0001 through NP-0005 represent storm water discharge and NP-0006 represents the treated effluent discharge associated with the administration building sanitary wastewater treatment plant. Currently NP-0006 is the only outfall with effluent limitations. The five surface water outfalls have monitoring requirements only. First quarter 1991 analytical data for each outfall is presented in Table 3-8.

Radiological Analysis

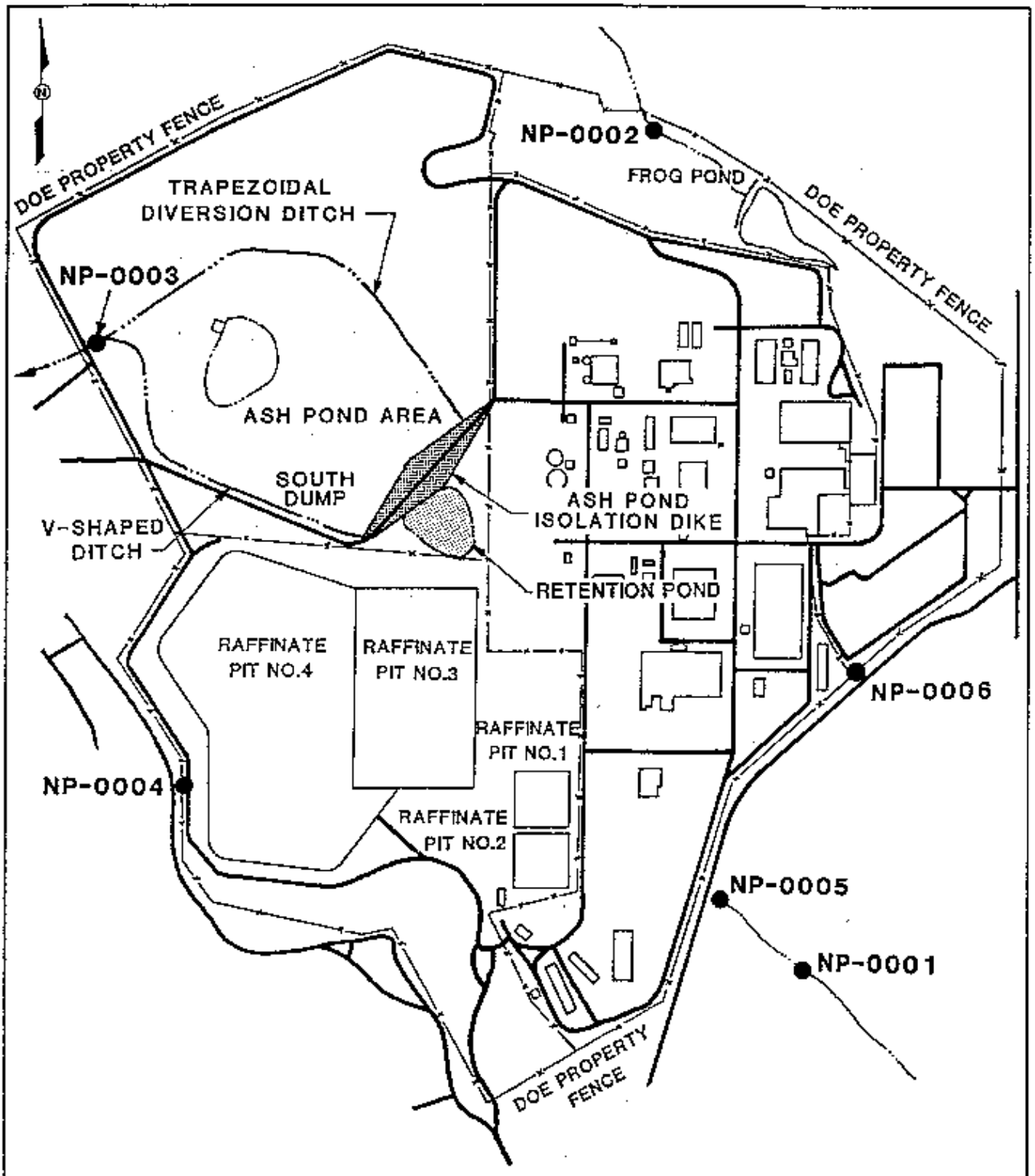
Gross Alpha and Total Uranium analyses correspond reasonably well with past data. The highest uranium levels were present in surface flow from the southeast portion of the site (NP-0005) and surface flow for the northwest area of the site (NP-0003). The peaks for these points were 2244 pCi/l and 3400 pCi/l, respectively.

Other outfalls exhibited the following range of uranium concentrations. NP-0002, the drainage from the Frog Pond area, ranged from 97 pCi/l to 197 pCi/l. NP-0001, (process sewer) was measured at 816 pCi/l. A uranium concentration of 9.5 pCi/l was present in the sample collected from NP-0004, behind raffinate pit No. 4.

Other Analysis

Other analyses include physical analysis (settleable solids and suspended solids) and chemical analysis (nitrate, pH, and lithium). First quarter 1991 values generally correspond to past values for the majority of parameters.

The discharge from the administration building treatment plant, NP-0006, has effluent limitations for quarterly samples. In addition to this quarterly monitoring, the subcontractor monitors the same parameters monthly, to assess plant performance. The NPDES permit contains effluent limitations on biochemical oxygen demand (BOD), total suspended solids (TSS), and fecal coliform at this outfall. These limits are 15 mg/l (BOD), and 20 mg/l (TSS), for weekly averages with maximum daily fecal coliform of 1000 colonies 1100 ml. NPDES permit limits were exceeded in the first quarter 1991 at this outfall. The BOD standard was exceeded in February. The cold months showed higher values due to upsets intensified by weather.



NPDES MONITORING LOCATIONS

FIGURE 3-5

SCALE 0 500 1000 FT
0 152.4 304.8 M

REPORT NO. DOE/OR/21548-202		EXHIBIT NO.: A/CP/128/0691	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 6/91	

TABLE 3-8 Results of Monthly NPDES Monitoring for NP-0001 through NP-0006

Outfall NP-0001 NPDES data for Q1 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	SET. SOLIDS	NITRATE	pH	LITHIUM	GROSS ALPHA	TOTAL URANIUM	
UNITS	GPD	mg/l	ml/l	mg/l		mg/l	pCi/l	mg/l	pCi/l
Jan. 3	1440	2.0	<0.1	1.56	7.14	0.0078	560	1.20	816

Outfall NP-0002 NPDES data for Q1 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	SET. SOLIDS	NITRATE	pH	LITHIUM	GROSS ALPHA	TOTAL URANIUM	
UNITS	GPD	mg/l	ml/l	mg/l		mg/l	pCi/l	mg/l	pCi/l
Jan. 3	5109	3.0	<0.1	1.68	6.1	<0.004	180	0.29	197
Feb. 5	56736	8.0	<0.1	2.31	6.1	0.0127	94	0.14	97
Mar. 1	1440	13.0	<0.1	4.72	6.25	ND	120	0.20	136

Outfall NP-003 NPDES data for Q1 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	SET. SOLIDS	NITRATE	pH	LITHIUM	GROSS ALPHA	TOTAL URANIUM	
UNITS	GPD	mg/l	ml/l	mg/l		mg/l	pCi/l	mg/l	pCi/l
Jan. 3	50490	5.0	<0.1	2.04	6.09	0.0084	2300	5.00	3400
Feb. 5	50500	4.0	<0.1	10.5	6.27	ND	210	0.28	192
Mar. 1	36700	13.0	<0.1	13.5	6.24	ND	1100	1.90	1292

TABLE 3-8 Results of Monthly NPDES Monitoring for NP-0001 through NP-0006 (Continued)

Outfall NP-0004 NPDES data for Q1 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	SET. SOLIDS	NITRATE	pH	LITHIUM	GROSS ALPHA	TOTAL URANIUM	
UNITS	GPD	mg/l	ml/l	mg/l		mg/l	pCi/l	mg/l	pCi/l
Mar. 11	Not Flowing	11.0	<0.1	2.0	6.76	ND	15	0.01	9.5

Outfall NP-0005 NPDES data for Q1 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	SET. SOLIDS	NITRATE	pH	LITHIUM	GROSS ALPHA	TOTAL URANIUM	
UNITS	GPD	mg/l	ml/l	mg/l		mg/l	pCi/l	mg/l	pCi/l
Jan. 3	250	13.0	<0.1	29.6	6.66	<0.004	1600	3.30	2244
Feb. 5	9360	5.0	<0.1	ND	5.95*	0.062	510	0.79	537
Mar. 1	11800	5.0	<0.1	29.4	6.51	ND	550	1.10	748

* Indicates value which exceeded effluent limitation

Outfall NP-0006 NPDES data for Q1 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	BOD	FECAL COLIFORMS	pH
UNITS	GPD	mg/l	mg/l	No./100 ml	
Jan. 30	1690	13	<2.0	<10	7.0
Feb. 13	2475	16	18.1*	77	6.3
Mar. 11	2385	1.0	<3.0	<1.0	7.0

* Indicates value which exceeded effluent limitation

4 AIR MONITORING

4.1 Radon Gas

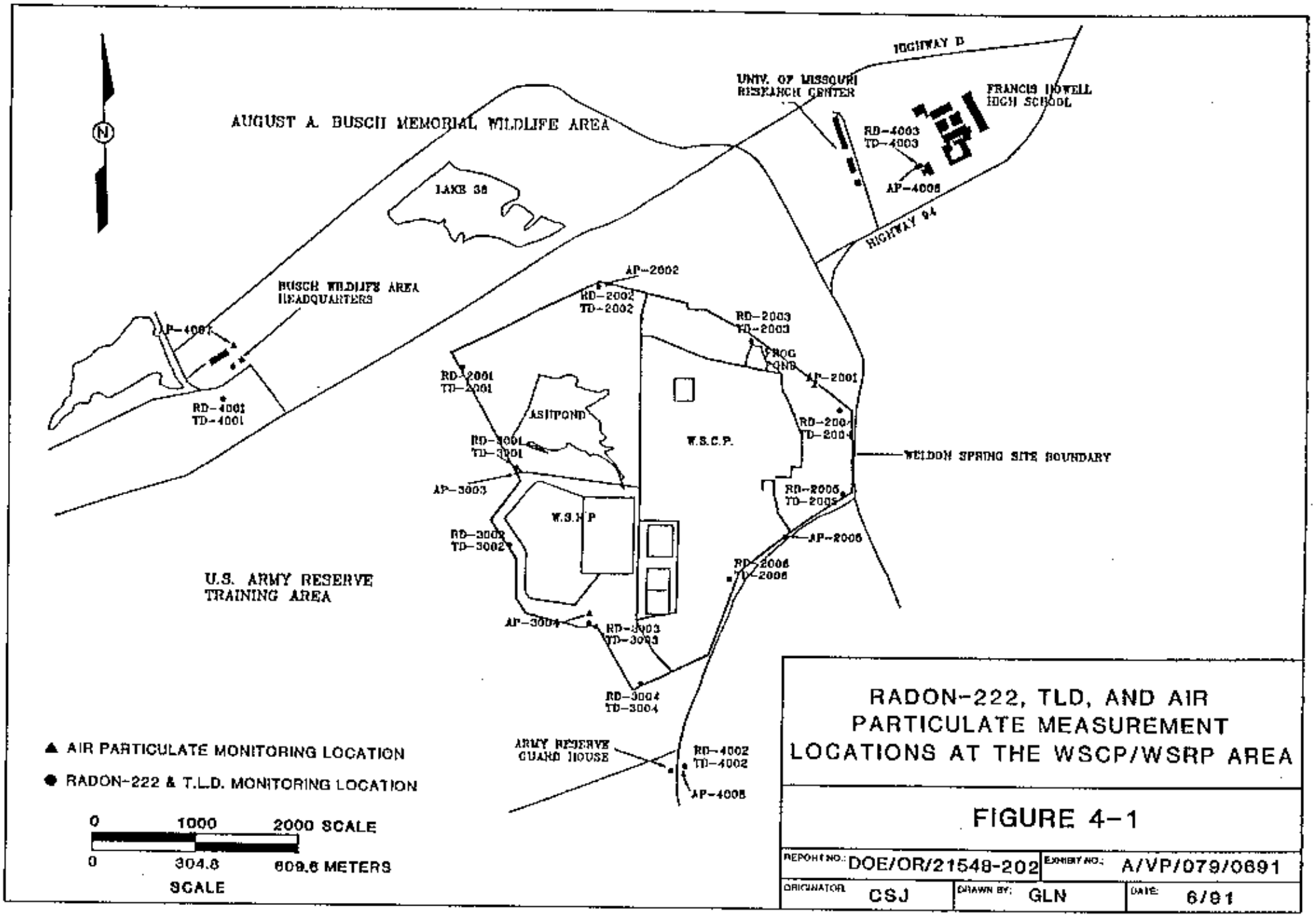
The radon gas monitoring program utilizes a pair of radon detectors at each of 22 permanent locations; each detector is exchanged quarterly. These detectors are deployed at six locations at the Weldon Spring Chemical Plant, six locations at the Weldon Spring quarry, four locations at the Weldon Spring raffinate pits, and six off-site locations. Radon monitoring locations are shown in Figures 4-1, 4-2, and 4-3. On-site detectors are distributed around the perimeter fences to ensure adequate detection of radon dispersing from the properties under various atmospheric conditions. Locations RD-4001, RD-4004, RD-4005, and RD-4006 were used to monitor background levels near the site.

Table 4-1 summarizes the first quarter 1991 radon concentrations detected at all site perimeter and off-site monitoring locations. Also contained in Table 4-1 is a comparison of the measured concentration with the Federally permitted radon concentration (for unrestricted areas) of 3 pCi/l (110 Bq/m^3) above background as authorized by U.S. Department of Energy (DOE) Order 5400.5.

An average ambient background concentration was determined by calculating the arithmetic average for the four background locations. This data yielded an average ambient background radon concentration of less than 0.1 pCi/l for the first quarter of 1991. This concentration was then subtracted from the concentration for each monitoring station, and compared to the DOE guideline of 3 pCi/l above background.

Radon concentrations at the site and quarry perimeters and at off-site locations for the first quarter of 1991 were within the typical range expected during years of normal precipitation. The quarterly radon concentrations (background included) ranged from less than 0.1 pCi/l at 10 locations to 0.9 pCi/l at monitoring location RD-1002.

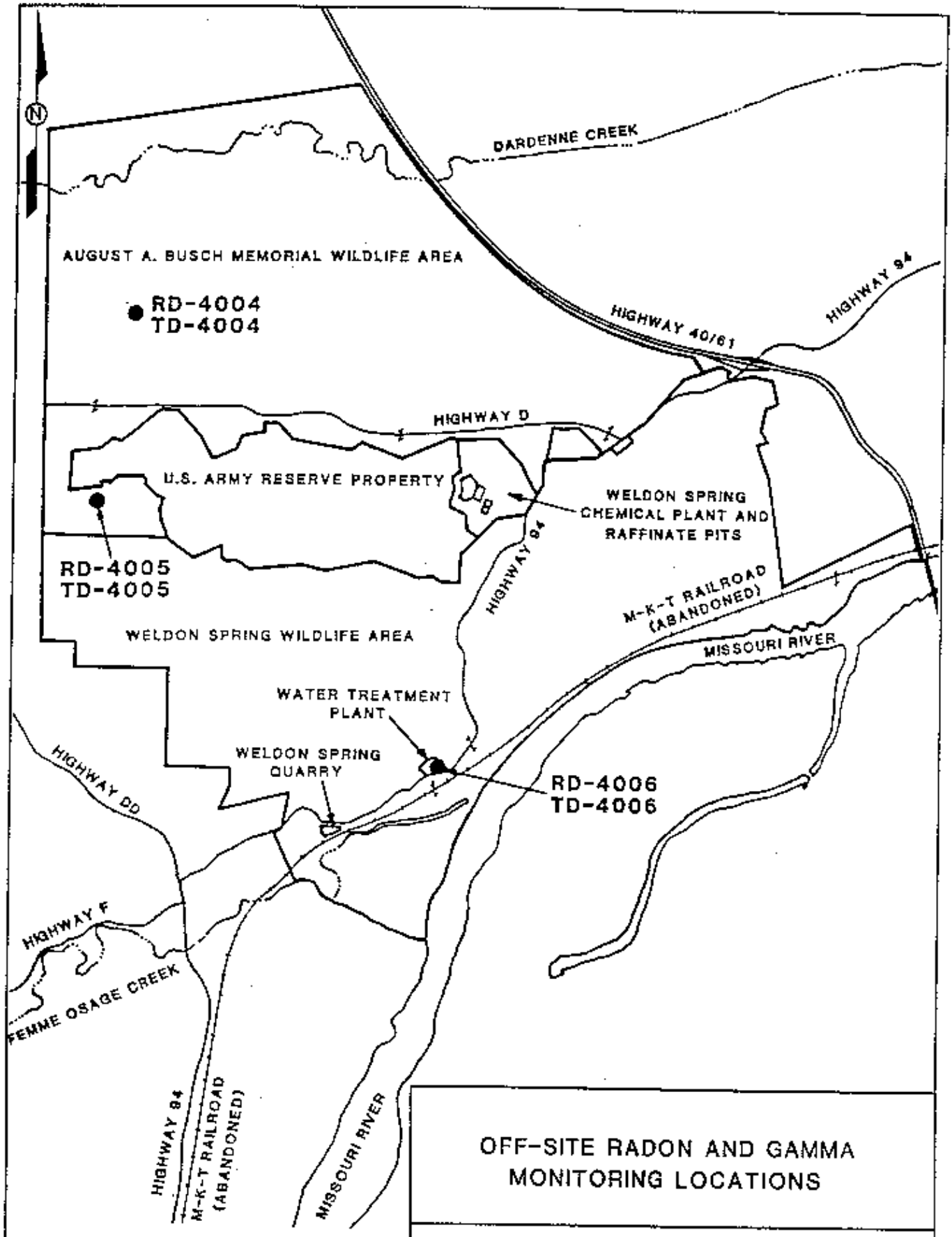
Radon concentrations found in the quarry are higher than concentrations measured at other locations because the radium concentrations in quarry wastes are typically much higher than other areas, and because the quarry is a large depression with side walls ranging from 3 m to 15 m (10 ft to 50 ft) high. In conjunction with stable meteorological



RADON-222, TLD, AND AIR PARTICULATE MEASUREMENT LOCATIONS AT THE WSCP/WSRP AREA

FIGURE 4-1

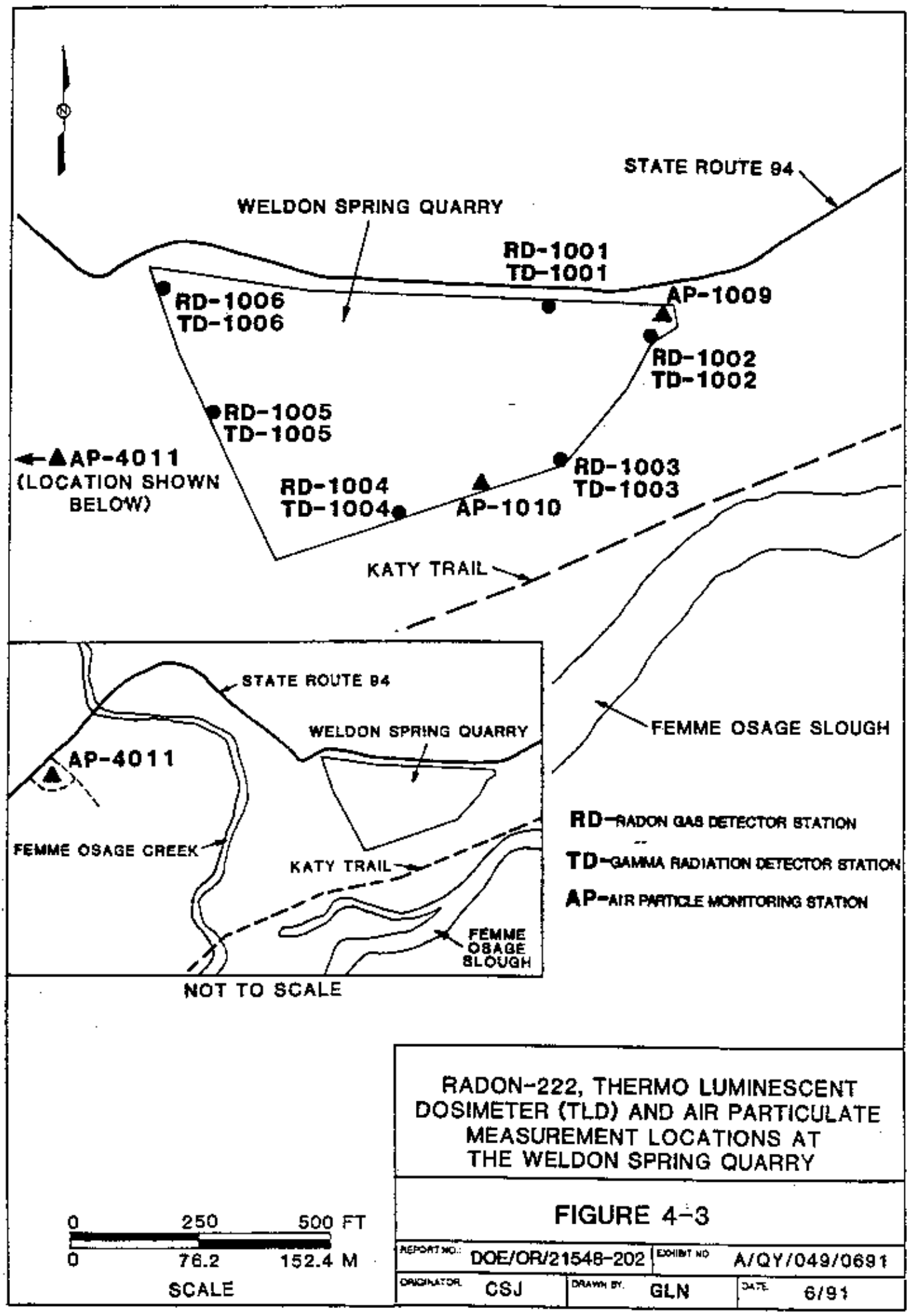
REPORT NO.: DOE/OR/21548-202		EXHIBIT NO.: A/VP/079/0691	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 6/91	



OFF-SITE RADON AND GAMMA MONITORING LOCATIONS

FIGURE 4-2

REPORT NO.: DOE/OR/21548-202		EXHIBIT NO.: A/VP/080/0691	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 6/91	



RADON-222, THERMO LUMINESCENT DOSIMETER (TLD) AND AIR PARTICULATE MEASUREMENT LOCATIONS AT THE WELDON SPRING QUARRY

FIGURE 4-3

REPORT NO.: DOE/OR/21548-202		EXHIBIT NO. A/QY/049/0691	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 6/91	

TABLE 4-1 1991 Track Etch Radon Results[a]

Location I.D.	1st quarter pCi/l	Percent of Guidance [b]
WSQ		
RD-1001	0.4	10
RD-1002	0.9	30
RD-1003	0.7	20
RD-1004	<0.1	0
RD-1005	0.5	13
RD-1006	0.2	3
WSCP		
RD-2001	<0.5	13
RD-2002	0.1	0
RD-2003	<0.1	0
RD-2004	<0.1	0
RD-2005	<0.1	0
RD-2006	<0.1	0
WSRP		
RD-3001	<0.1	0
RD-3002	<0.1	0
RD-3003	<0.2	3
RD-3004	0.1	0
OFF-SITE		
RD-4001*	<0.1	0
RD-4002	0.2	3
RD-4003	<0.2	3
RD-4004*	0.1	0
RD-4005*	<0.1	0
RD-4006*	<0.1	0

(a) Results include natural background.
(b) Percent of guideline calculated by taking the year-to-date average minus the average of the background stations divided by the DOE concentration guideline for RN-222 which is 3 pCi/l (100 Bq/m ^ 3)(Annual average above background) for uncontrolled areas.
* Denotes Background Station

conditions, this configuration tends to trap emanating radon within the quarry and raise the concentrations along the quarry perimeter.

4.2 Gamma Radiation Exposure

To monitor exposure from gamma radiation, spherical environmental thermoluminescent dosimeters (TLDs) were deployed at 22 locations. The gamma monitoring station locations are the same as the ambient radon monitoring locations (see Section 4.1).

Table 4-2 summarizes the quarterly and year-to-date results of total gamma radiation monitoring at the 16 Weldon Spring site (WSS) perimeter monitoring stations, Francis Howell High School, the Weldon Spring Army Reserve Training Area, and at the four background monitoring stations.

The annual average background gamma exposures measured with TLDs in 1989 and 1990 were 68 mR/year and 62 mR/year, respectively. The gamma exposures measured with TLDs in the first quarter of 1991 were consistent with 1989 and 1990 data. This was expected because no significant changes in the configuration or location of the wastes have occurred.

4.3 Radioactive Air Particulates

Eleven air particulate samplers monitor the Weldon Spring site. Five of these (AP–2001, AP-2002, AP-3003, AP-3004, and AP-2005) are located around the Weldon Spring Chemical Plant (WSCP) perimeter and two are located around the quarry perimeter as shown in Figure 4-3. Three monitoring stations (AP-4006, AP-4008, and AP-4011) are located off site at sensitive receptor locations; including Francis Howell High School, the Army Reserve property, and near a residential site west of the quarry. The monitoring station at the August A. Busch Wildlife Area (AP-4007) is used to monitor background levels in the vicinity of the WSCP. The off-site monitoring stations are also shown in Figure 4-2.

TABLE 4-2 1991 Environmental TLD Results[a]

Location I.D.	1st Quarter mrem
WSQ	
TD-1001	24
TD-1002	20
TD-1003	20
TD-1004	19
TD-1005	20
TD-1006	19
WSCP	
TD-2001	18
TD-2002	17
TD-2003	18
TD-2004	19
TD-2005	18
TD-2006	17
WSRP	
TD-3001	22
TD-3002	17
TD-3003	19
TD-3004	16
OFF-SITE	
TD-4001*	18
TD-4002	16
TD-4003	16
TD-4004*	19
TD-4005*	16
TD-4006*	17

(a) Results include natural background.
- Denotes loss of TLD.
* Denotes background station.

The sampling station near the August A. Busch Wildlife Area (ABWA) headquarters is used as a background air monitoring station. This station is approximately 0.8 km (0.5 mile) from the WSCP perimeter in a northwestern direction. The terrain between the WSCP and this sampling station is hilly and forested, providing a significant physical barrier to airborne particulates originating from the WSCP/ Weldon Spring raffinate pits (WSRP). In addition, winds from the southeast are relatively rare at the WSCP.

Table 4-3 summarizes the quarterly average concentrations and the standard deviations for the 11 air monitoring locations. The quarterly average concentration for each monitoring location was calculated by averaging either the weekly air particulate analysis results or the counting instrument's lower limit of detection (LLD), whichever was greater. The "<" sign in Table 4-3 appears when the actual average is less than the calculated average due to the use of LLD values in the calculation. The standard deviation for each of the monitoring locations was calculated using only results that were above the LLD. Locations AP-2005 and AP-4011 were not in operation for one and two weeks respectively, due to maintenance.

The first quarter net alpha concentrations ranged from 1.24×10^{-15} μCi/ml to 1.98×10^{-15} μCi/ml with $<1.50 \times 10^{-15}$ μCi/ml detected at the background station.

4.4 Asbestos

Air sampling for asbestos has been performed on a routine basis for three years. The monitoring data indicate no elevated levels of airborne asbestos during both asbestos abatement operations and during periods when no asbestos activities were in progress at the site. Since asbestos removal and handling operations were in progress during the first quarter 1991, perimeter asbestos sampling was performed. The results of asbestos analyses during the first quarter of 1991 were below the standard of 0.01 f/cc. Asbestos Analyses results are shown in Table 4-4.

TABLE 4-3 Radiological Air Particulate First Quarter 1991

MONITOR IDENTIFICATION NUMBER	QUARTERLY AVG. CONCENTRATION (1E-15 µCi/ml)	STANDARD DEVIATION	NUMBER OF WEEKS COLLECTED	NUMBER OF VALUES ABOVE LLD
AP-2001	1.62E-15	5.47E-16	13	12
AP-2002	1.45E-15	3.40E-16	13	13
AP-3003	1.50E-15	5.75E-16	13	13
AP-3004	<1.83E-15	6.57E-16	13	12
AP-2005	<1.75E-15	6.05E-16	12	10
AP-4006	<1.56E-15	4.17E-16	13	12
AP-4007*	<1.50E-15	3.30E-16	13	12
AP-4008	1.98E-15	7.08E-16	13	13
AP-1009	<1.60E-15	5.18E-16	13	12
AP1010	1.70E-15	4.80E-16	13	13
AP-4011	1.24E-15	5.29E-16	11	11

* Indicates background monitor station.
To convert µCi/ml to Bq/M^3, multiply by 3.7E10.

Table 4-4 Asbestos Analyses Results

Record #	Sample ID	Date	Location	Sample Time	Sample Volume	Fiberconc
SITE PERIMETER						
1	AA-2010-021591	02/15/91	AP-2001 DOWNWIND	305	4431.8	<0.001 LOD
2	AA-2011-021591	02/15/91	AP-3004 UPWIND	350	5075	<0.001 LOD
3	AA-2024-022291	02/22/91	AP-2005 DOWNWIND	490	4936	<0.001 LOD
4	AA-2025-022291	02/22/91	AP-3003 UPWIND	505	5085	<0.001 LOD
5	AA-2002-030191	03/01/91	AP-2005 UPWIND	480	4835	<0.001 LOD
6	AA-2003-030191	03/01/91	AP-3003 DOWNWIND	475	4785	<0.001 LOD
7	AA-2010-030891	03/08/91	AP-2005 UPWIND	590	5900	NONE DETECTED
8	AA-2011-030891	03/08/91	AP-3003 DOWNWIND	520	5200	NONE DETECTED
9	AA-2022-031591	03/15/91	AP-2005 UPWIND	410	4130	<0.001 LOD
10	AA-2023-031591	03/15/91	AP-3003 DOWNWIND	410	4141	<0.001 LOD

Table 4-4 Asbestos Analyses Results (Continued)

061491

FRANCIS HOWELL HIGH SCHOOL						
1*	AA-2001-021191	02/11/91	AP-4006	454		OVERLOADED
2*	AA-2003-021291	02/12/91	AP-4006	585		OVERLOADED
3	AA-2006-021491	02/14/91	AP-4006	379	5620.8	<0.0005 LOD
4	AA-2009-021591	02/15/91	AP-4006	440	6525.5	<0.0005 LOD
5**	AA-2012-021991	02/19/91	AP-4006	570	5742.2	0.165
6	AA-2015-022091	02/20/91	AP-4006	570	5742.2	<0.0005 LOD
7	AA-2018-022191	02/21/91	AP-4006	743	7485	<0.0005 LOD
8	AA-2023-022291	02/22/91	AP-4006	542	5420	<0.0002
9	AA-2026-022591	02/25/91	AP-4006	500	5035	<0.001 LOD
10	AA-2029-022691	02/26/91	AP-4006	740	7460	0.0001
11	AA-2032-022691	02/28/91	AP-4006	440	4432.5	0.003
12	AA-2001-030191	03/01/91	AP-4006	545	5490	0.0003
13	AA-2005-030491	03/04/91	AP-4006	495	4999.5	<0.001 LOD
14	AA-2007-030591	03/05/91	AP-4006	468	4714.6	<0.001 LOD
15	AA-2007-030591	03/05/91	AP-4006	468	4714.6	<0.001 LOD
16	AA-2009-030891	03/08/91	AP-4006	510	5151	<0.001 LOD
17	AA-2008-030691	03/06/91	AP-4006	558	5635.8	<0.001 LOD
18	AA-2012-031291	03/12/91	AP-4006	470	4747	<0.001 LOD
19	AA-2028-032591	03/25/91	AP-4006	470	4703.66	<0.001 LOD

* Probably due to windy conditions over dusty gravel road.
** Transmission Electron microscopy analysis indicates 0.165 f/cc to be non-asbestos.

LOD - Limit of detection
f/cc - fibers per cubic cm of air

(Asbestos abatement project commenced on 2/11/91 — 3/26/91 Building 302 and south corridor of Building 407)