Department of Energy
Oak Ridge Operations
Weldon Spring Site
Remedial Action Project Office
7295 Highway 94 South
St. Charles, Missouri 63304

December 18, 1991

ADDRESSEES:

QUARTERLY ENVIRONMENTAL DATA SUMMARY FOR THE THIRD 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 third quarter, highlights any potentially significant findings, and offers preliminary interpretations. Final interpretations will appear in the 1991 Annual Site Environmental Report.

The report indicates the occurrence of slightly elevated levels of total suspended solids for Outfalls NP-0001 and NP-0005 resulting from construction activities and a 2.24 inch rainfall prior to sampling.

If you have any questions please call Alan D. Gibson at (314)441-8978.

Sincerely,

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QUARTERLY ENVIRONMENTAL DATA SUMMARY THIRD QUARTER 1991

Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

DECEMBER 1991 **REV. 0**

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

Quarterly Environmental Data Summary Third Quarter 1991

Revision 0

December 1991

Prepared by

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and
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7295 Highway 94 South
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for the

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

ABSTRACT AND WELDON SPRING SITE QUARTERLY SELF ASSESSMENT THIRD 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 third 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, no significant differences were observed in off-site exposures during the third 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. 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.

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1 INTRODUCTION

This document is the sixth 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. 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. Quality control (QC) data for the third quarter are presented in tables throughout this document. This information provides insight as to the performance of the laboratory and the quality of the data. This

QC data is provided for information only. Final interpretation will be presented in the 1991 Annual Site Environmental Report (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

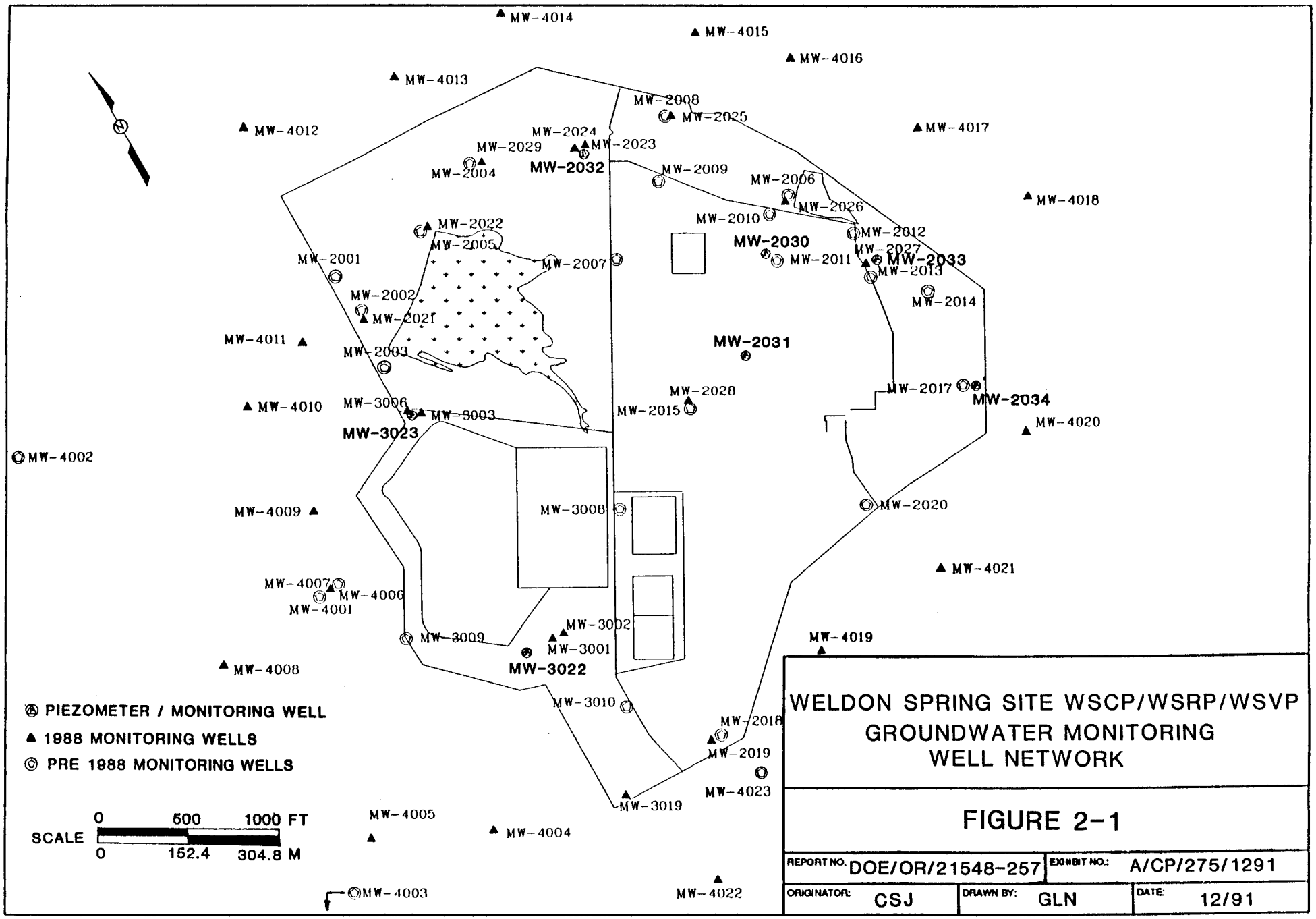
The groundwater at the chemical plant/raffinate pits/vicinity properties area is monitored on a semi-annual basis with the exception of MW-2001, MW-2002, MW-2003, MW-3003, MW-3006, MW-3008, MW-3009, MW-3023, MW-4012 and MW-4013 which are monitored quarterly. Monitoring well locations are shown in Figure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

2.1.1 Nitroaromatic Results

Table 2-1 contains nitroaromatic data from samples collected from the quarterly monitored groundwater wells at the WSCP/RP/VP area. Nitroaromatic compounds were detected in 18 samples. However, not all the data are currently available. The data available continues 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 U.S. Environmental Protection Agency (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.



WELDON SPRING SITE WSCP/WSRP/WSVP
GROUNDWATER MONITORING
WELL NETWORK

FIGURE 2-1

REPORT NO. DOE/OR/21548-257		EXHIBIT NO.: A/CP/275/1291	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 12/91	

TABLE 2-1 Third 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-Q391	ND	ND	0.073	0.061	ND	0.039
GW-2002-Q391	ND	ND	0.052	0.49	ND	0.037
GW-2003-080191	ND	ND	0.18	0.96	ND	ND
GW-2004-Q391	NA	NA	NA	NA	NA	NA
GW-2005-081491	ND	ND	0.089	0.14	ND	ND
GW-2006-Q391	NA	NA	NA	NA	NA	NA
GW-2007-Q391	NA	NA	NA	NA	NA	NA
GW-2008-071591	ND	ND	0.048	1.00	0.031	0.90
GW-2009-082291	ND	ND	0.074	0.33	ND	ND
GW-2010-091691	ND	ND	0.078	0.75	0.34	0.17
GW-2011-Q391	NA	NA	NA	NA	NA	NA
GW-2012-Q391	NA	NA	NA	NA	NA	NA
GW-2013-Q391	NA	NA	NA	NA	NA	NA
GW-2014-073091	ND	ND	0.12	0.86	ND	3.40
GW-2015-Q391	NA	NA	NA	NA	NA	NA
GW-2017-082291	ND	ND	ND	ND	ND	ND
GW-2018-082091	ND	ND	ND	ND	ND	ND
GW-2019-Q391	NA	NA	NA	NA	NA	NA
GW-2020-Q391	NA	NA	NA	NA	NA	NA
GW-2021-090391	ND	ND	ND	ND	ND	ND
GW-2022-081591	ND	ND	ND	ND	ND	ND
GW-2023-Q391	NA	NA	NA	NA	NA	NA
GW-2024-Q391	NA	NA	NA	NA	NA	NA
GW-2025-082691	ND	ND	ND	ND	ND	ND
GW-2026-081591	ND	ND	ND	ND	ND	ND
GW-2027-090391	ND	ND	ND	ND	ND	ND
GW-2028-Q391	NA	NA	NA	NA	NA	NA
GW-2029-Q391	NA	NA	NA	NA	NA	NA
GW-2030-Q391	NA	NA	NA	NA	NA	NA

TABLE 2-1 Third Quarter Nitroaromatic Data for Groundwater at the WSCP/RP/VP (Continued)

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-2031-Q391	NA	NA	NA	NA	NA	NA
GW-2032-Q391	NA	NA	NA	NA	NA	NA
GW-2033-Q391	NA	NA	NA	NA	NA	NA
GW-2034-Q391	NA	NA	NA	NA	NA	NA
GW-3001-Q391	NA	NA	NA	NA	NA	NA
GW-3002-Q391	NA	NA	NA	NA	NA	NA
GW-3003-091191	ND	ND	0.032	0.082	ND	ND
GW-3006-091191	ND	ND	ND	ND	ND	ND
GW-3008-091691	ND	ND	0.096	0.32	ND	ND
GW-3009-080191	ND	ND	0.16	0.11	ND	0.11
GW-3019-080891	ND	ND	ND	ND	ND	ND
GW-3022-Q391	NA	NA	NA	NA	NA	NA
GW-3023-091691	ND	ND	6.00	9.60	ND	ND
GW-4001-080691	ND	ND	7.40	6.80	1.60	64.0
GW-4002-080591	ND	ND	ND	0.069	0.093	0.10
GW-4003-080591	ND	ND	ND	ND	ND	ND
GW-4004-081991	ND	ND	ND	ND	ND	ND
GW-4005-081991	ND	ND	ND	ND	ND	ND
GW-4006-080891	ND	ND	0.19	6.40	ND	26.0
GW-4007-080691	ND	ND	ND	ND	ND	ND
GW-4008-080891	ND	ND	ND	ND	ND	ND
GW-4009-081391	ND	ND	ND	ND	ND	ND
GW-4010-070991	ND	ND	ND	ND	ND	ND
GW-4011-090991	ND	ND	ND	ND	ND	ND
GW-4012-091091	ND	ND	ND	ND	ND	ND
GW-4013-072391	ND	ND	0.086	1.90	0.066	86.0
GW-4014-072391	ND	ND	ND	0.053	ND	0.53
GW-4015-Q391	NA	NA	NA	NA	NA	NA

TABLE 2-1 Third Quarter Nitroaromatic Data for Groundwater at the WSCP/RP/VP (Continued)

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-4016-Q391	NA	NA	NA	NA	NA	NA
GW-4017-Q391	NA	NA	NA	NA	NA	NA
GW-4018-Q391	NA	NA	NA	NA	NA	NA
GW-4019-082091	ND	ND	ND	ND	ND	ND
GW-4020-Q391	NA	NA	NA	NA	NA	NA
GW-4021-090591	ND	ND	ND	ND	ND	ND
GW-4022-Q391	NA	NA	NA	NA	NA	NA
GW-4023-Q391	NA	NA	NA	NA	NA	NA
GW-0000-Q391	NA	NA	NA	NA	NA	NA

NA - Not Available
ND - Not Detected

TABLE 2-2 Third Quarter, Semiannual Uranium and Inorganic Anion Data in Groundwater at the WSCP/RP/VP

SAMPLE ID	NITRATE (mg/l)	SULFATE (mg/l)	URANIUM (pCi/l)
GW-2001-Q391	18.8	4.10	ND
GW-2002-Q391	232	97.5	ND
GW-2003-080191	223.0	121	0.60
GW-2004	NA	NA	NA
GW-2005-081491	70.6	21.2	2.00
GW-2006	NA	NA	NA
GW-2007-093091	NA	NA	0.87
GW-2008-071591	2.40	35.6	ND
GW-2009-082291	0.63	762	NA
GW-2010-091691	1.00	36.9	2.02
GW-2011-091991	4.18	11.8	NA
GW-2012-091991	0.40	62.9	NA
GW-2013-093091	NA	NA	ND
GW-2014-073091	1.86	42.6	ND
GW-2015	NA	NA	NA
GW-2017-082291	0.16	114	NA
GW-2018-082091	0.40	9.36	ND
GW-2019-091891	ND	49.5	NA
GW-2020	NA	NA	NA
GW-2021-090391	ND	16.3	NA
GW-2022-081591	ND	14.1	ND
GW-2023	NA	NA	NA
GW-2024-091891	ND	28.1	NA
GW-2025-082691	0.240	14.7	ND
GW-2026-081591	ND	18.0	NA
GW-2027-090391	ND	10.1	NA
GW-2028	NA	NA	ND
GW-2029	NA	NA	NA
GW-2030	NA	NA	NA

TABLE 2-2 Third Quarter, Semiannual Uranium and Inorganic Anion Data in Groundwater at the WSCP/RP/VP (Continued)

SAMPLE ID	NITRATE (mg/l)	SULFATE (mg/l)	URANIUM (pCi/l)
GW-2031	NA	NA	NA
GW-2032	NA	NA	NA
GW-2033	NA	NA	NA
GW-2034	NA	NA	NA
GW-3001	NA	NA	NA
GW-3002-082691	0.320	17.3	1.14
GW-3003-091191	253	227	20.5
GW-3006-091191	ND	22.0	2.31
GW-3008-091691	667	59.0	4.04
GW-3009-080191	94.5	82.5	0.90
GW-3010	NA	NA	NA
GW-3019-080891	ND	5.20	1.70
GW-3022	NA	NA	NA
GW-3023-091691	290	432	6.63
GW-4001-080691	25.6	63.2	0.30
GW-4002-080591	1.48	17.8	1.20
GW-4003-080591	0.71	32.1	2.30
GW-4004-081991	0.56	20.6	NA
GW-4005-081991	1.51	21.5	NA
GW-4006-080891	4.17	29.8	ND
GW-4007-080691	0.12	16.1	ND
GW-4008-080891	0.21	14.1	ND
GW-4009-081391	0.95	21.9	1.40
GW-4010-070991	ND	25.0	1.36
GW-4011-090991	25.3	53.8	2.88
GW-4012-091091	ND	44.7	3.46
GW-4013-072391	83.1	43.0	NA
GW-4014-072391	2.86	26.5	NA

TABLE 2-2 Third Quarter, Semiannual Uranium and Inorganic Anion Data in Groundwater at the WSCP/RP/VP (Continued)

SAMPLE ID	NITRATE (mg/l)	SULFATE (mg/l)	URANIUM (pCi/l)
GW-4015	NA	NA	NA
GW-4016	NA	NA	NA
GW-4017	NA	NA	NA
GW-4018-092491	11.0	7.10	0.87
GW-4019-082091	0.18	5.40	0.87
GW-4020	NA	NA	NA
GW-4021-090591	ND	320	NA
GW-4022	NA	NA	NA
GW-4023	NA	NA	NA

ND - Not Detected
NA - Not Available

The highest uranium level detected from the available data was 20.5 pCi/l from a sample obtained from Monitoring Well MW-3003. The 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 Weldon Spring Site Remedial Action Project (WSSRAP) priority.

Groundwater is currently being monitored in 48 wells in and around the quarry. Thirty-six monitoring wells installed by the DOE currently exist in or near the quarry. Four monitoring wells were installed by St. Charles County in 1986 and are currently included in the DOE's monitoring program. Eight St. Charles County municipal wells are also 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 and MW-1010 and MW-1011. The second program is a quarterly sampling of all wells south of the Femme Osage Slough, excluding MW-1010 and MW-1011 but including the St. Charles

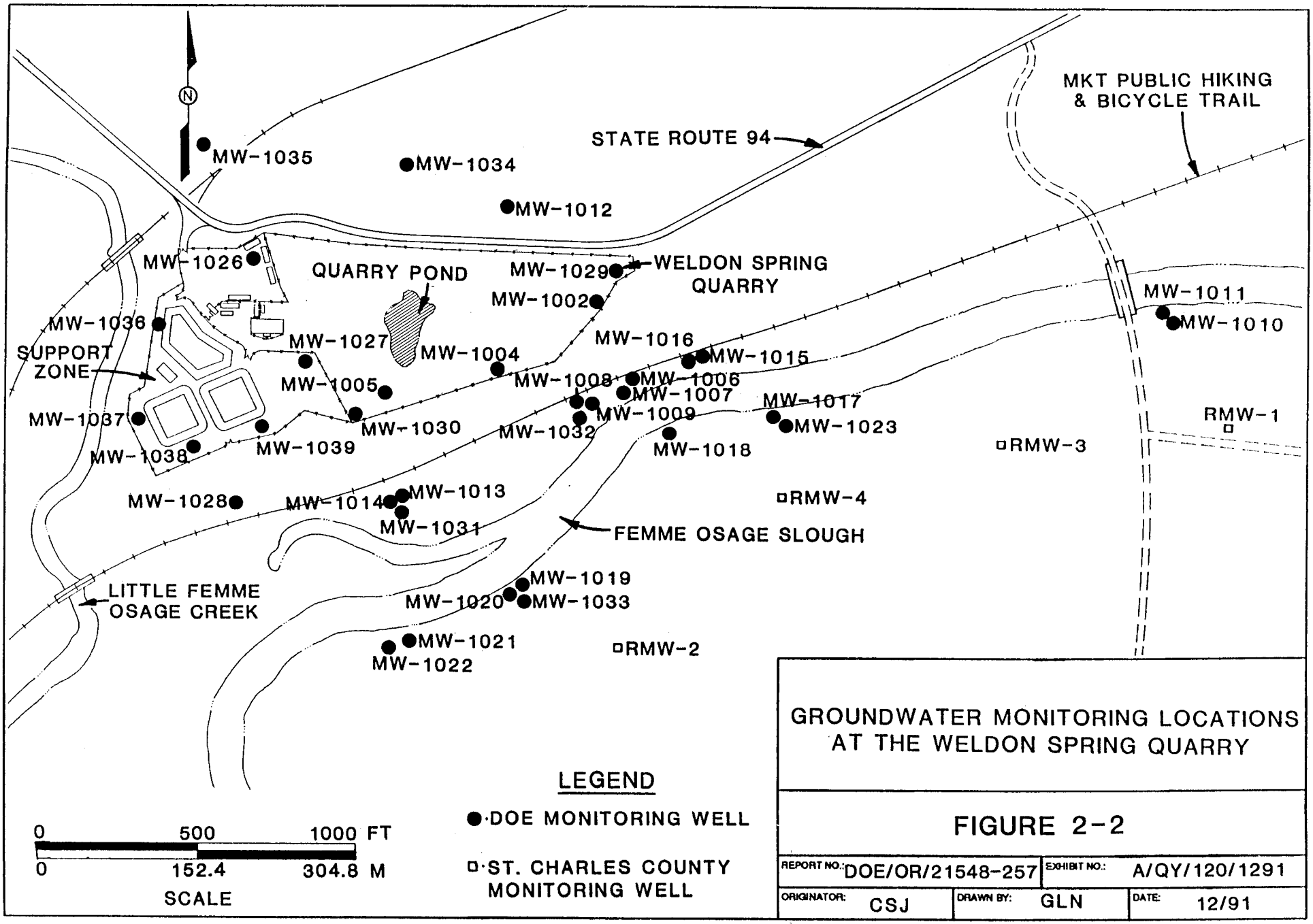
TABLE 2-3 Geochemical Results for Groundwater at the WSCP/RP/VP

SAMPLE ID	ARSENIC (µg/l)	BARIUM (µg/l)	CALCIUM (µg/l)	CHROMIUM (µg/l)	IRON (µg/l)	LITHIUM (µg/l)	MAGNESIUM (µg/l)	MANGANESE (µg/l)	NICKEL (µg/l)
GW-2001-Q391	ND	222	93600	ND	ND	ND	43300	ND	ND
GW-2002-Q391	ND	176	237000	ND	ND	404	91500	ND	146
GW-2003-080191	ND	140	244000	ND	ND	404	83400	ND	ND
GW-3003-091191	ND	109	202000	ND	ND	441	112000	27.9	27.2
GW-3006-091191	ND	110	53100	ND	100	ND	41600	77.5	ND
GW-3008-091691	ND	274	600000	ND	ND	228	156000	ND	97.1
GW-3009-080191	ND	1210	111000	ND	ND	ND	64100	8.40	78.6
GW-3023-091691	ND	179	409000	128	19000	813	92400	372	327
GW-4012-091091	ND	66.2	40100	34.0	ND	ND	29500	ND	ND
GW-4013-	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2-3 Geochemical Results for Groundwater at the WSCP/RP/VP (Continued)

SAMPLE ID	POTASSIUM (µg/l)	SODIUM (µg/l)	STRONTIUM (µg/l)	NITRITE (µg/l)	BROMIDE (µg/l)	CHLORIDE (µg/l)	PHOSPHORUS TOTAL (µg/l)	SILICA, DISSOLVED (µg/l)	ALKALINITY (mg/l)
GW-2001-Q391	1250	9050	101	ND	976	5060	700	8710	331
GW-2002-Q391	8590	117000	330	ND	1250	8700	100	12400	280
GW-2003-080191	6870	102000	415	ND	1110	7800	340	10000	321
GW-3003-091191	8580	100000	531	350	510	9200	200	9700	348
GW-3006-091191	ND	14500	197	ND	900	1400	100	10800	386
GW-3008-091691	1910	1960000	2620	ND	990	1590	80	12600	270
GW-3009-080191	2180	22900	225	185	470	3650	150	8480	161
GW-3023-091691	4160	1860000	670	1080	750	15800	10	11800	294
GW-4012-091091	27000	29000	152	ND	800	2600	100	11200	320
GW-4013-	NA	NA	NA	NA	NA	NA	NA	NA	322

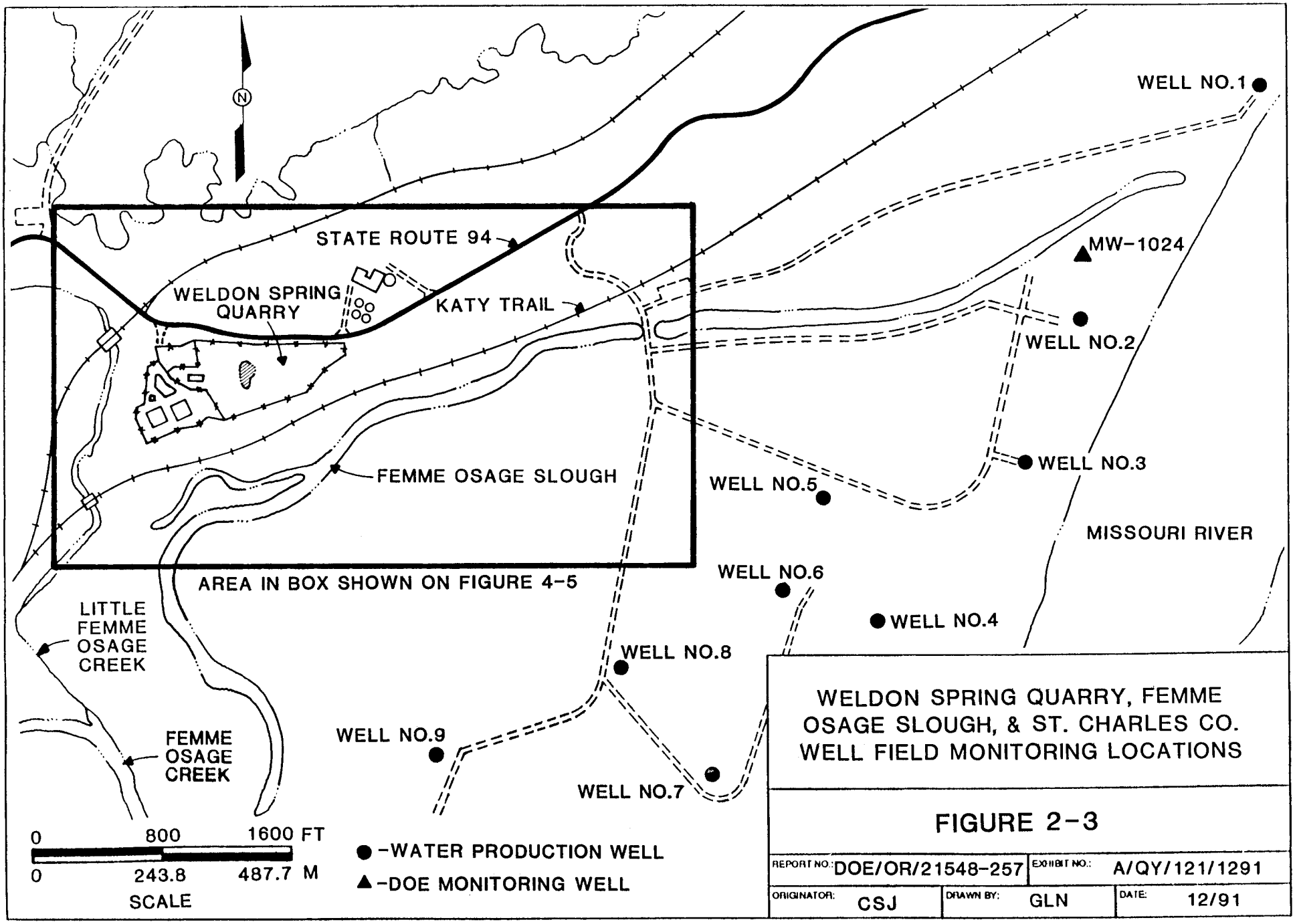
NA -Not Available
ND - Not Detected



GROUNDWATER MONITORING LOCATIONS AT THE WELDON SPRING QUARRY

FIGURE 2-2

REPORT NO.: DOE/OR/21548-257		EXHIBIT NO.: A/QY/120/1291	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 12/91	



WELDON SPRING QUARRY, FEMME OSAGE SLOUGH, & ST. CHARLES CO. WELL FIELD MONITORING LOCATIONS

FIGURE 2-3

REPORT NO.: DOE/OR/21548-257	EXHIBIT NO.: A/QY/121/1291		
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 12/91	

County well field. Both the raw and treated waters from the St. Charles County water treatment plant are also sampled.

2.2.1 Radiological Results

Radiological data are presented in Tables 2-4 and 2-5 for samples collected on a bimonthly and quarterly bases. The results show typical fluctuations near the average levels in the WSQ area with no dramatic increases.

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 third 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 and 2-5 display the analytical results for the fourth bimonthly sampling event and the third 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 arsenic and barium. Analytical results for these metals are presented in Tables 2-8 and 2-9. Results from the fourth bimonthly and third quarter analyses of arsenic and barium continue to indicate elevated concentrations in selected wells. The highest levels reported are 146 μg/l for arsenic in MW-1022 and 5,380 μg/l for barium detected in RMW-3.

TABLE 2-4 Fourth Bimonthly (July/Aug) Inorganic Anions and Radiological Results in Groundwater at the Weldon Spring Quarry

SAMPLE ID	NITRATE (mg/l)	SULFATE (mg/l)	URANIUM (pCi/l)
GW-1002-071691	1.93	49.5	NA
GW-1004-072291	0.113	305	4870
GW-1005-071691	ND	201	NA
GW-1006-081291	1.27	418	2870
GW-1007-081291	0.24	12.7	18.7
GW-1008-081291	ND	245	3220
GW-1009-081291	ND	341	9.80
GW-1010-080291	NS	NS	ND
GW-1011-080291	NS	NS	20.5
GW-1012-072991	1.57	49.6	2.30
GW-1013-081391	ND	116	888
GW-1014-081391	ND	88.6	995
GW-1015-081391	5.50	306	1480
GW-1016-081391	2.95	341	660
GW-1026-070991	ND	ND	ND
GW-1027-071591	0.18	129	336
GW-1028-081991	ND	72.3	1.73
GW-1029-072291	ND	89.1	2.90
GW-1030-072291	0.13	58.5	11.0
GW-1031-073091	184	42.6	41.8
GW-1032-073091	ND	274	657
GW-1033-092691	NA	NA	NA
GW-1034-072991	0.27	104	2.30
GW-1035-072991	ND	33.0	ND
GW-1036-073191	ND	81.5	4.60
GW-1037-073191	ND	17.8	1.20
GW-1038-073191	ND	57.0	3.80
GW-1039-073191	ND	21.9	37.8
GW-0000-082291-WB	NS	NS	1.73

ND - Not Detected NA - Not Detected NS - Not Sampled WB - Water Blank

TABLE 2-5 Third Quarter Inorganic Anions and Radiological Results for the Weldon Spring Quarry

SAMPLE ID	NITRATE (mg/l)	SULFATE (mg/l)	URANIUM (pCi/l)	GROSS ALPHA (pCi/l)
GW-1010-Q391	ND	ND	ND	NA
GW-1011-Q391	ND	9.71	9.52	NA
GW-1017-Q391	ND	ND	ND	NA
GW-1018-071891	ND	ND	0.86	NA
GW-1019-071891	ND	ND	ND	NA
GW-1020-071891	ND	ND	ND	NA
GW-1021-081491	ND	3.00	2.90	NA
GW-1022-081491	ND	3.54	1.20	NA
GW-1023-Q391	ND	ND	ND	NA
GW-1024-Q391	ND	6.40	ND	7.90
GW-RMW1-Q391	ND	38.2	1.73	2.60
GW-RMW2-Q391	ND	28.9	5.77	10.2
GW-RMW3-Q391	ND	ND	2.59	ND
GW-RMW4-Q391	0.51	31.3	2.02	0.60
GW-RAWW-Q391	ND	71.5	ND	1.82
GW-FINW-Q391	ND	78.0	ND	0.48
GW-PW02	NS	NS	0.90	3.10
GW-PW03	NS	NS	0.60	4.50
GW-PW04	NS	NS	ND	3.00
GW-PW05	NS	NS	ND	4.60
GW-PW06	NS	NS	ND	1.30
GW-PW07	NS	NS	ND	1.80
GW-PW08	NS	NS	ND	2.90
GW-PW09-Q391	ND	36.6	0.58	ND
GW-RMWX-Q391	ND	28.6	NA	NA

ND - Not Detected
NA - Not Available
NS - Not Sampled
X - Laboratory Blind Duplicate

TABLE 2-6 Fourth Bimonthly (July/Aug) Nitroaromatic Data for Groundwater at the Weldon Spring Quarry

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-1002-071691	ND	0.19	0.031	19.0	54.0	280
GW-1004-072291	ND	ND	4.00	6.00	13.0	7.20
GW-1005-071691	ND	ND	0.14	0.061	ND	ND
GW-1006-081291	ND	ND	0.21	6.10	32.0	220
GW-1007-081291	ND	ND	ND	ND	ND	ND
GW-1008-081291	ND	ND	ND	0.037	ND	ND
GW-1009-081291	ND	ND	ND	ND	ND	ND
GW-1010-Q391	ND	ND	ND	ND	ND	ND
GW-1011-Q391	ND	ND	ND	ND	ND	ND
GW-1012-072991	ND	ND	ND	ND	ND	ND
GW-1013-081391	ND	0.13	ND	0.040	ND	ND
GW-1014-081391	ND	ND	0.037	0.013	ND	ND
GW-1015-081391	ND	ND	0.065	1.00	34.0	300
GW-1016-081391	ND	ND	ND	0.30	9.50	75.0
GW-1026-070991	ND	ND	ND	ND	ND	ND
GW-1027-071591	ND	ND	0.10	3.60	68.0	0.12
GW-1028-081991	ND	ND	ND	ND	ND	ND
GW-1029-072291	ND	ND	ND	ND	ND	ND
GW-1030-072291	ND	ND	0.056	ND	ND	ND
GW-1031-073091	ND	ND	ND	ND	ND	ND
GW-1032-073091	ND	ND	0.040	0.36	0.12	ND
GW-1033-Q391	NA	NA	NA	NA	NA	NA
GW-1034-072991	ND	ND	ND	ND	ND	ND
GW-1035-072991	ND	ND	ND	ND	ND	ND
GW-1035-082191	ND	ND	ND	ND	ND	ND
GW-1036-073191	ND	ND	ND	ND	ND	ND
GW-1036-082191	ND	ND	ND	ND	ND	ND
GW-1037-073191	ND	ND	ND	ND	ND	ND
GW-1037-082191	ND	ND	ND	ND	ND	ND
GW-1038-073191	ND	ND	ND	ND	ND	ND

TABLE 2-6 Fourth Bimonthly (July/Aug) Nitroaromatic Data for Groundwater at the Weldon Spring Quarry (Continued)

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-1038-082091	ND	ND	ND	ND	ND	ND
GW-1039-073191	ND	ND	ND	ND	ND	ND
GW-1039-082091	ND	ND	ND	ND	ND	ND

ND - Not Detected
NA - Not Available

TABLE 2-7 Third Quarter Nitroaromatic Data for Groundwater at the Weldon Spring Quarry

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-Q391	ND	ND	ND	ND	ND	ND
GW-1011-Q391	ND	ND	ND	ND	ND	ND
GW-1017-Q391	ND	ND	ND	ND	ND	ND
GW-1018-071891	ND	ND	ND	ND	ND	ND
GW-1019-071891	ND	ND	ND	ND	ND	ND
GW-1020-071891	ND	ND	ND	ND	ND	ND
GW-1021-081491	ND	ND	ND	ND	ND	ND
GW-1022-081491	ND	ND	ND	ND	ND	ND
GW-1023-Q391	ND	ND	ND	ND	ND	ND
GW-1024-071591	ND	ND	ND	ND	ND	ND
GW-RMW1-Q391	ND	ND	ND	ND	ND	ND
GW-RMW2-Q391	ND	ND	ND	ND	ND	ND
GW-RMW3-Q391	ND	ND	ND	ND	ND	ND
GW-RMW4-Q391	ND	ND	ND	ND	ND	ND
GW-RMWX-Q391	ND	ND	ND	ND	ND	ND
GW-RAWW-Q391	ND	ND	ND	ND	ND	ND
GW-FI NW-Q391	ND	ND	ND	ND	ND	ND
GW-PW02-Q391	ND	ND	ND	ND	ND	ND
GW-PW03-Q391	ND	ND	ND	ND	ND	ND
GW-PW04-Q391	ND	ND	ND	ND	ND	ND
GW-PW05-Q391	ND	ND	ND	ND	ND	ND
GW-PW06-Q391	ND	ND	ND	ND	ND	ND
GW-PW07-Q391	NA	NA	NA	NA	NA	NA
GW-PW08-Q391	NA	NA	NA	NA	NA	NA
GW-PW09-Q391	ND	ND	ND	ND	ND	ND

ND - Not Detected
NA - Not Available

TABLE 2-8 Fourth Bimonthly (July/Aug) Results for Metals in Groundwater at the Weldon Spring Quarry

SAMPLE ID	ARSENIC (µg/l)	BARIUM (µg/l)
GW-1002-071691	ND	116
GW-1004-072291	ND	32.4
GW-1005-071691	ND	50.0
GW-1006-081291	ND	31.4
GW-1007-081291	30.4	374
GW-1008-081291	ND	43.9
GW-1009-081291	5.88	311
GW-1012-072991	ND	125
GW-1013-081391	2.63	126
GW-1014-081391	ND	128
GW-1015-081391	ND	118
GW-1016-081391	ND	122
GW-1026-070991	25.8	357
GW-1027-071591	ND	86.7
GW-1028-081991	ND	283
GW-1029-072291	ND	96.6
GW-1030-072291	6.20	266
GW-1031-073091	ND	111
GW-1032-073091	ND	138
GW-1033	NA	NA
GW-1034-072991	ND	161
GW-1035-082191	ND	277
GW-1036-082191	ND	252
GW-1037-082191	ND	573
GW-1038-082091	ND	215
GW-1039-082091	ND	417

ND - Not Detected
NA - Not Available

TABLE 2-9 Third Quarter Results for Metals in Groundwater at the Weldon Spring Quarry

SAMPLE ID	ARSENIC (µg/l)	BARIUM (µg/l)
GW-1010-Q391	98.7	317
GW-1011-Q391	4.39	178
GW-1017-Q391	144	835
GW-1018-071891	110	533
GW-1019-071891	80.9	794
GW-1020-071891	21.5	357
GW-1021-081491	90.2	680
GW-1022-081491	146	429
GW-1023-Q391	67.0	275
GW-1024-Q391	5.87	412
GW-RMW1-Q391	4.06	516
GW-RMW2-Q391	6.82	218
GW-RMW3-Q391	10.3	5380
GW-RMW4-Q391	ND	166
GW-RAWW-Q391	ND	320
GW-FINW-Q391	ND	82.3
GW-PW02-Q391	ND	241
GW-PW03-Q391	ND	240
GW-PW04-Q391	ND	221
GW-PW05-Q391	ND	310
GW-PW06-Q391	ND	303
GW-PW07-Q391	ND	437
GW-PW08-Q391	4.35	423
GW-PW09-Q391	3.62	403

ND - Not Detected

3 SURFACE WATER MONITORING

Routine samples were collected during the third 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 Annual Site Environmental Report (ASER).

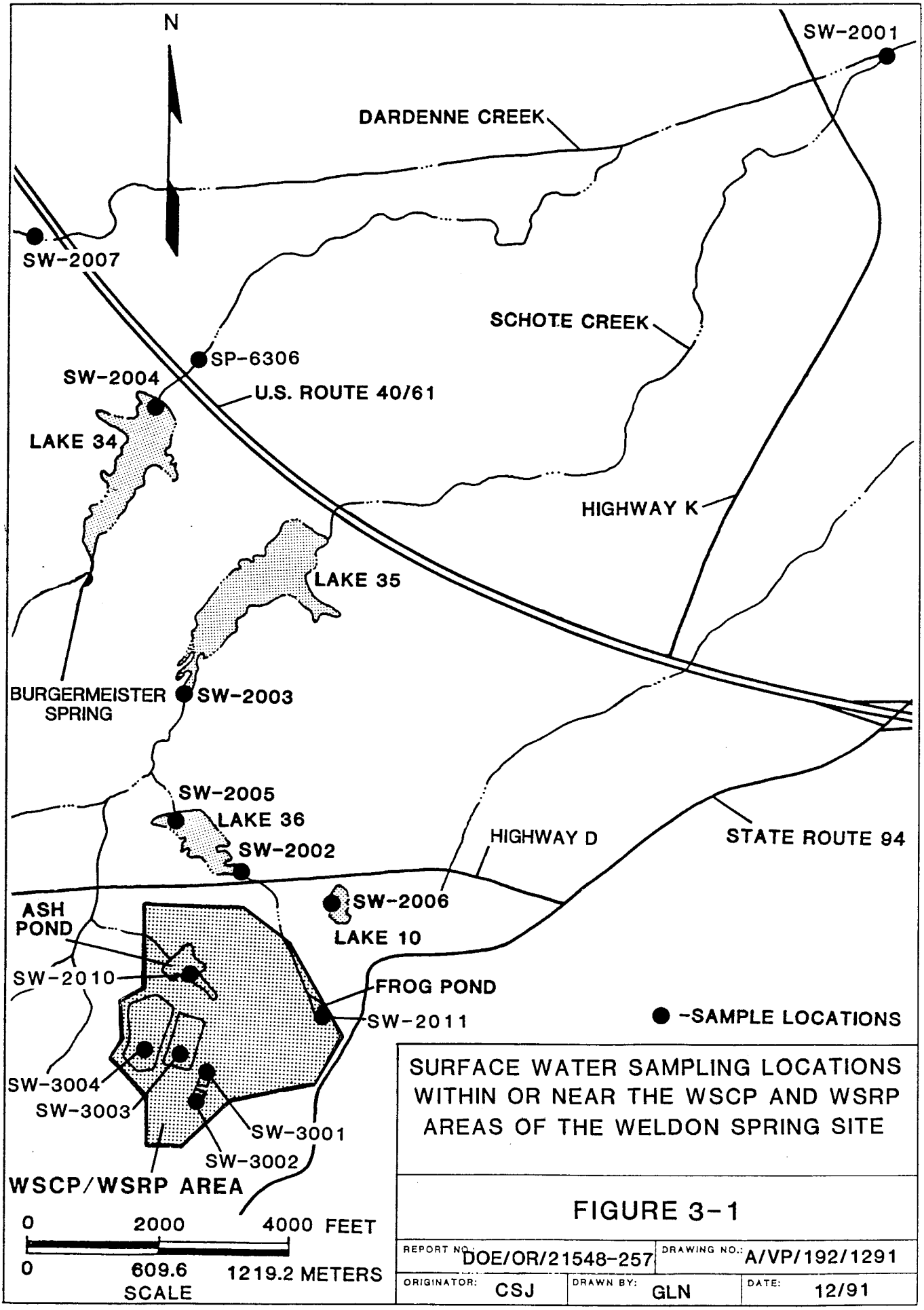
3.1 Chemical Plant/Raffinate Pits/Vicinity Properties

During the third quarter, surface water samples were collected from the 13 surface water sampling locations shown in Figure 3-1 and analyzed for uranium. The results, presented in Table 3-1, indicate that conditions remain similar to values measured historically.

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, and the results are presented in Table 3-2. The results of all samples indicate no apparent changes in environmental conditions. The highest measured level was 667 pCi/l detected at sampling location SW-1008, the quarry sump.

The third quarter uranium values measured in the Missouri River that are available are nearly the same as were 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.



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

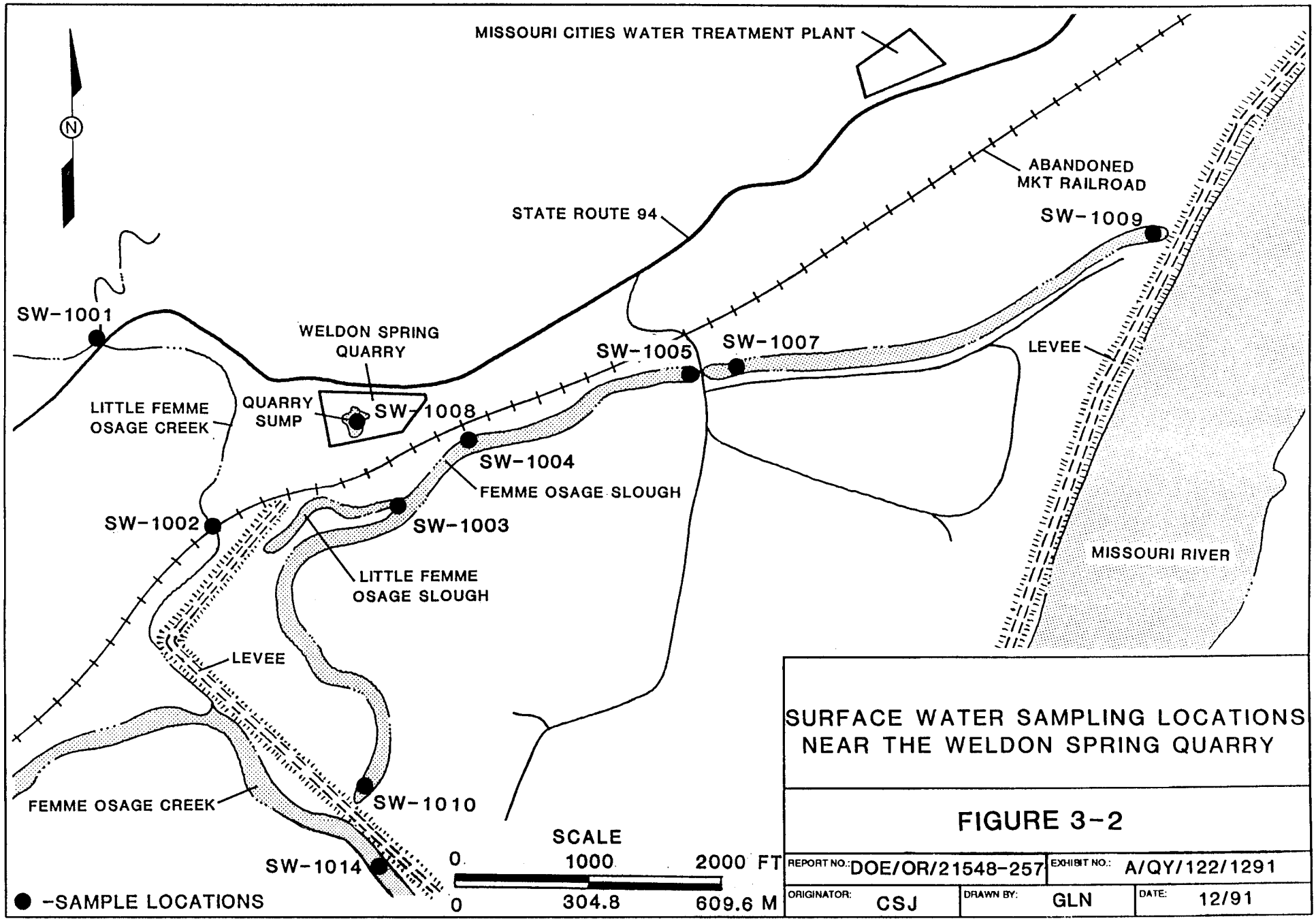
FIGURE 3-1

REPORT NO.: DOE/OR/21548-257	DRAWING NO.: A/VP/192/1291	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 12/91

TABLE 3-1 Third Quarter Uranium Results in Surface Water at the WSCP/RP/VP

SAMPLE ID	URANIUM, TOTAL (pCi/l)
SW-2001-Q391	ND
SW-2002-Q391	NA
SW-2003-Q391	2.72
SW-2004-Q391	6.12
SW-2005-Q391	4.76
SW-2007-Q391	ND
SW-2010-Q391	363
SW-2011-Q391	171
SW-2111-Q391	167
SW-3001-Q391	82.2
SW-3002-Q391	359
SW-3003-Q391	1590
SW-3004-Q391	213

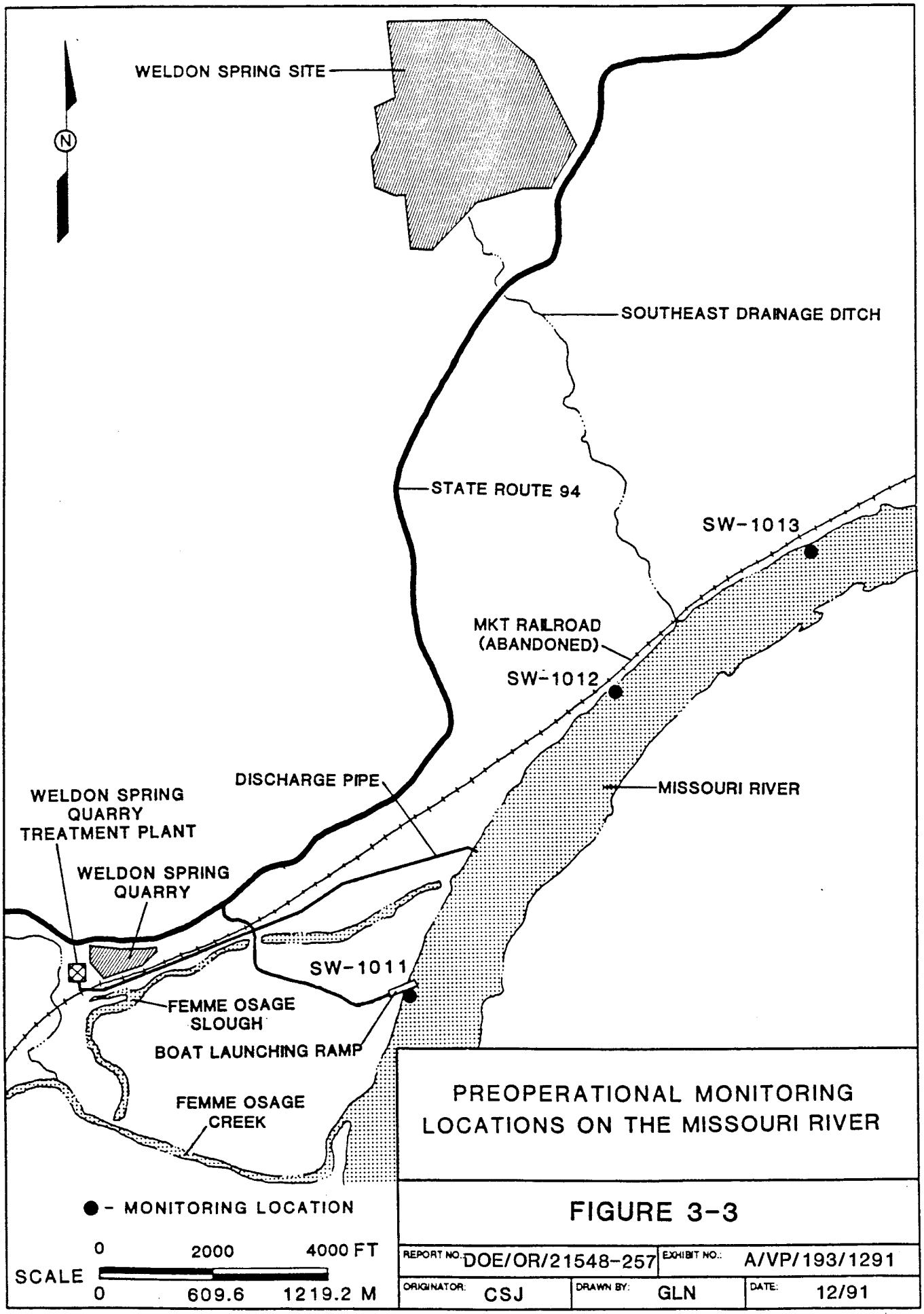
ND - Not Detected
NA - Not Available



SURFACE WATER SAMPLING LOCATIONS NEAR THE WELDON SPRING QUARRY

FIGURE 3-2

REPORT NO.: DOE/OR/21548-257		EXHIBIT NO.: A/QY/122/1291	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 12/91	



PREOPERATIONAL MONITORING LOCATIONS ON THE MISSOURI RIVER

FIGURE 3-3

REPORT NO.: DOE/OR/21548-257		EXHIBIT NO.: A/VP/193/1291	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 12/91	

TABLE 3-2 Third Quarter Uranium Results in Surface Water at the Weldon Spring Quarry

SAMPLE ID	URANIUM, TOTAL (pCi/l)
SW-1001-Q391	6.00
SW-1002-Q391	3.00
SW-1003-Q391	46.0
SW-1004-Q391	71.0
SW-1005-Q391	31.0
SW-1007-Q391	14.0
SW-1008-Q391	667
SW-1009-Q391	10.0
SW-1010-Q391	61.0
SW-1011-Q391	4.00
SW-1012	NA
SW-1013	NA
'SW-1014-Q391	1.00
SW-1105-Q391	35.0
SW-1114-Q391	3.00

NA - Not Available

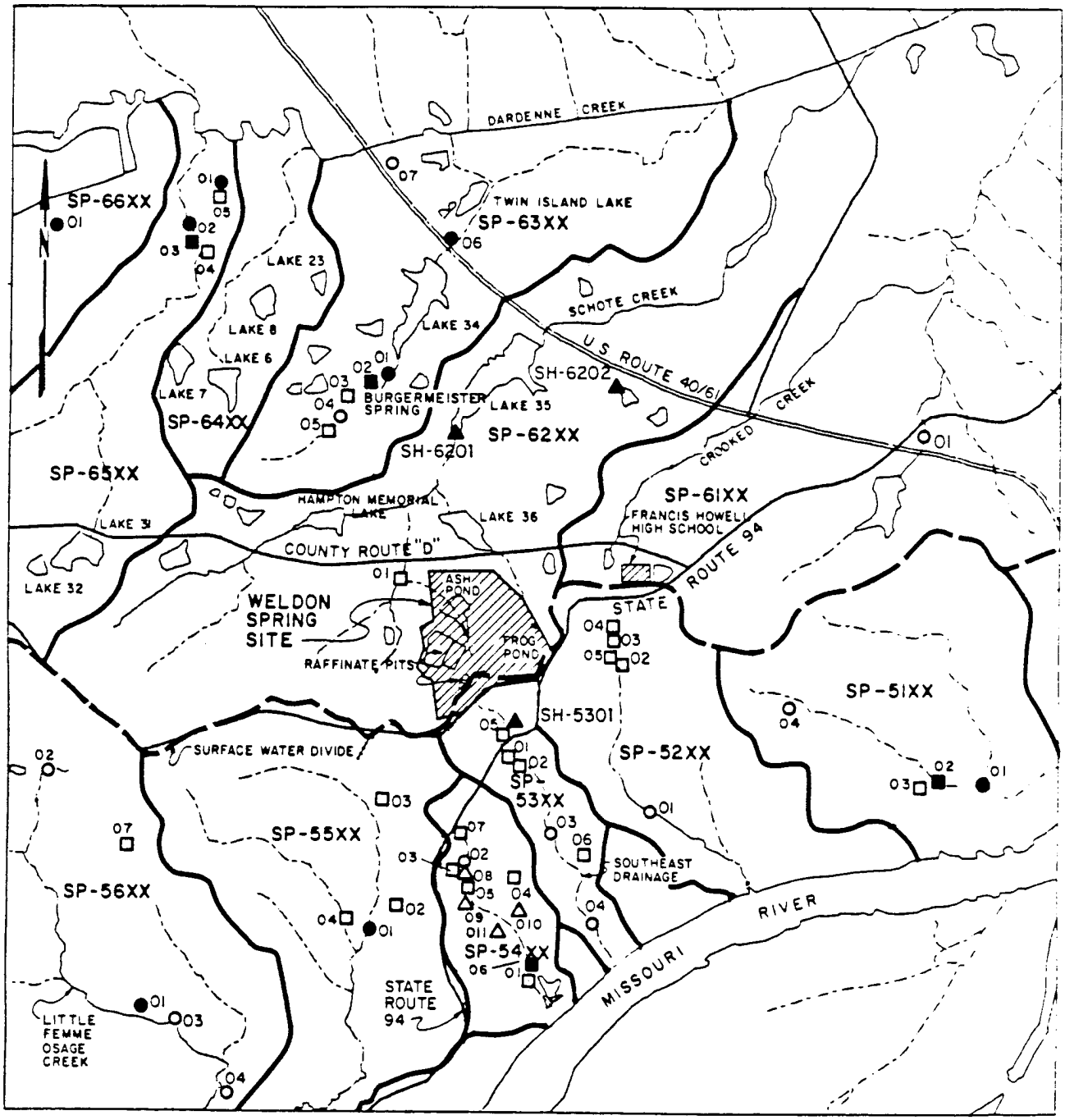
The analytical results for the six nitroaromatic compounds within the quarry sump were not available at the time of this report. The ponded water is to be treated for nitroaromatic compounds and other organics upon completion of the quarry water treatment plant.

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 include 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. Available analytical results for these parameters are listed in Tables 3-3 and 3-4. 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 NPDES permits. Permit No. MO-0107701 was issued on October 1, 1990, and currently addresses the five storm water and two wastewater discharges shown in Figure 3-5. Outfalls NP-0001 through NP-0005 represent storm water discharges; Outfall NP–0006 represents the treated effluent discharge associated with the administration building sanitary wastewater treatment plant, and Outfall NP-0007 represents the contaminated site water treatment plant which is under contract but not yet constructed. Outfalls NP-0006 and NP-0007 have effluent limitations. The five storm water outfalls have monitoring requirements only. Third quarter 1991 analytical data for each outfall is presented in Table 3-5. Permit No. MO-0108987 was issued on May 5, 1989, for Outfall NP-1001 of the Weldon Spring Quarry contaminated water treatment plant. The plant is not completely constructed and no discharge took place during the third quarter of 1991.



SOURCE: MDNR, 1989

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

SPRINGS AND SEEPS IN THE VICINITY OF THE WSS

FIGURE 3-4

REPORT NO.: DOE/OR/21548-257		EXHIBIT NO.: A/VP/194/1291	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 12/91	

TABLE 3-3 Third Quarter Uranium Results in Springs Near the Weldon Spring Site

SAMPLE ID	TOTAL URANIUM (pCi/l)
SP-5201	ND
SP-5203	NA
SP-5301	314
SP-5302	365
SP-5302-Q391-DU	4010
SP-5303	300
SP-5304	172
SP-5503	0.58
SP-5601	ND
SP-6301	66.6
SP-6302	NA
SP-6303	2.31
SP-6303-Q391-DU	43.5
SP-6306	1.44

NA - Not Available
ND - Not Detected
DU - Duplicate Sample

TABLE 3-4 Third Quarter Nitroaromatic Results in Springs Near the Weldon Spring Site

SAMPLE ID	1,3,5-TRINITROBENZENE	1,3-DINITROBENZENE	2,4,6-TNT	2,4-DNT	2,6-DNT	NITROBENZENE
SP-6301-Q391	0.09	ND	0.29	0.04	0.46	ND
SP-6302	NA	NA	NA	NA	NA	NA
SP-6303-Q391	0.30	ND	0.51	0.09	0.86	ND
SP-6306-Q391	ND	ND	ND	ND	ND	ND
SP-6306-Q391-DU	0.86	ND	ND	ND	0.97	ND

ND - Not Detected
NA - Not Available

3.4.1 Radiological Analysis

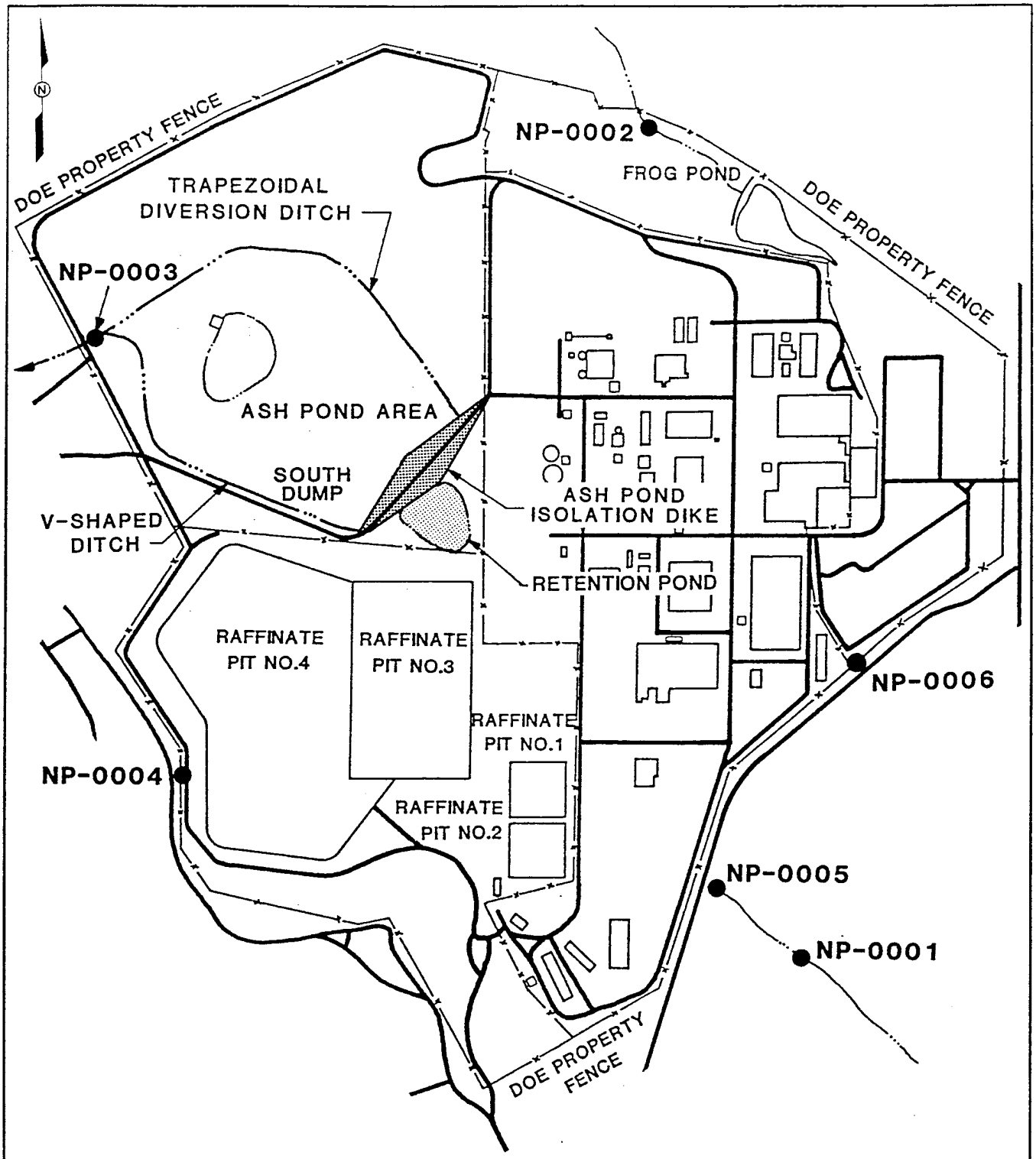
Gross alpha and total uranium analyses corresponded reasonably well with past data. The highest uranium levels were present in surface flow from Outfalls NP-0001, NP-0003, and NP-0005. The peaks for these points were 198, 253.6, and 282.7 pCi/l, respectively.

Other outfalls exhibited the following peaks of uranium concentrations. Outfall NP-0002 had a peak of 96.3 pCi/l and Outfall NP-0004 had a peak of 4.5 pCi/l. Although not required by the NPDES permit, the outfall from the administration building sanitary wastewater treatment plant (Outfall NP-0006) was also monitored for total uranium. No uranium was detected at this outfall.

3.4.2 Other Analysis

Other analyses for NP-0001 through NP-0005 included physical analysis (settleable solids and total suspended solids) and chemical analysis (nitrate, pH, and lithium). Third quarter 1991 values generally correspond to past values for the majority of parameters. Two exceptions were high total suspended solids (TSS) values for Outfalls NP-0005 and NP-0001. The TSS was higher than usual due to off-site construction activity and a 2.24 in. rainfall that ended two hours before sample collection. Settleable solids were not analyzed for Outfall NP-0004 since the sample was collected from a pooled area that was algae laden and the algae would have prevented proper settling.

The discharge from the administration building treatment plant, Outfall No. NP-0006, has effluent limitations and a requirement to monitor once per quarter. Flow must be measured once a month. The subcontractor monitors the effluent once a month to assess plant performance, thus generating two additional sample analyses a quarter. The NPDES permit specifies effluent limitations for biochemical oxygen demand (BOD), TSS, pH, and fecal coliform at this outfall. The limits for BOD are 10 mg/l monthly average and 15 mg/l weekly average; for TSS, 15 mg/l monthly average and 20 mg/l weekly average; for fecal coliform, 200 colonies per 100 ml monthly average and 1,000 colonies per 100 ml daily maximum. The pH is limited to the range of 6.0 to 9.0. NPDES permit limits were not exceeded in the third quarter of 1991 at this outfall.



NPDES MONITORING LOCATIONS

FIGURE 3-5

SCALE 0 500 1000 FT
0 152.4 304.8 M

REPORT NO.: DOE/OR/21548-257		EXHIBIT NO.: A/CP/276/1291	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 12/91	

TABLE 3-5 Results of Monthly NPDES Monitoring for NP-0001 through NP-0006

Outfall NP-0001 NPDES data for Q3 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	SET. SOLIDS	NITRATE	pH	LITHIUM	GROSS ALPHA	TOTAL URANIUM	
UNITS	GPD**	mg/l	ml/l/hr	mg/l	pH units	mg/l	pCi/l	mg/l	pCi/l
Jul. 2	1,660,920	538	0.5	32.4	6.85	ND	133	0.291	198

Outfall NP-0002 NPDES data for Q3 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	SET. SOLIDS	NITRATE	pH	LITHIUM	GROSS ALPHA	TOTAL URANIUM	
UNITS	GPD**	mg/l	ml/l/hr	mg/l	pH units	mg/l	pCi/l	mg/l	pCi/l
Jul. 2	809,280	283	0.2	19.3	6.84	ND	31.8	0.059	49.0
Aug.	No Discharge								
Sep. 4	101,888	ND	<0.1	ND	6.87	ND	40.1	0.142	96.3

Outfall NP-003 NPDES data for Q3 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	SET. SOLIDS	NITRATE	pH	LITHIUM	GROSS ALPHA	TOTAL URANIUM	
UNITS	GPD**	mg/l	ml/l/hr	mg/l	pH units	mg/l	pCi/l	mg/l	pCi/l
Jul. 2	422,352	38	<0.1	0.01	6.73	ND	13.3	0.02	14.0
Aug.	No discharge								
Sep. 4	140,843	ND	<0.1	0.410	6.75	ND	94.80	0.374	253.6

*Indicates value which exceeded effluent limitation
**Indicates flow rate at time of sample collection

TABLE 3-5 Results of Monthly NPDES Monitoring for NP-0001 through NP-0006 (Continued)

Outfall NP-0004 NPDES data for Q3 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	SET. SOLIDS	NITRATE	pH	LITHIUM	GROSS ALPHA	TOTAL URANIUM	
UNITS	GPD**	mg/l	ml/l/hr	mg/l	pH units	mg/l	pCi/l	mg/l	pCi/l
Aug. 27	ND	15	---	1.81	6.92	ND	43.2	0.0067	4.5

Outfall NP-0005 NPDES data for Q3 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	SET. SOLIDS	NITRATE	pH	LITHIUM	GROSS ALPHA	TOTAL URANIUM	
UNITS	GPD**	mg/l	ml/l/hr	mg/l	pH units	mg/l	pCi/l	mg/l	pCi/l
Jul. 2	108,288	212	0.7	33.9	6.64	ND	48.7	0.071	48.0
Aug.	No discharge								
Sep. 1	1,440	ND	<0.1	5.07	6.45	ND	134	0.417	282.7

* Indicates value which exceeded effluent limitation

Outfall NP-0006 NPDES data for Q3 1991

DATE SAMPLED	FLOW	SUSP. SOLIDS	BOD	FECAL COLIFORMS	pH
UNITS	GPD**	mg/l	mg/l	No./100 ml	pH units
Jul. 17	1,890	6.0	<3.0	<1	6.4
Aug. 8	2,115	10.0	<6.0	<1	6.5
Sep. 11	2,178	1.0	<3.0	<1	6.2

** Indicates flow rate at time of sample collection

A characterization sample was collected from Outfall NP-0006 on August 27. The sample was analyzed for the following parameters and the results are shown in parentheses: lithium (ND), nitrate (15.7 mg/l), uranium-natural (ND), TSS (7.0 mg/l), gross alpha (ND).

4 AIR MONITORING

4.1 Radon Gas

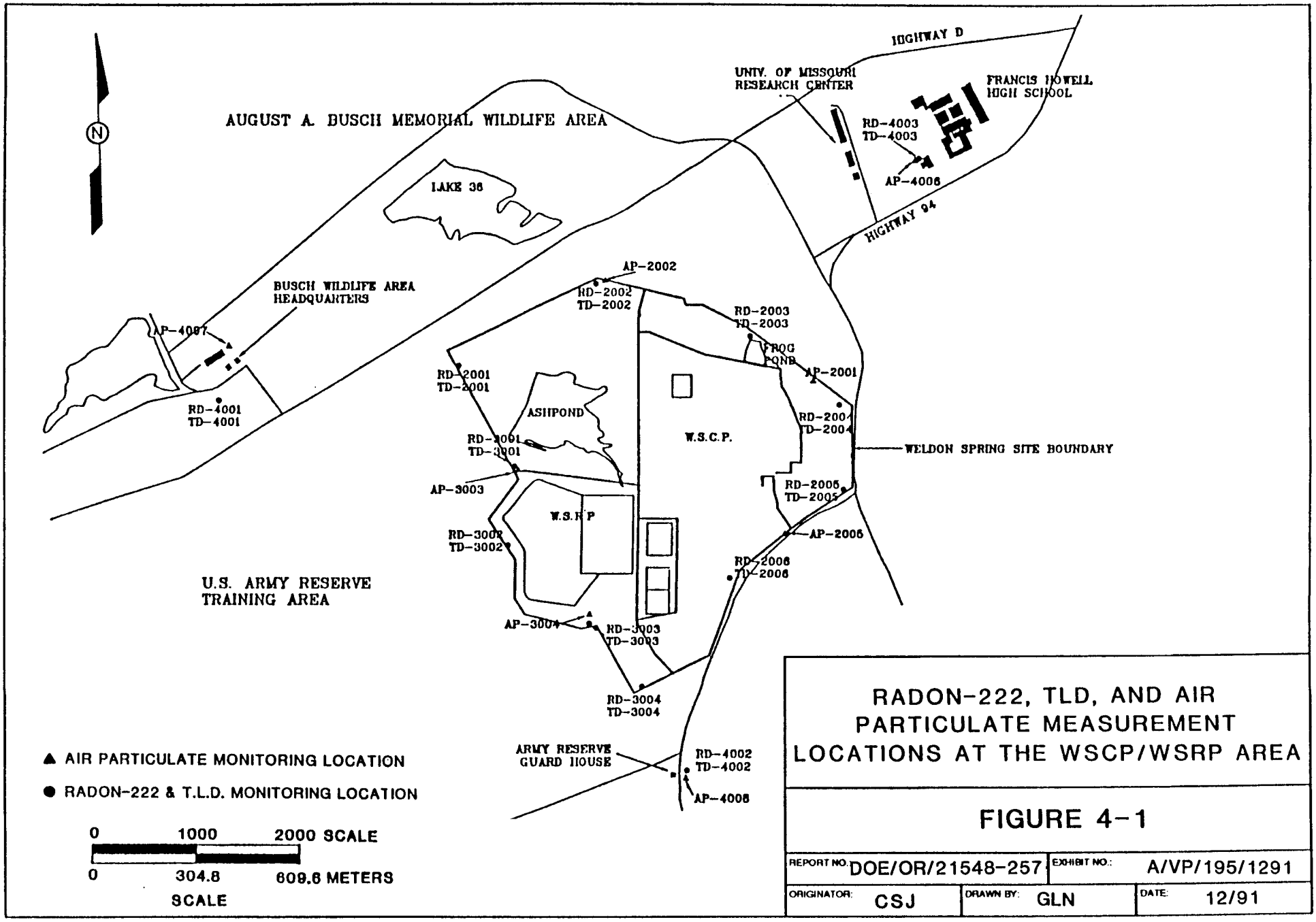
The radon gas monitoring program utilizes a pair of radon detectors at each of 22 permanent locations; each detector is exchanged quarterly. These detectors are deployed at six locations at the Weldon Spring Chemical Plant, six locations at the Weldon Spring Quarry, four locations at the Weldon Spring 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 third 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 0.6 pCi/l for the third 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 third quarter of 1991 were within the typical range expected during periods of below normal precipitation as was the condition for this period. The quarterly radon concentrations (background included) ranged from 0.5 pCi/l at RD-4001 to 2.0 pCi/l at monitoring location RD-1001 and RD-1002.

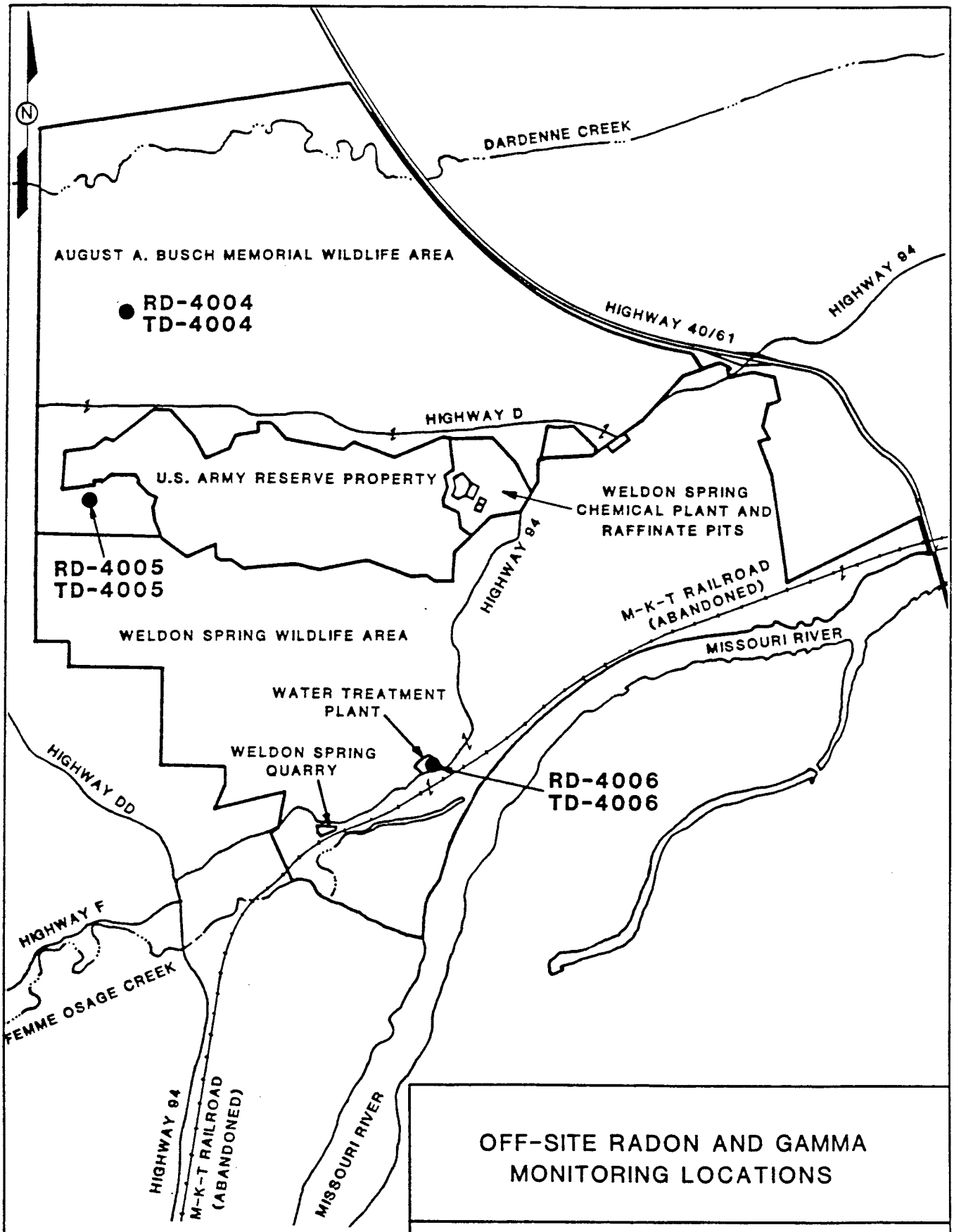
Radon concentrations found in the quarry are higher than concentrations measured at other locations because the radium concentrations in quarry wastes are typically much higher than other areas, and because the quarry is a large depression with side walls ranging from 3 m to 15 m (10 ft to 50 ft) high.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



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

FIGURE 4-1

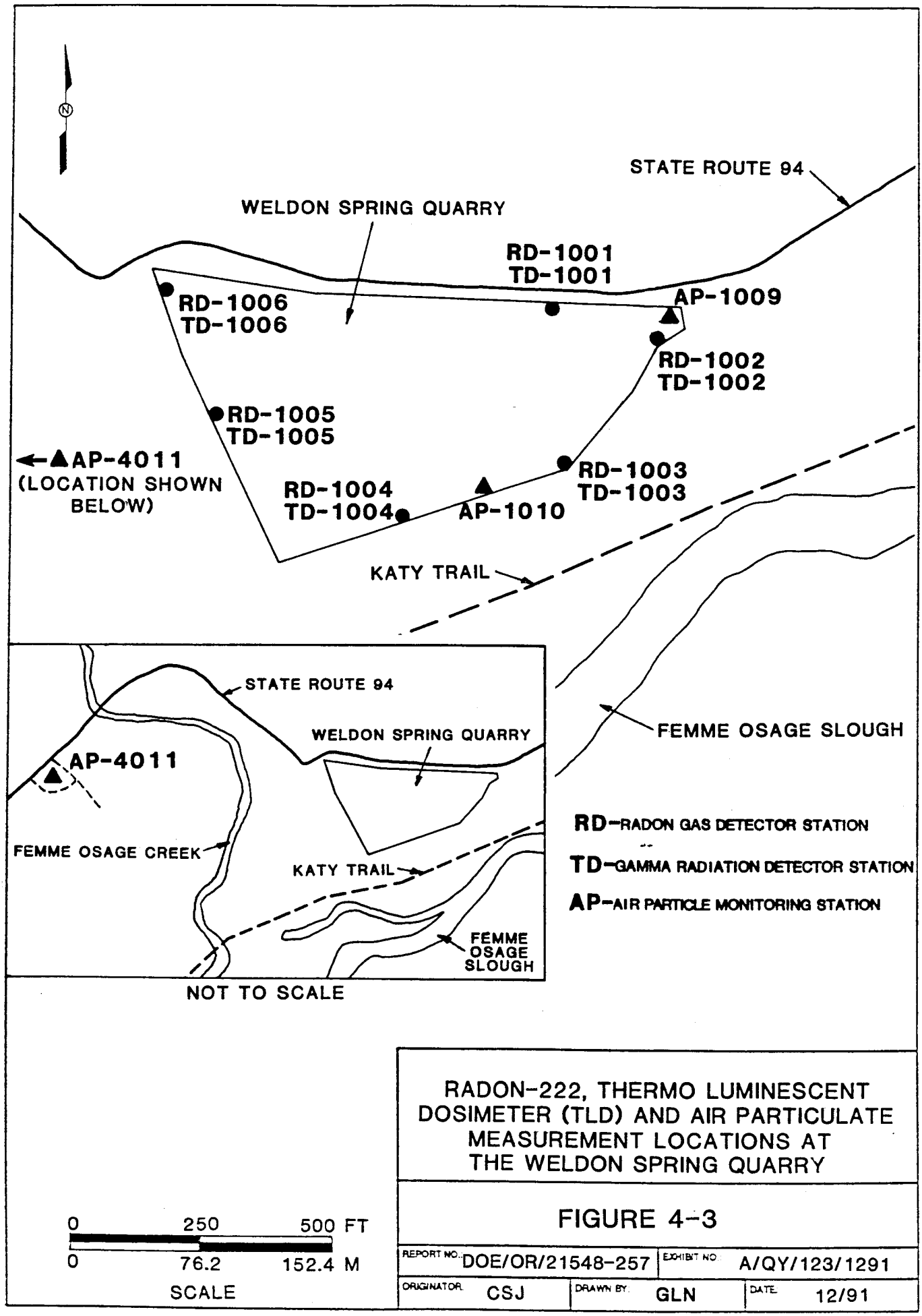
REPORT NO. DOE/OR/21548-257		EXHIBIT NO.: A/VP/195/1291	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 12/91	



OFF-SITE RADON AND GAMMA MONITORING LOCATIONS

FIGURE 4-2

REPORT NO.: DOE/OR/21548-257		EXHIBIT NO.: A/VP/196/1291	
ORIGINATOR: CSJ	DRAWN BY: GLN	DATE: 12/91	



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

FIGURE 4-3

REPORT NO. DOE/OR/21548-257		EXHIBIT NO. A/QY/123/1291	
ORIGINATOR CSJ	DRAWN BY GLN	DATE 12/91	

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

LOCATION ID	3RD QUARTER pCi/l	PERCENT OF GUIDANCE [b]
WSQ		
RD-1001	1.9	43
RD-1002	2.0	47
RD-1003	0.8	7
RD-1004	0.9	10
RD-1005	0.8	7
RD-1006	0.7	3
WSCP		
RD-2001	0.5	0
RD-2002	0.7	3
RD-2003	0.5	0
RD-2004	0.4	0
RD-2005	0.5	0
RD-2006	0.7	3
WSRP		
RD-3001	0.8	7
RD-3002	0.8	7
RD-3003	0.5	0
RD-3004	0.5	0
OFF-SITE		
RD-4001*	0.5	0
RD-4002	0.6	0
RD-4003	0.6	0
RD-4004*	0.6	0
RD-4005*	0.6	0
RD-4006*	0.7	3

(a) Results include natural background.
(b) Percent of guideline calculated by taking the quarterly 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

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 first, second, and third quarter results of total gamma radiation monitoring at the 16 Weldon Spring site (WSS) perimeter monitoring stations, the 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, second, and third 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 low volume air particulate samplers monitor the Weldon Spring site continuously. 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 ID	1ST QUARTER mrem	2ND QUARTER mrem	3RD QUARTER mrem
WSQ			
TD-1001	24	17	21
TD-1002	20	15	17
TD-1003	20	20	19
TD-1004	19	17	18
TD-1005	20	17	18
TD-1006	19	18	17
WSCP			
TD-2001	18	16	15
TD-2002	17	16	17
TD-2003	18	17	16
TD-2004	19	17	17
TD-2005	18	14	15
TD-2006	17	15	16
WSRP			
TD-3001	22	14	15
TD-3002	17	13	13
TD-3003	19	17	16
TD-3004	16	14	16
OFF-SITE			
TD-4001*	18	16	---
TD-4002	16	13	14
TD-4003	16	12	12
TD-4004*	19	--	16
TD-4005*	16	13	12
TD-4006*	17	15	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).

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. Due to maintenance, all monitors were not operating the entire 13 weeks as indicated in Table 4-3. However, the sensitive receptor monitoring stations (AP-4006, AP-4008, and AP-4011) were in operation the majority of the time and these stations are also equipped with high volume air monitoring. The high volume air monitors are part of the WSS radionuclide National Emissions Standards for Hazardous Air Pollutants (NESHAPs) requirements and were in operation the third quarter. The high volume monitoring results will be presented in the *Annual Site Environmental Report.*

The third quarter net alpha concentrations ranged from $<1.20 \times 10^{-15}$ μCi/ml to $<1.60 \times 10^{-15}$ μCi/ml with 1.22×10^{-15} μCi/ml detected at the background station.

4.4 Asbestos

No environmental asbestos monitoring was performed in the third quarter of 1991.

TABLE 4-3 Radiological Air Particulate Third 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	<1.54E-15	7.36E-16	13	12
AP-2002	1.49E-15	5.53E-16	11	11
AP-3003	<1.22E-15	5.92E-16	11	8
AP-3004	<1.20E-15	2.61E-16	9	7
AP-2005	<1.51E-15	3.86E-16	10	8
AP-4006	<1.38E-15	3.62E-16	13	11
AP-4007*	1.22E-15	2.94E-16	13	12
AP-4008	1.60E-15	6.95E-16	12	12
AP-1009	<1.58E-15	5.35E-16	9	7
AP1010	<1.40E-15	4.62E-16	9	9
AP-4011	<1.57E-15	6.81E-16	12	10

* Indicates background monitor station.
To convert μCi/ml to Bq/M^3, multiply by 3.7E10.
NA Not available

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