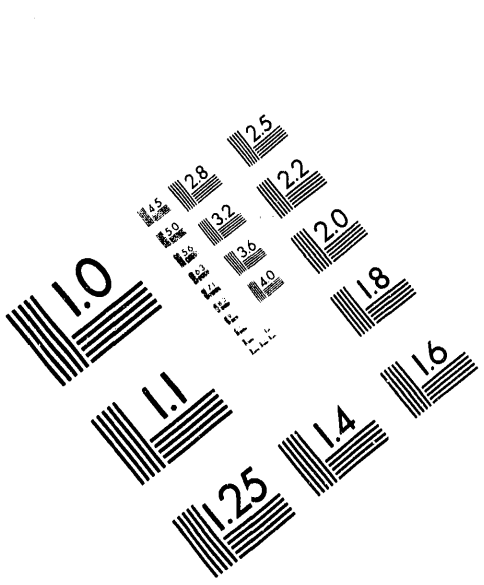

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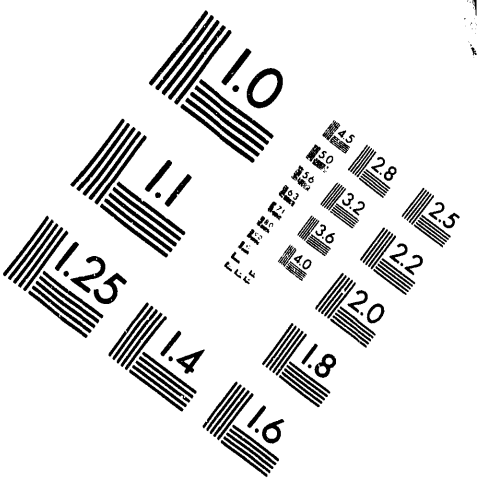

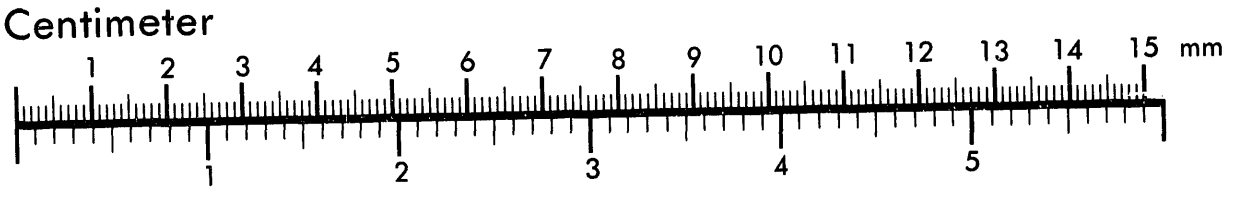

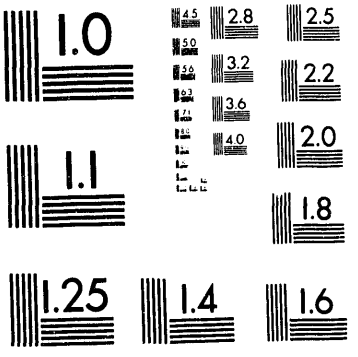

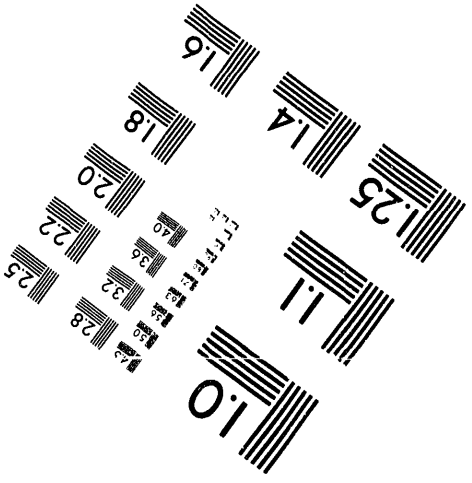

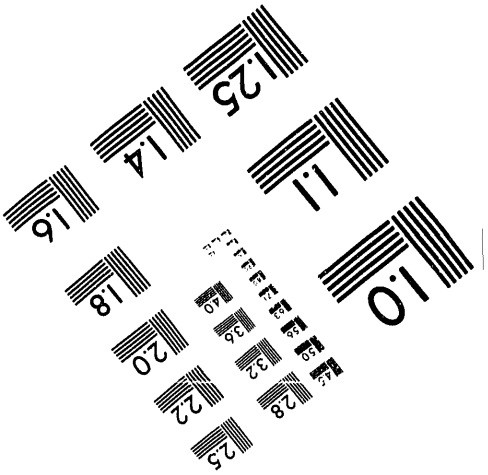

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WSRC-TR-93-063

FOURTH QUARTER 1992 AND 1992 SUMMARY

F-AREA ACID/CAUSTIC BASIN GROUNDWATER MONITORING REPORT (U)

KEY WORDS

FAC wells
gross alpha
iron
manganese
turbidity

PUBLICATION DATE: MARCH 1993

Authorized Derivative Classifier:

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Abstract

During fourth quarter 1992, samples from the six FAC monitoring wells at the F-Area Acid/Caustic Basin were analyzed for indicator parameters, groundwater quality parameters, parameters indicating suitability as drinking water, and other constituents. Monitoring results that exceeded the final Primary Drinking Water Standards (PDWS) or the Savannah River Site (SRS) flagging criteria or turbidity standard during the quarter are the focus of this report.

Gross alpha exceeded the final PDWS in downgradient well FAC 4. Iron exceeded the Flag 2 criterion in 5 of the 6 wells; a change in sampling procedure accounts for marked increases. Three samples were elevated for each of the following constituents: manganese, total organic carbon, and total organic halogens. Turbidity equaled or exceeded the SRS standard in wells FAC 7 and 8.

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Executive Summary

The six monitoring wells at the F-Area Acid/Caustic Basin are sampled quarterly as part of the Savannah River Site (SRS) Groundwater Monitoring Program and to comply with South Carolina Hazardous Waste Management Regulations. During fourth quarter 1992, samples from the monitoring wells were analyzed for indicator parameters, groundwater quality parameters, parameters indicating suitability as drinking water, and other constituents. Monitoring results that exceeded final Primary Drinking Water Standards (PDWS), other SRS flagging criteria, or the SRS turbidity standard are the focus of this report.

During fourth quarter 1992, wells FAC 5 and 6 at the F-Area Acid/Caustic Basin did not yield two well volumes prior to sampling; thus, the samples collected from these wells may not be representative groundwater samples. Gross alpha exceeded the final PDWS in well FAC 4 during fourth quarter. Iron exceeded the Flag 2 criterion in wells FAC 3, 5, 6, 7, and 8, with a high value of 13,400 μg/L in well FAC 3. Manganese exceeded the Flag 2 criterion in wells FAC 3, 4, and 7, with a maximum concentration of 644 μg/L in well FAC 4. Total organic halogens were elevated in wells FAC 5, 6, and 7, with a high concentration of 280 μg/L in well FAC 7. Total organic carbon exceeded its Flag 2 criterion in wells FAC 6, 7, and 8, with a maximum value of 30,500 μg/L in FAC 6.

Samples from wells FAC 7 and 8 exceeded the SRS turbidity standard, with a maximum value of 393 nephelometric units (NTU) in FAC 7.

Water-table elevations from FAC piezometers at the F-Area Acid/Caustic Basin indicate that groundwater flow is toward the north-northwest (using SRS grid coordinates) at a rate of approximately 120 ft/yr. Upgradient wells FAC 3 and 8 as well as downgradient wells contained constituents at elevated levels, and turbidity was elevated in one upgradient and one downgradient well.

During 1992, gross alpha, lead, nitrate, or total alpha-emitting radium exceeded final PDWS in one or more of the downgradient wells at the F-Area Acid/Caustic Basin. Water-elevation data from the FAC monitoring wells indicate that groundwater flow directions during the year generally were northwest at rates ranging from 1,200 ft/yr to 3,700 ft/yr. Fourth quarter data from the newly installed FAC piezometers indicate a north-northwesterly flow direction at a rate of 120 ft/yr.

Introduction

The F-Area Acid/Caustic Basin is located east of F Area at the Savannah River Site (SRS) on a slope that leads to an unnamed tributary of Upper Three Runs Creek. The basin, constructed in the early 1950s, is an unlined earthen pit that received dilute sulfuric acid and sodium hydroxide solutions and other wastes from several areas within SRS. The basin provided mixing and neutralization of the dilute solutions before their discharge to nearby streams. The F-Area Acid/Caustic Basin remained in service until new neutralization facilities became operational in 1982 (Heffner and Exploration Resources, 1991).

Four groundwater monitoring wells were installed at the F-Area Acid/Caustic Basin between August 1983 and July 1984. Under the terms of a consent decree executed May 26, 1988, by the U.S. District Court (District of South Carolina, Aiken Division), the basin became subject to requirements of Subtitle C of the Resource Conservation and Recovery Act (RCRA), the South Carolina Hazardous Waste Management Regulations (SCHWMR), and associated regulations. The monitoring wells were re-evaluated during the summer of 1988 to ensure compliance with SCHWMR. As part of this compliance effort, four additional wells were installed at the F-Area Acid/Caustic Basin during third quarter 1988. Wells FAC 1 and 2 were abandoned in March 1989 because they were dry and were not included in the RCRA monitoring program.

The monitoring wells at the F-Area Acid/Caustic Basin are sampled quarterly as part of the SRS Groundwater Monitoring Program and to comply with SCHWMR. Because the screen zone elevations of the monitoring wells vary, the pattern of water elevations has made interpretation of horizontal flow direction beneath the basin difficult. The revised Groundwater Quality Assessment Plan for the F-Area Acid/Caustic Basin (WSRC, 1991), submitted to the South Carolina Department of Health and Environmental Control on April 30, 1991, proposed the installation of six permanent piezometers to provide additional water-elevation data, to help define the groundwater flow direction, and to assess the current monitoring well network as required by SCHWMR. A water-elevation map and hydrograph based on piezometer data are included in this report this quarter.

Discussion

Groundwater Monitoring Data

The groundwater sampling procedure was modified beginning fourth quarter 1992 in response to regulatory guidance and advances in sampling equipment design (WSRC, 1992). The modified procedure requires evacuation of a minimum of two well volumes and stabilization of pH, specific conductance, and turbidity prior to sample collection. Stability is established when a minimum of three successive measurements, taken within a given time period, are within a specified tolerance range. If a well pumps dry before two well volumes are purged or before stabilization is achieved, it must be revisited within 24 hours for the data to be considered from a single sampling event. On the second visit within 24 hours, samples are taken without purging or stability measurements; thus, these samples may not be representative of the groundwater quality.

A further modification in the procedure is that samples collected for metals analyses are not filtered. Thus, the analyses are for total metals rather than dissolved metals. Variable-speed pumps have been installed in some wells in specific areas at SRS that have had a history of elevated metals. Samples from these wells are collected at a slower rate to minimize turbidity, which has been associated with elevated metal levels. Decreased aluminum and iron concentrations as well as lower turbidity values have been observed for samples from wells with variable-speed pumps. At present, no FAC wells have variable-speed pumps.

During fourth quarter 1992, samples from six monitoring wells at the F-Area Acid/Caustic Basin were analyzed for indicator parameters, groundwater quality parameters, parameters indicating suitability as drinking water, and other constituents. This report describes results that exceeded Safe Drinking Water Act final Primary Drinking Water Standards (PDWS) established by the U.S. Environmental Protection Agency (EPA) (Appendix A), the South Carolina final Primary Drinking Water Standard for lead (Appendix A), SRS flagging criteria (Appendix B), or SRS turbidity standards.

The drinking water standard for lead was changed to the South Carolina Primary Drinking Water Standard of 50 μg/L fourth quarter 1992. Lead data for the earlier quarters of 1992 were made consistent with the 50 μg/L standard for this annual report. The SRS flagging criteria are based on final and proposed PDWS, Secondary Drinking Water Standards, and method detection limits. For simplicity, results that either equal or exceed standards are described only as *exceeding* or *above* standards. Constituent levels that exceed the final PDWS, screening levels, or other Flag 2 criteria are described as *elevated*, and constituent levels that exceed Flag 1 criteria are described as *slightly elevated*.

The final PDWS for individual analytes provided in Appendix A may not always match the SRS flagging criteria provided in Appendix B. The final PDWS are used as guidelines in this compliance report to meet regulatory requirements; the flagging criteria are used by

EPD/EMS to identify relative levels of constituents in the groundwater and as guides for scheduling groundwater monitoring.

Illustrations of the monitored waste management unit at SRS (Figure 1), the individual monitoring wells (Figure 2), and the flow direction of the groundwater beneath the basin (Figure 3) are in Appendix C; monitoring results as well as analyses that exceeded holding times, the final PDWS, other flagging criteria, or the turbidity standard are presented in Appendix D; data quality/useability assessment is discussed in Appendix E; and hydrographs are in Appendix F.

Analytical Results Exceeding Standards

Results for any analytes that exceeded the final PDWS (see Appendix A) during fourth quarter 1992 are summarized in Table 1 (Appendix D). Gross alpha activity exceeded the final PDWS in well FAC 4.

Constituents that exceeded other flagging criteria (see Appendix B) during fourth quarter 1992 are summarized in Table 2 (Appendix D). Iron exceeded the Flag 2 criterion in wells FAC 3, 5, 6, 7, and 8, with a maximum value of 13,400 μg/L in well FAC 3. This marked increase in iron values for fourth quarter is concurrent with the change to analysis of unfiltered metals samples. Manganese exceeded the Flag 2 criterion in wells FAC 3, 4, and 7, with a maximum concentration of 644 μg/L in well FAC 4, and total organic halogens were elevated in wells FAC 5, 6, and 7 with a maximum concentration of 280 μg/L in well FAC 7. Total organic carbon exceeded its Flag 2 criterion in samples from FAC 6, 7, and 8, with a maximum concentration of 30,500 μg/L in well FAC 6. Radium-226, which is not included in Appendix A, exceeded the 5.0E+00 pCi/L final PDWS for total radium (radium-226 plus radium-228) in well FAC 4. EPA (1991) has proposed a PDWS of 2.0E+01 pCi/L for radium-226; the level of 1.4E+01 pCi/L in well FAC 4 would not exceed this proposed standard.

Table 3 (Appendix D) presents all of the results for individual wells and indicates those analyses that exceeded holding times or final PDWS. Table 3 also lists the number of well volumes purged from each well during fourth quarter 1992. Wells FAC 5 and 6 each failed to produce two well volumes before running dry; thus, they may not have produced representative groundwater samples. The samplers noted that the water from wells FAC 3 and 6 was light brown and that the water from well FAC 5 was brown and the turbidity was varied.

Constituent results are compared with the PDWS in the database of values reported by the laboratory. Many constituents are reported to more significant digits in the database than in these reports. Thus, some constituent results in Table 3 that appear to equal the PDWS are not marked in the *D* column. Those results are below the PDWS in the database.

Some of the values for earlier quarters presented in the results tables of this report may differ from the values for those same quarters presented in previous reports, and reported values may not match reported sample dates. These differences result from the following: (1) the computer program that creates the analytical results tables was revised beginning second quarter 1992 to present the highest value for analytes with more than one result (previously, the program presented the first value encountered in the database); (2) a new

computer program, which rounds numbers differently from the former computer program, was first used during third quarter 1992; and (3) some reanalyses may have been performed by the laboratories after the quarterly reports had gone to press. The sample dates in the tables are the dates when the field data were collected. These dates may differ from the dates of the laboratory analyses if the highest results were obtained for samples collected on different dates.

Turbidity Results Exceeding Standards

During fourth quarter 1992, the turbidity in the samples from wells FAC 3 and 5 was between 5 nephelometric turbidity units (NTU) and the SRS turbidity standard of 50 NTU. Wells FAC 7 and 8 exceeded that standard, with values up to 393 NTU (Table 3, Appendix D).

A value of 5 NTU, established by EPA (1986) as a general standard for acceptability of groundwater samples, is considered unrealistic for monitoring wells at SRS. Gass (1989) has documented turbidity measurements ranging up to 5,000 NTU from properly designed wells screened in poorly productive formations. During the 1989 RCRA Compliance Evaluation Inspection, officials from EPA Region IV indicated that the SRS turbidity standard of 50 NTU is conservative. These officials also agreed that water-table wells in this area often correspond to nonaquifer formations, rendering development of these wells more difficult due to the low yield and high proportion of mobile fines typical of these formations (Bergren and Bennett, 1989).

Water Elevations, Flow Directions, and Flow Rates

Water-level measurements from the FAC monitoring wells at the F-Area Acid/Caustic Basin do not provide a clear pattern and, thus, have made groundwater flow rate estimates uncertain. The newly installed piezometers provide additional water elevations for determining groundwater flow estimates.

Figure 3 (Appendix C) was generated using only water elevations from the FAC monitoring wells, and Figure 4 (Appendix C) was generated using only water elevations from the FAC piezometers (1P–6P). Although all of these wells are screened in the water-table unit, most of the FAC monitoring wells are screened in a clay confining layer beneath the basin, while all of the FAC piezometers are screened above this clay layer.

The groundwater flow direction derived using FAC monitoring well water elevations appears to be northwest (using SRS grid coordinates). The groundwater flow direction derived from the FAC piezometers appears to be north-northwest (using SRS grid coordinates).

The groundwater flow rate in the water table (Aquifer Zone IIB_2) beneath the F-Area Acid/Caustic Basin is estimated using the following equation:

$$\text{Flow (ft/day)} = \frac{\text{Hydraulic Conductivity (ft/day)}}{\text{Porosity (unitless)}} \times \frac{dh\ \text{(ft)}}{dl\ \text{(ft)}}$$

A hydraulic conductivity constant of 10 ft/day (Geraghty & Miller, Inc., 1990) is a conservative estimate (i.e., the actual hydraulic conductivity should be somewhat less than 10 ft/day). The effective porosity value is estimated at 20% (Killian et al., 1987), *dh* is the difference in head, and *dl* is the length of the flow path. Flow rate estimates vary depending on the vertical gradient between wells, the size of the area under consideration, and the number of data points. For this reason, the estimation of flow rate should be considered accurate only to an order of magnitude.

Flow rate estimates are calculated as follows: flow path length is calculated to the nearest foot. Flow rate per day is calculated to two significant figures using the above equation. This value is then multiplied by 365 and rounded to two significant figures for the flow rate per year.

Using the above equation with data from the FAC monitoring wells, with $dh = 8$ ft and $dl = 45$ ft (see Figure 3 in Appendix C), the flow rate estimate for groundwater in the water table beneath the F-Area Acid/Caustic Basin is as follows:

$$\frac{10}{0.20} \times \frac{8}{45} = 8.9 \text{ ft/day}$$

$$8.9 \text{ ft/day} \times 365 \text{ days} \approx 3{,}200 \text{ ft/yr}$$

Using the above equation with data from the FAC piezometers, with $dh = 0.75$ ft and $dl = 113$ ft (see Figure 4 in Appendix C), the flow rate estimate for groundwater in the water table beneath the F-Area Acid/Caustic Basin is as follows:

$$\frac{10}{0.20} \times \frac{0.75}{113} = 0.33 \text{ ft/day}$$

$$0.33 \text{ ft/day} \times 365 \text{ days} \approx 120 \text{ ft/yr}$$

Water elevations for the FAC piezometers probably represent fully unconfined conditions, while water elevations for FAC monitoring wells intersecting the clay layer may have equilibrated with hydrostatic head below the clay layer. As a result, water-table conditions determined by piezometer water elevations are probably more representative of true water-table conditions than those determined by water elevations obtained at monitoring wells.

Hydrographs for the FAC monitoring wells and the FAC piezometers are presented in Appendix F.

Results for Upgradient vs. Downgradient Wells

Wells FAC 3 and 8 are the designated upgradient wells at the F-Area Acid/Caustic Basin. During fourth quarter 1992, the only constituent detected above its final PDWS, gross alpha, was found in downgradient well FAC 4. One or both of the upgradient wells contained elevated levels of iron, manganese, and total organic carbon. With the exception of iron, however, maximum results for each of these constituents occur in downgradient wells.

Conclusions

Gross alpha, iron, manganese, total organic carbon, and total organic halogens exceeded final PDWS or other Flag 2 criteria in FAC wells at the F-Area Acid/Caustic Basin during fourth quarter 1992. Gross alpha was detected above its final PDWS only in downgradient well FAC 4. Upgradient wells FAC 3 and 8 contained elevated levels of most of the remaining constituents detected above Flag 2, and samples from wells FAC 7 and 8 exceeded the SRS turbidity standard of 50 NTU. Maximum results for iron were obtained from upgradient well FAC 3, while maximum results for the other constituents above Flag 2 were obtained from downgradient wells. Generally, elevated levels of constituents found in downgradient wells but not in upgradient wells at a waste management unit are considered products of the waste management unit.

Because historical records indicate that no radionuclides were disposed of at this waste management unit (Heffner and Exploration Resources, 1991), the elevated level of gross alpha in well FAC 4 is not considered to be due to seepage from the F-Area Acid/Caustic Basin.

Water-table elevations from the FAC piezometers at the F-Area Acid/Caustic Basin indicate that the groundwater flow is toward the north-northwest relative to SRS grid coordinates at a rate of approximately 120 ft/yr. The flow direction determined from FAC monitoring well data historically has been northwest. The piezometers were installed to clarify apparently anomalous water-table data from the FAC monitoring wells.

1992 Summary

Gross alpha in well FAC 4 was the only constituent to exceed the final PDWS in a well at the F-Area Acid/Caustic Basin during all four quarters of 1992. Total alpha-emitting radium was analyzed only in split samples from well FAC 4 during first quarter 1992, when it was above the final PDWS for total radium (radium-226 plus radium-228). Radium-226, a component of both total alpha-emitting radium and of total radium, exhibited activities above the total radium final PDWS value of 5.0E+00 pCi/L during first quarter only in well FAC 3; during first, second, and fourth quarters in well FAC 4; during first quarter only in well FAC 5; during first and second quarters in well FAC 7; and during first quarter only in well FAC 8. Total alpha-emitting radium was the most persistent constituent above its standard at the F-Area Acid/Caustic Basin during 1991.

Lead was elevated in well FAC 4 during first quarter 1992. Gross alpha was detected above its final PDWS in well FAC 5 only during first quarter, and nitrate as nitrogen was detected above its final PDWS in wells FAC 5 and 7 only during third quarter. Elevated levels of gross alpha, tetrachloroethylene, and trichloroethylene occurred occasionally during 1991.

Water-elevation data from the FAC monitoring wells indicate that groundwater flow directions during 1992 generally were northwest at rates ranging from 1,200 ft/yr (first quarter) to 3,700 ft/yr (second quarter). Fourth quarter data from the new FAC piezometers (1P–6P), installed during first quarter 1992, indicate a north-northwesterly flow direction at a rate of 120 ft/yr. Water elevations determined by the FAC piezometers probably represent fully unconfined conditions, while water elevations for the FAC monitoring wells intersect a clay confining layer and may have equilibrated with the hydrostatic head beneath the clay layer. Thus, the water-table conditions determined by using the piezometer data are probably more representative of true water-table conditions than those determined by using the monitoring well data. The FAC monitoring well data for 1991 indicate that the flow direction was north to northwest at approximately 2,000 ft/yr.

Errata

First Quarter 1992:

- The definitions for the abbreviations *TM* and *WA* were not included in the "Key to Reading the Tables" in Appendix D. *TM* and *WA* represent TMA/Eberline and Roy F. Weston, Inc., laboratories, respectively.

Second Quarter 1992:

- Page 5, **Upgradient Versus Downgradient Results**: The designated upgradient wells should be FAC 3 and 8. The discussion of upgradient versus downgradient results should be revised accordingly.

Third Quarter 1992:

- Prior to third quarter 1992, the results of certain analyses for *nitrate-nitrite as nitrogen* were reported incorrectly by the General Engineering laboratory as *nitrate as nitrogen* results. The analyses in the results tables of this report are reported correctly (*nitrate-nitrite* results have been separated from true *nitrate* results).

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Appendix A – Final Primary Drinking Water Standards

Final Primary Drinking Water Standards

Analyte	Unit	Level	Status	Reference
Arsenic	µg/L	50	Final	CFR, 1991
Barium	µg/L	2,000	Final	CFR, 1991
Benzene	µg/L	5	Final	CFR, 1991
Bromodichloromethane	µg/L	100[a]	Final	CFR, 1991
Bromoform	µg/L	100[a]	Final	CFR, 1991
Cadmium	µg/L	5	Final	CFR, 1991
Carbon tetrachloride	µg/L	5	Final	CFR, 1991
Chlordane	µg/L	2	Final	CFR, 1991
Chloroethene (Vinyl chloride)	µg/L	2	Final	CFR, 1991
Chloroform	µg/L	100[a]	Final	CFR, 1991
Chromium	µg/L	100	Final	CFR, 1991
Copper	µg/L	1,300	Final	CFR, 1991
Dibromochloromethane	µg/L	100[a]	Final	CFR, 1991
Dibromochloropropane	µg/L	0.2	Final	CFR, 1991
1,2-Dichlorobenzene	µg/L	600	Final	CFR, 1991
1,4-Dichlorobenzene	µg/L	75	Final	CFR, 1991
1,2-Dichloroethane	µg/L	5	Final	CFR, 1991
1,1-Dichloroethylene	µg/L	7	Final	CFR, 1991
cis-1,2-Dichloroethylene	µg/L	70	Final	CFR, 1991
trans-1,2-Dichloroethylene	µg/L	100	Final	CFR, 1991
2,4-Dichlorophenoxyacetic acid	µg/L	70	Final	CFR, 1991
1,2-Dichloropropane	µg/L	5	Final	CFR, 1991
Endrin	µg/L	0.2	Final	CFR, 1991
Ethylbenzene	µg/L	700	Final	CFR, 1991
Fluoride	µg/L	4,000	Final	CFR, 1991
Gross alpha[b]	pCi/L	1.5E+01	Final	CFR, 1991
Heptachlor	µg/L	0.4	Final	CFR, 1991
Heptachlor epoxide	µg/L	0.2	Final	CFR, 1991
Lead	µg/L	50	Final	SCDHEC, 1981
Lindane	µg/L	0.2	Final	CFR, 1991
Mercury	µg/L	2	Final	CFR, 1991
Methoxychlor	µg/L	40	Final	CFR, 1991
Nitrate as nitrogen	µg/L	10,000	Final	CFR, 1991
Nitrate-nitrite as nitrogen	µg/L	10,000	Final	CFR, 1991
Nitrite as nitrogen	µg/L	1,000	Final	CFR, 1991
Nonvolatile beta[c]	pCi/L	5E+01	Final	EPA, 1977
PCBs[d]	µg/L	0.5	Final	CFR, 1991
Pentachlorophenol	µg/L	1	Final	CFR, 1991
Selenium	µg/L	50	Final	CFR, 1991
Strontium-89/90[e]	pCi/L	8E+00	Final	CFR, 1991
Strontium-90	pCi/L	8E+00	Final	CFR, 1991
Styrene	µg/L	100	Final	CFR, 1991
Tetrachloroethylene	µg/L	5	Final	CFR, 1991
Toluene	µg/L	1,000	Final	CFR, 1991
Total radium (Radium-226 and -228)	pCi/L	5E+00	Final	CFR, 1991
Total trihalomethanes	µg/L	100	Final	CFR, 1991
Toxaphene	µg/L	3	Final	CFR, 1991
2,4,5-TP (Silvex)	µg/L	50	Final	CFR, 1991
1,1,1-Trichloroethane	µg/L	200	Final	CFR, 1991

Analyte	Unit	Level	Status	Reference
Trichloroethylene	µg/L	5	Final	CFR, 1991
Tritium	pCi/mL	2E+01	Final	CFR, 1991
Xylenes	µg/L	10,000	Final	CFR, 1991

Note: The drinking water standard for lead was changed to the South Carolina Primary Drinking Water Standard of 50 µg/L fourth quarter 1992.

[a] This value is the drinking water standard for total trihalomethanes (the sum of bromoform, bromodichloromethane, chloroform, and dibromochloromethane).

[b] The standard given is for gross alpha including radium-226 but excluding radon and uranium.

[c] This is the screening level above which providers of public drinking water should perform analyses for specific man-made radionuclides. The standard for the total dose equivalent from all such radionuclides is 4 mrem per year.

[d] Analyses were conducted in 1992 for the following: PCB 1016, PCB 1221, PCB 1232, PCB 1242, PCB 1248, PCB 1254, and PCB 1260.

[e] For double radionuclide analyses where each separate radionuclide has its own standard, the more stringent standard is used.

References

CFR (Code of Federal Regulations), 1991. *National Primary Drinking Water Regulations*, **40 CFR, Part 141**, pp. 578–715. Washington, DC.

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SCDHEC (South Carolina Department of Health and Environmental Control), 1981. **State Primary Drinking Water Regulations**, R.61-58.5. Columbia, SC.

Appendix B – Flagging Criteria

Flagging Criteria

Beginning in 1991, the Savannah River Site Environmental Protection Department/ Environmental Monitoring Section modified its guidelines for flagging constituents in the Groundwater Monitoring Program. These flagging criteria are as follows:

- Flag 2 criteria for constituents equal the Safe Drinking Water Act (SDWA) final Primary Drinking Water Standard (PDWS), the SDWA proposed PDWS, or the SDWA Secondary Drinking Water Standard (SDWS). If a constituent does not have a drinking water standard, the Flag 2 criterion equals 10 times the method detection limit (MDL) calculated as the 90th percentile detection limit obtained recently by one of the primary analytical laboratories.

- Flag 1 criteria for constituents equal one-half of the final PDWS, one-half the proposed PDWS, or one-half the SDWS. If a constituent does not have an drinking water standard, the Flag 1 criterion equals 5 times the MDL calculated as the 90th percentile detection limit obtained recently by one of the primary analytical laboratories.

- Flag 0 criteria are assigned to constituent levels below Flag 1 criteria, constituent levels below the sample detection limits, or constituents having no flagging criteria.

The following parameters are not assigned flagging criteria: alkalinity, calcium, carbonate, color, corrosivity, magnesium, odor, potassium, Eh, silica, sodium, total dissolved solids, total phosphorus, total phosphates (as P), and turbidity. In addition, common laboratory contaminants and cleaners including phthalates, methylene chloride, ketones, and toluene are not assigned flagging criteria.

Analyte	Unit	Flag 1	Flag 2	Source
Acenaphthene	µg/L	50	100	EPA Method 8270
Acenaphthylene	µg/L	50	100	EPA Method 8270
Acetone	µg/L	50	100	EPA Method 8240
Acetonitrile (Methyl cyanide)	µg/L	500	1,000	EPA Method 8240
Acetophenone	µg/L	50	100	EPA Method 8270
2-Acetylaminofluorene	µg/L	50	100	EPA Method 8270
Acrolein	µg/L	100	200	EPA Method 8240
Acrylonitrile	µg/L	100	200	EPA Method 8240
Aldrin	µg/L	2.5	5	EPA Method 8080
Alkalinity (as $CaCO_3$)		No flag	No flag	Set by EPD/EMS
Allyl chloride	µg/L	250	500	EPA Method 8240
Aluminum	µg/L	25	50	Secondary DWS (CFR, 1991b)
Americium-241	pCi/L	3.17E+00	6.34E+00	Proposed DWS (EPA, 1991)
Americium-243	pCi/L	3.19E+00	6.37E+00	Proposed DWS (EPA, 1991)
4-Aminobiphenyl	µg/L	50	100	EPA Method 8270
Ammonia	µg/L	500	1,000	APHA Method 417B
Ammonia nitrogen	µg/L	50	100	EPA Method 350.1
Aniline	µg/L	50	100	EPA Method 8270
Anthracene	µg/L	50	100	EPA Method 8270
Antimony	µg/L	2.5	5	Proposed DWS (EPA, 1990)
Antimony-125	pCi/L	1.5E+02	3E+02	Final DWS (EPA, 1977)
Aramite	µg/L	50	100	EPA Method 8270

Analyte	Unit	Flag 1	Flag 2	Source
Arsenic	µg/L	25	50	Final DWS (CFR, 1991a)
Barium	µg/L	1,000	2,000	Final DWS (CFR, 1991a)
Barium-140	pCi/L	4.5E+01	9E+01	Final DWS (EPA, 1977)
Benzene	µg/L	2.5	5	Final DWS (CFR, 1991a)
alpha-Benzene hexachloride	µg/L	2.5	5	EPA Method 8080
beta-Benzene hexachloride	µg/L	2.5	5	EPA Method 8080
delta-Benzene hexachloride	µg/L	2.5	5	EPA Method 8080
Benzidine	µg/L	250	500	EPA Method 8270
Benzo[*a*]anthracene	µg/L	0.05	0.1	Proposed DWS (EPA, 1990)
Benzo[*b*]fluoranthene	µg/L	0.1	0.2	Proposed DWS (EPA, 1990)
Benzo[*k*]fluoranthene	µg/L	0.1	0.2	Proposed DWS (EPA, 1990)
Benzo[*g,h,i*]perylene	µg/L	50	100	EPA Method 8270
Benzo[*a*]pyrene	µg/L	0.1	0.2	Proposed DWS (EPA, 1990)
Benzoic acid	µg/L	250	500	EPA Method 8270
1,4-Benzoquinone	µg/L	50	100	EPA Method 8270
Benzyl alcohol	µg/L	100	200	EPA Method 8270
Beryllium	µg/L	0.5	1	Proposed DWS (EPA, 1990)
Beryllium-7	pCi/L	3E+03	6E+03	Final DWS (EPA, 1977)
Bis(2-chloroethoxy) methane	µg/L	50	100	EPA Method 8270
Bis(2-chloroethyl) ether	µg/L	50	100	EPA Method 8270
Bis(2-chloroisopropyl) ether	µg/L	50	100	EPA Method 8270
Bis(chloromethyl) ether	µg/L	50	100	EPA Method 8270
Bis(chloromethyl-ethyl) ether	µg/L	50	100	EPA Method 8270
Bis(2-ethylhexyl) phthalate		No flag	No flag	Set by EPD/EMS
Bromide	µg/L	5,000	10,000	EPA Method 300.0
Bromodichloromethane	µg/L	50	100	Final DWS (CFR, 1991a)
Bromoform	µg/L	50	100	Final DWS (CFR, 1991a)
Bromomethane (Methyl bromide)	µg/L	5	10	EPA Method 8240
4-Bromophenyl phenyl ether	µg/L	50	100	EPA Method 8270
2-sec-Butyl-4,6-dinitrophenol	µg/L	3.5	7	Proposed DWS (EPA, 1990)
Butylbenzyl phthalate		No flag	No flag	Set by EPD/EMS
Cadmium	µg/L	2.5	5	Final DWS (CFR, 1991a)
Calcium		No flag	No flag	Set by EPD/EMS
Carbon disulfide	µg/L	5	10	EPA Method 8240
Carbon tetrachloride	µg/L	2.5	5	Final DWS (CFR, 1991a)
Carbon-14	pCi/L	1E+03	2E+03	Final DWS (EPA, 1977)
Carbonate	µg/L	500	1,000	EPA Method 310.1
Cerium-141	pCi/L	1.5E+02	3E+02	Final DWS (EPA, 1977)
Cerium-144	pCi/L	1.31E+02	2.61E+02	Proposed DWS (EPA, 1991)
Cesium-134	pCi/L	4.07E+01	8.13E+01	Proposed DWS (EPA, 1991)
Cesium-137	pCi/L	1E+02	2E+02	Final DWS (EPA, 1977)
Chlordane	µg/L	1	2	Final DWS (CFR, 1991a)
Chloride	µg/L	125,000	250,000	Secondary DWS (CFR, 1991b)
4-Chloroaniline	µg/L	50	100	EPA Method 8270
Chlorobenzene	µg/L	5	10	EPA Method 8240
Chlorobenzilate	µg/L	50	100	EPA Method 8270
Chloroethane	µg/L	5	10	EPA Method 8240
Chloroethene (Vinyl chloride)	µg/L	1	2	Final DWS (CFR, 1991a)
Chloroethyl vinyl ether	µg/L	5	10	EPA Method 8240
2-Chloroethyl vinyl ether	µg/L	5	10	EPA Method 8240
Chloroform	µg/L	50	100	Final DWS (CFR, 1991a)
para-Chloro-meta-cresol	µg/L	50	100	EPA Method 8270
Chloromethane (Methyl chloride)	µg/L	5	10	EPA Method 8240
2-Chloronaphthalene	µg/L	50	100	EPA Method 8240
2-Chlorophenol	µg/L	50	100	EPA Method 8270

Analyte	Unit	Flag 1	Flag 2	Source
4-Chlorophenyl phenyl ether	µg/L	50	100	EPA Method 8270
Chloroprene	µg/L	1,000	2,000	EPA Method 8240
Chromium	µg/L	50	100	Final DWS (CFR, 1991a)
Chromium-51	pCi/L	3E+03	6E+03	Final DWS (EPA, 1977)
Chrysene	µg/L	0.1	0.2	Proposed DWS (EPA, 1990)
Cobalt	µg/L	20	40	EPA Method 6010
Cobalt-57	pCi/L	5E+02	1E+03	Final DWS (EPA, 1977)
Cobalt-58	pCi/L	4.5E+03	9E+03	Final DWS (EPA, 1977)
Cobalt-60	pCi/L	5E+01	1E+02	Final DWS (EPA, 1977)
Color		No flag	No flag	Set by EPD/EMS
Copper	µg/L	650	1,300	Final DWS (CFR, 1991a)
Corrosivity		No flag	No flag	Set by EPD/EMS
m-Cresol (3-Methylphenol)	µg/L	50	100	EPA Method 8270
o-Cresol (2-Methylphenol)	µg/L	50	100	EPA Method 8270
p-Cresol (4-Methylphenol)	µg/L	50	100	EPA Method 8270
Curium-242	pCi/L	6.65E+01	1.33E+02	Proposed DWS (EPA, 1991)
Curium-243	pCi/L	4.15E+00	8.3E+00	Proposed DWS (EPA, 1991)
Curium-244	pCi/L	4.92E+00	9.84E+00	Proposed DWS (EPA, 1991)
Curium-246	pCi/L	3.14E+00	6.27E+00	Proposed DWS (EPA, 1991)
Cyanide	µg/L	100	200	Proposed DWS (EPA, 1990)
p,p'-DDD	µg/L	2.5	5	EPA Method 8080
p,p'-DDE	µg/L	2.5	5	EPA Method 8080
p,p'-DDT	µg/L	2.5	5	EPA Method 8080
Di-n-butyl phthalate		No flag	No flag	Set by EPD/EMS
Di-n-octyl phthalate		No flag	No flag	Set by EPD/EMS
Diallate	µg/L	50	100	EPA Method 8270
Dibenz[*a,h*]anthracene	µg/L	0.15	0.3	Proposed DWS (EPA, 1990)
Dibenzofuran	µg/L	50	100	EPA Method 8270
Dibromochloromethane	µg/L	50	100	Final DWS (CFR, 1991a)
Dibromochloropropane	µg/L	0.1	0.2	Final DWS (CFR, 1991a)
1,2-Dibromo-3-chloropropane	µg/L	250	500	EPA Method 8240
1,2-Dibromoethane	µg/L	100	200	EPA Method 8240
Dibromomethane (Methylene bromide)	µg/L	5	10	EPA Method 8240
1,2-Dichlorobenzene	µg/L	300	600	Final DWS (CFR, 1991a)
1,3-Dichlorobenzene	µg/L	50	100	EPA Method 8270
1,4-Dichlorobenzene	µg/L	37.5	75	Final DWS (CFR, 1991a)
3,3'-Dichlorobenzidine	µg/L	50	100	EPA Method 8270
trans-1,4-Dichloro-2-butene	µg/L	150	300	EPA Method 8240
Dichlorodifluoromethane	µg/L	5	10	EPA Method 8240
1,1-Dichloroethane	µg/L	5	10	EPA Method 8240
1,2-Dichloroethane	µg/L	2.5	5	Final DWS (CFR, 1991a)
cis-1,2-Dichloroethene	µg/L	35	70	Final DWS (CFR, 1991a)
1,1-Dichloroethylene	µg/L	3.5	7	Final DWS (CFR, 1991a)
1,2-Dichloroethylene	µg/L	25	50	EPA Method 8240
trans-1,2-Dichloroethylene	µg/L	50	100	Final DWS (CFR, 1991a)
Dichloromethane (Methylene chloride)		No flag	No flag	Set by EPD/EMS
2,4-Dichlorophenol	µg/L	50	100	EPA Method 8270
2,6-Dichlorophenol	µg/L	50	100	EPA Method 8270
2,4-Dichlorophenoxyacetic acid	µg/L	35	70	Final DWS (CFR, 1991a)
1,2-Dichloropropane	µg/L	2.5	5	Final DWS (CFR, 1991a)
cis-1,3-Dichloropropene	µg/L	5	10	EPA Method 8240
trans-1,3-Dichloropropene	µg/L	5	10	EPA Method 8240
Dieldrin	µg/L	2.5	5	EPA Method 8080

Analyte	Unit	Flag 1	Flag 2	Source
Diethyl phthalate		No flag	No flag	Set by EPD/EMS
Dimethoate	µg/L	50	100	EPA Method 8270
p-Dimethylaminoazobenzene	µg/L	50	100	EPA Method 8270
p-(Dimethylamino)ethylbenzene	µg/L	50	100	EPA Method 8270
7,12-Dimethylbenz[a]anthracene	µg/L	50	100	EPA Method 8270
3,3'-Dimethylbenzidine	µg/L	50	100	EPA Method 8270
a,a-Dimethylphenethylamine	µg/L	50	100	EPA Method 8270
2,4-Dimethyl phenol	µg/L	50	100	EPA Method 8270
Dimethyl phthalate		No flag	No flag	Set by EPD/EMS
1,3-Dinitrobenzene	µg/L	50	100	EPA Method 8270
4,6-Dinitro-ortho-cresol	µg/L	250	500	EPA Method 8270
2,4-Dinitrophenol	µg/L	250	500	EPA Method 8270
2,4-Dinitrotoluene	µg/L	50	100	EPA Method 8270
2,6-Dinitrotoluene	µg/L	50	100	EPA Method 8270
1,4-Dioxane	µg/L	50	100	EPA Method 8270
Diphenylamine	µg/L	50	100	EPA Method 8270
1,2-Diphenylhydrazine	µg/L	50	100	EPA Method 8270
Dissolved organic carbon	µg/L	5,000	10,000	EPA Method 9060
Disulfoton	µg/L	50	100	EPA Method 8270
Eh		No flag	No flag	Set by EPD/EMS
alpha-Endosulfan	µg/L	50	100	EPA Method 8270
beta-Endosulfan	µg/L	50	100	EPA Method 8270
Endosulfan I	µg/L	2.5	5	EPA Method 8080
Endosulfan II	µg/L	2.5	5	EPA Method 8080
Endosulfan sulfate	µg/L	2.5	5	EPA Method 8080
Endrin	µg/L	0.1	0.2	Final DWS (CFR, 1991a)
Endrin aldehyde	µg/L	2.5	5	EPA Method 8080
Endrin ketone		No flag	No flag	Set by EPD/EMS
Ethyl methacrylate	µg/L	50	100	EPA Method 8270
Ethyl methanesulfonate	µg/L	50	100	EPA Method 8270
Ethylbenzene	µg/L	350	700	Final DWS (CFR, 1991a)
Europium-154	pCi/L	1E+02	2E+02	Final DWS (EPA, 1977)
Europium-155	pCi/L	3E+02	6E+02	Final DWS (EPA, 1977)
Famphur	µg/L	50	100	EPA Method 8270
Fluoranthene	µg/L	50	100	EPA Method 8270
Fluorene	µg/L	50	100	EPA Method 8270
Fluoride	µg/L	2,000	4,000	Final DWS (CFR, 1991a)
Gross alpha	pCi/L	7.5E+00	1.5E+01	Final DWS (CFR, 1991a)
Heptachlor	µg/L	0.2	0.4	Final DWS (CFR, 1991a)
Heptachlor epoxide	µg/L	0.1	0.2	Final DWS (CFR, 1991a)
Heptachlorodibenzo-p-dioxin isomers	µg/L	0.00325	0.0065	EPA Method 8280
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	µg/L	0.00325	0.0065	EPA Method 8280
Heptachlorodibenzo-p-furan isomers	µg/L	0.00225	0.0045	EPA Method 8280
1,2,3,4,6,7,8-Heptachlorodibenzo-p-furan	µg/L	0.00225	0.0045	EPA Method 8280
Hexachlorobenzene	µg/L	0.5	1	Proposed DWS (EPA, 1990)
Hexachlorobutadiene	µg/L	50	100	EPA Method 8270
Hexachlorocyclopentadiene	µg/L	25	50	Proposed DWS (EPA, 1990)
Hexachlorodibenzo-p-dioxin isomers	µg/L	0.00225	0.0045	EPA Method 8280
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	µg/L	0.00225	0.0045	EPA Method 8280
Hexachlorodibenzo-p-furan isomers	µg/L	0.002	0.004	EPA Method 8280

Analyte	Unit	Flag 1	Flag 2	Source
1,2,3,4,7,8-Hexachlorodibenzo-p-furan	µg/L	0.002	0.004	EPA Method 8280
Hexachloroethane	µg/L	50	100	EPA Method 8270
Hexachlorophene	µg/L	250	500	EPA Method 8270
Hexachloropropene	µg/L	50	100	EPA Method 8270
2-Hexanone	µg/L	100	200	EPA Method 8240
Indeno[1,2,3-*c,d*]pyrene	µg/L	50	100	EPA Method 8270
Iodine	µg/L	500	1,000	EPA Method 415
Iodine-129	pCi/L	5E-01	1E+00	Final DWS (EPA, 1977)
Iodine-131	pCi/L	1.5E+00	3E+00	Final DWS (EPA, 1977)
Iodomethane (Methyl iodide)	µg/L	75	150	EPA Method 8240
Iron	µg/L	150	300	Secondary DWS (CFR, 1991b)
Iron-55	pCi/L	1E+03	2E+03	Final DWS (EPA, 1977)
Iron-59	pCi/L	1E+02	2E+02	Final DWS (EPA, 1977)
Isobutyl alcohol	µg/L	500	1,000	EPA Method 8240
Isodrin	µg/L	50	100	EPA Method 8270
Isophorone	µg/L	50	100	EPA Method 8270
Isosafrole	µg/L	50	100	EPA Method 8270
Kepone	µg/L	50	100	EPA Method 8270
Lanthanum-140	pCi/L	3E+01	6E+01	Final DWS (EPA, 1977)
Lead	µg/L	7.5	15	Final DWS (CFR, 1991a)
Lindane	µg/L	0.1	0.2	Final DWS (CFR, 1991a)
Lithium	µg/L	25	50	EPA Method 6010
Magnesium		No flag	No flag	Set by EPD/EMS
Manganese	µg/L	25	50	Secondary DWS (CFR, 1991b)
Manganese-54	pCi/L	1.5E+02	3E+02	Final DWS (EPA, 1977)
Mercury	µg/L	1	2	Final DWS (CFR, 1991a)
Methacrylonitrile	µg/L	250	500	EPA Method 8240
Methapyrilene	µg/L	50	100	EPA Method 8270
Methoxychlor	µg/L	20	40	Final DWS (CFR, 1991a)
3-Methylcholanthrene	µg/L	50	100	EPA Method 8270
2-Methyl-4,6-dinitrophenol	µg/L	250	500	EPA Method 8270
Methyl ethyl ketone		No flag	No flag	Set by EPD/EMS
Methyl isobutyl ketone		No flag	No flag	Set by EPD/EMS
Methyl methacrylate	µg/L	50	100	EPA Method 8270
Methyl methanesulfonate	µg/L	50	100	EPA Method 8270
2-Methylnaphthalene	µg/L	50	100	EPA Method 8270
Molybdenum	µg/L	250	500	EPA Method 6010
Naphthalene	µg/L	50	100	EPA Method 8270
1,4-Naphthoquinone	µg/L	50	100	EPA Method 8270
1-Naphthylamine	µg/L	50	100	EPA Method 8270
2-Naphthylamine	µg/L	50	100	EPA Method 8270
Neptunium-237	pCi/L	3.53E+00	7.06E+00	Proposed DWS (EPA, 1991)
Nickel	µg/L	50	100	Proposed DWS (EPA, 1990)
Nickel-59	pCi/L	1.5E+02	3E+02	Final DWS (EPA, 1977)
Nickel-63	pCi/L	2.5E+01	5E+01	Final DWS (EPA, 1977)
Niobium-95	pCi/L	1.5E+02	3E+02	Final DWS (EPA, 1977)
Nitrate as nitrogen	µg/L	5,000	10,000	Final DWS (CFR, 1991a)
Nitrate-nitrite as nitrogen	µg/L	5,000	10,000	Final DWS (CFR, 1991a)
Nitrite as nitrogen	µg/L	500	1,000	Final DWS (CFR, 1991a)
2-Nitroaniline	µg/L	50	100	EPA Method 8270
3-Nitroaniline	µg/L	50	100	EPA Method 8270
4-Nitroaniline	µg/L	50	100	EPA Method 8270
Nitrobenzene	µg/L	50	100	EPA Method 8270
Nitrogen by Kjeldahl method	µg/L	500	1,000	EPA Method 351.2

Analyte	Unit	Flag 1	Flag 2	Source
2-Nitrophenol	µg/L	50	100	EPA Method 8270
4-Nitrophenol	µg/L	50	100	EPA Method 8270
4-Nitroquinoline-1-oxide	µg/L	50	100	EPA Method 8270
N-Nitrosodi-n-butylamine	µg/L	50	100	EPA Method 8270
N-Nitrosodiethylamine	µg/L	50	100	EPA Method 8270
N-Nitrosodimethylamine	µg/L	50	100	EPA Method 8270
N-Nitrosodiphenylamine	µg/L	50	100	EPA Method 8270
N-Nitrosodi-propylamine	µg/L	50	100	EPA Method 8270
N-Nitrosomethylethylamine	µg/L	50	100	EPA Method 8270
N-Nitrosomorpholine	µg/L	50	100	EPA Method 8270
N-Nitrosopiperidine	µg/L	50	100	EPA Method 8270
N-Nitrosopyrrolidine	µg/L	50	100	EPA Method 8270
5-Nitro-o-toluidine	µg/L	50	100	EPA Method 8270
Nonvolatile beta	pCi/L	2.5E+01	5E+01	Proposed DWS (EPA, 1986)
Octachlorodibenzo-p-dioxin isomers	µg/L	0.005	0.01	EPA Method 8280
Octachlorodibenzo-p-furan isomers	µg/L	0.005	0.01	EPA Method 8280
Odor		No flag	No flag	Set by EPD/EMS
Oil & Grease	µg/L	5,000	10,000	EPA Method 413.1
Parathion	µg/L	2.5	5	EPA Method 8080
Parathion methyl	µg/L	2.5	5	EPA Method 8080
PCB 1016	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
PCB 1221	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
PCB 1232	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
PCB 1242	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
PCB 1248	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
PCB 1254	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
PCB 1260	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
PCB 1262	µg/L	0.25	0.5	Final DWS (CFR, 1991a)
Pentachlorobenzene	µg/L	50	100	EPA Method 8270
Pentachlorodibenzo-p-dioxin isomers	µg/L	0.00275	0.0055	EPA Method 8280
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	µg/L	0.00275	0.0055	EPA Method 8280
Pentachlorodibenzo-p-furan isomers	µg/L	0.00275	0.0055	EPA Method 8280
1,2,3,7,8-Pentachlorodibenzo-p-furan	µg/L	0.00275	0.0055	EPA Method 8280
Pentachloroethane	µg/L	50	100	EPA Method 8270
Pentachloronitrobenzene	µg/L	50	100	EPA Method 8270
Pentachlorophenol	µg/L	0.5	1	Final DWS (CFR, 1991a)
pH	pH	8	10	Set by EPD/EMS
pH	pH	4	3	Set by EPD/EMS
Phenacetin	µg/L	50	100	EPA Method 8270
Phenanthrene	µg/L	50	100	EPA Method 8270
Phenol	µg/L	50	100	EPA Method 8270
Phenols	µg/L	25	50	EPA Method 420.1
p-Phenylenediamine	µg/L	50	100	EPA Method 8270
Phorate	µg/L	2.5	5	EPA Method 8080
2-Picoline	µg/L	50	100	EPA Method 8270
Plutonium-238	pCi/L	3.51E+00	7.02E+00	Proposed DWS (EPA, 1991)
Plutonium-239	pCi/L	3.11E+01	6.21E+01	Proposed DWS (EPA, 1991)
Plutonium-239/240[a]	pCi/L	3.11E+01	6.21E+01	Proposed DWS (EPA, 1991)
Plutonium-240	pCi/L	3.11E+01	6.22E+01	Proposed DWS (EPA, 1991)
Plutonium-241	pCi/L	3.13E+01	6.26E+01	Proposed DWS (EPA, 1991)
Plutonium-242	pCi/L	3.27E+01	6.54E+01	Proposed DWS (EPA, 1991)
Potassium		No flag	No flag	Set by EPD/EMS

Analyte	Unit	Flag 1	Flag 2	Source
Potassium-40	pCi/L	1.5E+02	3E+02	Proposed DWS (EPA, 1986)
Pronamid	µg/L	50	100	EPA Method 8270
Propionitrile	µg/L	1,000	2,000	EPA Method 8240
Pyrene	µg/L	50	100	EPA Method 8270
Pyridine	µg/L	50	100	EPA Method 8270
Radium-226	pCi/L	7.85E+00	1.57E+01	Proposed DWS (EPA, 1991)
Radium-228	pCi/L	3.93E+00	7.85E+00	Proposed DWS (EPA, 1991)
Radon-222	pCi/L	1.5E+02	3E+02	Proposed DWS (EPA, 1991)
Ruthenium-103	pCi/L	1E+02	2E+02	Final DWS (EPA, 1977)
Ruthenium-106	pCi/L	1.5E+01	3E+01	Final DWS (EPA, 1977)
Safrole	µg/L	50	100	EPA Method 8270
Selenium	µg/L	25	50	Final DWS (CFR, 1991a)
Silica		No flag	No flag	Set by EPD/EMS
Silver	µg/L	25	50	Final DWS (CFR, 1991a)
Sodium		No flag	No flag	Set by EPD/EMS
Sodium-22	pCi/L	2.33E+02	4.66E+02	Proposed DWS (EPA, 1991)
Specific conductance	µS/cm	250	500	Set by EPD/EMS
Strontium-89	pCi/L	1E+01	2E+01	Final DWS (EPA, 1977)
Strontium-89/90[a]	pCi/L	4E+00	8E+00	Final DWS (CFR, 1991a)
Strontium-90	pCi/L	4E+00	8E+00	Final DWS (CFR, 1991a)
Styrene	µg/L	50	100	Final DWS (CFR, 1991a)
Sulfate	µg/L	200,000	400,000	Proposed DWS (EPA, 1990)
Sulfide	µg/L	5,000	10,000	EPA Method 9030
Sulfotepp	µg/L	50	100	EPA Method 8270
Surfactants		No flag	No flag	Set by EPD/EMS
2,3,7,8-TCDD	µg/L	0.00225	0.0045	EPA Method 8280
2,3,7,8-TCDF	µg/L	0.002	0.004	EPA Method 8280
Technetium-99	pCi/L	4.5E+02	9E+02	Final DWS (EPA, 1977)
1,2,4,5-Tetrachlorobenzene	µg/L	50	100	EPA Method 8270
Tetrachlorodibenzo-p-dioxin isomers	µg/L	0.00225	0.0045	EPA Method 8280
Tetrachlorodibenzo-p-furan isomers	µg/L	0.002	0.004	EPA Method 8280
1,1,1,2-Tetrachloroethane	µg/L	5	10	EPA Method 8240
1,1,2,2-Tetrachloroethane	µg/L	5	10	EPA Method 8240
Tetrachloroethylene	µg/L	2.5	5	Final DWS (CFR, 1991a)
2,3,4,6-Tetrachlorophenol	µg/L	50	100	EPA Method 8270
Tetraethyl dithiopyrophosphate	µg/L	50	100	EPA Method 8270
Thallium	µg/L	0.5	1	Proposed DWS (EPA, 1990)
Thionazin	µg/L	50	100	EPA Method 8270
Thorium-228	pCi/L	6.25E+01	1.25E+02	Proposed DWS (EPA, 1991)
Thorium-230	pCi/L	3.96E+01	7.92E+01	Proposed DWS (EPA, 1991)
Thorium-232	pCi/L	4.4E+01	8.8E+01	Proposed DWS (EPA, 1991)
Thorium-234	pCi/L	2E+02	4.01E+02	Proposed DWS (EPA, 1991)
Tin	µg/L	10	20	EPA Method 282.2
Tin-113	pCi/L	1.5E+02	3E+02	Final DWS (EPA, 1977)
Toluene	µg/L	500	1,000	Final DWS (CFR, 1991a)
o-Toluidine	µg/L	50	100	EPA Method 8270
Total carbon	µg/L	5,000	10,000	EPA Method 9060
Total dissolved solids		No flag	No flag	Set by EPD/EMS
Total hydrocarbons	µg/L	5,000	10,000	EPA Method 418.1
Total inorganic carbon	µg/L	5,000	10,000	EPA Method 9060
Total organic carbon	µg/L	5,000	10,000	EPA Method 9060
Total organic halogens	µg/L	25	50	EPA Method 9020
Total organic nitrogen	µg/L	500	1,000	EPA Method 420

Analyte	Unit	Flag 1	Flag 2	Source
Total petroleum hydrocarbons	µg/L	5,000	10,000	EPA Method 418.1
Total phosphates (as P)		No flag	No flag	Set by EPD/EMS
Total phosphorus		No flag	No flag	Set by EPD/EMS
Total radium	pCi/L	2.5E+00	5E+00	Final DWS (CFR, 1991a)
Total silica	µg/L	500	1,000	EPA Method 6010
Total trihalomethanes	µg/L	50	100	Final DWS (CFR, 1991a)
Toxaphene	µg/l	1.5	3	Final DWS (CFR, 1991a)
2,4,5-TP (Silvex)	µg/L	25	50	Final DWS (CFR, 1991a)
Tributyl phosphate	µg/L	50	100	EPA Method 8270
1,2,4-Trichlorobenzene	µg/L	4.5	9	Proposed DWS (EPA, 1990)
1,1,1-Trichloroethane	µg/L	100	200	Final DWS (CFR, 1991a)
1,1,2-Trichloroethane	µg/L	2.5	5	Proposed DWS (EPA, 1990)
Trichloroethylene	µg/L	2.5	5	Final DWS (CFR, 1991a)
Trichlorofluoromethane	µg/L	5	10	EPA Method 8240
2,4,5-Trichlorophenol	µg/L	50	100	EPA Method 8270
2,4,6-Trichlorophenol	µg/L	50	100	EPA Method 8270
2,4,5-Trichlorophenoxyacetic acid	µg/L	2.5	5	EPA Method 8150
1,2,3-Trichloropropane	µg/L	5	10	EPA Method 8240
O,O,O-Triethyl phosphorothioate	µg/L	50	100	EPA Method 8270
1,3,5-Trinitrobenzene	µg/L	50	100	EPA Method 8270
Tritium	pCi/mL	1E+01	2E+01	Final DWS (CFR, 1991a)
Turbidity		No flag	No flag	Set by EPD/EMS
Uranium	µg/L	10	20	Proposed DWS (EPA, 1991)
Uranium alpha activity	pCi/L	1.5E+01	3E+01	Proposed DWS (EPA, 1991)
Uranium-233/234[a]	pCi/L	6.9E-00	1.38E+01	Proposed DWS (EPA, 1991)
Uranium-234	pCi/L	6.95E+00	1.39E+01	Proposed DWS (EPA, 1991)
Uranium-235	pCi/L	7.25E+00	1.45E+01	Proposed DWS (EPA, 1991)
Uranium-238	pCi/L	7.3E+00	1.46E+01	Proposed DWS (EPA, 1991)
Vanadium	µg/L	50	100	EPA Method 6010
Vinyl acetate	µg/L	5	10	EPA Method 8240
Xylenes	µg/L	5,000	10,000	Final DWS (CFR, 1991a)
Zinc	µg/L	2,500	5,000	Secondary DWS (CFR, 1991b)
Zinc-65	pCi/L	1.5E+02	3E+02	Final DWS (EPA, 1977)
Zirconium-95	pCi/L	1E+02	2E+02	Final DWS (EPA, 1977)
Zirconium/Niobium-95[a]	pCi/L	1E+02	2E+02	Final DWS (EPA, 1977)

[a] For double radionuclide analyses where each separate radionuclide has its own standard, the more stringent standard is used.

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Appendix C – Figures

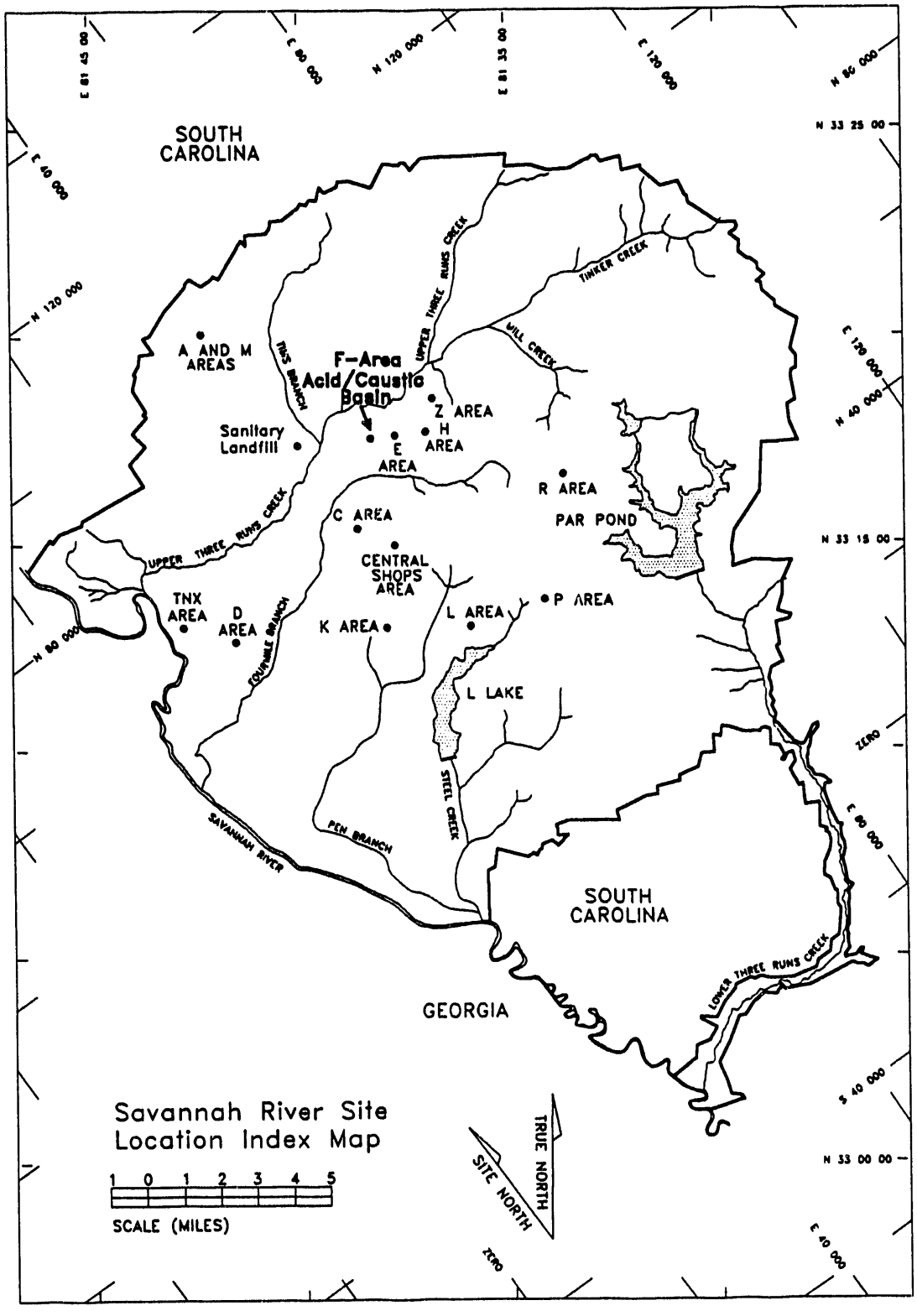

Figure 1. Location of the F-Area Acid/Caustic Basin at the Savannah River Site

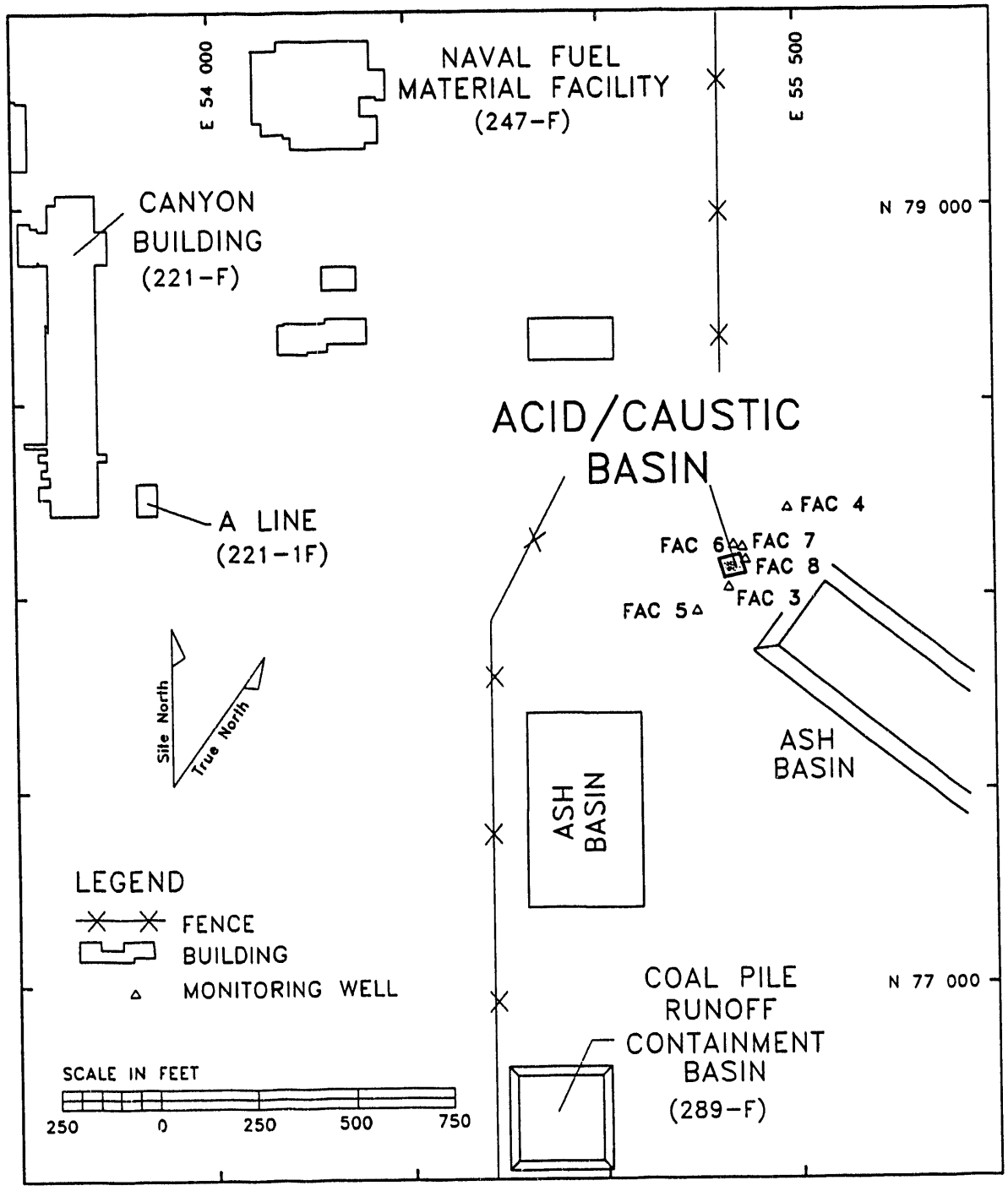

Figure 2. Location of Groundwater Monitoring Wells at the F-Area Acid/Caustic Basin

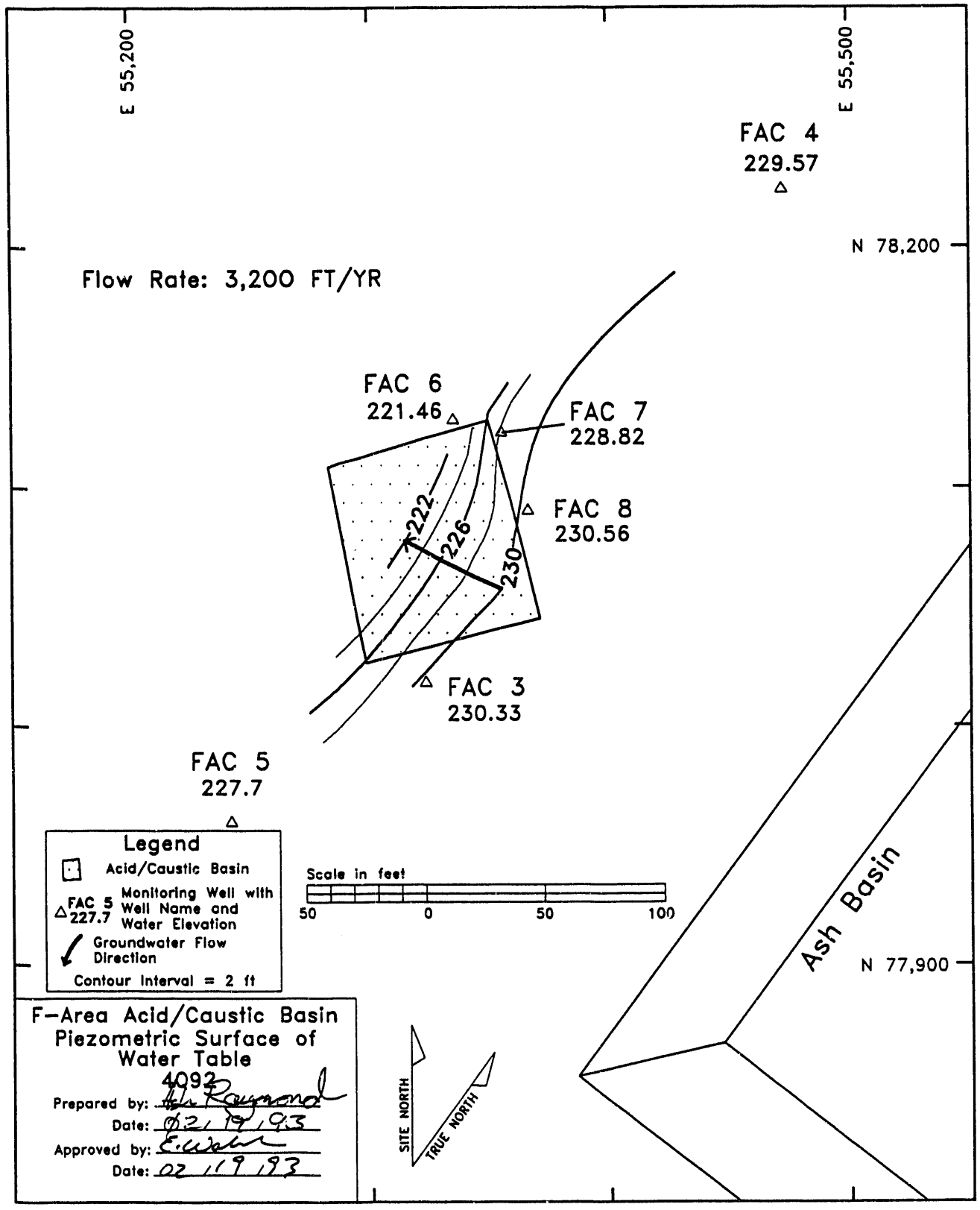

Figure 3. Water-Elevation Contour Map of the Water Table at the F-Area Acid/Caustic Basin, Monitoring Well Data

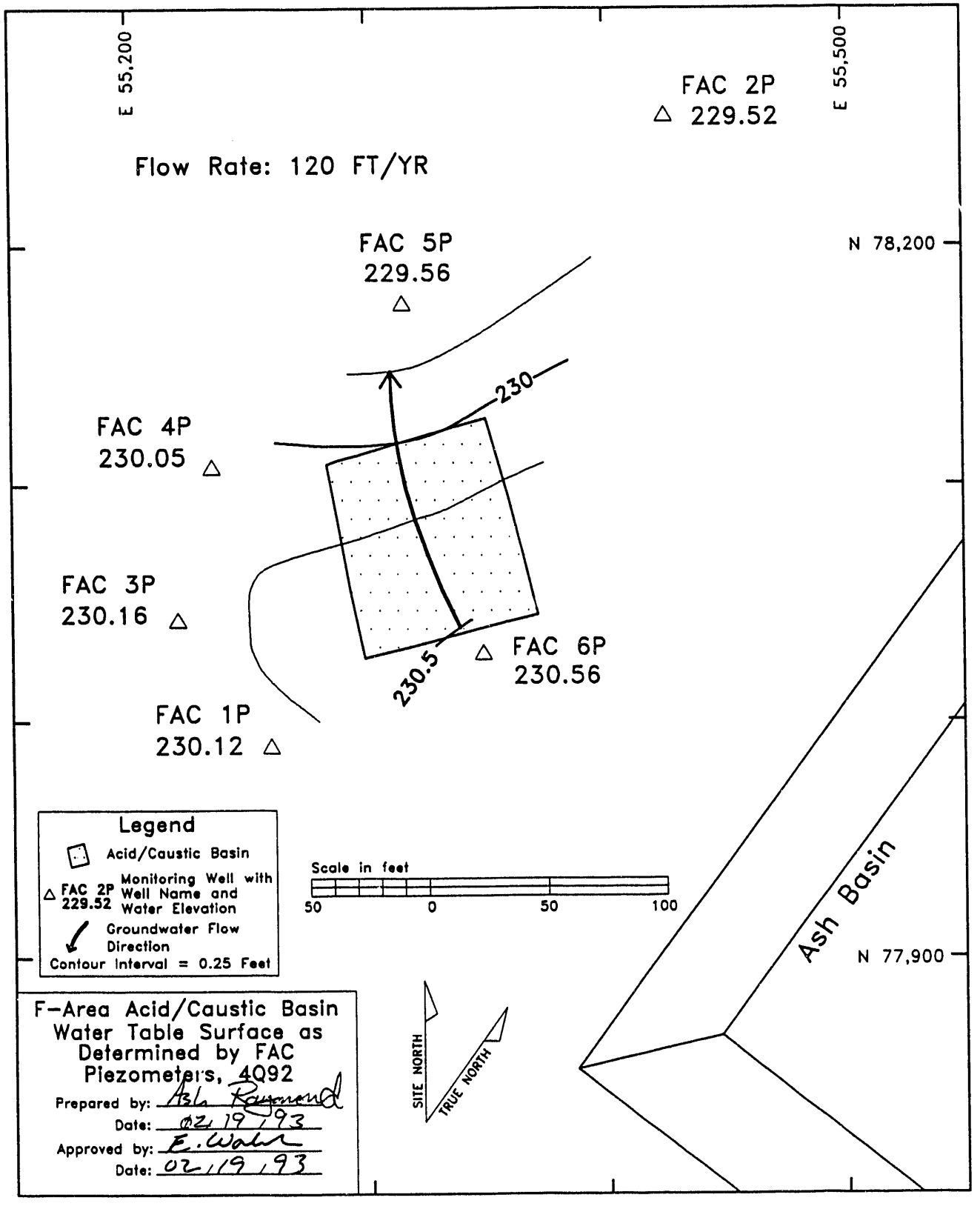

Figure 4. Water-Elevation Contour Map of the Water Table at the F-Area Acid/Caustic Basin, Piezometer Data

Appendix D – Groundwater Monitoring Results Tables

Key to Reading the Tables

The following abbreviations may appear in the tabular data:

B = sample collected from well using an open bucket bailer
BA = Barringer Laboratories, Inc.
CN = Clemson Technical Center, Inc.
CS = carbon steel
D = primary drinking water standard (PDWS)
E = exponential notation (e.g., 1.1E−09 = 1.1×10^{-9} = 0.0000000011)
EM = Environmental Protection Department/Environmental Monitoring Section (EPD/EMS) Laboratory
GE = General Engineering Laboratories
GP = Environmental Physics, Inc.
H = holding time
1,2,3,4,6,7,8-HPCDD = 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin
1,2,3,4,6,7,8-HPCDF = 1,2,3,4,6,7,8-heptachlorodibenzo-p-furan
1,2,3,4,7,8-HXCDD = 1,2,3,4,7,8-hexachlorodibenzo-p-dioxin
1,2,3,4,7,8-HXCDF = 1,2,3,4,7,8-hexachlorodibenzo-p-furan
Lindane = gamma-benzene hexachloride
mg/L = milligrams per liter
Mod = modifier
msl = mean sea level
MSL = million structures per liter
NTU = turbidity unit
P = sample collected from well using a bladder pump
PCB = polychlorinated biphenyl
1,2,3,7,8-PCDD = 1,2,3,7,8-pentachlorodibenzo-p-dioxin
1,2,3,7,8-PCDF = 1,2,3,7,8-pentachlorodibenzo-p-furan
pCi/L = picocuries per liter
pCi/mL = picocuries per milliliter
PDWS = primary drinking water standard
pH = pH unit
PVC = polyvinyl chloride
S = sample collected from well using a single-speed centrifugal downhole pump
Sp. conductance = specific conductance
SP = Spencer Testing Services, Inc.
TCDD = tetrachlorodibenzo-p-dioxin
TCDF = tetrachlorodibenzo-p-furan
TM = TMA/Eberline
TOC = top of casing
V = sample collected from well using a variable-speed pump
WA = Roy F. Weston, Inc.
μg/L = micrograms per liter
μS/cm = microsiemens per centimeter

Holding Times

Standard analytical methods include a limit, called holding time, on the maximum elapsed time between sample collection and extraction or analysis by the laboratory. In the data tables, a large dot (•) in the H (holding time) column indicates that holding time was exceeded. Analyses performed beyond holding time may not yield valid results.

The South Carolina Department of Health and Environmental Control allows only 15 minutes to elapse between sampling and analysis for pH. Thus, only field pH measurements can meet the holding time criterion; laboratory pH analyses will always exceed it.

Laboratory-initiated procedures for reducing the number of other analyses performed out of holding time include subcontracting analyses when difficulties with equipment, personnel, or work load would prevent timely analyses. Beginning fourth quarter 1991, SRS reduced the compensation to laboratories for analyses performed out of holding time.

Data Qualification

The contract laboratories continually assess their own accuracy and precision according to U.S. Environmental Protection Agency (EPA) guidelines. They submit sample- or batch-specific quality assurance/quality control information either at the same time as analytical results or in a quarterly summary. Properly defined and used result modifiers (also referred to as qualifiers) can be a key component in assessing data useability. Result modifiers designed by EPD/EMS and provided to the primary laboratories are defined below. These modifiers appear in the data tables under the column "Mod."

Result modifier	Definition
(Blank)	Data are not qualified. Number should be interpreted exactly as reported.
A[a]	Value reported is the mean of two or more determinations.
J[a]	Value is estimated because quantitation in the sample or in associated quality control samples did not meet specifications.
L[a]	Value is off-scale high. The actual value is not known but is known to be greater than the value shown.
M[a]	Presence of the analyte is verified but not quantified.
R[a]	Result was rejected because performance requirements in the sample analysis or associated quality control analyses were not met.
T[a]	Analyte was not detected; if present, it was below the criteria for detection.
V[a]	Analyte was detected in the associated method blank.
1	Result may be an underestimation of the true value due to analytical bias.
2	Result may be an overestimation of the true value due to analytical bias.

Result modifier	Definition
3	The associated result may be of poor precision (high variability) due to analytical bias.
6	The associated result is from a reanalysis performed out of holding time due to problems with an earlier analysis.

[a] These codes are based on the STORET codes from EPA.

Table 1. Constituents Exceeding the Final Primary Drinking Water Standards in 1992

Well	Constituent	Unit	1Q92	2Q92	3Q92	4Q92	Mod
FAC 4	Gross alpha	pCi/L	6.2E+01[a]	1.5E+01[a]	1.5E+01	4.2E+01	
	Gross alpha	pCi/L	4.6E+01[a]	1.5E+01[a]	NA[b]	NA	
	Gross alpha	pCi/L	3.3E+01[a]	NA	NA	NA	
	Gross alpha	pCi/L	3.5E+01[a]	NA	NA	NA	
	Lead	µg/L	98	-[c]	-	-	
	Total alpha-emitting radium[d]	pCi/L	1.9E+01[e]	NA	NA	NA	
	Total alpha-emitting radium	pCi/L	1.8E+01[e]	NA	NA	NA	
FAC 5	Gross alpha	pCi/L	3.3E+01	-	-	-	
	Nitrate as nitrogen	µg/L	-	-	278,000	-	
FAC 7	Nitrate as nitrogen	µg/L	-	-	77,600	-	

[a] Duplicate/replicate samples of gross alpha.
[c] - = not above PDWS.
[b] NA = not analyzed.
[d] The PDWS for total radium was applied to total alpha-emitting radium.
[e] Duplicate/replicate samples of total alpha-emitting radium.

Table 2. Constituents Exceeding Half the Final Primary Drinking Water Standards, Other Flag 1 or Flag 2 Criteria, or the SRS Turbidity Standard

Well	Constituent	Unit	4Q92	Mod	Flag
FAC 3	Iron	µg/L	13,400		2
	Manganese	µg/L	59		2
FAC 4	Manganese	µg/L	644		2
	Nitrate as nitrogen	µg/L	5,760		1
	Nonvolatile beta	pCi/L	2.6E+01		1
	Radium-226	pCi/L	1.4E+01		1
FAC 5	Iron	µg/L	468		2
	Manganese	µg/L	28		1
	Total organic carbon	µg/L	9,140		1
	Total organic halogens	µg/L	239		2
FAC 6	Iron	µg/L	950		2
	Total organic carbon	µg/L	30,500		2
	Total organic halogens	µg/L	187		2
FAC 7	Iron	µg/L	7,880		2
	Manganese	µg/L	76		2
	Total organic carbon	µg/L	11,900		2
	Total organic halogens	µg/L	280		2
	Turbidity	NTU	393		0
FAC 8	Iron	µg/L	2,580		2
	Manganese	µg/L	28		1
	Total organic carbon	µg/L	12,500		2
	Total organic halogens	µg/L	40		1
	Turbidity	NTU	110		0

Note: Constituents exceeding half the final PDWS appear *italicized.* These results do not include field data results.

Table 3. Groundwater Monitoring Results for Individual Wells

WELL FAC 3

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Pump	Formation
N78018.3 E55322.7	33.288592 °N 81.672674 °W	254.8-224.8 ft msl	311.8 ft msl	4" PVC	B	Water table

SAMPLE DATE	03/04/92	05/27/92	08/30/92	11/23/92

FIELD DATA

Analyte	1Q92	2Q92	3Q92	4Q92	Unit
Water elevation	231.0	230.6	230.0	230.3	ft msl
pH	6.0	6.2	6.9	6.6	pH
Sp. conductance	209	181	210	162	µS/cm
Water temperature	21.3	20.5	22.4	20.1	°C
Alkalinity as $CaCO_3$	46	32	62	34	mg/L
Volume purged	3.9	3.9	2.6	3.0	Well vol.

ANALYTICAL DATA

H	D	Analyte	1Q92	2Q92	3Q92	4Q92	Mod	Unit	Lab	Flag
		Arsenic	<2.0	<2.0	<2.0	<2.0		µg/L	WA	0
		Barium	19	20	24	195		µg/L	WA	0
		Benzene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Bromodichloromethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Bromoform	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Bromomethane (Methyl bromide)	<10	<10	<10	<10		µg/L	WA	0
		Cadmium	0.58	1.2	0.53	<0.35	V	µg/L	WA	0
		Calcium	22,700	22,200	26,900	16,600	V	µg/L	WA	0
		Carbon tetrachloride	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Chloride	4,260	3,450	3,100	3,800		µg/L	WA	0
		Chlorobenzene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Chloroethane	<10	<10	<10	<10		µg/L	WA	0
		Chloroethene (Vinyl chloride)	<10	<10	<10	<10		µg/L	WA	0
		2-Chloroethyl vinyl ether	<10	<10	<10	<10		µg/L	WA	0
		Chloroform	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Chloromethane (Methyl chloride)	<10	<10	<10	<10		µg/L	WA	0
		Chromium	1.2	4.0	2.7	14		µg/L	WA	0
		Dibromochloromethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,1-Dichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,2-Dichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,1-Dichloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		trans-1,2-Dichloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Dichloromethane (Methylene chloride)	<5.0	7.2	18	<5.0		µg/L	WA	0
		2,4-Dichlorophenoxyacetic acid	<1.1	<1.1	<1.1	<1.1		µg/L	WA	0
		1,2-Dichloropropane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		cis-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		trans-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Endrin	<0.11	<0.11	<0.11	<0.11		µg/L	WA	0
		Ethylbenzene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Fluoride	<100	<100	<100	<100		µg/L	WA	0
		Gross alpha	1.7E+00	7.8E+00	1.1E+01	6.9E+00		pCi/L	CN	0
		Iron	2.1	<1.9	4.7	13,400		µg/L	WA	2
		Lead	<2.0	<2.0	<2.0	2.5	J3	µg/L	WA	0
		Lindane	<0.055	<0.057	<0.056	<0.055		µg/L	WA	0
		Magnesium	2,870	3,040	2,900	2,770	V	µg/L	WA	0
		Manganese	3.7	3.8	2.4	59		µg/L	WA	2
		Mercury	0.58	<0.20	0.33	0.78		µg/L	WA	0
		Methoxychlor	<0.55	<0.57	<0.56	<0.55		µg/L	WA	0
		Nitrate as nitrogen	533	460	343	260		µg/L	WA	0
		Nonvolatile beta	2.2E+00	8.3E+00	1.1E+01	1.1E+01		pCi/L	CN	0
•		pH	7.1	8.1	6.9	6.6	J	pH	WA	0
		Phenols	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Potassium	4,350	4,620	4,150	3,250	V	µg/L	WA	0

Note: Flagging levels, modifiers, and laboratories are for 4th quarter 1992 data only. See Appendix B for flagging criteria.

• = exceeded holding time for 4th quarter 1992.

■ = exceeded final primary drinking water standard for 4th quarter 1992.

Well FAC 3 continued

ANALYTICAL DATA

H	D	Analyte	1Q92	2Q92	3Q92	4Q92	Mod	Unit	Lab	Flag
		Radium-226	8.0E+00	4.5E+00	<1.0E+00	1.3E+00		pCi/L	CN	0
		Radium-228	<7.8E+00		<1.0E+00			pCi/L		
		Selenium	<2.0	<2.0	<2.0	<2.0		µg/L	WA	0
		Silica	11,600	10,700	12,200	12,900	V	µg/L	WA	0
		Silver	0.90	<0.70	<0.70	<0.70		µg/L	WA	0
		Sodium	8,940	6,090	5,040	3,480	V	µg/L	WA	0
•		Specific conductance	193	166	187	172	J	µS/cm	WA	0
		Sulfate	44,200	29,600	37,200	37,200		µg/L	WA	0
		1,1,2,2-Tetrachloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Tetrachloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Toluene	<5.0	1.0	<5.0	<5.0		µg/L	WA	0
•		Total dissolved solids	147,000	124,000	153,000	114,000	JV	µg/L	WA	0
		Total organic carbon	1,830	3,070	1,850	3,440		µg/L	WA	0
		Total organic halogens	115	55	39	17		µg/L	WA	0
		Total phosphates (as P)	753	185	258	405		µg/L	WA	0
		Toxaphene	<1.1	<1.1	<1.1	<1.1		µg/L	WA	0
		2,4,5-TP (Silvex)	<0.56	<0.57	<0.56	<0.56		µg/L	WA	0
		1,1,1-Trichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,1,2-Trichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Trichloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Trichlorofluoromethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Tritium	1.6E+00	<2.0E+00	1.3E+00	<7.0E-01		pCi/mL	CN	0
•		Turbidity	742	271	222	5.4	J	NTU	WA	0

WELL FAC 4

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Pump	Formation
N78223.8 E55472.9	33.289292 °N 81.672678 °W	237.8-207.8 ft msl	309.9 ft msl	4" PVC	S	Water table

SAMPLE DATE	02/28/92	05/27/92	08/29/92	11/23/92

FIELD DATA

Analyte	1Q92	2Q92	3Q92	4Q92	Unit
Water elevation	230.1	229.8	229.3	229.6	ft msl
pH	4.9	4.5	4.6	4.9	pH
Sp. conductance	147	169	202	211	µS/cm
Water temperature	21.1	21.7	22.2	21.4	°C
Alkalinity as $CaCO_3$	0	0	0	0	mg/L
Volume purged	4.0	4.0	4.0	7.1	Well vol.

ANALYTICAL DATA

H	D	Analyte	1Q92	2Q92	3Q92	4Q92	Mod	Unit	Lab	Flag
		Arsenic	<2.0	<2.0	<2.0	<2.0		µg/L	GE	0
		Barium	41	45	51	59		µg/L	WA	0
		Benzene	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		Bromodichloromethane	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		Bromoform	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		Bromomethane (Methyl bromide)	<1.0	<10	<10	<1.0		µg/L	GE	0
		Cadmium	<0.35	0.42	<0.35	1.6	V	µg/L	WA	0
		Calcium	7,670	8,800	8,910	10,400		µg/L	GE	0
		Carbon tetrachloride	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		Chloride	5,000	5,440	5,470	4,470		µg/L	GE	0
		Chlorobenzene	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		Chloroethane	<1.0	<10	<10	<1.0		µg/L	GE	0
		Chloroethene (Vinyl chloride)	<1.0	<10	<10	<1.0		µg/L	GE	0
		2-Chloroethyl vinyl ether	<1.0	<10	<10	<1.0		µg/L	GE	0
		Chloroform	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0

Note: Flagging levels, modifiers, and laboratories are for 4th quarter 1992 data only. See Appendix B for flagging criteria.
• = exceeded holding time for 4th quarter 1992.
■ = exceeded final primary drinking water standard for 4th quarter 1992.

Well FAC 4 continued

ANALYTICAL DATA

H	D	Analyte	1Q92	2Q92	3Q92	4Q92	Mod	Unit	Lab	Flag
		Chloromethane (Methyl chloride)	<1.0	<10	<10	<1.0		µg/L	GE	0
		Chromium	<1.1	1.7	1.4	<1.1		µg/L	WA	0
		Dibromochloromethane	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		1,1-Dichloroethane	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		1,2-Dichloroethane	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		1,1-Dichloroethylene	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		trans-1,2-Dichloroethylene	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		Dichloromethane (Methylene chloride)	<1.0	5.9	16	<1.0		µg/L	GE	0
•		2,4-Dichlorophenoxyacetic acid	<0.30	<1.1	<1.1	<0.30	J6	µg/L	GE	0
		1,2-Dichloropropane	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		cis-1,3-Dichloropropene	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		trans-1,3-Dichloropropene	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		Endrin	<0.0060	<0.11	<0.11	<0.0060		µg/L	GE	0
		Ethylbenzene	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		Fluoride	<100	<100	<100	<100		µg/L	GE	0
	■	Gross alpha	6.2E+01	1.5E+01	1.5E+01	4.2E+01		pCi/L	GP	2
		Iron	16	27	54	25		µg/L	WA	0
		Lead	98	<2.0	<2.0	<2.0		µg/L	WA	0
		Lindane	<0.0050	<0.056	<0.055	<0.0050		µg/L	GE	0
		Magnesium	3,160	3,520	3,720	4,410		µg/L	GE	0
		Manganese	378	434	504	644		µg/L	GE	2
		Mercury	0.56	<0.20	0.33	0.61		µg/L	GE	0
		Methoxychlor	<0.50	<0.56	<0.55	<0.50		µg/L	GE	0
		Nitrate as nitrogen	3,610	3,480	3,660	5,760		µg/L	WA	1
		Nitrate-nitrite as nitrogen	2,740			7,200		µg/L	GE	1
		Nonvolatile beta	3.9E+01	1.1E+01	9.7E+00	2.6E+01		pCi/L	GP	1
•		pH	5.1	5.6	5.2	5.1	J	pH	WA	0
		Phenols	<5.0	<5.0	<5.0	<5.0		µg/L	GE	0
		Potassium	2,970	3,400	3,490	3,880	V	µg/L	WA	0
		Radium-226	1.5E+01	1.1E+01	1.8E+00	1.4E+01		pCi/L	CN	1
		Radium-228	<1.8E+01		2.4E+00			pCi/L		
		Selenium	<2.0	<2.0	<2.0	2.2	J3	µg/L	WA	0
		Silica	8,050	8,160	8,290	8,910		µg/L	GE	0
		Silicon	3,870					µg/L		
		Silver	<0.70	1.4	<0.70	<0.70		µg/L	WA	0
		Sodium	9,900	11,800	14,300	17,200	V	µg/L	WA	0
		Specific conductance	150	150	179	195		µS/cm	GE	0
		Sulfate	53,300	33,300	46,700	48,900		µg/L	WA	0
		1,1,2,2-Tetrachloroethane	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		Tetrachloroethylene	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		Toluene	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		Total alpha-emitting radium	1.9E+01					pCi/L		
		Total dissolved solids	102,000	125,000	127,000	137,000	V	µg/L	GE	0
		Total organic carbon	646	6,450	<500	580		µg/L	WA	0
		Total organic halogens	36	<20	35	6.4		µg/L	WA	0
		Total phosphates (as P)	80	20	214	314		µg/L	WA	0
		Toxaphene	<0.24	<1.1	<1.1	<0.24		µg/L	GE	0
•		2,4,5-TP (Silvex)	<0.090	<0.54	<0.56	<0.090	J6	µg/L	GE	0
		1,1,1-Trichloroethane	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		1,1,2-Trichloroethane	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		Trichloroethylene	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		Trichlorofluoromethane	<1.0	<5.0	<5.0	<1.0		µg/L	GE	0
		Tritium	4.0E+00	7.5E+00	5.6E+00	5.3E+00		pCi/mL	CN	0
•		Turbidity	16	2.9	5.5	1.2	J	NTU	WA	0

Note: Flagging levels, modifiers, and laboratories are for 4th quarter 1992 data only. See Appendix B for flagging criteria.

• = exceeded holding time for 4th quarter 1992.

■ = exceeded final primary drinking water standard for 4th quarter 1992.

WELL FAC 5

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Pump	Formation
N77960.3 E55241.3	33.288331 °N 81.672776 °W	234.0-214.0 ft msl	315.8 ft msl	4" PVC	B	Water table

SAMPLE DATE	03/05/92	05/27/92	09/02/92	11/23/92

FIELD DATA

Analyte	1Q92	2Q92	3Q92	4Q92	Unit
Water elevation	228.1	227.9	227.1	227.7	ft msl
pH	5.1	5.2	5.0	5.3	pH
Sp. conductance	92	97	94	89	µS/cm
Water temperature	20.8	20.5	22.7	20.4	°C
Alkalinity as $CaCO_3$	1	5	1	4	mg/L
Volume purged	1.6	1.6	1.9	1.9	Well vol.

ANALYTICAL DATA

H	D	Analyte	1Q92	2Q92	3Q92	4Q92	Mod	Unit	Lab	Flag
		Arsenic	<2.0	<2.0	<2.0	<2.0		µg/L	WA	0
		Barium	<6.6	<4.0	<4.0	23	J3	µg/L	WA	0
		Benzene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Bromodichloromethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Bromoform	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Bromomethane (Methyl bromide)	<10	<10	<10	<10		µg/L	WA	0
		Cadmium	2.0	<0.35	<0.35	<0.35	V	µg/L	WA	0
		Calcium	5,030	6,300	8,180	4,710	V	µg/L	WA	0
		Carbon tetrachloride	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Chloride	3,620	4,160	2,760	3,130		µg/L	WA	0
		Chlorobenzene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Chloroethane	<10	<10	<10	<10		µg/L	WA	0
		Chloroethene (Vinyl chloride)	<10	<10	<10	<10		µg/L	WA	0
		2-Chloroethyl vinyl ether	<10	<10	<10	<10		µg/L	WA	0
		Chloroform	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Chloromethane (Methyl chloride)	<10	<10	<10	<10		µg/L	WA	0
		Chromium	<1.1	2.3	1.2	1.7	J3	µg/L	WA	0
		Dibromochloromethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,1-Dichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,2-Dichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,1-Dichloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		trans-1,2-Dichloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Dichloromethane (Methylene chloride)	<5.0	5.2	34	<5.0		µg/L	WA	0
		2,4-Dichlorophenoxyacetic acid	<1.1	<1.1	1.1	<1.1	J	µg/L	WA	0
		1,2-Dichloropropane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		cis-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		trans-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Endrin	<0.11	<0.11	<0.11	<0.11		µg/L	WA	0
		Ethylbenzene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Fluoride	<100	<100	<100	<100		µg/L	WA	0
		Gross alpha	3.3E+01	<3.0E+00	1.3E+01	2.4E+00		pCi/L	CN	0
		Iron	14	10	7.5	468		µg/L	WA	2
		Lead	<2.0	<2.0	<2.0	<2.0		µg/L	WA	0
		Lindane	<0.055	<0.056	<0.057	<0.054		µg/L	WA	0
		Magnesium	1,920	2,130	2,250	1,570	V	µg/L	WA	0
		Manganese	34	41	42	28		µg/L	WA	1
		Mercury	<0.20	<0.20	0.39	<0.20		µg/L	WA	0
		Methoxychlor	<0.55	<0.56	<0.57	<0.54		µg/L	WA	0
		Nitrate as nitrogen	432	227	278,000	487		µg/L	WA	0
		Nonvolatile beta	3.2E+01	<5.0E+00	2.5E+01	4.7E+00		pCi/L	CN	0
•		pH	5.9	5.8	5.7	5.8	J	pH	WA	0
		Phenols	<5.0	<5.0	<5.0	7.9		µg/L	WA	0

Note: Flagging levels, modifiers, and laboratories are for 4th quarter 1992 data only. See Appendix B for flagging criteria.
• = exceeded holding time for 4th quarter 1992.
■ = exceeded final primary drinking water standard for 4th quarter 1992.

Well FAC 5 continued

ANALYTICAL DATA

H	D	Analyte	1Q92	2Q92	3Q92	4Q92	Mod	Unit	Lab	Flag
		Potassium	3,370	3,030	3,920	2,150	V	µg/L	WA	0
		Radium-226	1.2E+01	1.2E+00	<1.0E+00	1.7E+00		pCi/L	CN	0
		Radium-228	<1.2E+01		1.4E+00			pCi/L		
		Selenium	<2.0	<2.0	2.4	<2.0		µg/L	WA	0
		Silica	7,490	6,730	7,150	6,710	V	µg/L	WA	0
		Silver	1.7	1.0	1.9	<0.70		µg/L	WA	0
		Sodium	3,580	3,700	5,660	3,960	V	µg/L	WA	0
•		Specific conductance	77	89	86	83	J	µS/cm	WA	0
		Sulfate	23,700	26,800	25,800	23,400		µg/L	WA	0
		1,1,2,2-Tetrachloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Tetrachloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Toluene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
•		Total dissolved solids	49,000	68,000	43,000	82,000	JV	µg/L	WA	0
		Total organic carbon	2,540	5,980	947	9,140		µg/L	WA	1
		Total organic halogens	<5.0	93	41	239		µg/L	WA	2
		Total phosphates (as P)	216	62	52	199		µg/L	WA	0
		Toxaphene	<1.1	<1.1	<1.1	<1.1		µg/L	WA	0
		2,4,5-TP (Silvex)	<0.56	<0.56	<0.58	<0.55	J	µg/L	WA	0
		1,1,1-Trichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,1,2-Trichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Trichloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Trichlorofluoromethane	1.7	4.6	<5.0	4.4	J	µg/L	WA	0
		Tritium	9.8E-01	<2.0E+00	1.8E+00	1.4E+00		pCi/mL	CN	0
•		Turbidity	148	58	8.2	7.2	J	NTU	WA	0

WELL FAC 6

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Pump	Formation
N78129.0 E55335.5	33.288858 °N 81.672855 °W	236.2-216.2 ft msl	312.5 ft msl	4" PVC	B	Water table

SAMPLE DATE	03/05/92	05/27/92	08/30/92	11/23/92

FIELD DATA

Analyte	1Q92	2Q92	3Q92	4Q92	Unit
Water elevation	224.0	223.3	222.9	232.1	ft msl
pH	5.7	5.9	5.6	5.6	pH
Sp. conductance	120	83	75	63	µS/cm
Water temperature	20.5	21.0	21.0	19.6	°C
Alkalinity as $CaCO_3$	24	22	5	13	mg/L
Volume purged	2.3	2.2	2.3	1.1	Well vol.

ANALYTICAL DATA

H	D	Analyte	1Q92	2Q92	3Q92	4Q92	Mod	Unit	Lab	Flag
		Arsenic	<2.0	<2.0	<2.0	<2.0		µg/L	WA	0
		Barium	9.7	4.8	12	23	J3	µg/L	WA	0
		Benzene	1.4	<5.0	<5.0	<5.0		µg/L	WA	0
		Bromodichloromethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Bromoform	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Bromomethane (Methyl bromide)	<10	<10	<10	<10		µg/L	WA	0
		Cadmium	1.3	0.92	<0.35	<0.35	V	µg/L	WA	0
		Calcium	8,730	6,890	2,850	7,280	V	µg/L	WA	0
		Carbon tetrachloride	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Chloride	4,640	4,700	3,090	3,040		µg/L	WA	0
		Chlorobenzene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Chloroethane	<10	<10	<10	<10		µg/L	WA	0
		Chloroethene (Vinyl chloride)	<10	<10	<10	<10		µg/L	WA	0
		2-Chloroethyl vinyl ether	<10	<10	<10	<10		µg/L	WA	0

Note: Flagging levels, modifiers, and laboratories are for 4th quarter 1992 data only. See Appendix B for flagging criteria.

• = exceeded holding time for 4th quarter 1992.

■ = exceeded final primary drinking water standard for 4th quarter 1992.

Well FAC 6 continued

ANALYTICAL DATA

H	D	Analyte	1Q92	2Q92	3Q92	4Q92	Mod	Unit	Lab	Flag
		Chloroform	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Chloromethane (Methyl chloride)	<10	<10	<10	<10		µg/L	WA	0
		Chromium	1.2	1.3	<1.1	3.1	J3	µg/L	WA	0
		Dibromochloromethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,1-Dichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,2-Dichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,1-Dichloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		trans-1,2-Dichloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Dichloromethane (Methylene chloride)	<5.0	6.8	18	<5.0		µg/L	WA	0
		2,4-Dichlorophenoxyacetic acid	<1.1	<1.1	<1.1	<1.1		µg/L	WA	0
		1,2-Dichloropropane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		cis-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		trans-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Endrin	<0.11	<0.11	<0.11	<0.11		µg/L	WA	0
		Ethylbenzene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Fluoride	<100	<100	<100	<100		µg/L	WA	0
		Gross alpha	6.1E+00	<3.0E+00	<2.0E+00	<2.0E+00		pCi/L	CN	0
		Iron	4.1	8.1	8.2	950		µg/L	WA	2
		Lead	<2.0	<2.0	<2.0	2.2	J3	µg/L	WA	0
		Lindane	<0.056	<0.056	<0.055	<0.055		µg/L	WA	0
		Magnesium	878	769	631	581	V	µg/L	WA	0
		Manganese	21	21	15	19		µg/L	WA	0
		Mercury	<0.20	<0.20	0.27	0.29		µg/L	WA	0
		Methoxychlor	<0.56	<0.56	<0.55	<0.55		µg/L	WA	0
		Nitrate as nitrogen	365	219	188	236		µg/L	WA	0
		Nonvolatile beta	6.7E+00	<5.0E+00	<2.0E+00	<2.0E+00		pCi/L	CN	0
•		pH	6.4	6.2	6.1	6.0	J	pH	WA	0
		Phenols	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Potassium	2,690	1,610	1,140	1,560	V	µg/L	WA	0
		Radium-226	2.1E+00	9.2E-01	<1.0E+00	<1.0E+00		pCi/L	CN	0
		Radium-228	<7.6E+00		<1.0E+00			pCi/L		
		Selenium	<2.0	<2.0	<2.0	2.0	J3	µg/L	WA	0
		Silica	8,860	9,200	9,010	11,000	V	µg/L	WA	0
		Silver	1.1	3.1	<0.70	<0.70		µg/L	WA	0
		Sodium	11,100	4,940	4,960	4,730	V	µg/L	WA	0
•		Specific conductance	102	80	62	70	J	µS/cm	WA	0
		Sulfate	16,900	9,190	8,210	10,000		µg/L	WA	0
		1,1,2,2-Tetrachloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Tetrachloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Toluene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
•		Total dissolved solids	70,000	69,000	56,000	93,000	JV	µg/L	WA	0
		Total organic carbon	1,930	18,000	<500	30,500		µg/L	WA	2
		Total organic halogens	<5.0	235	124	187		µg/L	WA	2
		Total phosphates (as P)	58	42	490	90		µg/L	WA	0
		Toxaphene	<1.1	<1.1	<1.1	<1.1		µg/L	WA	0
		2,4,5-TP (Silvex)	<0.56	<0.56	<0.55	<0.57		µg/L	WA	0
		1,1,1-Trichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,1,2-Trichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Trichloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Trichlorofluoromethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Tritium	2.4E+00	<2.0E+00	2.3E+00	1.9E+00		pCi/mL	CN	0
•		Turbidity	55	25	50	3.0	J	NTU	WA	0

Note: Flagging levels, modifiers, and laboratories are for 4th quarter 1992 data only. See Appendix B for flagging criteria.

• = exceeded holding time for 4th quarter 1992.

■ = exceeded final primary drinking water standard for 4th quarter 1992.

WELL FAC 7

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Pump	Formation
N78123.4 E55356.2	33.288879 °N 81.672790 °W	235.7-215.7 ft msl	312 ft msl	4" PVC	B	Water table

SAMPLE DATE	03/04/92	05/28/92	09/02/92	11/22/92

FIELD DATA

Analyte	1Q92	2Q92	3Q92	4Q92	Unit
Water elevation	229.4	228.8	228.5	228.8	ft msl
pH	5.3	5.4	5.2	5.2	pH
Sp. conductance	69	59	46	39	µS/cm
Water temperature	20.3	20.2	21.6	20.9	°C
Alkalinity as $CaCO_3$	9	13	4	9	mg/L
Volume purged	4.0	2.3	1.9	2.0	Well vol.

ANALYTICAL DATA

H	D	Analyte	1Q92	2Q92	3Q92	4Q92	Mod	Unit	Lab	Flag
		Arsenic	<2.0	<2.0	<2.0	<2.0		µg/L	WA	0
		Barium	<6.6	<4.0	5.3	145		µg/L	WA	0
		Benzene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Bromodichloromethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Bromoform	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Bromomethane (Methyl bromide)	<10	<10	<10	<10		µg/L	WA	0
		Cadmium	<0.35	<0.35	<0.35	0.85	V	µg/L	WA	0
		Calcium	5,080	6,030	5,700	16,300	V	µg/L	WA	0
		Carbon tetrachloride	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Chloride	4,340	4,180	2,910	3,290		µg/L	WA	0
		Chlorobenzene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Chloroethane	<10	<10	<10	<10		µg/L	WA	0
		Chloroethene (Vinyl chloride)	<10	<10	<10	<10		µg/L	WA	0
		2-Chloroethyl vinyl ether	<10	<10	<10	<10		µg/L	WA	0
		Chloroform	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Chloromethane (Methyl chloride)	<10	<10	<10	<10		µg/L	WA	0
		Chromium	<1.1	<1.1	<1.1	13		µg/L	WA	0
		Dibromochloromethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,1-Dichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,2-Dichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,1-Dichloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		trans-1,2-Dichloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Dichloromethane (Methylene chloride)	<5.0	8.7	11	<5.0		µg/L	WA	0
		2,4-Dichlorophenoxyacetic acid	<1.1	<1.1	<1.1	<1.0		µg/L	WA	0
		1,2-Dichloropropane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		cis-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		trans-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Endrin	<0.11	<0.11	<0.11	<0.11		µg/L	WA	0
		Ethylbenzene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Fluoride	<100	<100	<100	<100		µg/L	WA	0
		Gross alpha	5.6E+00	<3.0E+00	<2.0E+00	5.9E+00		pCi/L	CN	0
		Iron	261	12	5.8	7,880		µg/L	WA	2
		Lead	<2.0	<2.0	3.5	6.5	J3	µg/L	WA	0
		Lindane	<0.053	<0.056	<0.057	<0.055		µg/L	WA	0
		Magnesium	415	428	357	759	V	µg/L	WA	0
		Manganese	103	13	9.2	76		µg/L	WA	2
		Mercury	<0.20	<0.20	<0.20	0.51		µg/L	WA	0
		Methoxychlor	<0.53	<0.56	<0.57	<0.55		µg/L	WA	0
		Nitrate as nitrogen	246	181	77,600	113		µg/L	WA	0
		Nonvolatile beta	6.4E+00	<5.0E+00	<2.0E+00	5.5E+00		pCi/L	CN	0
•		pH	6.7	6.5	5.5	7.4	J	pH	WA	0
		Phenols	<5.0	<5.0	<5.0	17	J3	µg/L	WA	0

Note: Flagging levels, modifiers, and laboratories are for 4th quarter 1992 data only. See Appendix B for flagging criteria.

• = exceeded holding time for 4th quarter 1992.

■ = exceeded final primary drinking water standard for 4th quarter 1992.

Well FAC 7 continued

ANALYTICAL DATA

H	D	Analyte	1Q92	2Q92	3Q92	4Q92	Mod	Unit	Lab	Flag
		Potassium	1,530	1,010	1,160	1,290	V	µg/L	WA	0
		Radium-226	9.4E+00	5.5E+00	1.0E+00	<1.0E+00		pCi/L	CN	0
		Radium-228	<7.6E+00		<1.0E+00			pCi/L		
		Selenium	<2.0	<2.0	<2.0	<2.0		µg/L	WA	0
		Silica	9,150	7,170	7,640	10,500	V	µg/L	WA	0
		Silver	<0.70	<0.70	0.78	<0.70		µg/L	WA	0
		Sodium	4,430	4,330	5,330	3,430	V	µg/L	WA	0
•		Specific conductance	86	63	47	105	J	µS/cm	WA	0
		Sulfate	7,040	5,560	5,630	5,620		µg/L	WA	0
		1,1,2,2-Tetrachloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Tetrachloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Toluene	<5.0	1.1	<5.0	<5.0		µg/L	WA	0
•		Total dissolved solids	96,000	47,000	41,000	98,000	JV	µg/L	WA	0
		Total organic carbon	2,540	19,500	<500	11,900		µg/L	WA	2
		Total organic halogens	64	152	28	280		µg/L	WA	2
		Total phosphates (as P)	1,740	<50	37	862		µg/L	WA	0
		Toxaphene	<1.1	<1.1	<1.1	<1.1		µg/L	WA	0
		2,4,5-TP (Silvex)	<0.55	<0.56	<0.58	<0.53		µg/L	WA	0
		1,1,1-Trichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,1,2-Trichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Trichloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Trichlorofluoromethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Tritium	2.6E+00	2.9E+00	2.4E+00	1.9E+00		pCi/mL	CN	0
		Turbidity	865	16	8.0	393		NTU	WA	0

WELL FAC 8

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Pump	Formation
N78090.9 E55366.0	33.288823 °N 81.672701 °W	236.0-216.0 ft msl	311 ft msl	4" PVC	B	Water table

SAMPLE DATE	03/05/92	05/27/92	09/02/92	11/22/92

FIELD DATA

Analyte	1Q92	2Q92	3Q92	4Q92	Unit
Water elevation	231.1	230.8	230.4	230.6	ft msl
pH	5.7	5.8	5.6	5.3	pH
Sp. conductance	96	83	57	44	µS/cm
Water temperature	20.2	19.1	21.1	20.7	°C
Alkalinity as $CaCO_3$	24	26	11	11	mg/L
Volume purged	2.9	3.3	3.4	2.0	Well vol.

ANALYTICAL DATA

H	D	Analyte	1Q92	2Q92	3Q92	4Q92	Mod	Unit	Lab	Flag
		Arsenic	<2.0	<2.0	<2.0	<2.0		µg/L	WA	0
		Barium	13	5.4	<4.0	53		µg/L	WA	0
		Benzene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Bromodichloromethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Bromoform	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Bromomethane (Methyl bromide)	<10	<10	<10	<10		µg/L	WA	0
		Cadmium	<0.35	0.92	<0.35	<0.35	V	µg/L	WA	0
		Calcium	8,430	13,800	4,810	7,070	V	µg/L	WA	0
		Carbon tetrachloride	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Chloride	4,770	3,980	3,100	3,210		µg/L	WA	0
		Chlorobenzene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Chloroethane	<10	<10	<10	<10		µg/L	WA	0
		Chloroethene (Vinyl chloride)	<10	<10	<10	<10		µg/L	WA	0
		2-Chloroethyl vinyl ether	<10	<10	<10	<10		µg/L	WA	0

Note: Flagging levels, modifiers, and laboratories are for 4th quarter 1992 data only. See Appendix B for flagging criteria.

• = exceeded holding time for 4th quarter 1992.

■ = exceeded final primary drinking water standard for 4th quarter 1992.

Well FAC 8 continued

ANALYTICAL DATA

H	D	Analyte	1Q92	2Q92	3Q92	4Q92	Mod	Unit	Lab	Flag
		Chloroform	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Chloromethane (Methyl chloride)	<10	<10	<10	<10		µg/L	WA	0
		Chromium	<1.1	1.6	<1.1	5.3		µg/L	WA	0
		Dibromochloromethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,1-Dichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,2-Dichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,1-Dichloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		trans-1,2-Dichloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Dichloromethane (Methylene chloride)	1.5	<5.0	34	<5.0		µg/L	WA	0
		2,4-Dichlorophenoxyacetic acid	<1.1	<1.1	1.5	<1.0		µg/L	WA	0
		1,2-Dichloropropane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		cis-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		trans-1,3-Dichloropropene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Endrin	<0.11	<0.11	<0.11	<0.11		µg/L	WA	0
		Ethylbenzene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Fluoride	<100	<100	<100	<100		µg/L	WA	0
		Gross alpha	1.2E+01	<3.0E+00	<2.0E+00	<2.0E+00		pCi/L	CN	0
		Iron	6.0	<1.9	2.8	2,580		µg/L	WA	2
		Lead	<2.0	<2.0	<2.0	4.3	J3	µg/L	WA	0
		Lindane	<0.057	<0.056	<0.057	<0.055		µg/L	WA	0
		Magnesium	322	379	216	361	V	µg/L	WA	0
		Manganese	15	16	12	28		µg/L	WA	1
		Mercury	<0.20	<0.20	0.31	0.57		µg/L	WA	0
		Methoxychlor	<0.57	<0.56	<0.57	<0.55		µg/L	WA	0
		Nitrate as nitrogen	261	313	1,140	144		µg/L	WA	0
		Nonvolatile beta	1.7E+01	<5.0E+00	<2.0E+00	<2.0E+00		pCi/L	CN	0
•		pH	6.7	6.2	5.4	6.5	J	pH	WA	0
		Phenols	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Potassium	1,670	1,640	1,430	1,160	V	µg/L	WA	0
		Radium-226	5.3E+00	2.1E+00	<1.0E+00	1.2E+00		pCi/L	CN	0
		Radium-228	<5.2E+00		<1.0E+00			pCi/L		
		Selenium	<2.0	<2.0	<2.0	<2.0		µg/L	WA	0
		Silica	8,040	7,680	6,770	8,370	V	µg/L	WA	0
		Silver	0.70	0.88	<0.70	<0.70		µg/L	WA	0
		Sodium	8,010	12,000	15,400	4,820	V	µg/L	WA	0
•		Specific conductance	134	76	51	76	J	µS/cm	WA	0
		Sulfate	9,510	5,330	4,080	3,830		µg/L	WA	0
		1,1,2,2-Tetrachloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Tetrachloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Toluene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
•		Total dissolved solids	103,000	64,000	6,000	51,000	JV	µg/L	WA	0
		Total organic carbon	1,630	2,470	<500	12,500		µg/L	WA	2
		Total organic halogens	455	53	23	40		µg/L	WA	1
		Total phosphates (as P)	247	<20	21	231		µg/L	WA	0
		Toxaphene	<1.1	<1.1	<1.1	<1.1		µg/L	WA	0
		2,4,5-TP (Silvex)	<0.56	<0.58	<0.57	<0.53		µg/L	WA	0
		1,1,1-Trichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		1,1,2-Trichloroethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Trichloroethylene	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Trichlorofluoromethane	<5.0	<5.0	<5.0	<5.0		µg/L	WA	0
		Tritium	3.0E+00	2.5E+00	2.7E+00	2.7E+00		pCi/mL	CN	0
		Turbidity	136	6.9	1.1	110		NTU	WA	0

Note: Flagging levels, modifiers, and laboratories are for 4th quarter 1992 data only. See Appendix B for flagging criteria.

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Appendix E – Data Quality/Useability Assessment

Data Quality/Useability Assessment

Quality assurance/quality control (QA/QC) procedures relating to accuracy and precision of analyses performed on groundwater samples are followed in the field and laboratory and are reviewed prior to publication of results. The Environmental Protection Department/ Environmental Monitoring Section's (EPD/EMS) review of the volume of analytical data acquired each quarter and presented in various reports is an ongoing process; its review of the QA/QC data cannot be completed in time to meet the deadlines for the reports required by the Resource Conservation and Recovery Act and associated regulations. Other site and regulatory personnel can obtain further information on the data quality and useability in a variety of ways, including those described below.

Data Qualification

The contract laboratories continually assess their own accuracy and precision according to U.S. Environmental Protection Agency (EPA) guidelines. They submit sample- or batch-specific QA/QC information either at the same time as analytical results or in a quarterly summary. Properly defined and used result modifiers (also referred to as qualifiers) can be a key component in assessing data useability. Result modifiers designed by EPD/EMS and provided to the primary laboratories are presented in Appendix D.

Assessment of Accuracy of the Data

Accuracy, or the nearness of the reported result to the true concentration of a constituent in a sample, can be assessed in several ways.

A laboratory's general accuracy can be judged by analysis of results obtained from known samples. The non-radionuclide contract laboratories analyze commercial reference samples every quarter at EPD/EMS' request. The results of these analyses are presented in the EPD/EMS quarterly report, *The Savannah River Site's Groundwater Monitoring Program.* The primary laboratories also seek or maintain state certification by participating periodically in performance studies; reference samples and analysis of results are provided by EPA. Results of these studies also are published in the EPD/EMS quarterly reports.

Analysis of blanks provides a tool for assessing the accuracy of both sampling and laboratory analysis. Results for all field blanks for the quarter can be found in the EPD/EMS quarterly reports. Any field or laboratory blanks that exceeded established minimums are identified in the same reports, in tables associating them with groundwater samples analyzed in the same batches.

Surrogates, organic compounds similar in chemical behavior to the compounds of interest but not normally found in environmental samples, are used to monitor the effect of the matrix on the accuracy of analyses for organic parameters. For example, for analyses of volatile organics by EPA method 8240, three surrogate compounds are added to all samples

and blanks in each analytical batch. In analyses of semivolatile organics, three to four acid compounds and three to four base/neutral compounds are used. Other surrogates are used in pesticides analyses. Percent recoveries for surrogate analyses are calculated by laboratory personnel, reported to EPD/EMS, reviewed, and entered into the database, but they are not published. If recoveries are not within specified limits, the laboratory is expected to re-run the samples or attach result qualifiers to the data identifying the anomalous results.

Sample-specific accuracy for both organic and inorganic parameters can be assessed by examination of matrix spike/matrix spike duplicate results. A sample is analyzed unspiked to determine a baseline set of values. A second portion of sample is spiked with known concentrations of compounds appropriate to the analyses being performed, typically 5 volatile organic compounds for volatile organic analyses, 11 semivolatile compounds for semivolatiles, 6 pesticide compounds for pesticides, all metals for metals analyses, and a known quantity of cyanide for cyanide analysis. The percentage of the spike compound which is recovered, i.e., measured in excess of the value obtained for the unspiked sample, is a direct measure of analytical accuracy. EPA requires matrix spike/matrix spike duplicates to be run at least once per 20 samples of similar matrix.

Matrix spike/matrix spike duplicate results are reported to EPD/EMS but are not published. For organic compounds, according to EPA guidelines, no action is taken on the basis of matrix spike/matrix spike duplicate data alone (i.e., no result modifiers are assigned solely on the basis of matrix spike results); however, the results can indicate if a lab is having a systematic problem in the analysis of one or more analytes.

In the case of inorganic compounds, such as metals, the matrix spike sample analysis provides information about the effect of each sample matrix on the digestion and measurement methodology. Data qualifiers can be assigned on the basis of the percentage of spike recovery and are reported in the published results tables.

Assessment of Precision

Precision of the analyses, or agreement of a set of replicate results among themselves, is assessed through the use of duplicates (laboratory-initiated) and blind replicates (provided by EPD/EMS). The results of duplicate and replicate analyses are presented in the results tables of the first, second, and third quarter reports as multiple entries for an analyte under a single well heading. The results of replicate analyses are presented in the results tables in first, second, and third quarter reports as two separate sets of results for the same well. Duplicate and replicate results are not presented in fourth quarter reports; the results tables present instead only the highest result for each analyte for each quarter of the year.

The laboratories assess precision by calculating the relative percent difference, or RPD, for each pair of laboratory-initiated duplicate results. During 1992, at least one of the contract laboratories used a data qualifier (J3) to modify metals analyses when the RPD for laboratory duplicates was greater than 20%.

Additional statistical comparisons of laboratory duplicate and blind replicate results, both intra- and interlaboratory, are presented in the EPD/EMS quarterly reports. The calculation used for these reports is the MRD, or mean relative difference, which is similar to EPA's RPD except that the MRD provides a single value for all of the analyses of a particular compound, either inter- or intralaboratory, during one quarter. Because detection limits may vary among samples, the MRD requires calculation of a reference detection limit, which is the detection limit at the 90th percentile of the array of limits in the population of all replicate and duplicate analyses for a given analyte during a particular quarter. The MRD is not method-specific.

Method-Specific Accuracy and Precision

The contract laboratories' EPA-approved laboratory procedures include QA/QC requirements as an integral part of the methods. Thus, knowledge of the method used in obtaining data is an important component of determining data useability. EPA has conducted extensive research and development on the methods approved for the analysis of water and waste water; information on the accuracy and precision of the method is available from EPA publications, as is full information on required QA/QC procedures. A listing of the methods used by the primary laboratories during first quarter 1992 is given below along with the source for the method description. Many, if not all, of these sources include presentations of representative accuracy and precision results.

Method	Used to Analyze	Source
EPA120.1	Specific conductance	EPA EMSL 1983
EPA150.1	pH	EPA EMSL 1983
EPA160.1	Filterable residue (total dissolved solids)	EPA EMSL 1983
EPA160.2	Nonfilterable residue	EPA EMSL 1983
EPA180.1	Turbidity	EPA EMSL 1983
EPA200.7	Trace elements	EPA EMSL 1983
EPA206.2	Arsenic	EPA EMSL 1983
EPA208.2	Barium	EPA EMSL 1983
EPA239.2	Lead	EPA EMSL 1983
EPA245.1	Mercury	EPA EMSL 1983
EPA270.2	Selenium	EPA EMSL 1983
EPA279.2	Thallium	EPA EMSL 1983
EPA300.0	Inorganics, non-metallics	EPA EMSL 1991
EPA310.1	Alkalinity	EPA EMSL 1983
EPA325.2	Chloride	EPA EMSL 1983
EPA335.3	Cyanide	EPA EMSL 1983
EPA340.2	Fluoride	EPA EMSL 1983
EPA353.1	Nitrogen, nitrate-nitrite	EPA EMSL 1983
EPA353.2	Nitrogen, nitrate, nitrite, or combined	EPA EMSL 1983
EPA353.3	Nitrogen, nitrate-nitrite, or nitrite only	EPA EMSL 1983
EPA354.1	Nitrogen, nitrite	EPA EMSL 1983
EPA365.1	Phosphorus, all forms (reported as total phosphates)	EPA EMSL 1983
EPA365.2	Phosphorus, all forms (reported as total phosphates)	EPA EMSL 1983
EPA375.4	Sulfate, turbidimetric	EPA EMSL 1983
EPA376.2	Sulfide	EPA EMSL 1983
APHA403	Alkalinity	APHA 1985
EPA413.1	Oil & grease	EPA EMSL 1983
APHA415A	Iodine	APHA 1985

Method	Used to Analyze	Source
EPA415.1	Total organic carbon	EPA EMSL 1983
EPA418.1	Petroleum hydrocarbons	EPA EMSL 1983
EPA420.1	Phenolics	EPA EMSL 1983
EPA420.2	Phenolics	EPA EMSL 1983
APHA705	Total alpha-emitting radium	APHA 1985
ASTMD3869C	Iodide	ASTM 1992
APHA5320	Dissolved organic halogen	APHA 1989
EPA6010	Metals	EPA 1986
EPA7041	Antimony	EPA 1986
EPA7060	Arsenic	EPA 1986
EPA7421	Lead	EPA 1986
EPA7470	Mercury	EPA 1986
EPA7740	Selenium	EPA 1986
EPA7841	Thallium	EPA 1986
EPA8010	Halogenated volatile organics	EPA 1986
EPA8020	Aromatic volatile organics	EPA 1986
EPA8080	Organochlorine pesticides and PCBs	EPA 1986
EPA8140	Organophosphorus pesticides	EPA 1986
EPA8150	Chlorinated herbicides	EPA 1986
EPA8240	GCMS VOA	EPA 1986
EPA8270	GCMS semivolatiles	EPA 1986
EPA8280	Dioxins and furans	EPA 1986
EPA9012	Total cyanide	EPA 1986
EPA9020	Total organic halides	EPA 1986
EPA9030	Sulfides	EPA 1986

An example of the available method-specific QA/QC information is that for the analysis of metals by EPA Method 6010/200.7 (EPA 1986/EPA EMSL 1983). The primary laboratories, General Engineering Laboratories (GE) and Roy F. Weston, Inc. (Weston), use this inductively coupled plasma (ICP) atomic emission spectrometric method.

The following precision and accuracy data are based on the experience of seven laboratories that applied the ICP technique to acid-distilled water matrices that had been dosed with various metal concentrates. (Note: not all seven laboratories analyzed all 14 elements.) The references give results for samples having three concentration ranges; the results here are for samples having the lowest values, similar to actual groundwater results for SRS.

ICP Precision and Accuracy Data

Element	True value (µg/L)	Mean reported value (µg/L)	Mean percent RSD[a]
Beryllium	20	20	9.8
Manganese	15	15	6.7
Vanadium	70	69	2.9
Arsenic	22	19	23
Chromium	10	10	18
Copper	11	11	40
Iron	20	19	15
Aluminum	60	62	33

Element	True value (µg/L)	Mean reported value (µg/L)	Mean percent RSD[a]
Cadmium	2.5	2.9	16
Cobalt	20	20	4.1
Nickel	30	28	11
Lead	24	30	32
Zinc	16	19	45
Selenium	6	8.5	42

Note: In EPA (1986), the column heading is Mean Standard Deviation (%).

[a] Relative standard deviation.

As another example, EPA Method 601/8010 (EPA 1991a/EPA 1986) is used by both GE and Weston for analyses of halogenated volatile organics. In the presentation of the method in both references, the following table gives method-specific accuracy and precision as functions of concentration. Contract laboratories are expected to achieve or at least approach these limits.

Accuracy and Precision as Functions of Concentration for EPA Method 601/8010

Parameter	Accuracy as recovery, X'[a] (µg/L)	Single analyst precision (µg/L)[b]	Overall precision (µg/L)[c]
Bromodichloromethane	$1.12C - 1.02$[d]	$0.11\bar{X} + 0.04$[e]	$0.20\bar{X} + 1.00$
Bromoform	$0.96C - 2.05$	$0.12\bar{X} + 0.58$	$0.21\bar{X} + 2.41$
Bromomethane	$0.76C - 1.27$	$0.28\bar{X} + 0.27$	$0.36\bar{X} + 0.94$
Carbon tetrachloride	$0.98C - 1.04$	$0.15\bar{X} + 0.38$	$0.20\bar{X} + 0.39$
Chlorobenzene	$1.00C - 1.23$	$0.15\bar{X} - 0.02$	$0.18\bar{X} + 1.21$
Chloroethane	$0.99C - 1.53$	$0.14\bar{X} - 0.13$	$0.17\bar{X} + 0.63$
2-Chloroethyl vinyl ether[f]	$1.00C$	$0.20\bar{X}$	$0.35\bar{X}$
Chloroform	$0.93C - 0.39$	$0.13\bar{X} + 0.15$	$0.19\bar{X} - 0.02$
Chloromethane	$0.77C + 0.18$	$0.28\bar{X} - 0.31$	$0.52\bar{X} + 1.31$
Dibromochloromethane	$0.94C + 2.72$	$0.11\bar{X} + 1.10$	$0.24\bar{X} + 1.68$
1,2-Dichlorobenzene	$0.93C + 1.70$	$0.20\bar{X} + 0.97$	$0.13\bar{X} + 6.13$
1,3-Dichlorobenzene	$0.95C + 0.43$	$0.14\bar{X} + 2.33$	$0.26\bar{X} + 2.34$
1,4-Dichlorobenzene	$0.93C - 0.09$	$0.15\bar{X} + 0.29$	$0.20\bar{X} + 0.41$
1,1-Dichloroethane	$0.95C - 1.08$	$0.09\bar{X} + 0.17$	$0.14\bar{X} + 0.94$
1,2-Dichloroethane	$1.04C - 1.06$	$0.11\bar{X} + 0.70$	$0.15\bar{X} + 0.94$
1,1-Dichloroethene	$0.98C - 0.87$	$0.21\bar{X} - 0.23$	$0.29\bar{X} - 0.40$
trans-1,2-Dichloroethene	$0.97C - 0.16$	$0.11\bar{X} + 1.46$	$0.17\bar{X} + 1.46$
1,2-Dichloropropane[f]	$1.00C$	$0.13\bar{X}$	$0.23\bar{X}$
cis-1,3-Dichloropropene[f]	$1.00C$	$0.18\bar{X}$	$0.32\bar{X}$
trans-1,3-Dichloropropene[f]	$1.00C$	$0.18\bar{X}$	$0.32\bar{X}$
Methylene chloride	$0.91C - 0.93$	$0.11\bar{X} + 0.33$	$0.21\bar{X} + 1.43$
1,1,2,2-Tetrachlorethane	$0.95C + 0.19$	$0.14\bar{X} + 2.41$	$0.23\bar{X} + 2.79$
Tetrachloroethylene	$0.94C + 0.06$	$0.14\bar{X} + 0.38$	$0.18\bar{X} + 2.21$
1,1,1-Trichloroethane	$0.90C - 0.16$	$0.15\bar{X} + 0.04$	$0.20\bar{X} + 0.37$
1,1,2-Trichloroethane	$0.86C + 0.30$	$0.13\bar{X} - 0.14$	$0.19\bar{X} + 0.67$
Trichloroethylene	$0.87C + 0.48$	$0.13\bar{X} - 0.03$	$0.23\bar{X} + 0.30$

Parameter	Accuracy as recovery, X'[a] (µg/L)	Single analyst precision (µg/L)[b]	Overall precision (µg/L)[c]
Trichlorofluoromethane	$0.89C-0.07$	$0.15\bar{X}+0.67$	$0.26\bar{X}+0.91$
Vinyl chloride	$0.97C-0.36$	$0.13\bar{X}+0.65$	$0.27\bar{X}+0.40$

[a] X' = expected recovery for one or more measurements of a sample containing a concentration of C, in µg/L.
[b] Expected single analyst standard deviation of measurements.
[c] Expected interlaboratory standard deviation of measurements.
[d] C = true value for the concentration, in µg/L.
[e] $\bar{X}$ = average recovery found for measurements of samples containing a concentration of C, in µg/L.
[f] Estimates based on performance in a single laboratory.

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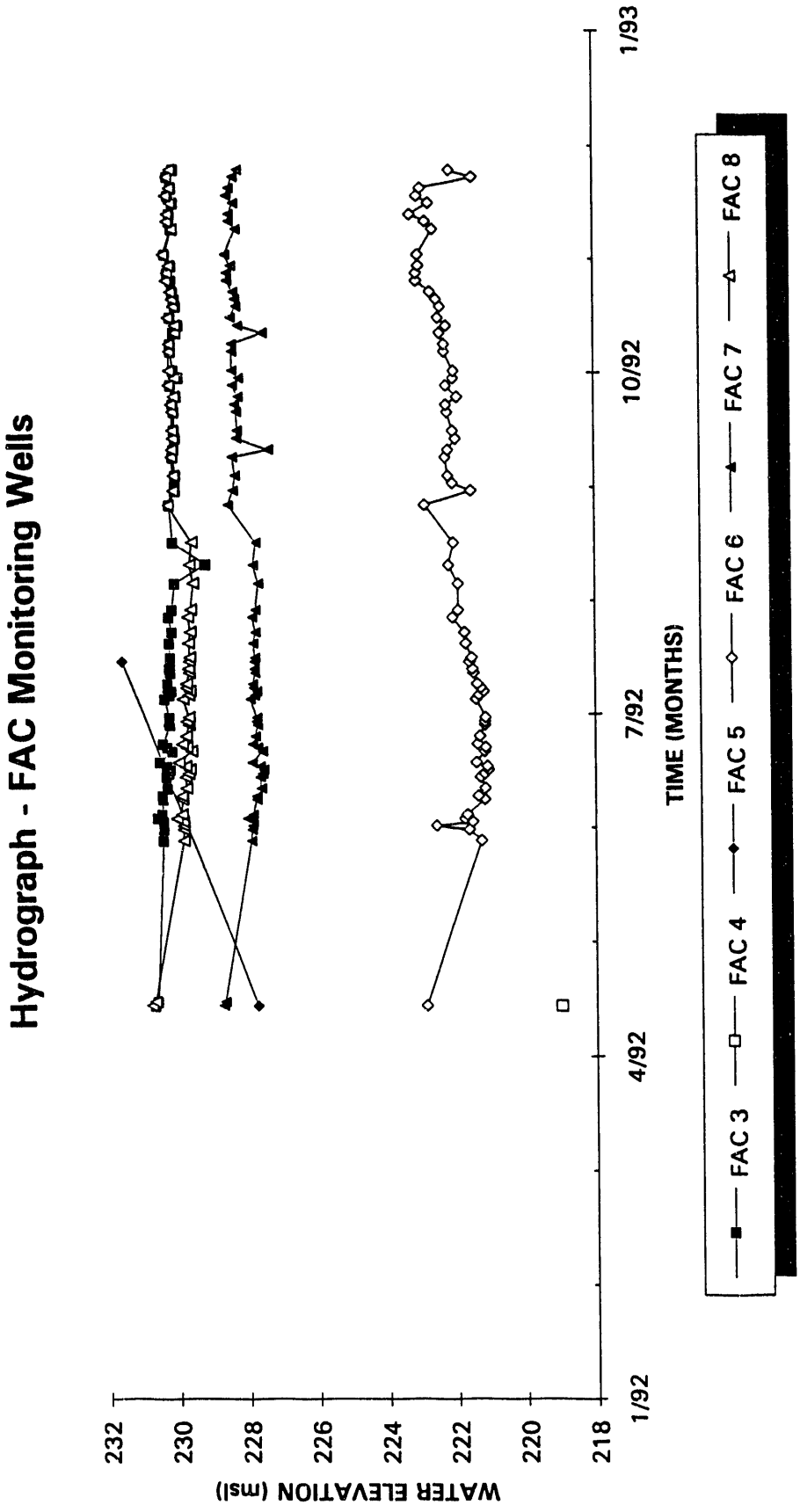
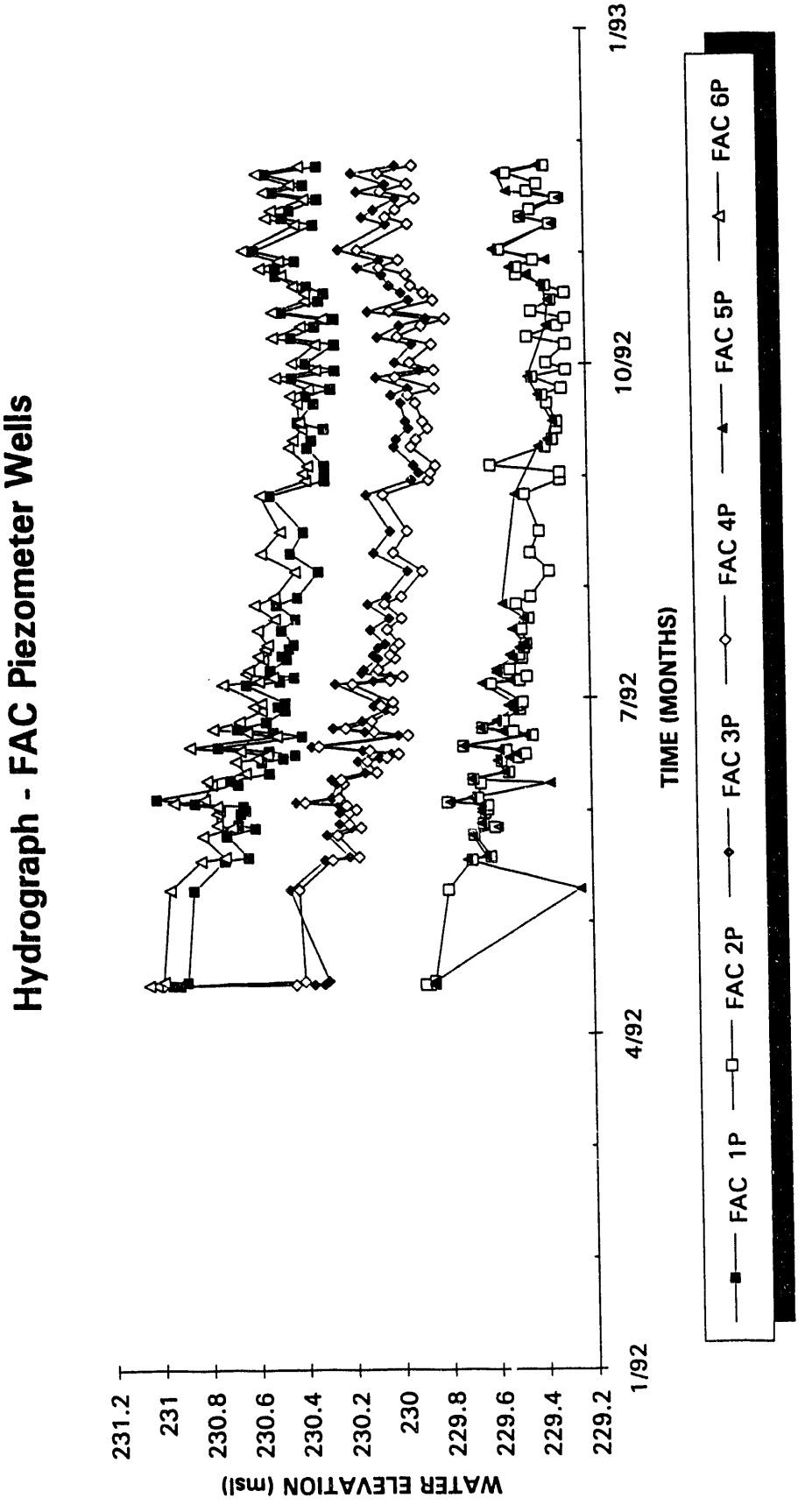
Appendix F – Hydrographs


Hydrograph - FAC Monitoring Wells
WATER ELEVATION (msl)
232
230
228
226
224
222
220
218
1/92
4/92
7/92
10/92
1/93
TIME (MONTHS)
FAC 3
FAC 4
FAC 5
FAC 6
FAC 7
FAC 8


Hydrograph - FAC Piezometer Wells
WATER ELEVATION (msl)
231.2
231
230.8
230.6
230.4
230.2
230
229.8
229.6
229.4
229.2
1/92
4/92
7/92
10/92
1/93
TIME (MONTHS)
FAC 1P
FAC 2P
FAC 3P
FAC 4P
FAC 5P
FAC 6P

DATE
FILMED
8/17/93
END