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

SECOND QUARTER 1995

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Key Words

aluminum
iron

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Abstract

During second quarter 1995, samples from the KAC monitoring wells at the K-Area Acid/Caustic Basin were collected and analyzed for herbicides/pesticides, indicator parameters, metals, nitrate, radionuclide indicators, and other constituents. Monitoring results that exceeded the final Primary Drinking Water Standards (PDWS), or Savannah River Site (SRS) Flag 2 criteria such as the SRS turbidity standard (50 NTU) are provided in this report.

No constituents exceeded the final PDWS in the KAC wells. Aluminum and iron exceeded SRS flagging criteria in one or more of the downgradient wells.

Groundwater flow direction and rate in the water table beneath the K-Area Acid/Caustic Basin were similar to past quarters.

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Executive Summary

The KAC monitoring wells at the K-Area Acid/Caustic Basin are sampled quarterly as part of the Savannah River Site (SRS) Groundwater Monitoring Program and to comply with the terms of a consent decree signed May 26, 1988, by the U.S. District Court (District of South Carolina, Aiken Division).

During second quarter 1995, samples from the KAC wells were analyzed for herbicides/pesticides, indicator parameters, metals, nitrate, radionuclide indicators, and other constituents. Monitoring results that exceeded final Primary Drinking Water Standards or SRS Flag 2 criteria such as the SRS turbidity standard (50 NTU) are discussed in this report.

During second quarter 1995, no constituents exceeded standards in upgradient well KAC 3. Aluminum and iron exceeded Flag 2 criteria in one or more of the downgradient wells. Iron ranged from 380 µg/L to 1680 µg/L and aluminum ranged from 130 µg/L to 2040 µg/L. No well samples exceeded the SRS turbidity standard of 50 NTU.

Groundwater flow direction to the southwest at a rate of 365 ft/year in the water table beneath the K-Area Acid/Caustic Basin was similar to that of previous quarters.

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Introduction

The K-Area Acid/Caustic Basin is located in the eastern portion of K-Area at the Savannah River Site (SRS) (Figure 1, Appendix C) near a tributary of Pen Branch. The following description outlines important events at the basin:

- The K-Area Acid/Caustic Basin was constructed in the early 1950s as an unlined earthen pit that received dilute sulfuric acid and sodium hydroxide solutions and other wastes from several areas within SRS. The basin provided an area for the mixing and neutralization of the dilute solutions before their discharge to nearby streams (Heffner and Exploration Resources, 1991).
- The basin remained in service until new neutralization facilities became operational in 1982 (Heffner and Exploration Resources, 1991).
- Monitoring wells KAC 1, 2, 3, and 4 (Figure 2, Appendix C) were installed at the basin between October 1983 and July 1984 (EPD/EMS, 1994).
- Under the terms of a consent decree signed May 26, 1988, by the U.S. District Court (Civil Action 1:85-2583-6, 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 on June 1, 1988.
- The KAC monitoring wells were reevaluated during the summer of 1988 to ensure compliance with SCHWMR. As part of this compliance effort, wells KAC 5, 6, and 7 (Figure 2, Appendix C) were installed at the basin in the fall of 1988 (EPD/EMS, 1994).
- The revised Groundwater Quality Assessment Plan (WSRC, 1991), submitted to the South Carolina Department of Health and Environmental Control (SCDHEC) on April 30, 1991, proposed the installation of two additional water-table wells (KAC 8 and 9) at the basin.
- Wells KAC 8 and 9 (Figure 2, Appendix C) were installed in first quarter 1992 (EPD/EMS, 1994) and first sampled during second quarter 1992.

Each quarter, the Environmental Protection Department/Environmental Monitoring Section (EPD/EMS) samples the KAC monitoring wells as part of the SRS Groundwater Monitoring Program. The Environmental Restoration Department provides a quarterly report describing the monitoring results to SCDHEC in compliance with the consent decree.

Discussion

Groundwater Monitoring Data

The EPD/EMS groundwater sampling procedure (EPD/EMS, 1992) 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 the result of 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 variable-speed pump was installed during fourth quarter 1992 in well KAC 1, which had a history of elevated metals. Samples from wells with variable-speed pumps are collected at slower rates to minimize turbidity, which has been associated with elevated metals levels. Decreased aluminum and iron concentrations as well as lower turbidity values have been observed for samples from wells with variable-speed pumps.

During second quarter 1995, samples from the KAC monitoring wells were analyzed for herbicides/pesticides, indicator parameters, metals, nitrate, radionuclide indicators, and other constituents. This report describes results that equaled or exceeded the Safe Drinking Water Act final Primary Drinking Water Standards (PDWS) or drinking water screening levels, as established by the U.S. Environmental Protection Agency (EPA) (Appendix A); the South Carolina final PDWS for lead (Appendix A); SRS flagging criteria that are based on final and proposed PDWS, Secondary Drinking Water Standards, and method detection limits (Appendix B); or the SRS turbidity standard. Constituent levels that equaled or exceeded the final PDWS, screening levels, or other Flag 2 criteria are described as *exceeding* standards, *above* standards, or as *elevated*.

The final PDWS for individual analytes presented in Appendix A may not always match the SRS flagging criteria presented in Appendix B. The final PDWS generally are used in this compliance report as guidelines 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.

Analytical Results Exceeding Standards

Results for analytes that exceeded the final PDWS (see Appendix A) during second quarter 1995 are summarized in Table 1 (Appendix D). No constituents exceeded the final PDWS during the quarter.

Constituents that exceeded other Flag 2 criteria (see Appendix B) during second quarter 1995 are summarized in Table 2 (Appendix D). Aluminum exceeded the Flag 2 criterion in wells KAC 6, 7, and 9, with a maximum concentration of 2040 µg/L in well KAC 7. Iron exceeded the Flag 2 criterion in wells KAC 6 and 7, with a maximum concentration of 1680 µg/L in well KAC 6.

Table 3 (Appendix D) presents all of the results for individual wells and indicates the analytical laboratories that conducted the analyses, the dilution factors used in the analyses, and the analyses that received modifiers (which help identify laboratory accuracy and precision) or that exceeded the EPA-approved holding times during second quarter 1995. Constituent results in Table 3 that appear to equal the final PDWS but are not marked in the *ST* column (exceeded final PDWS or screening level) are below the final PDWS in the database. Database results, the results that are compared to the final PDWS, are entered with more significant digits than the results given in this report. Apparent discrepancies are the result of the rounding of reported results.

Table 3 also lists the number of well volumes purged from each well during second quarter 1995 and provides a statement that describes incomplete or unsuccessful sampling events. Wells KAC 6 and 7 failed to yield enough water to meet the purging and stabilization criteria; thus, samples from these wells may not be representative of the groundwater at the basin.

Appendix D provides definitions of the abbreviations and the modifiers used in the results tables as well as descriptions of holding times, data rounding, and data qualification practices.

Appendix E provides a general assessment of the quality and usability of the data provided by EPD/EMS.

Turbidity Results Exceeding Standards

A value of 5 nephelometric turbidity units (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 screen 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).

During second quarter 1995, wells KAC 1, 6, and 7 had laboratory turbidity measurements between 5 NTU and the SRS standard of 50 NTU. The maximum value reported for turbidity was 38.7 NTU from well KAC 6. Laboratory turbidity measurements for the remaining wells were less than 5 NTU.

Water Elevations, Flow Directions, and Flow Rates

Water-level elevations and groundwater flow direction beneath the K-Area Acid/Caustic Basin are shown in Figure 3 (Appendix C). Wells KAC 4, 8, and 9 are screened below the water table; their water-level elevations were not contoured or considered in the determination of groundwater flow direction or rate. However, these wells are downgradient from the basin (Figure 3, Appendix C) and are suitable for detecting groundwater contamination.

Well KAC 8 has consistently exhibited higher water elevations than the other submerged wells, KAC 4 and 9. Historical data indicate a ponding or losing stream effect in the area of well KAC 8, creating a mound of groundwater to the east of the basin. This mound could be attributed to the influx of water into the water table from the nearby K-Area outfall effluent stream south of well KAC 8, resulting in a higher water elevation for well KAC 8.

The groundwater flow direction (using universal transverse Mercator coordinates) determined from this quarter's water-level elevations is southwest.

The groundwater flow rate in the water table beneath the K-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 percent (Killian et al., 1987); *dh* is the difference in head, and *dl* is the length of the flow path to the nearest 10 ft. 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 rate per day is calculated to two significant digits using the above equation. This value is then multiplied by 365 and rounded to two significant digits for the flow rate per year.

Using the above equation with data from the six non-submerged KAC monitoring wells, the flow rate estimate for groundwater in the water table beneath the K-Area Acid/Caustic Basin (Figure 3, Appendix C) is as follows:

$$\frac{10}{0.20} \times \frac{2}{100} = 1.0\ \text{ft/day}$$

$$1.0\ \text{ft/day} \times 365\ \text{days} \approx 365\ \text{ft/year}$$

Results for Upgradient vs. Downgradient Wells

Wells KAC 3 and 5 are upgradient of the basin; the remaining KAC wells are downgradient. During second quarter 1995, no constituents exceeded the final PDWS or the SRS turbidity standard in either upgradient or downgradient wells. Aluminum exceeded Flag 2 criteria in downgradient wells KAC 6, 7, and 9. Elevated iron levels were reported in samples from KAC 6 and 7.

Conclusions

No constituents exceeded the final PDWS in monitoring wells at the K-Area Acid/Caustic Basin during second quarter 1995. Historically, few constituents have exceeded final PDWS in these wells. Tritium appeared to be elevated in well KAC 7 during fourth quarter 1993; however, this value was considered to be the result of laboratory error.

Aluminum and iron exceeded Flag 2 criteria in one or more of the downgradient wells. Generally, constituents found in downgradient wells but not upgradient wells at a waste management unit are considered products of the waste management unit. Aluminum and iron have consistently exceeded standards in some KAC wells in past quarters.

Groundwater flow in the water table beneath the K-Area Acid/Caustic Basin was to the southwest at approximately 365 ft/year.

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Errata

In tables with four quarters of data, some values for earlier quarters may differ from values for those same quarters presented in earlier reports because some reanalyses may have been performed by the laboratories after the reports were printed.

Second quarter 1995

- No errata have been reported.

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Appendix A

Final Primary Drinking Water Standards

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Final Primary Drinking Water Standards

Analyte	Unit	Level	Status	Source
Alachlor	µg/L	2	Final	EPA, 1993
Aldicarb[a]	µg/L	3	Final	EPA, 1993
Aldicarb sulfone[a]	µg/L	2	Final	EPA, 1993
Aldicarb sulfoxide[a]	µg/L	4	Final	EPA, 1993
Antimony	µg/L	6	Final	EPA, 1993
Arsenic	µg/L	50	Final	EPA, 1993
Asbestos	Fibers/L	7,000,000	Final	EPA, 1993
Atrazine	µg/L	3	Final	EPA, 1993
Barium	µg/L	2,000	Final	EPA, 1993
Benzene	µg/L	5	Final	EPA, 1993
Benzo[*a*]pyrene	µg/L	0.2	Final	EPA, 1993
Beryllium	µg/L	4	Final	EPA, 1993
Bis(2-ethylhexyl) phthalate	µg/L	6	Final	EPA, 1993
Bromodichloromethane	µg/L	100	Final	EPA, 1993
Bromoform	µg/L	100	Final	EPA, 1993
2-sec-Butyl-4,6-dinitrophenol	µg/L	7	Final	EPA, 1993
Cadmium	µg/L	5	Final	EPA, 1993
Carbofuran	µg/L	40	Final	EPA, 1993
Carbon tetrachloride	µg/L	5	Final	EPA, 1993
Chlordane	µg/L	2	Final	EPA, 1993
Chlorobenzene	µg/L	100	Final	EPA, 1993
Chloroethene (Vinyl chloride)	µg/L	2	Final	EPA, 1993
Chloroform	µg/L	100	Final	EPA, 1993
Chromium	µg/L	100	Final	EPA, 1993
Copper	µg/L	1,300	Final	EPA, 1993
Cyanide	µg/L	200	Final	EPA, 1993
Dalapon[a]	µg/L	200	Final	EPA, 1993
Dibromochloromethane	µg/L	100	Final	EPA, 1993
1,2-Dibromo-3-chloropropane	µg/L	0.2	Final	EPA, 1993
1,2-Dibromoethane	µg/L	0.05	Final	EPA, 1993
1,2-Dichlorobenzene	µg/L	600	Final	EPA, 1993
1,4-Dichlorobenzene	µg/L	75	Final	EPA, 1993
1,2-Dichloroethane	µg/L	5	Final	EPA, 1993
1,1-Dichloroethylene	µg/L	7	Final	EPA, 1993
1,2-Dichloroethylene	µg/L	50	Final	EPA, 1993
cis-1,2-Dichloroethylene	µg/L	70	Final	EPA, 1993
trans-1,2-Dichloroethylene	µg/L	100	Final	EPA, 1993
Dichloromethane (Methylene chloride)	µg/L	5	Final	EPA, 1993
2,4-Dichlorophenoxyacetic acid	µg/L	70	Final	EPA, 1993
1,2-Dichloropropane	µg/L	5	Final	EPA, 1993
Di(2-ethylhexyl) adipate[a]	µg/L	400	Final	EPA, 1993
Diquat dibromide[a]	µg/L	20	Final	EPA, 1993
Endothall[a]	µg/L	100	Final	EPA, 1993
Endrin	µg/L	2	Final	EPA, 1993
Ethylbenzene	µg/L	700	Final	EPA, 1993
Fluoride	µg/L	4,000	Final	EPA, 1993
Glyphosate[a]	µg/L	700	Final	EPA, 1993
Gross alpha[b]	pCi/L	1.5E+01	Final	EPA, 1993
Heptachlor	µg/L	0.4	Final	EPA, 1993

Heptachlor epoxide	µg/L	0.2	Final	EPA, 1993
Hexachlorobenzene	µg/L	1	Final	EPA, 1993
Hexachlorocyclopentadiene	µg/L	50	Final	EPA, 1993
Lead	µg/L	50	Final	SCDHEC, 1981
Lindane	µg/L	0.2	Final	EPA, 1993
Mercury	µg/L	2	Final	EPA, 1993
Methoxychlor	µg/L	40	Final	EPA, 1993
Nickel	µg/L	100	Final	EPA, 1993
Nitrate as nitrogen	µg/L	10,000	Final	EPA, 1993
Nitrate-nitrite as nitrogen	µg/L	10,000	Final	EPA, 1993
Nitrite as nitrogen	µg/L	1,000	Final	EPA, 1993
Nonvolatile beta	pCi/L	5E+01	Interim Final	EPA, 1977
Oxamyl[a]	µg/L	200	Final	EPA, 1993
PCB 1016	µg/L	0.5	Final	EPA, 1993
PCB 1221	µg/L	0.5	Final	EPA, 1993
PCB 1232	µg/L	0.5	Final	EPA, 1993
PCB 1242	µg/L	0.5	Final	EPA, 1993
PCB 1248	µg/L	0.5	Final	EPA, 1993
PCB 1254	µg/L	0.5	Final	EPA, 1993
PCB 1260	µg/L	0.5	Final	EPA, 1993
PCB 1262	µg/L	0.5	Final	EPA, 1993
Pentachlorophenol	µg/L	1	Final	EPA, 1993
Picloram[a]	µg/L	500	Final	EPA, 1993
Selenium	µg/L	50	Final	EPA, 1993
Simazine[a]	µg/L	4	Final	EPA, 1993
Strontium-89/90[c]	pCi/L	8E+00	Final	EPA, 1993
Strontium-90	pCi/L	8E+00	Final	EPA, 1993
Styrene	µg/L	100	Final	EPA, 1993
2,3,7,8-TCDD	µg/L	0.00003	Final	EPA, 1993
Tetrachloroethylene	µg/L	5	Final	EPA, 1993
Thallium	µg/L	2	Final	EPA, 1993
Toluene	µg/L	1,000	Final	EPA, 1993
Toxaphene	µg/L	3	Final	EPA, 1993
2,4,5-TP (Silvex)	µg/L	50	Final	EPA, 1993
1,2,4-Trichlorobenzene	µg/L	70	Final	EPA, 1993
1,1,1-Trichloroethane	µg/L	200	Final	EPA, 1993
1,1,2-Trichloroethane	µg/L	5	Final	EPA, 1993
Trichloroethylene	µg/L	5	Final	EPA, 1993
Tritium	pCi/mL	2E+01	Final	EPA, 1993
Xylenes	µg/L	10,000	Final	EPA, 1993

Note: Final PDWS were assigned to alachlor, aldicarb, aldicarb sulfone, aldicarb sulfoxide, atrazine, carbofuran, dalapon, di(2-ethylhexyl) adipate, diquat dibromide, endothall, glyphosate, oxamyl, picloram, and simazine in the SRS Groundwater Monitoring Program for the first time beginning first quarter 1994.

[a] At present, EMS does not perform this analysis because the constituent is not in the current contract.

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

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

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Appendix B

Flagging Criteria

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Flagging Criteria

The Savannah River Site Environmental Protection Department/Environmental Monitoring Section (EPD/EMS) flagging criteria are as follows:

- Flag 2 criteria for constituents equal the Safe Drinking Water Act (SDWA) final Primary Drinking Water Standards (PDWS), the SDWA proposed PDWS, or the SDWA Secondary Drinking Water Standards (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 a 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 exceptions to the flagging rules:

- EPD/EMS sets flagging criteria for pH and specific conductance. No flags are set for alkalinity, calcium, carbonate, magnesium, potassium, silica, sodium, total dissolved solids, total phosphates (as P), and total phosphorus. Analyses for these parameters are conducted as part of the biennial comprehensive analyses or by special request.

- Aesthetic parameters such as color, corrosivity, Eh, odor, surfactants, and turbidity are not assigned flagging criteria but are analyzed by special request.

- Common laboratory contaminants and cleaners such as dichloromethane (methylene chloride), ketones, phthalates, and toluene are not assigned flagging criteria unless they have primary drinking water standards. These constituents are analyzed by special request.

Analyte	Unit	Flag 1	Flag 2	Source[a]
Acenaphthene	µg/L	50	100	EPA Method 8270
Acenaphthylene	µg/L	50	100	EPA Method 8270
Acetone	µg/L	500	1,000	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
Actinium-228	pCi/L	1.64E+03	3.27E+03	Proposed PDWS (EPA, 1991)
Alachlor	µg/L	1	2	Final PDWS (EPA, 1993a)
Aldicarb[b]	µg/L	1.5	3	Final PDWS (EPA, 1993a)
Aldicarb sulfone[b]	µg/L	1	2	Final PDWS (EPA, 1993a)
Aldicarb sulfoxide[b]	µg/L	2	4	Final PDWS (EPA, 1993a)
Aldrin	µg/L	0.25	0.5	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	SDWS (EPA, 1993b)
Aluminum, dissolved	µg/L	25	50	SDWS (EPA, 1993b)
Aluminum, total recoverable	µg/L	25	50	SDWS (EPA, 1993b)

Americium-241	pCi/L	3.17E+00	6.34E+00	Proposed PDWS (EPA, 1991)
Americium-243	pCi/L	3.19E+00	6.37E+00	Proposed PDWS (EPA, 1991)
4-Aminobiphenyl	µg/L	50	100	EPA Method 8270
Ammonia	µg/L	500	1,000	APHA Method 417B
Ammonia nitrogen	µg/L	500	1,000	EPA Method 350.1
Aniline	µg/L	50	100	EPA Method 8270
Anthracene	µg/L	50	100	EPA Method 8270
Antimony	µg/L	3	6	Final PDWS (EPA, 1993a)
Antimony, dissolved	µg/L	3	6	Final PDWS (EPA, 1993a)
Antimony, total recoverable	µg/L	3	6	Final PDWS (EPA, 1993a)
Antimony-125	pCi/L	1.5E+02	3E+02	Interim Final PDWS (EPA, 1977)
Aramite	µg/L	50	100	EPA Method 8270
Arsenic	µg/L	25	50	Final PDWS (EPA, 1993a)
Arsenic, dissolved	µg/L	25	50	Final PDWS (EPA, 1993a)
Arsenic, total recoverable	µg/L	25	50	Final PDWS (EPA, 1993a)
Asbestos	Fibers/L	3,500,000	7,000,000	Final PDWS (EPA, 1993a)
Atrazine	µg/L	1.5	3	Final PDWS (EPA, 1993a)
Azobenzene	µg/L	50	100	EPA Method 625
Barium	µg/L	1,000	2,000	Final PDWS (EPA, 1993a)
Barium, dissolved	µg/L	1,000	2,000	Final PDWS (EPA, 1993a)
Barium, total recoverable	µg/L	1,000	2,000	Final PDWS (EPA, 1993a)
Barium-140[c]	pCi/L	4.5E+01	9E+01	Interim Final PDWS (EPA, 1977)
Benzene	µg/L	2.5	5	Final PDWS (EPA, 1993a)
alpha-Benzene hexachloride	µg/L	0.25	0.5	EPA Method 8080
beta-Benzene hexachloride	µg/L	0.25	0.5	EPA Method 8080
delta-Benzene hexachloride	µg/L	0.25	0.5	EPA Method 8080
Benzidine	µg/L	250	500	EPA Method 8270
Benzo[*a*]anthracene	µg/L	0.05	0.1	Proposed PDWS (EPA, 1990)
Benzo[*b*]fluoranthene	µg/L	0.1	0.2	Proposed PDWS (EPA, 1990)
Benzo[*k*]fluoranthene	µg/L	0.1	0.2	Proposed PDWS (EPA, 1990)
Benzoic acid	µg/L	250	500	EPA Method 8270
Benzo[*g,h,i*]perylene	µg/L	50	100	EPA Method 8270
Benzo[*a*]pyrene	µg/L	0.1	0.2	Final PDWS (EPA, 1993a)
1,4-Benzoquinone	µg/L	50	100	EPA Method 8270
Benzyl alcohol	µg/L	50	100	EPA Method 8270
Beryllium	µg/L	2	4	Final PDWS (EPA, 1993a)
Beryllium, dissolved	µg/L	2	4	Final PDWS (EPA, 1993a)
Beryllium, total recoverable	µg/L	2	4	Final PDWS (EPA, 1993a)
Beryllium-7	pCi/L	3E+03	6E+03	Interim Final PDWS (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(2-ethylhexyl) phthalate	µg/L	3	6	Final PDWS (EPA, 1993a)
Bismuth-214	pCi/L	9.4E+03	1.89E+04	Proposed PDWS (EPA, 1991)
Boron	µg/L	150	300	EPA Method 6010
Boron, dissolved	µg/L	150	300	EPA Method 6010
Boron, total recoverable	µg/L	150	300	EPA Method 6010
Bromide	µg/L	5,000	10,000	EPA Method 300.0
Bromodichloromethane	µg/L	50	100	Final PDWS (EPA, 1993a)
Bromoform	µg/L	50	100	Final PDWS (EPA, 1993a)
Bromomethane (Methyl bromide)	µg/L	5	10	EPA Method 8240
4-Bromophenyl phenyl ether	µg/L	50	100	EPA Method 8270
Butylbenzyl phthalate		No flag	No flag	Set by EPD/EMS

2-sec-Butyl-4,6-dinitrophenol	µg/L	3.5	7	Final PDWS (EPA, 1993a)
Cadmium	µg/L	2.5	5	Final PDWS (EPA, 1993a)
Cadmium, dissolved	µg/L	2.5	5	Final PDWS (EPA, 1993a)
Cadmium, total recoverable	µg/L	2.5	5	Final PDWS (EPA, 1993a)
Calcium		No flag	No flag	Set by EPD/EMS
Calcium, dissolved		No flag	No flag	Set by EPD/EMS
Calcium, total recoverable		No flag	No flag	Set by EPD/EMS
Carbofuran	µg/L	20	40	Final PDWS (EPA, 1993a)
Carbon-14	pCi/L	1E+03	2E+03	Interim Final PDWS (EPA, 1977)
Carbonate		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 PDWS (EPA, 1993a)
Cerium-141[c]	pCi/L	1.5E+02	3E+02	Interim Final PDWS (EPA, 1977)
Cerium-144	pCi/L	1.31E+02	2.61E+02	Proposed PDWS (EPA, 1991)
Cesium-134[d]	pCi/L	4.07E+01	8.13E+01	Proposed PDWS (EPA, 1991)
Cesium-137	pCi/L	1E+02	2E+02	Interim Final PDWS (EPA, 1977)
Chlordane	µg/L	1	2	Final PDWS (EPA, 1993a)
Chloride	µg/L	125,000	250,000	SDWS (EPA, 1993b)
4-Chloroaniline	µg/L	50	100	EPA Method 8270
Chlorobenzene	µg/L	50	100	Final PDWS (EPA, 1993a)
Chlorobenzilate	µg/L	50	100	EPA Method 8270
4-Chloro-m-cresol	µg/L	50	100	EPA Method 8270
Chloroethane	µg/L	5	10	EPA Method 8240
Chloroethene (Vinyl chloride)	µg/L	1	2	Final PDWS (EPA, 1993a)
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 PDWS (EPA, 1993a)
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
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 PDWS (EPA, 1993a)
Chromium, dissolved	µg/L	50	100	Final PDWS (EPA, 1993a)
Chromium, total recoverable	µg/L	50	100	Final PDWS (EPA, 1993a)
Chromium-51[c]	pCi/L	3E+03	6E+03	Interim Final PDWS (EPA, 1977)
Chrysene	µg/L	0.1	0.2	Proposed PDWS (EPA, 1990)
Cobalt	µg/L	20	40	EPA Method 6010
Cobalt, dissolved	µg/L	20	40	EPA Method 6010
Cobalt, total recoverable	µg/L	20	40	EPA Method 6010
Cobalt-57	pCi/L	5E+02	1E+03	Interim Final PDWS (EPA, 1977)
Cobalt-58[d]	pCi/L	4.5E+03	9E+03	Interim Final PDWS (EPA, 1977)
Cobalt-60	pCi/L	5E+01	1E+02	Interim Final PDWS (EPA, 1977)
Color		No flag	No flag	Set by EPD/EMS
Copper	µg/L	500	1,000	Final PDWS (SCDHEC, 1981)
Copper, dissolved	µg/L	500	1,000	Final PDWS (SCDHEC, 1981)
Copper, total recoverable	µg/L	500	1,000	Final PDWS (SCDHEC, 1981)
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 PDWS (EPA, 1991)
Curium-243	pCi/L	4.15E+00	8.3E+00	Proposed PDWS (EPA, 1991)
Curium-243/244[e]	pCi/L	4.15E+00	8.3E+00	Proposed PDWS (EPA, 1991)
Curium-244	pCi/L	4.92E+00	9.84E+00	Proposed PDWS (EPA, 1991)

Curium-245/246^{e}	pCi/L	3.12E+00	6.23E+00	Proposed PDWS (EPA, 1991)
Curium-246	pCi/L	3.14E+00	6.27E+00	Proposed PDWS (EPA, 1991)
Cyanide	µg/L	100	200	Final PDWS (EPA, 1993a)
Dalapon^{b}	µg/L	100	200	Final PDWS (EPA, 1993a)
p,p′-DDD	µg/L	0.5	1	EPA Method 8080
p,p′-DDE	µg/L	0.5	1	EPA Method 8080
p,p′-DDT	µg/L	0.5	1	EPA Method 8080
Diallate	µg/L	50	100	EPA Method 8270
Dibenz[*a,h*]anthracene	µg/L	0.15	0.3	Proposed PDWS (EPA, 1990)
Dibenzofuran	µg/L	50	100	EPA Method 8270
Dibromochloromethane	µg/L	50	100	Final PDWS (EPA, 1993a)
1,2-Dibromo-3-chloropropane	µg/L	0.1	0.2	Final PDWS (EPA, 1993a)
1,2-Dibromoethane	µg/L	0.025	0.05	Final PDWS (EPA, 1993a)
Dibromomethane (Methylene bromide)	µg/L	5	10	EPA Method 8240
Di-n-butyl phthalate		No flag	No flag	Set by EPD/EMS
1,2-Dichlorobenzene	µg/L	300	600	Final PDWS (EPA, 1993a)
1,3-Dichlorobenzene	µg/L	50	100	EPA Method 8270
1,4-Dichlorobenzene	µg/L	37.5	75	Final PDWS (EPA, 1993a)
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 PDWS (EPA, 1993a)
1,1-Dichloroethylene	µg/L	3.5	7	Final PDWS (EPA, 1993a)
1,2-Dichloroethylene	µg/L	25	50	Final PDWS (EPA, 1993a)
cis-1,2-Dichloroethylene	µg/L	35	70	Final PDWS (EPA, 1993a)
trans-1,2-Dichloroethylene	µg/L	50	100	Final PDWS (EPA, 1993a)
Dichloromethane (Methylene chloride)	µg/L	2.5	5	Final PDWS (EPA, 1993a)
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 PDWS (EPA, 1993a)
1,2-Dichloropropane	µg/L	2.5	5	Final PDWS (EPA, 1993a)
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
Di(2-ethylhexyl) adipate	µg/L	200	400	Final PDWS (EPA, 1993a)
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
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
Di-n-octyl phthalate		No flag	No flag	Set by EPD/EMS
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

Diquat dibromide[b]	µg/L	10	20	Final PDWS (EPA, 1993a)
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
Endosulfan I	µg/L	0.5	1	EPA Method 8080
Endosulfan II	µg/L	0.5	1	EPA Method 8080
Endosulfan sulfate	µg/L	0.5	1	EPA Method 8080
Endothall[b]	µg/L	50	100	Final PDWS (EPA, 1993a)
Endrin	µg/L	1	2	Final PDWS (EPA, 1993a)
Endrin aldehyde	µg/L	0.5	1	EPA Method 8080
Endrin ketone		No flag	No flag	Set by EPD/EMS
Ethylbenzene	µg/L	350	700	Final PDWS (EPA, 1993a)
Ethyl methacrylate	µg/L	50	100	EPA Method 8270
Ethyl methanesulfonate	µg/L	50	100	EPA Method 8270
Europium-152	pCi/L	3E+01	6E+01	Interim Final PDWS (EPA, 1977)
Europium-154	pCi/L	1E+02	2E+02	Interim Final PDWS (EPA, 1977)
Europium-155	pCi/L	3E+02	6E+02	Interim Final PDWS (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 PDWS (EPA, 1993a)
Glyphosate[b]	µg/L	350	700	Final PDWS (EPA, 1993a)
Gross alpha	pCi/L	7.5E+00	1.5E+01	Final PDWS (EPA, 1993a)
Heptachlor	µg/L	0.2	0.4	Final PDWS (EPA, 1993a)
Heptachlor epoxide	µg/L	0.1	0.2	Final PDWS (EPA, 1993a)
Heptachlorodibenzo-p-dioxin isomers	µg/L	0.00325	0.0065	EPA Method 8280
1,2,3,4,6,7,8-HPCDD	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-HPCDF	µg/L	0.00225	0.0045	EPA Method 8280
Hexachlorobenzene	µg/L	0.5	1	Final PDWS (EPA, 1993a)
Hexachlorobutadiene	µg/L	50	100	EPA Method 8270
Hexachlorocyclopentadiene	µg/L	25	50	Final PDWS (EPA, 1993a)
Hexachlorodibenzo-p-dioxin isomers	µg/L	0.00225	0.0045	EPA Method 8280
1,2,3,4,7,8-HXCDD	µg/L	0.00225	0.0045	EPA Method 8280
Hexachlorodibenzo-p-furan isomers	µg/L	0.002	0.004	EPA Method 8280
1,2,3,4,7,8-HXCDF	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	50	100	EPA Method 8240
Indeno[1,2,3-*c,d*]pyrene	µg/L	50	100	EPA Method 8270
Iodine	µg/L	250	500	APHA Method 415A
Iodine-129	pCi/L	5E-01	1E+00	Interim Final PDWS (EPA, 1977)
Iodine-131[c]	pCi/L	1.5E+00	3E+00	Interim Final PDWS (EPA, 1977)
Iodomethane (Methyl iodide)	µg/L	75	150	EPA Method 8240
Iron	µg/L	150	300	SDWS (EPA, 1993b)
Iron, dissolved	µg/L	150	300	SDWS (EPA, 1993b)
Iron, total recoverable	µg/L	150	300	SDWS (EPA, 1993b)
Iron-55[c]	pCi/L	1E+03	2E+03	Interim Final PDWS (EPA, 1977)
Iron-59[c]	pCi/L	1E+02	2E+02	Interim Final PDWS (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[c]	pCi/L	3E+01	6E+01	Interim Final PDWS (EPA, 1977)
Lead	µg/L	25	50	Final PDWS (SCDHEC, 1981)
Lead, dissolved	µg/L	25	50	Final PDWS (SCDHEC, 1981)
Lead, total recoverable	µg/L	25	50	Final PDWS (SCDHEC, 1981)
Lead-212	pCi/L	6.2E+01	1.23E+02	Proposed PDWS (EPA, 1991)
Lindane	µg/L	0.1	0.2	Final PDWS (EPA, 1993a)
Lithium	µg/L	25	50	EPA Method 6010
Lithium, dissolved	µg/L	25	50	EPA Method 6010
Lithium, total recoverable	µg/L	25	50	EPA Method 6010
Magnesium		No flag	No flag	Set by EPD/EMS
Magnesium, dissolved		No flag	No flag	Set by EPD/EMS
Magnesium, total recoverable		No flag	No flag	Set by EPD/EMS
Manganese	µg/L	25	50	SDWS (EPA, 1993b)
Manganese, dissolved	µg/L	25	50	SDWS (EPA, 1993b)
Manganese, total recoverable	µg/L	25	50	SDWS (EPA, 1993b)
Manganese-54	pCi/L	1.5E+02	3E+02	Interim Final PDWS (EPA, 1977)
Mercury	µg/L	1	2	Final PDWS (EPA, 1993a)
Mercury, dissolved	µg/L	1	2	Final PDWS (EPA, 1993a)
Mercury, total recoverable	µg/L	1	2	Final PDWS (EPA, 1993a)
Methacrylonitrile	µg/L	250	500	EPA Method 8240
Methapyrilene	µg/L	50	100	EPA Method 8270
Methoxychlor	µg/L	20	40	Final PDWS (EPA, 1993a)
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
Molybdenum, dissolved	µg/L	250	500	EPA Method 6010
Molybdenum, total recoverable	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 PDWS (EPA, 1991)
Nickel	µg/L	50	100	Final PDWS (EPA, 1993a)
Nickel, dissolved	µg/L	50	100	Final PDWS (EPA, 1993a)
Nickel, total recoverable	µg/L	50	100	Final PDWS (EPA, 1993a)
Nickel-59[c]	pCi/L	1.5E+02	3E+02	Interim Final PDWS (EPA, 1977)
Nickel-63[c]	pCi/L	2.5E+01	5E+01	Interim Final PDWS (EPA, 1977)
Niobium-95[c]	pCi/L	1.5E+02	3.E+02	Interim Final PDWS (EPA, 1977)
Nitrate as nitrogen	µg/L	5,000	10,000	Final PDWS (EPA, 1993a)
Nitrate-nitrite as nitrogen	µg/L	5,000	10,000	Final PDWS (EPA, 1993a)
Nitrite as nitrogen	µg/L	500	1,000	Final PDWS (EPA, 1993a)
m-Nitroaniline	µg/L	50	100	EPA Method 8270
o-Nitroaniline	µg/L	50	100	EPA Method 8270
p-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

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-Nitrosodipropylamine	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	Interim Final PDWS (EPA, 1977)
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
Oxamyl[b]	µg/L	100	200	Final PDWS (EPA, 1993a)
Parathion	µg/L	0.25	0.5	EPA Method 8080
Parathion methyl	µg/L	0.25	0.5	EPA Method 8080
PCB 1016	µg/L	0.25	0.5	Final PDWS (EPA, 1993a)
PCB 1221	µg/L	0.25	0.5	Final PDWS (EPA, 1993a)
PCB 1232	µg/L	0.25	0.5	Final PDWS (EPA, 1993a)
PCB 1242	µg/L	0.25	0.5	Final PDWS (EPA, 1993a)
PCB 1248	µg/L	0.25	0.5	Final PDWS (EPA, 1993a)
PCB 1254	µg/L	0.25	0.5	Final PDWS (EPA, 1993a)
PCB 1260	µg/L	0.25	0.5	Final PDWS (EPA, 1993a)
PCB 1262	µg/L	0.25	0.5	Final PDWS (EPA, 1993a)
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-PCDD	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-PCDF	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 PDWS (EPA, 1993a)
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	0.5	1	EPA Method 8080
Picloram[b]	µg/L	250	500	Final PDWS (EPA, 1993a)
2-Picoline	µg/L	50	100	EPA Method 8270
Plutonium-238	pCi/L	3.51E+00	7.02E+00	Proposed PDWS (EPA, 1991)
Plutonium-239	pCi/L	3.11E+01	6.21E+01	Proposed PDWS (EPA, 1991)
Plutonium-239/240[e]	pCi/L	3.11E+01	6.21E+01	Proposed PDWS (EPA, 1991)
Plutonium-240	pCi/L	3.11E+01	6.22E+01	Proposed PDWS (EPA, 1991)

Plutonium-241[c]	pCi/L	3.13E+01	6.26E+01	Proposed PDWS (EPA, 1991)
Plutonium-242[c]	pCi/L	3.27E+01	6.54E+01	Proposed PDWS (EPA, 1991)
Potassium		No flag	No flag	Set by EPD/EMS
Potassium, dissolved		No flag	No flag	Set by EPD/EMS
Potassium, total recoverable		No flag	No flag	Set by EPD/EMS
Potassium-40	pCi/L	1.5E+02	3E+02	Proposed PDWS (EPA, 1986)
Promethium-144	pCi/L	5E+01	1E+02	EPA Method 901.1
Promethium-146	pCi/L	5E+01	1E+02	EPA Method 901.1
Promethium-147	pCi/L	2.62E+03	5.24E+03	Proposed PDWS (EPA, 1991)
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 (alpha-emitting)[f]	pCi/L	1E+01	2E+01	Proposed PDWS (EPA, 1991)
Radium-226	pCi/L	1E+01	2E+01	Proposed PDWS (EPA, 1991)
Radium-228	pCi/L	1E+01	2E+01	Proposed PDWS (EPA, 1991)
Radon-222	pCi/L	1.5E+02	3E+02	Proposed PDWS (EPA, 1991)
Ruthenium-103[c]	pCi/L	1E+02	2E+02	Interim Final PDWS (EPA, 1977)
Ruthenium-106	pCi/L	1.5E+01	3E+01	Interim Final PDWS (EPA, 1977)
Safrole	µg/L	50	100	EPA Method 8270
Selenium	µg/L	25	50	Final PDWS (EPA, 1993a)
Selenium, dissolved	µg/L	25	50	Final PDWS (EPA, 1993a)
Selenium, total recoverable	µg/L	25	50	Final PDWS (EPA, 1993a)
Silica		No flag	No flag	Set by EPD/EMS
Silica, dissolved		No flag	No flag	Set by EPD/EMS
Silica, total recoverable		No flag	No flag	Set by EPD/EMS
Silver	µg/L	50	100	SDWS (EPA, 1993b)
Silver, dissolved	µg/L	50	100	SDWS (EPA, 1993b)
Silver, total recoverable	µg/L	50	100	SDWS (EPA, 1993b)
Simazine[b]	µg/L	2	4	Final PDWS (EPA, 1993a)
Sodium		No flag	No flag	Set by EPD/EMS
Sodium, dissolved		No flag	No flag	Set by EPD/EMS
Sodium, total recoverable		No flag	No flag	Set by EPD/EMS
Sodium-22	pCi/L	2.33E+02	4.66E+02	Proposed PDWS (EPA, 1991)
Specific conductance	µS/cm	250	500	Set by EPD/EMS
Strontium-89	pCi/L	1E+01	2E+01	Interim Final PDWS (EPA, 1977)
Strontium-89/90[e]	pCi/L	4E+00	8E+00	Final PDWS (EPA, 1993a)
Strontium-90	pCi/L	4E+00	8E+00	Final PDWS (EPA, 1993a)
Styrene	µg/L	50	100	Final PDWS (EPA, 1993a)
Sulfate	µg/L	200,000	400,000	Proposed PDWS (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	0.000015	0.00003	Final PDWS (EPA, 1993a)
2,3,7,8-TCDF	µg/L	0.002	0.004	EPA Method 8280
Technetium-99	pCi/L	4.5E+02	9E+02	Interim Final PDWS (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 PDWS (EPA, 1993a)
2,3,4,6-Tetrachlorophenol	µg/L	50	100	EPA Method 8270
Thallium	µg/L	1	2	Final PDWS (EPA, 1993a)

Thallium, dissolved	µg/L	1	2	Final PDWS (EPA, 1993a)
Thallium, total recoverable	µg/L	1	2	Final PDWS (EPA, 1993a)
Thionazin	µg/L	50	100	EPA Method 8270
Thorium-228	pCi/L	6.25E+01	1.25E+02	Proposed PDWS (EPA, 1991)
Thorium-230	pCi/L	3.96E+01	7.92E+01	Proposed PDWS (EPA, 1991)
Thorium-232	pCi/L	4.4E+01	8.8E+01	Proposed PDWS (EPA, 1991)
Thorium-234	pCi/L	2E+02	4.01E+02	Proposed PDWS (EPA, 1991)
Tin	µg/L	10	20	EPA Method 282.2
Tin, dissolved	µg/L	10	20	EPA Method 282.2
Tin, total recoverable	µg/L	10	20	EPA Method 282.2
Tin-113[c]	pCi/L	1.5E+02	3E+02	Interim Final PDWS (EPA, 1977)
Toluene	µg/L	500	1,000	Final PDWS (EPA, 1993a)
o-Toluidine	µg/L	50	100	EPA Method 8270
Total carbon	µg/L	5,000	10,000	EPA Method 9060
Total coliform		0	0	Final PDWS (EPA, 1993a)
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	APHA Method 420
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
Toxaphene	µg/L	1.5	3	Final PDWS (EPA, 1993a)
2,4,5-TP (Silvex)	µg/L	25	50	Final PDWS (EPA, 1993a)
Tributyl phosphate	µg/L	50	100	EPA Method 8270
1,2,4-Trichlorobenzene	µg/L	35	70	Final PDWS (EPA, 1993a)
1,1,1-Trichloroethane	µg/L	100	200	Final PDWS (EPA, 1993a)
1,1,2-Trichloroethane	µg/L	2.5	5	Final PDWS (EPA, 1993a)
Trichloroethylene	µg/L	2.5	5	Final PDWS (EPA, 1993a)
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 PDWS (EPA, 1993a)
Turbidity[g]		No flag	No flag	Set by EPD/EMS
Uranium	µg/L	10	20	Proposed PDWS (EPA, 1991)
Uranium, dissolved	µg/L	10	20	Proposed PDWS (EPA, 1991)
Uranium, total recoverable	µg/L	10	20	Proposed PDWS (EPA, 1991)
Uranium alpha activity	pCi/L	1.5E+01	3E+01	Proposed PDWS (EPA, 1991)
Uranium-233/234[e]	pCi/L	6.9E+00	1.38E+01	Proposed PDWS (EPA, 1991)
Uranium-234	pCi/L	6.95E+00	1.39E+01	Proposed PDWS (EPA, 1991)
Uranium-235	pCi/L	7.25E+00	1.45E+01	Proposed PDWS (EPA, 1991)
Uranium-238	pCi/L	7.3E+00	1.46E+01	Proposed PDWS (EPA, 1991)
Vanadium	µg/L	40	80	EPA Method 6010.
Vanadium, dissolved	µg/L	40	80	EPA Method 6010
Vanadium, total recoverable	µg/L	40	80	EPA Method 6010
Vinyl acetate	µg/L	5	10	EPA Method 8240
Xylenes	µg/L	5,000	10,000	Final PDWS (EPA, 1993a)
Yttrium-88	pCi/L	5E+01	1E+02	EPA Method 901.1
Zinc	µg/L	2,500	5,000	SDWS (EPA, 1993b)

Zinc, dissolved	µg/L	2,500	5,000	SDWS (EPA, 1993b)
Zinc, total recoverable	µg/L	2,500	5,000	SDWS (EPA, 1993b)
Zinc-65	pCi/L	1.5E+02	3E+02	Interim Final PDWS (EPA, 1977)
Zirconium-95[c]	pCi/L	1E+02	2E+02	Interim Final PDWS (EPA, 1977)
Zirconium/Niobium-95[c]	pCi/L	1E+02	2E+02	Interim Final PDWS (EPA, 1977)

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[a] References for methods are in Appendix E; references for dated sources are at the end of this appendix.

[b] EMS is currently unable to perform this analysis.

[c] EMS discontinued monitoring this radionuclide because it is inappropriate for the SRS Groundwater Monitoring Program.

[d] EPD/EMS set this flagging criterion using the 1991 proposed PDWS because the final PDWS in 1977 may have been in error.

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

[f] The applied standard is for radium-226.

[g] The primary maximum contaminant level range for turbidity is 1–5 NTU, which is inappropriate for the SRS Groundwater Monitoring Program.

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Appendix C

Figures

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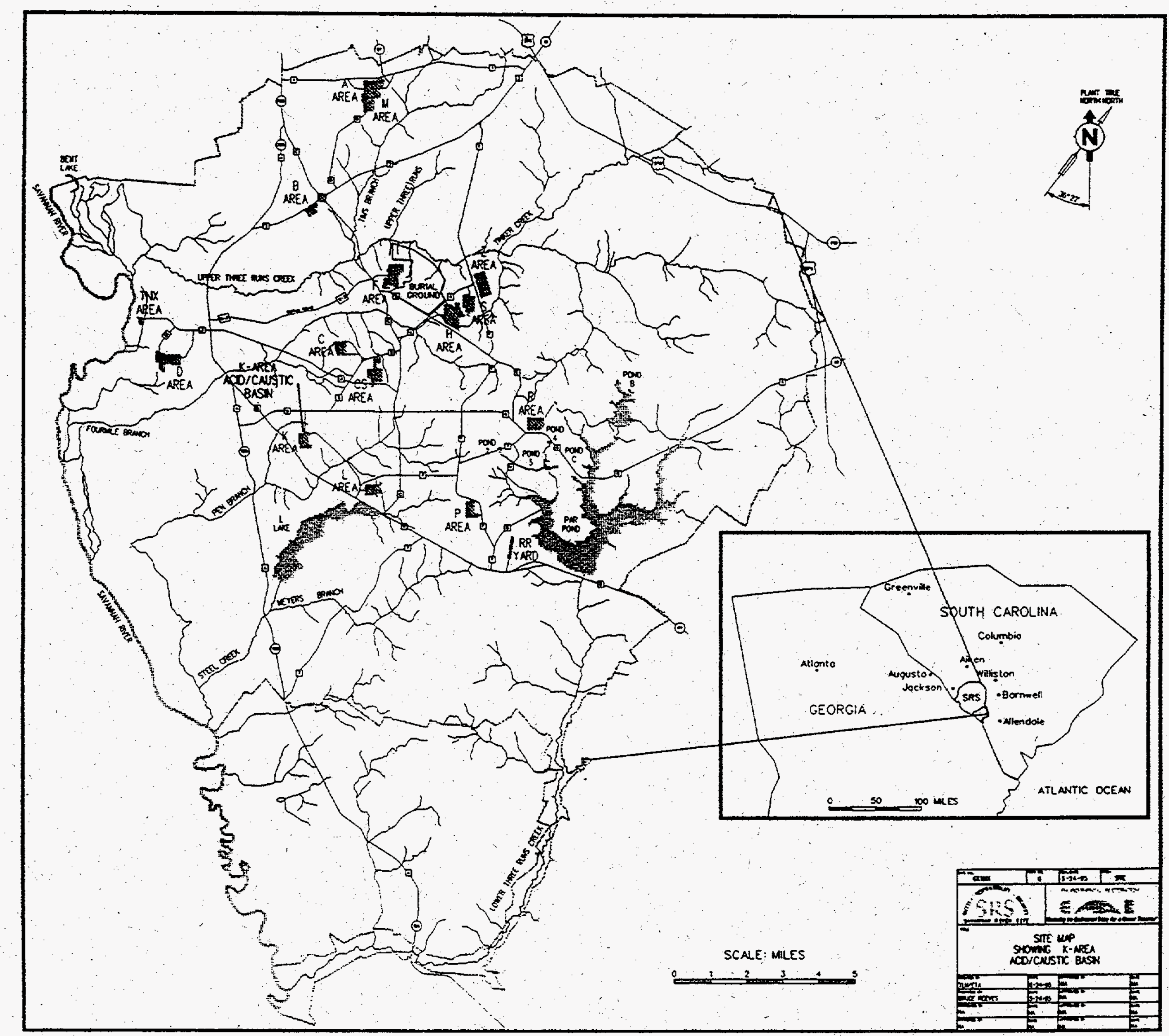


Figure 1. **Location of the K-Area Acid/Caustic Basin at the Savannah River Site**

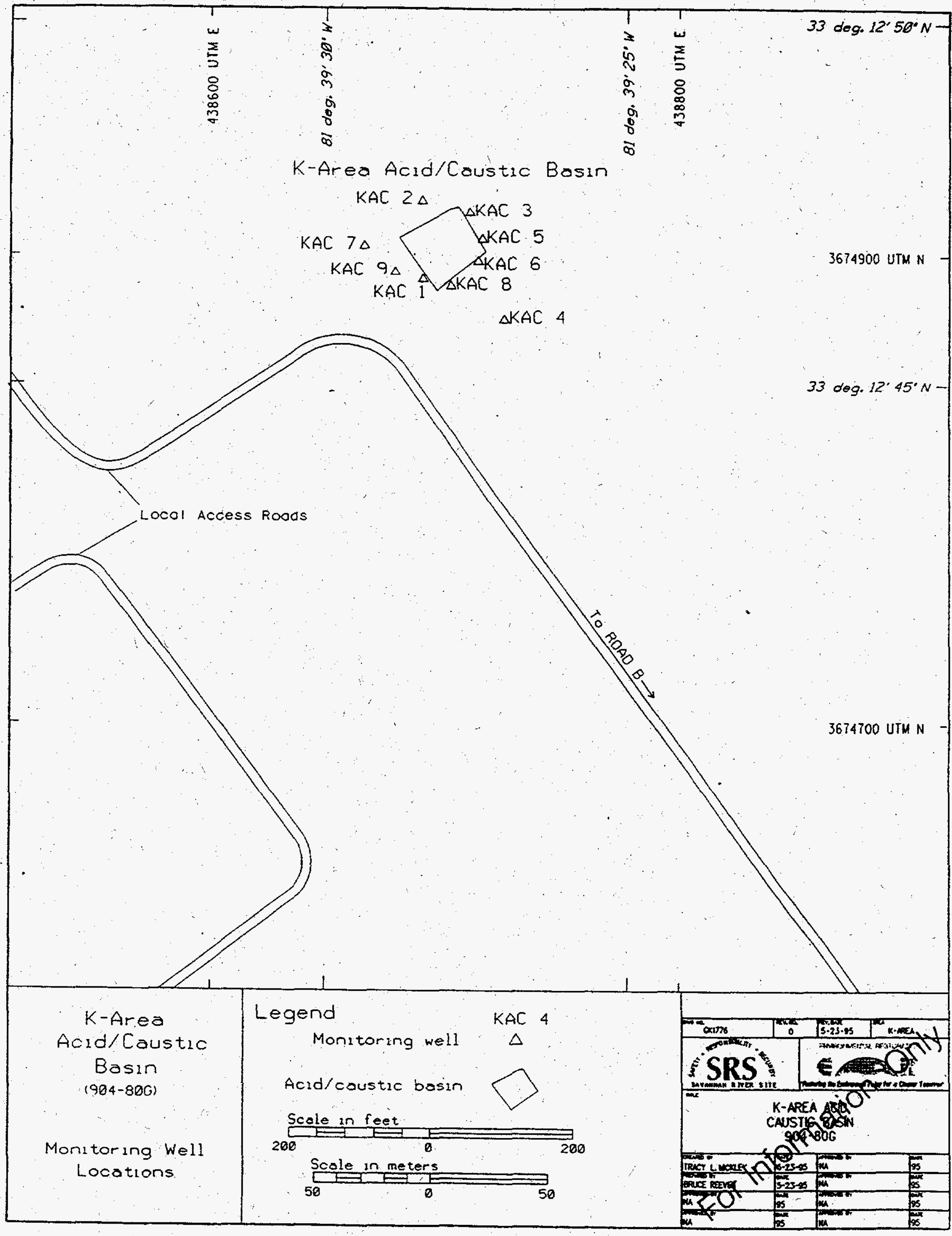
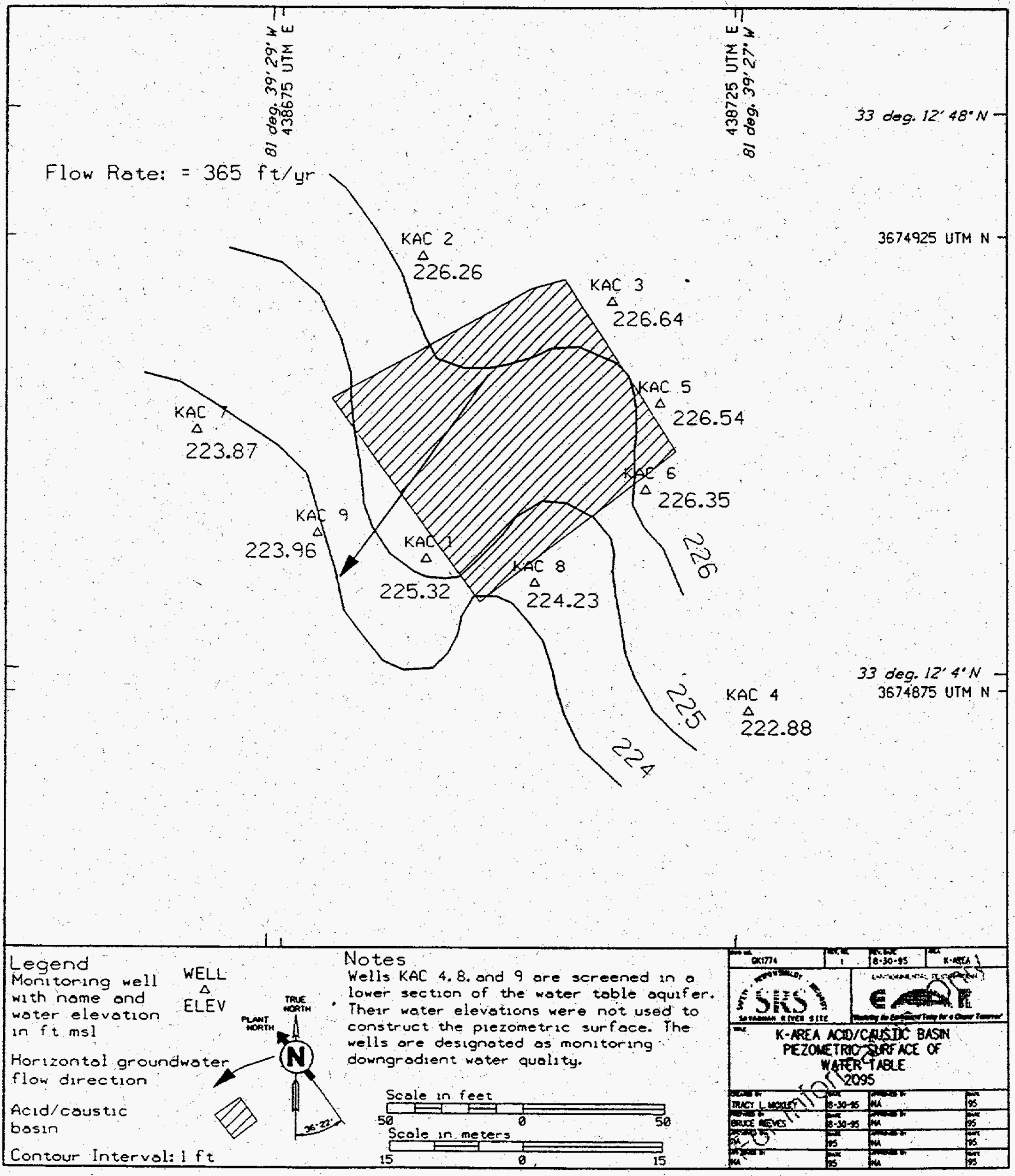


Figure 2. Location of Groundwater Monitoring Wells at the K-Area Acid/Caustic Basin



Notes
Wells KAC 4, 8, and 9 are screened in a lower section of the water table aquifer. Their water elevations were not used to construct the piezometric surface. The wells are designated as monitoring downgradient water quality.

Figure 3. Piezometric Surface Map of the Water Table at the K-Area Acid/Caustic Basin

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Appendix D

Groundwater Monitoring Results Tables

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Key to Reading the Tables

The following abbreviations may appear in the data tables:

Constituents

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
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
Sp. conductance	specific conductance
TCDD	tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzo-p-furan

Laboratories

CN	Clemson Technical Center, Inc.
EM	Environmental Protection Department/Environmental Monitoring Section (EPD/EMS) Laboratory
GE and GP	General Engineering Laboratories
SC	Savannah River Technology Center
SP	Spencer Testing Services, Inc.
TM	TMA/Eberline
WA and WS	Roy F. Weston, Inc.

Sampling Codes

B	blank sample was collected
C	well was pumping continuously
D	well was dry
E	equipment blank was collected
I	well went dry during sampling; insufficient water to collect all samples
L	well went dry before sampling began; only depth to water can be determined
P	inaccessibility or mechanical failure prevented sample collection and field analysis of the water
S	no water in standpipe; for water level events only
X	well went dry during purging; samples collected after well recovered

Sampling Methods

B	sample collected using an open-bucket bailer
P	sample collected using a bladder pump
S	sample collected using a single-speed centrifugal downhole pump
V	sample collected using a variable-speed pump

Units

E	exponential notation (e.g., 1.1E-09 = 1.1 × 10^{-9} = 0.0000000011)
mg/L	milligrams per liter
msl	mean sea level
MSL	million structures per liter
NTU	turbidity unit
pCi/L	picocuries per liter
pCi/mL	picocuries per milliliter
pH	pH unit
µg/L	micrograms per liter
µS/cm	microsiemens per centimeter

Other

CS	carbon steel
DF	dilution factor column in data tables
H	holding time column in data tables
Mod	modifier column in data tables
PDWS	primary drinking water standard
PVC	polyvinyl chloride
ST	exceeded standard column in data tables
TOC	top of casing

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 bullet (•) in the *H* (holding time) column indicates that holding time was exceeded. Analyses performed beyond holding times 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 always will exceed it.

The laboratory procedure used for the determination of specific conductance allows one day to elapse between sampling and analysis. Thus, laboratory specific conductance measurements may exceed the holding time criterion.

Data Rounding

Constituent results in analytical results tables that appear to equal the final PDWS but are not marked in the *ST* (exceeded the final PDWS or screening level) column are below the final PDWS in the database. Values stored in the database contain more significant digits than the reported results. Apparent discrepancies in the tables are due to the rounding of reported results.

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 usability. Result modifiers designed by the EPD/EMS and provided to the primary laboratories are defined below. These modifiers appear in the data tables under the column *Mod*. The lettered modifiers are based on EPA's STORET codes.

Result modifier	
(Blank)	Data are not qualified. Numbers should be interpreted exactly as reported.
J	Value is estimated because quantitation in the sample or in associated quality control samples did not meet specifications.
I	The value in the result field is the instrument reading, not the sample quantification limit. Always used with the result qualifier *U*.
L	Value is off-scale high. The actual value is not known but is known to be greater than the value shown.
M	Presence of the analyte is verified but not quantified.
R	Result was rejected because performance requirements in the sample analysis or associated quality control analyses were not met.
T	Analyte was not detected; if present, it was below the criteria for detection.
U	Material analyzed for but not detected. Analytical result reported is less than the sample quantitation limit.
V	Analyte was detected in an associated method blank.
Y	Result was obtained from an unpreserved or improperly preserved sample. Data may not be accurate.
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.
3	The associated result may be of poor precision (high variability) due to analytical bias.
4	Result is associated with QA results indicating matrix interference.
6	The associated result is from a reanalysis performed out of holding time due to problems with an earlier analysis.

Table 1. Maximum Results for Constituents Exceeding Final Primary Drinking Water Standards

Well	Constituent	Unit	3Q94	4Q94	1Q95	2Q95	Mod
N[a]	None		N	N	N	N	

Note:The modifier column applies to second quarter 1995 data only.

[a] – = Not above final PDWS.

Table 2. Maximum Results for Constituents Exceeding Other Flag 2 Criteria or the SRS Turbidity Standard

Well	Constituent	Unit	2Q95	Mod
KAC 6	Aluminum, total recoverable	µg/L	911	
	Iron, total recoverable	µg/L	1680	
KAC 7	Aluminum, total recoverable	µg/L	2040	
	Iron, total recoverable	µg/L	380	
KAC 9	Aluminum, total recoverable	µg/L	130	

Notes: These results do not include field data. The groundwater samples are unfiltered. Thus, the results for metals are for total recoverable metals. Flags are established by EPD/EMS and are based on final PDWS, Secondary Drinking Water Standards, or method detection limits. (Appendix B.)

Table 3. Groundwater Monitoring Results for Individual Wells

WELL: KAC 1

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Pump	Formation
N 53167 E 42614.8	33.212893 Deg N 81.657866 Deg W	229-199 ft msl	266 ft msl	4" PVC	V	Water Table

FIELD MEASUREMENTS

Sample date: 04/20/95	Time: 11:00
Depth to water: 40.68 ft (12.40 m) below TOC	pH:6.2
Water elevation: 225.32 ft (68.70 m) msl	Alkalinity: 16 mg/L
Sp. conductance:143 uS/cm	Water temperature: 19.9 deg C
Turbidity: 8.8 NTU	
Water evacuated before sampling:41 gal	Volumes purged: 2.375 well volumes

LABORATORY ANALYSES

H	ST	Analyte	Result	DF	Mod	Unit	Flag	Lab
		Gross alpha	< .3	1	UI	pCi/L	0	TM
		Nitrate as nitrogen	94	1		ug/L	0	WA
		Nonvolatile beta	< .2	1	UI	pCi/L	0	TM
		Tritium	1.69	1		pCi/mL	0	TM
		Tritium	1.1	1		pCi/mL	0	TM
		Aluminum, total recoverable	< 87	1	U	ug/L	0	WA
		Arsenic, total recoverable	< 12	1	U	ug/L	0	WA
		Barium, total recoverable	2.1	1	J	ug/L	0	WA
		Cadmium, total recoverable	< 4.7	1	U	ug/L	0	WA
		Chromium, total recoverable	2.9	1	J	ug/L	0	WA
		Iron, total recoverable	29.4	1		ug/L	0	WA
		Lead, total recoverable	3.9	1	J	ug/L	0	WA
		Manganese, total recoverable	1.1	1	J	ug/L	0	WA
		Mercury, total recoverable	< .67	1	U	ug/L	0	WA
		Radium-226	.1	1	J	pCi/L	0	TM
		Radium-226	.18	1	J	pCi/L	0	TM
		Radium-228	5	1	V	pCi/L	0	TM
		Selenium, total recoverable	2.8	1	J	ug/L	0	WA
		Silver, total recoverable	< 1.4	1	U	ug/L	0	WA
		Sodium, total recoverable	26300	1		ug/L	0	WA
		Sulfate	36500	10		ug/L	0	WA
*		pH	6.2	1	J	pH	0	WA

Number of Records: 22

*** = exceeded holding time. + = exceeded screening level or final primary drinking water standard.**

WELL: KAC 2

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Pump	Formation
N 53255.5 E 42677.2	33.213191 Deg N 81.657873 Deg W	225.4-195.4 ft msl	257.5 ft msl	4" PVC	S	Water Table

FIELD MEASUREMENTS

Sample date: 04/20/95	Time: 12:16
Depth to water: 31.24 ft (9.524 m) below TOC	pH:6.8
Water elevation: 226.26 ft (68.98 m) msl	Alkalinity: 51 mg/L
Sp. conductance:231 uS/cm	Water temperature: 20.2 deg C
Turbidity: 0.9 NTU	
Water evacuated before sampling:57 gal	Volumes purged: 2.816 well volumes

LABORATORY ANALYSES

H	ST	Analyte	Result	DF	Mod	Unit	Flag	Lab
		Gross alpha	< .3	1	UI	pCi/L	0	TM
		Gross alpha	< -.5	1	UI	pCi/L	0	TM
		Nitrate as nitrogen	97	1		ug/L	0	WA
		Nonvolatile beta	< -.2	1	UI	pCi/L	0	TM
		Nonvolatile beta	< .3	1	UI	pCi/L	0	TM
		Tritium	2.23	1		pCi/mL	0	TM
		Aluminum, total recoverable	< 87	1	U	ug/L	0	WA
		Arsenic, total recoverable	2.4	1	JV	ug/L	0	WA
		Barium, total recoverable	.8	1	J	ug/L	0	WA
		Cadmium, total recoverable	< 4.7	1	U	ug/L	0	WA
		Chromium, total recoverable	2.5	1	J	ug/L	0	WA
		Iron, total recoverable	83.3	1		ug/L	0	WA
		Lead, total recoverable	2	1	J	ug/L	0	WA
		Manganese, total recoverable	1	1	J	ug/L	0	WA
		Mercury, total recoverable	< .67	1	U	ug/L	0	WA
		Radium-226	< -.01	1	UI	pCi/L	0	TM
		Radium-228	1.6	1	JV	pCi/L	0	TM
		Radium-228	1.4	1	JV	pCi/L	0	TM
		Selenium, total recoverable	< 19	1	U	ug/L	0	WA
		Silver, total recoverable	3.5	1	V	ug/L	0	WA
		Sodium, total recoverable	42700	1		ug/L	0	WA
		Sulfate	50200	10		ug/L	0	WA
*		pH	6.63	1	J	pH	0	WA

Number of Records: 23

*** = exceeded holding time. + = exceeded screening level or final primary drinking water standard.**

WELL: KAC 3

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Pump	Formation
N 53201.8 E 42723.9	33.213148 Deg N 81.657646 Deg W	225.8-195.8 ft msl	257.8 ft msl	4" PVC	S	Water Table

FIELD MEASUREMENTS

Sample date: 04/20/95	Time: 10:30
Depth to water: 31.16 ft (9.5 m) below TOC	pH:6
Water elevation: 226.64 ft (69.10 m) msl	Alkalinity:9 mg/L
Sp. conductance: 94 uS/cm	Water temperature: 18.9 deg C
Turbidity: 0.7 NTU	
Water evacuated before sampling: 125 gal	Volumes purged: 6.179 well volumes

LABORATORY ANALYSES

H	ST	Analyte	Result	DF	Mod	Unit	Flag	Lab
		Gross alpha	< -.8	1	UI	pCi/L	0	TM
		Nitrate as nitrogen	84	1		ug/L	0	WA
		Nonvolatile beta	< -.5	1	UI	pCi/L	0	TM
		Tritium	1.07	1		pCi/mL	0	TM
		Aluminum, total recoverable	< 87	1	U	ug/L	0	WA
		Arsenic, total recoverable	< 12	1	U	ug/L	0	WA
		Barium, total recoverable	2.8	1	J	ug/L	0	WA
		Cadmium, total recoverable	< 4.7	1	U	ug/L	0	WA
		Chromium, total recoverable	< 10	1	U	ug/L	0	WA
		Iron, total recoverable	11.3	1	J	ug/L	0	WA
		Lead, total recoverable	1.6	1	J	ug/L	0	WA
		Manganese, total recoverable	1.5	1	J	ug/L	0	WA
		Mercury, total recoverable	< .67	1	U	ug/L	0	WA
		Radium-226	.12	1	J	pCi/L	0	TM
		Radium-228	4.1	1	V	pCi/L	0	TM
		Selenium, total recoverable	2.8	1	J	ug/L	0	WA
		Silver, total recoverable	< 1.4	1	U	ug/L	0	WA
		Sodium, total recoverable	15700	1		ug/L	0	WA
		Sulfate	20000	5		ug/L	0	WA
*		pH	5.97	1	J	pH	0	WA
*		pH	5.97	1	J	pH	0	WA

Number of Records: 21

*** = exceeded holding time. + = exceeded screening level or final primary drinking water standard.**

WELL: KAC 4

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Pump	Formation
N 53053.5	33.212743 Deg N	208-178 ft msl	260 ft msl	4" PVC	S	Water Table
E 42676.4	81.657484 Deg W					

FIELD MEASUREMENTS

Sample date: 04/20/95	Time: 09:02
Depth to water: 37.12 ft (11.32 m) below TOC	pH:5.2
Water elevation: 222.88 ft (67.95 m) msl	Alkalinity:0 mg/L
Sp. conductance: 59 uS/cm	Water temperature: 19.1 deg C
Turbidity: 0.5 NTU	
Water evacuated before sampling: 102 gal	Volumes purged: 3.465 well volumes

LABORATORY ANALYSES

H	ST	Analyte	Result	DF	Mod	Unit	Flag	Lab
		Nitrate as nitrogen	82	1		ug/L	0	WA
		Tritium	2.23	1		pCi/mL	0	TM
		Aluminum, total recoverable	< 87	1	U	ug/L	0	WA
		Arsenic, total recoverable	< 12	1	U	ug/L	0	WA
		Barium, total recoverable	4.3	1	J	ug/L	0	WA
		Cadmium, total recoverable	< 4.7	1	U	ug/L	0	WA
		Chromium, total recoverable	1.5	1	J	ug/L	0	WA
		Iron, total recoverable	9.7	1	J	ug/L	0	WA
		Lead, total recoverable	< 13	1	U	ug/L	0	WA
		Manganese, total recoverable	2.5	1	J	ug/L	0	WA
		Mercury, total recoverable	.102	1	J	ug/L	0	WA
		Selenium, total recoverable	< 19	1	U	ug/L	0	WA
		Silver, total recoverable	1.2	1	JV	ug/L	0	WA
		Sodium, total recoverable	8180	1		ug/L	0	WA
		Sulfate	9540	2		ug/L	0	WA
*		pH	5.33	1	J	pH	0	WA

Number of Records: 16

*** = exceeded holding time. + = exceeded screening level or final primary drinking water standard.**

WELL: KAC 5

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Pump	Formation
N 53161.7 E 42716.3	33.213047 Deg N 81.657589 Deg W	224.3-204.3 ft msl	259 ft msl	4" PVC	S	Water Table

FIELD MEASUREMENTS

Sample date: 04/20/95	Time: 10:09
Depth to water: 32.46 ft (9.896 m) below TOC	pH:5.6
Water elevation: 226.54 ft (69.07 m) msl	Alkalinity:3 mg/L
Sp. conductance: 75 uS/cm	Water temperature: 20 deg C
Turbidity: 3.2 NTU	
Water evacuated before sampling:47 gal	Volumes purged: 3.222 well volumes

LABORATORY ANALYSES

H	ST	Analyte	Result	DF	Mod	Unit	Flag	Lab
		Gross alpha	1	1	J	pCi/L	0	TM
		Nitrate as nitrogen	26	1	J	ug/L	0	WA
		Nonvolatile beta	< 1.1	1	UI	pCi/L	0	TM
		Aluminum, total recoverable	< 87	1	U	ug/L	0	WA
		Arsenic, total recoverable	< 12	1	U	ug/L	0	WA
		Barium, total recoverable	2.3	1	J	ug/L	0	WA
		Cadmium, total recoverable	< 4.7	1	U	ug/L	0	WA
		Chromium, total recoverable	< 10	1	U	ug/L	0	WA
		Iron, total recoverable	18.3	1	J	ug/L	0	WA
		Lead, total recoverable	< 13	1	U	ug/L	0	WA
		Manganese, total recoverable	4.6	1	J	ug/L	0	WA
		Mercury, total recoverable	.144	1	J	ug/L	0	WA
		Radium-226	< .02	1	UI	pCi/L	0	TM
		Radium-228	3.9	1	V	pCi/L	0	TM
		Selenium, total recoverable	< 19	1	U	ug/L	0	WA
		Silver, total recoverable	< 1.4	1	U	ug/L	0	WA
		Sodium, total recoverable	12100	1		ug/L	0	WA
		Sulfate	20300	5		ug/L	0	WA
*		pH	5.53	1	J	pH	0	WA

Number of Records: 19

*** = exceeded holding time. + = exceeded screening level or final primary drinking water standard.**

WELL: KAC 6

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Pump	Formation
N 53139.9 E 42693.5	33.212962 Deg N 81.657606 Deg W	224.6-204.6 ft msl	259 ft msl	4" PVC	S	Water Table

FIELD MEASUREMENTS

Sample date: 04/21/95	Time: 08:51
Depth to water: 32.65 ft (9.954 m) below TOC	pH:5.4
Water elevation: 226.35 ft (69.01 m) msl	Alkalinity:4 mg/L
Sp. conductance: 92 uS/cm	Water temperature: 19.3 deg C
Turbidity: 38.7 NTU	
Water evacuated before sampling:11 gal	Volumes purged: .7710 well volumes

Well went dry during purging; samples collected after well recovered

LABORATORY ANALYSES

H	ST	Analyte	Result	DF	Mod	Unit	Flag	Lab
		Gross alpha	< .2	1	UI	pCi/L	0	TM
		Nitrate as nitrogen	63	1		ug/L	0	WA
		Nonvolatile beta	< -.1	1	UI	pCi/L	0	TM
		Tritium	< .38	1	UI	pCi/mL	0	TM
		Aluminum, total recoverable	911	1		ug/L	2	WA
		Arsenic, total recoverable	< 12	1	U	ug/L	0	WA
		Barium, total recoverable	4.6	1	J	ug/L	0	WA
		Cadmium, total recoverable	< 4.7	1	U	ug/L	0	WA
		Chromium, total recoverable	4.3	1	J	ug/L	0	WA
		Iron, total recoverable	1680	1		ug/L	2	WA
		Lead, total recoverable	11.4	1	J	ug/L	0	WA
		Manganese, total recoverable	9.1	1		ug/L	0	WA
		Mercury, total recoverable	< .67	1	U	ug/L	0	WA
		Mercury, total recoverable	< .67	1	U	ug/L	0	WA
		Radium-226	.2	1	J	pCi/L	0	TM
		Radium-226	< .06	1	UI	pCi/L	0	TM
		Radium-228	1.1	1	J	pCi/L	0	TM
		Radium-228	1.3	1	J	pCi/L	0	TM
		Selenium, total recoverable	< 19	1	U	ug/L	0	WA
		Silver, total recoverable	< 1.4	1	U	ug/L	0	WA
		Sodium, total recoverable	12900	1		ug/L	0	WA
		Sulfate	26700	10		ug/L	0	WA
		Sulfate	28300	10		ug/L	0	WA
*		pH	5.64	1	J	pH	0	WA

Number of Records: 24

*** = exceeded holding time. + = exceeded screening level or final primary drinking water standard.**

WELL: KAC 7

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Pump	Formation
N 53252.9 E 42574.5	33.213018 Deg N 81.658139 Deg W	223-203 ft msl	265.1 ft msl	4" PVC	S	Water Table

FIELD MEASUREMENTS

Sample date: 04/21/95	Time: 09:03
Depth to water: 41.23 ft (12.57 m) below TOC	pH:5.8
Water elevation: 223.87 ft (68.25 m) msl	Alkalinity: 26 mg/L
Sp. conductance:157 uS/cm	Water temperature: 19 deg C
Turbidity: 14.2 NTU	
Water evacuated before sampling:10 gal	Volumes purged: .7304 well volumes

Well went dry during purging; samples collected after well recovered

LABORATORY ANALYSES

H	ST	Analyte	Result	DF	Mod	Unit	Flag	Lab
		Gross alpha	< -.6	1	UI	pCi/L	0	TM
		Nitrate as nitrogen	982	1		ug/L	0	WA
		Nonvolatile beta	< .4	1	UI	pCi/L	0	TM
		Tritium	5.41	1		pCi/mL	0	TM
		Aluminum, total recoverable	2040	1		ug/L	2	WA
		Arsenic, total recoverable	3.4	1	J	ug/L	0	WA
		Barium, total recoverable	4.6	1	J	ug/L	0	WA
		Cadmium, total recoverable	< 4.7	1	U	ug/L	0	WA
		Chromium, total recoverable	< 10	1	U	ug/L	0	WA
		Iron, total recoverable	380	1		ug/L	2	WA
		Lead, total recoverable	14.9	1		ug/L	0	WA
		Manganese, total recoverable	2	1	J	ug/L	0	WA
		Mercury, total recoverable	< .67	1	U	ug/L	0	WA
		Radium-226	< -.01	1	UI	pCi/L	0	TM
		Radium-228	1	1	J	pCi/L	0	TM
		Selenium, total recoverable	< 19	1	U	ug/L	0	WA
		Silver, total recoverable	< 1.4	1	U	ug/L	0	WA
		Sodium, total recoverable	23800	1		ug/L	0	WA
		Sulfate	34300	10		ug/L	0	WA
*		pH	5.95	1	J	pH	0	WA

Number of Records: 20

*** = exceeded holding time. + = exceeded screening level or final primary drinking water standard.**

WELL: KAC 8

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Pump	Formation
N 53136 E 42641.9	33.212869 Deg N 81.657734 Deg W	212.3-192.3 ft msl	262.2 ft msl	4" PVC	S	Water Table

FIELD MEASUREMENTS

Sample date: 04/20/95	Time: 09:34
Depth to water: 37.97 ft (11.58 m) below TOC	pH:5.5
Water elevation: 224.23 ft (68.36 m) msl	Alkalinity:1 mg/L
Sp. conductance:174 uS/cm	Water temperature: 19.5 deg C
Turbidity: 0.7 NTU	
Water evacuated before sampling:92 gal	Volumes purged: 4.392 well volumes

LABORATORY ANALYSES

H	ST	Analyte	Result	DF	Mod	Unit	Flag	Lab
*		Nitrate as nitrogen	218	1	J	ug/L	0	WA
*		Nitrate as nitrogen	228	1	J	ug/L	0	WA
		Tritium	.84	1		pCi/mL	0	TM
		Aluminum, total recoverable	< 87	1	U	ug/L	0	WA
		Arsenic, total recoverable	< 12	1	U	ug/L	0	WA
		Barium, total recoverable	6.1	1	J	ug/L	0	WA
		Cadmium, total recoverable	< 4.7	1	U	ug/L	0	WA
		Chromium, total recoverable	1.7	1	J	ug/L	0	WA
		Iron, total recoverable	107	1		ug/L	0	WA
		Lead, total recoverable	2.8	1	J	ug/L	0	WA
		Manganese, total recoverable	9.6	1		ug/L	0	WA
		Mercury, total recoverable	.069	1	J	ug/L	0	WA
		Selenium, total recoverable	< 19	1	U	ug/L	0	WA
		Silver, total recoverable	.55	1	JV	ug/L	0	WA
		Sodium, total recoverable	29600	1		ug/L	0	WA
		Sulfate	53100	10		ug/L	0	WA
*		pH	5.58	1	J	pH	0	WA

Number of Records: 17

*** = exceeded holding time. + = exceeded screening level or final primary drinking water standard.**

WELL: KAC 9

SRS Coord.	Lat/Longitude	Screen Zone Elevation	Top of Casing	Casing	Pump	Formation
N 53197.8 E 42588.1	33.212918 Deg N 81.657996 Deg W	215.7-195.7 ft msl	267.1 ft msl	4" PVC	S	Water Table

FIELD MEASUREMENTS

Sample date: 04/20/95
Depth to water: 43.14 ft (13.15 m) below TOC
Water elevation: 223.96 ft (68.28 m) msl
Sp. conductance:336 uS/cm
Turbidity: 0.7 NTU
Water evacuated before sampling:61 gal

Time: 11:36
pH:7.4
Alkalinity: 43 mg/L
Water temperature: 20 deg C

Volumes purged: 3.290 well volumes

LABORATORY ANALYSES

H	ST	Analyte	Result	DF	Mod	Unit	Flag	Lab
		Gross alpha	< .1	1	UI	pCi/L	0	TM
		Nitrate as nitrogen	331	1		ug/L	0	WA
		Nonvolatile beta	< .8	1	UI	pCi/L	0	TM
		Tritium	1.6	1		pCi/mL	0	TM
		Aluminum, total recoverable	130	1		ug/L	2	WA
		Arsenic, total recoverable	< 12	1	U	ug/L	0	WA
		Barium, total recoverable	10.5	1		ug/L	0	WA
		Cadmium, total recoverable	< 4.7	1	U	ug/L	0	WA
		Chromium, total recoverable	1	1	J	ug/L	0	WA
		Iron, total recoverable	28.5	1		ug/L	0	WA
		Lead, total recoverable	< 13	1	U	ug/L	0	WA
		Manganese, total recoverable	13.8	1		ug/L	0	WA
		Mercury, total recoverable	< .67	1	U	ug/L	0	WA
		Radium-226	< .12	1	UI	pCi/L	0	TM
		Radium-228	2.5	1	JV	pCi/L	0	TM
		Selenium, total recoverable	< 19	1	U	ug/L	0	WA
		Silver, total recoverable	< 1.4	1	U	ug/L	0	WA
		Sodium, total recoverable	54200	1		ug/L	0	WA
		Sulfate	91900	20		ug/L	0	WA
*		pH	7.1	1	J	pH	0	WA
*		pH	7.1	1	J	pH	0	WA

Number of Records: 21

*** = exceeded holding time. + = exceeded screening level or final primary drinking water standard.**

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Appendix E

Data Quality/Usability Assessment

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Data Quality/Usability 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 review by the Environmental Protection Department/Environmental Monitoring Section (EPD/EMS) 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 usability 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 quarterly summaries. Properly defined and used result modifiers (also referred to as qualifiers) can be a key component in assessing data usability. Result modifiers designed by EPD/EMS and used by 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 groundwater monitoring quarterly reports. 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 exceed 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 be EPA Method 8240, three surrogate compounds are added to all samples and blanks in each analytical batch. In analyses of semivolatile organics, three acid compounds and three base/neutral compounds are used. Two surrogates are used in organochlorine 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 reanalyze the samples or attach 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 the sample is spiked with known concentrations of compounds appropriate to the analyses being performed, typically five volatile organic compounds for volatile organics analyses, eleven semivolatile compounds for semivolatiles, six pesticide compounds for pesticides, all metals for metals analyses by SW-846 methods (EPA, 1986), and a known quantity of cyanide for cyanide analysis. The percentage of the spike compound that 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 laboratory 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 assigned by the laboratories on the basis of the percentage of spike recovery 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 initiated by the laboratory and blind replicates provided by EPD/EMS. The results of duplicate and replicate analyses are presented in those results tables of the quarterly reports which report only one quarter of data, usually during first, second, and third quarters. Duplicate and replicate results are not presented in results tables that report more than one quarter of data, generally provided in fourth quarter reports. In this case, the results tables instead present only the highest result for each analyte for each quarter of the year.

The laboratories assess precision by calculating the relative percent difference (RPD) for each pair of laboratory-initiated duplicate results. One of the contract laboratories uses a data qualifier(J3) to modify metals analyses when the RPD for laboratory duplicates is greater than 20 percent.

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 mean relative difference (MRD) which is similar to EPA's RPD except that the MRD is the average of all the RPD values from one laboratory for each compound (intralaboratory MRD) or all the RPD values from all laboratories for each compound (interlaboratory MRD), 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 duplicate and replicate 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 usability. 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 a 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 fourth quarter 1993 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.

Methods Used by the Contract Laboratories

Method	Used to Analyze	Source
EPA120.1	Specific conductance	EPA EMSL, 1983
EPA150.1	pH	EPA EMSL, 1983
EPA160.1	Total dissolved solids	EPA EMSL, 1983
EPA160.2	Total dissolved solids, total suspended solids	EPA EMSL, 1983
EPA180.1	Turbidity	EPA EMSL, 1983
EPA200.7	Metals	EPA EMSL, 1983
EPA204.2	Antimony	EPA EMSL, 1983
EPA206.2	Arsenic	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	Chloride, nitrite, sulfate	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
EPA365.1	Phosphorus, all forms (reported as total phosphates)	EPA EMSL, 1983
EPA365.2	Phosphorus, all forms (reported as total phosphates)	EPA EMSL, 1983
EPA376.2	Sulfide	EPA EMSL, 1983
EPA413.1	Oil & grease	EPA EMSL, 1983
EPA415.1	Dissolved organic carbon, total inorganic carbon, total organic carbon	EPA EMSL, 1983
EPA418.1	Total petroleum hydrocarbons	EPA EMSL, 1983
EPA420.2	Phenols	EPA EMSL, 1983
EPA900.0	Gross alpha, nonvolatile beta	EPA EMSL, 1980
EPA900.1	Total alpha-emitting radium	EPA EMSL, 1980
EPA906.0	Tritium	EPA EMSL, 1980
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	Chlorinated volatile organics	EPA, 1986
EPA8080	Organochlorine pesticides and PCBs	EPA, 1986
EPA8150	Chlorinated herbicides	EPA, 1986
EPA8240	GCMS volatiles	EPA, 1986
EPA8270	GCMS semivolatiles	EPA, 1986
EPA8280	Dioxins and furans	EPA, 1986
EPA9012	Cyanide	EPA, 1986
EPA9020	Total organic halogens	EPA, 1986
EPA9020A	Total organic halogens	EPA, 1986
EPA9030	Sulfide	EPA, 1986
EPA9060	Dissolved organic carbon, total inorganic carbon, total organic carbon	EPA, 1986

An example of 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 spiked 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 (mg/L)	Mean reported value (mg/L)	Mean percent RSD[a]
Aluminum	60	62	33
Arsenic	22	19	23
Beryllium	20	20	9.8
Cadmium	2.5	2.9	16
Chromium	10	10	18
Cobalt	20	20	4.1
Copper	11	11	40
Iron	20	19	15
Lead	24	30	32
Manganese	15	15	6.7
Nickel	30	28	11
Selenium	6	8.5	42
Vanadium	70	69	2.9
Zinc	16	19	45

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[a] Relative standard deviation. In EPA (1986), the column heading is Mean Standard Deviation (%).

As another example, EPA Method 601/8010 (EPA, 1991/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] (mg/L)	Single analyst precision (mg/L)[b]	Overall precision (mg/L)[c]
Bromodichloromethane	$1.12C-1.02$[d]	0.11+0.04[e]	0.20+1.00
Bromoform	$0.96C-2.05$	0.12+0.58	0.21+2.41
Bromomethane	$0.76C-1.27$	0.28+0.27	0.36+0.94
Carbon tetrachloride	$0.98C-1.04$	0.15+0.38	0.20+0.39
Chlorobenzene	$1.00C-1.23$	0.15-0.02	0.18+1.21
Chloroethane	$0.99C-1.53$	0.14-0.13	0.17+0.63
2-Chloroethyl vinyl ether[f]	$1.00C$	0.20	0.35
Chloroform	$0.93C-0.39$	0.13+0.15	0.19-0.02
Chloromethane	$0.77C+0.18$	0.28-0.31	0.52+1.31
Dibromochloromethane	$0.94C+2.72$	0.11+1.10	0.24+1.68
1,2-Dichlorobenzene	$0.93C+1.70$	0.20+0.97	0.13+6.13
1,3-Dichlorobenzene	$0.95C+0.43$	0.14+2.33	0.26+2.34
1,4-Dichlorobenzene	$0.93C-0.09$	0.15+0.29	0.20+0.41
1,1-Dichloroethane	$0.95C-1.08$	0.09+0.17	0.14+0.94
1,2-Dichloroethane	$1.04C-1.06$	0.11+0.70	0.15+0.94
1,1-Dichloroethene	$0.98C-0.87$	0.21-0.23	0.29-0.40
trans-1,2-Dichloroethene	$0.97C-0.16$	0.11+1.46	0.17+1.46
Dichloromethane (Methylene chloride)	$0.91C-0.93$	0.11+0.33	0.21+1.43
1,2-Dichloropropane[f]	$1.00C$	0.13	0.23
cis-1,3-Dichloropropene[f]	$1.00C$	0.18	0.32
trans-1,3-Dichloropropene[f]	1.00C	0.18	0.32
1,1,2,2-Tetrachloroethane	$0.95C+0.19$	0.14+2.41	0.23+2.79
Tetrachloroethylene	$0.94C+0.06$	0.14+0.38	0.18+2.21
1,1,1-Trichloroethane	$0.90C-0.16$	0.15+0.04	0.20+0.37
1,1,2-Trichloroethane	$0.86C+0.30$	0.13-0.14	0.19+0.67
Trichloroethylene	$0.87C+0.48$	0.13-0.03	0.23+0.30
Trichlorofluoromethane	$0.89C-0.07$	0.15+0.67	0.26+0.91
Vinyl chloride	$0.97C-0.36$	0.13+0.65	0.27+0.40

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[a] X' = expected recovery for one or more measurements of a sample containing a concentration of C, inmg/L.

[b] Expected single analyst standard deviation of measurements.

[c] Expected interlaboratory standard deviation of measurements.

[d] C = true value for the concentration, in mg/L.

[e] = average recovery found for measurements of samples containing a concentration of C, in mg/L.

[f] Estimates based on performance of a single laboratory.

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