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RCRA FACILITY INVESTIGATION/SITE INSPECTION TECHNICAL MEMORANDUM NO. 4 VOLUME II SITE 5, ARMY RESERVE DISPOSAL AREA, TOWHEE TRAIL SITE 16, ARMY RESERVE DISPOSAL AREA, MOTOR MISSILE MAGAZINES, NSB KINGS BAY GA

12/1/1992

ABB ENVIRONMENTAL

FINAL

RCRA FACILITY INVESTIGATION/SITE INSPECTION TECHNICAL MEMORANDUM No. 4, VOLUME II

SITE 5, ARMY RESERVE DISPOSAL AREA, TOWHEE TRAIL
SITE 16, ARMY RESERVE DISPOSAL AREA, MOTOR MISSILE MAGAZINES

NAVAL INSTALLATION RESTORATION PROGRAM
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

CONTRACT NO. N62467-89-D-0317

DECEMBER 1992

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA
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This Technical Memorandum No, 4, Volume II, summarizes findings and results based on information and data collected from Site 5, Army Reserve Disposal Area, Towhee Trail, and Site 16, Army Reserve Disposal Area, Motor Missile Magazines, as a result of groundwater sampling event No. 4, which was performed on September 9 through September 13, 1992.

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TECHNICAL MEMORANDUM No. 4
VOLUME II
SITE 5, ARMY RESERVE DISPOSAL AREA, TOWHEE TRAIL
SITE 16, ARMY RESERVE DISPOSAL AREA,
MOTOR MISSILE MAGAZINES

NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

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Charleston, South Carolina 29411-0068

Prepared by:

ABB Environmental Services, Inc.
1400 Centerpoint Blvd., Suite 158
Knoxville, Tennessee 37932-1968

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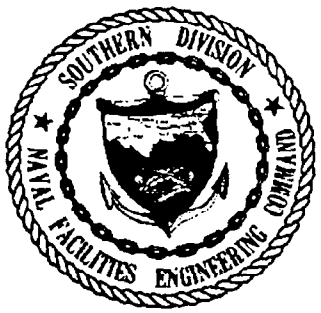

FOREWORD

In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the 1986 Superfund Amendments and Reauthorization Act (SARA), the 1976 Resource Conservation and Recovery Act (RCRA), as augmented by the 1984 Hazardous and Solid Waste Amendments (HSWA), and as directed in Executive Order 12580 of January 1987, the Department of Defense (DOD) conducts an Installation Restoration (IR) Program for evaluating and remediating problems related to releases and disposal of toxic and hazardous materials at DOD facilities.

The Naval Assessment and Control of Installation Pollutants (NACIP) program was developed by the Navy to implement the IR Program for all Naval and Marine Corps facilities. The NACIP program was conducted originally in three phases: (1) Phase I, Initial Assessment Study, (2) Phase II, Confirmation Study (including a Verification Step and a Characterization Step), and (3) Phase III, Planning and Implementation of Remedial Measures. The three-phase IR Program was modified and updated to be congruent with the CERCLA/SARA and RCRA/HSWA-driven DOD IR program.

The updated nomenclature for the RCRA/SARA process is as follows:

- Preliminary Assessment and Site Inspection
- Remedial Investigation
- Feasibility Study
- Planning and Implementation of Remedial Design

Three sites at the Naval Submarine Base (NSB) in Kings Bay, Georgia, were identified for investigation under the IR Program. A work plan for conducting a RCRA Facility Investigation/Site Inspection (RFI/SI) at each of the three sites has been completed and implemented. This technical memorandum discusses the RFI/SI field program and summarizes findings and results based on information and data collected as a result of the September 1992 field effort, which included the fourth of six groundwater sampling events. Certain Appendix IX parameters have been deleted from the groundwater monitoring program based on laboratory analytical results of environmental samples collected during the RFI/SI field program and during the first two groundwater sampling events.

Southern Division Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) has the responsibility for implementation of the Navy and Marine Corps IR Program in the southeastern and midwestern United States. Questions regarding this report should be addressed to the SOUTHNAVFACENGCOM Engineer-in-Charge, Mr. Ed Lohr, at (803) 743-0355.

EXECUTIVE SUMMARY

ABB Environmental Services, Inc. (ABB-ES), under contract to Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), conducted site investigation activities at three of four former waste disposal sites at the Naval Submarine Base (NSB), in Kings Bay, Georgia. This technical memorandum is the fourth of five technical memoranda associated with the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) and Site Inspection (SI) that will continue into calendar year 1993. The RFI/SI field program and preparation of this report were completed under the Comprehensive Long-Term Environmental Action Navy (CLEAN) contract (contract number N62467-89-D-0317, Contract Task Order [CTO] Number 041) between SOUTHNAVFACENGCOM and ABB-ES.

This Technical Memorandum No. 4, Volume II, summarizes findings and results based on information and data collected from Site 5, Army Reserve Disposal Area, Towhee Trail, and Site 16, Army Reserve Disposal Area, Motor Missile Magazines, as a result of groundwater sampling event No. 4, which was performed on September 9 through September 13, 1992.

Groundwater sampling event No. 4 at Sites 5 and 16 involved collection of 14 groundwater samples, including three duplicate samples. Samples were submitted to CH2M HILL Laboratories in Montgomery, Alabama, for analysis of a modified list of Appendix IX parameters. The following paragraphs summarize the analytical results for groundwater samples collected from Sites 5 and 16 during the fourth groundwater sampling event.

Site-related volatile organic compounds (VOCs) were not detected in groundwater samples collected from Sites 5 and 16. VOCs will continue to be monitored for at all three sites.

One site-related semivolatile organic compound (SVOC), naphthalene, was detected in one groundwater sample collected from Site 16. Groundwater samples collected from Site 5 did not require analysis for SVOCs because of the confirmed absence of SVOCs at this site during the second groundwater sampling event in May 1992.

Polychlorinated biphenyl (PCB) compounds were not detected in groundwater samples collected during the first three sampling events at Site 5 and also were not detected during the third sampling event. PCBs will continue to be monitored for at Site 5 because of the confirmation of low levels of the PCB Aroclor 1260 in surface soils collected during the third sampling event at Site 5.

Both filtered and unfiltered groundwater samples were collected during the third sampling event to establish whether aquifer solids in groundwater contribute to the total concentration of inorganic constituents in groundwater. Unfiltered samples were also analyzed for total dissolved solids (TDS) and total suspended solids (TSS) to establish what percentage of the total solids in groundwater represents suspended particulates.

Concentrations of inorganics were significantly lower for filtered groundwater samples compared to unfiltered samples. The results for filtered samples are considered to be a more accurate representation of groundwater quality because of the relatively high concentrations of suspended solids in groundwater.

ACKNOWLEDGEMENTS

In preparing this report, the personnel at ABB Environmental Services, Inc. commend the support, assistance, and cooperation provided by the personnel at NSB Kings Bay, Georgia, and SOUTHNAVFACENGCOM. In particular, ABB-ES acknowledges the outstanding effort, dedication, and professionalism provided by the following people in the preparation of this report.

Name	Title	Position	Location
Ed Lohr	Engineer	Engineer-in-Charge	SOUTHNAVFACENGCOM
James More	Engineer	Environmental Coordinator	NSB Kings Bay, GA

RCRA Facility Investigation/Site Inspection
Technical Memorandum No. 4
Volume II, Sites 5 and 16

Naval Installation Restoration Program
Naval Submarine Base
Kings Bay, Georgia

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GLOSSARY OF ACRONYMS

ABB-ES	ABB Environmental Services, Inc.
CLEAN	Comprehensive Long-Term Environmental Action, Navy
CMS	Corrective Measures Study
CRQL	contract required quantitation limit
CTO	Contract Task Order
FID	flame ionization detector
HSWA	Hazardous and Solid Waste Amendments
IAS	Initial Assessment Study
IR	Installation Restoration
MCL	maximum contaminant level
mg/l	milligrams per liter
µg/l	micrograms per liter
µg/kg	micrograms per kilogram
NEESA	Naval Energy and Environmental Support Activity
NSB	Naval Submarine Base
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyl
ppm	parts per million
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SI	Site Inspection
SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
SVOC	semivolatile organic compound
TDS	total dissolved solids
TSS	total suspended solids
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

1.0 INTRODUCTION

1.1 PURPOSE. ABB Environmental Services, Inc. (ABB-ES), under contract to Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), conducted site investigation activities at three of four former waste disposal sites at the Naval Submarine Base (NSB) in Kings Bay, Georgia. This Technical Memorandum is the fourth of five Technical Memoranda associated with the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) and Site Inspection (SI) that will continue into calendar year 1993. The RFI/SI field program and preparation of this report were completed under the Comprehensive Long-Term Environmental Action Navy (CLEAN) contract (contract number N62467-89-D-0317, Contract Task Order [CTO] Number 041) between SOUTHNAVFACENGCOM and ABB-ES.

An Initial Assessment Study (IAS) was conducted in 1985 (C.C. Johnson and Associates, 1985) at NSB Kings Bay, Georgia. The IAS identified 16 waste spill sites. None of the 16 sites required further action under the Navy Installation Restoration (IR) Program; however, four of the sites required further action under the Hazardous Waste Facility Permit. In February 1988, a RCRA and Hazardous and Solid Waste Amendments (HSWA) permit was issued to NSB Kings Bay by the Georgia Department of Natural Resources, Environmental Protection Division.

The overall purpose of the RFI/SI is to characterize three of the four previously identified sites with potential for contamination and/or contaminant migration. The three sites are identified as follows:

- Site 5 - Army Reserve Disposal Area, Towhee Trail
- Site 11 - Old Camden County Landfill
- Site 16 - Army Reserve Disposal Area, Motor Missile Magazines

The fourth site, Site 12 - Army Reserve Disposal Area, Future Dry Dock, is included in the RFI/SI but no sampling or analyses will be conducted. NSB Kings Bay Public Works Department will conduct a records search and information review to be reported in the comprehensive RFI/SI Report. The RFI/SI Report will be prepared following completion of six groundwater sampling events scheduled to extend into calendar year 1993.

The information obtained during the RFI/SI will be used to eliminate sites from further consideration within the Navy IR Program (i.e., no further action) or present the necessary information (i.e., nature and distribution of contaminants) to plan further response actions including a Corrective Measures Study (CMS) and/or RCRA permit modification.

This Technical Memorandum No. 4, Volume II, presents summarized findings and results based on information and data collected from Sites 5 and 16 as a result of groundwater sampling event No. 4, which was performed on September 9 through September 13, 1992. Technical Memorandum No. 4, Volume I, presents summarized findings and results based on information and data collected from Site 11 as a result of groundwater sampling event No. 4.

2.0 FIELD PROGRAM

2.1 GROUNDWATER SAMPLING. Groundwater sampling was performed from September 8 through 13, 1992. Groundwater samples were collected from each of the 11 wells installed at Sites 5 and 16 during the RFI/SI. Analysis of the samples included a modified list of Appendix IX parameters. Laboratory services were provided by CH2M HILL Laboratories, Inc. in Montgomery, Alabama. Level C data quality objectives and deliverables were specified for the analytical program. Results of groundwater sample analyses are discussed in Sections 3.0 and 4.0.

Upon opening each monitoring well, the headspace was screened for volatile organic compounds (VOCs) using a flame ionization detector (FID). Prior to sample collection, each well was purged of at least three well volumes. Samples were collected within 24 hours following purging. Decontaminated Teflon bailers were used to purge the monitoring wells and to collect samples. For non-filtered samples, groundwater was transferred from the bailer directly into labeled sample containers. For samples requiring filtration, groundwater was pumped from the bailer through a 0.45-micron filter using a Masterflex™ peristaltic pump with polyethylene tubing and then collected in a labeled sample container. ABB-ES personnel placed the filled containers on ice in ice chests immediately after collection. Chain-of-custody was initiated in the field at the time of sample collection. Samples were shipped via overnight courier service to the laboratory on the date of collection.

Appropriate preservatives were added to the empty sample containers by the laboratory before delivery of the containers to the project. Following sample collection, ABB-ES personnel checked pH values of an aliquot of all preserved samples except VOC samples. Samples for cyanide analysis were also checked for sulfide interference by testing an aliquot of the sample with lead acetate test paper.

Field parameters for groundwater samples included pH, conductivity, and temperature.

3.0 ANALYTICAL PROGRAM

This section summarizes the analytical program for groundwater samples collected from monitoring wells at Sites 5 and 16 during groundwater sampling event No. 4 at NSB Kings Bay. In addition, it assesses data quality and useability.

3.1 CHEMICAL ANALYSES. During the third groundwater sampling event at NSB Kings Bay, samples were collected including two duplicate samples. All samples were collected in accordance with the procedures outlined in the Quality Assurance Project Plan, Appendix A of the NSB Kings Bay Work Plan (ABB-ES, 1991). Samples were submitted to CH2M HILL Laboratories in Montgomery, Alabama, for chemical analyses. Table 3-1 summarizes the sampling and analysis program for samples collected from Sites 5 and 16 during the fourth sampling event. Samples were analyzed in accordance with U.S. Environmental Protection Agency (USEPA) SW-846 methods (USEPA, 1986) and Naval Energy and Environmental Support Activity (NEESA) Level C documentation (NEESA, 1988) for a modified list of Appendix IX VOCs, semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), inorganic analytes (including total cyanide and sulfide), total dissolved solids (TDS), and total suspended solids (TSS). Table 3-2 provides the modified list of Appendix IX compounds and corresponding USEPA analytical method numbers.

3.2 DATA QUALITY ASSESSMENT. All groundwater samples collected during the RFI/SI were properly preserved, placed in coolers, and packed with bagged ice immediately after their collection. All samples remained in the custody of the field operations leader until delivery to the courier service providing overnight shipment to the laboratory. All samples were shipped, complete with chain-of-custody forms, to CH2M HILL Laboratories within 24 hours for analysis. Upon arrival at CH2M HILL, the chain-of-custody and preservation of the samples was checked with the contents of each cooler by CH2M HILL personnel. After verification, the chain-of-custody form was signed by CH2M HILL personnel and the samples accepted for analysis.

Review of the field notebook and chain-of-custody forms did not indicate any non-conformance relative to field instrument calibration or sample handling. All required field quality control (QC) samples were collected in conformance with the requirements of the USEPA, NEESA, and ABB-ES Quality Assurance Plans and the June 1988 NEESA "Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Program" (NEESA, 1988) (Document 20.2-047B). Field QC samples include field duplicates, equipment rinseate blanks, source water blanks, and VOC trip blanks for each VOC sample shipment.

The analytical results for environmental samples collected during groundwater sampling event No. 4 were evaluated and validated according to NEESA Level C QC criteria to determine data quality and useability. The data tables included in Appendix A reflect validation according to Level C criteria. These criteria are described in Section 7.3.2 of NEESA Document 20.2-047B. The following subsections discuss analytical performance and the evaluation of field and laboratory QC samples.

Table 3-1 Summary of Sampling and Analysis Program for Sites 5 and 16

Location and Type of Sampling	Laboratory Analysis				
	A	B	C	D	E
Site 5					
Groundwater	7	0	7	14	7
Site 16					
Groundwater	4	4	0	8	4
Field Duplicates					
Groundwater	1	1	1	2	1
Quality Control Samples					
Trip Blanks	3	0	0	0	0
Rinseate Blanks	3	1	1	3	3
Field Blanks	2	2	2	3	2

A - Volatile Organic Compounds (VOCs)
B - Semivolatile Organic Compounds (SVOCs)
C - Polychlorinated Biphenyls (PCBs)
D - Inorganic constituents (including cyanide and sulfide)
E - Total Dissolved Solids (TDS) and Total Suspended Solids (TSS)

Table 3-2 Compounds and Analytical Methods for Groundwater Sampling Event No. 4 at Sites 5 and 16

Parameter: **Volatile Organic Compounds (38 total) Target Compound List plus 4 additional compounds**
Method: **SW-846 Method 8240**

Chloromethane	cis-1,3-Dichloropropene
Bromomethane	Trichloroethane
Vinyl Chloride	Dibromochloromethane
Chloroethane	1,1,2-Trichloroethane
Methylene Chloride	Benzene
Acetone	trans-1,3-Dichloropropene
Carbon Disulfide	Bromoform
Trichlorofluoromethane*	2-Hexanone
1,1-Dichloroethene	4-Methyl-2-Pentanone
1,1-Dichloroethane	Tetrachloroethane
1,2-Dichloroethene (total)	1,1,2,2-Tetrachloroethane
Chloroform	Toluene
1,2-Dichloroethane	Chlorobenzene
2-Butanone	Ethylbenzene
1,1,1-Trichloroethane	Styrene
Carbon Tetrachloride	Xylene (total)
Vinyl Acetate	1,3-Dichlorobenzene*
Bromodichloromethane	1,4-Dichlorobenzene*
1,2-Dichloropropane	1,2-Dichlorobenzene*

* Non-TCL compounds

Parameter: **Polychlorinated Biphenyls (PCBs) (7 total)**
Method: **SW-846 Method 8080**

Aroclor-1016	Aroclor-1221	Aroclor-1232
Aroclor-1242	Aroclor-1248	Aroclor-1254
	Aroclor-1260	

Parameter: **Appendix IX Inorganic Analytes (19 total)**
Method: **SW-846 Methods (listed in parentheses)**

Antimony (6010)	Copper (6010)	Thallium (7841)
Arsenic (7060)	Lead (7421)	Vanadium (6010)
Barium (6010)	Mercury (7470)	Zinc (6010)
Beryllium (6010)	Nickel (6010)	Tin (6010)
Cadmium (6010)	Selenium (7740)	Cyanide (9010)
Chromium (6010)	Silver (6010)	Sulfide (9030)
	Cobalt (6010)	

Table 3-2 Compounds and Analytical Methods for Groundwater Sampling Event No. 4 at Sites 5 and 16 (continued)

Parameter: **Semivolatile Organic Compounds (base/neutral fraction) Target Compound List (base/neutral fraction)**
Method: **SW-846 Method 8270 (50 total)**

bis(2-Chloroethyl)Ether
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Benzyl Alcohol
1,2-Dichlorobenzene
bis(2-Chloroisopropyl)Ether
N-Nitroso-Di-n-Propylamine
Hexachloroethane
Nitrobenzene
Isophorone
bis(2-Chloroethoxy)Methane
1,2,4-Trichlorobenzene
Naphthalene
4-Chloroaniline
Hexachlorobutadiene
2-Methylnaphthalene
Hexachlorocyclopentadiene
2-Chloronaphthalene
2-Nitroaniline
Dimethylphthalate
Acenaphthylene
2,6-Dinitrotoluene
3-Nitroaniline
Acenaphthene
Dibenzofuran
2,4-Dinitrotoluene
Diethylphthalate
4-Chlorophenyl-phenylether
Fluorene
4-Nitroaniline
N-Nitrosodiphenylamine
4-Bromophenyl-phenylether
Hexachlorobenzene
Phenanthrene
Anthracene
Di-n-Butylphthalate
Fluoranthene
Pyrene
Butylbenzylphthalate
3,3'-Dichlorobenzidine
Benzo(a)Anthracene
Chrysene
bis(2-Ethylhexyl)Phthalate
Di-n-Octyl Phthalate
Benzo(b)Fluoranthene
Benzo(k)Fluoranthene
Benzo(a)Pyrene
Indeno(1,2,3-cd)Pyrene
Dibenz(a,h)Anthracene
Benzo(g,h,i)Perylene

Parameter: **Total Dissolved Solids (TDS)/ Total Suspended Solids (TSS)**
Method: **Standard Methods-- Methods 2540C and 2540D**

3.2.1 Analytical Performance Review of analytical data indicated the laboratory generally met applicable analytical QC criteria for all chemical analyses. Extraction and analysis holding times for all sample lots (except four volatile analyses) were met. The data review and validation were performed under a subcontract to Heartland Environmental Services, Inc., of St. Peters, Missouri.

For VOC analyses, all initial and continuing calibration standards, internal standard/surrogate recoveries, precision, and accuracy criteria were met. However, analysis holding times for one trip blank (BT-25-FB) and three groundwater samples (KBA-16-2, KBA-16-3, and KBA-16-4) were exceeded. No qualification of data was required because samples were analyzed within one day of the expired holding time.

Two analytical blanks associated with certain VOC sample analyses contained detectable concentrations of methylene chloride, a common laboratory solvent and frequently observed artifact in laboratory method blanks. Qualifications of sample results for VOC compounds associated with blank contamination are made according to NEESA Level C QC guidelines. Table 3-3 summarizes VOC method blank analytical results. Sample results for all compounds associated with methylene chloride contamination were appropriately qualified as undetected because sample values were less than 10 times the method blank concentration.

For SVOC analyses, all holding times, initial and continuing calibration standards, internal standard recoveries, precision, and accuracy criteria were met. However, surrogate recoveries for groundwater samples KBA-16-1, KBA-16-2, KBA-16-3, and KBA-16-4 were below QC limits. Sample results and sample quantitation limits for these four samples were appropriately qualified as estimated and flagged with a J or UJ qualifier. All sample results qualified as estimated are considered useable data.

Two analytical blanks associated with certain SVOC sample analyses contained detectable concentrations of di-n-butylphthalate. Di-n-butylphthalate is a common laboratory and field contaminant that can originate from many types of plastic gloves, containers, and tubing used during field and laboratory operations. Qualifications of sample results for SVOC compounds associated with blank contamination are made according to NEESA Level C QC guidelines. Table 3-3 summarizes SVOC method blank analytical results. Sample results for all compounds associated with phthalate contamination were appropriately qualified as undetected because sample values were less than 10 times the method blank concentration.

For inorganic analyses, all holding times were met. One matrix spike result for lead, selenium, and thallium was below QC limits and one matrix spike result for nickel and zinc was above QC limits. One duplicate analysis for cyanide also exceeded QC limits. Associated sample results and quantitation limits were appropriately qualified as estimated. Several inorganics were detected in method blanks. Table 3-3 summarizes inorganic preparation and calibration blank analytical results. Inorganic results for environmental samples, in which concentrations of metals were also found in associated blanks, are designated undetected if the concentration in the sample is below the contract required quantitation limit (CRQL) and less than five times the blank value. For sample concentrations between five and 10 times that found in a blank that exhibited

Table 3-3 Summary of Organic Analyses of Method Blanks and Inorganic Analysis of Preparation Blanks

Blank Analysis Results				
Method Blank ID	Compound	Concentration	CRQL[a]	Associated Samples
Volatile Organic Chemical Aqueous Analysis (µg/l)				
VBLKW3	Methylene chloride	4 J	5	KBA-5-5, KBA-5-6, KBA-5-7, KBA-16-4, BT-25-FB, BT-27-FB, BS-26-ER, BS-10-ER, BS-12-ER
VBLKW	Methylene chloride	4 J	5	KBA-5-3, KBA-5-3D
Semivolatile Organic Chemical Aqueous Analysis (µg/l)				
SBLKW	Di-n-butylphthalate	5 J	10	BS-10-FB,BS-12-FB, BS-24-ER, KBA-16-2D
SBLKW2	Di-n-butylphthalate	5 J	10	KBA-16-1, KBA-16-2, KBA-16-3, KBA-16-4
Inorganic Aqueous Analysis (µg/l)				
22723	Barium	0.67 J	200	KBA-16-1, KBA-16-1F,
22725	Lead	0.77 J	5	KBA-16-2, KBA-16-2F,
	Mercury	0.137 J	0.2	KBA-16-3, KBA-16-3F, KBA-16-4, KBA-16-4F, KBA-5-5, KBA-5-5F, KBA-5-6, KBA-5-6F, KBA-5-7, KBA-5-7F, KBA-5-5D, BS-10-FB, BS-11-FB, BS-12-FB, BS-24-ER, BS-26-ER
22727	Nickel	11.71 J	40	KBA-5-1, KBA-5-1F,
	Vanadium	1.9 J	50	KBA-5-2, KBA-5-2F, KBA-5-3, KBA-5-3D, KBA-5-3F, KBA-5-4, KBA-5-4F, BS-25-ER

Notes:

[a]Contract required quantitation limit
J = indicates that the reported concentration is estimated because it is below the CRQL
µg/l = micrograms per liter

negative bias for an inorganic analyte, the sample results are qualified as estimated. No qualification is required if the sample value is more than five times the blank value and there is no negative bias, or more than 10 times the blank value if there is negative basis. All sample results qualified as estimated are considered useable data.

3.2.2 Evaluation of Field QC Samples Three field blanks, three trip blanks, and three rinseate blanks were collected during the fourth groundwater sampling event at Sites 5 and 16. One field blank, BS-10-FB, represents organic-free, deionized water used as a final rinse during equipment decontamination procedures, and one field blank, BS-12-FB, represents regular deionized water used as an intermediate rinse during equipment decontamination procedures. The third field blank, BS-11-FB, is a filter blank that represents organic-free, deionized water that has been passed through a 0.45-micron filter. The three equipment rinseate samples, BS-24-ER, BS-25-ER, and BS-26-ER, were collected during decontamination procedures involving Teflon bailers.

No PCBs or SVOCs were found in field blanks or rinseate blanks. The VOCs methylene chloride, acetone, and chloroform were detected in trip blanks BT-25-FB, BT-26-FB, and BT-27-FB as shown in Table 3-4. Sample results for VOC compounds associated with trip blank contamination are qualified according to NEESA Level C QC guidelines. Sample results for methylene chloride and acetone associated with trip blank contamination have been appropriately qualified as undetected because sample values were less than 10 times the trip blank concentration. None of the environmental samples associated with the trip blanks contained detectable levels of chloroform and, therefore, no qualification for chloroform contamination was required.

Methylene chloride was also detected in one rinseate sample, BS-24-ER, and acetone was detected in one rinseate sample, BS-26-ER, and both field blanks, BS-10-FB and BS-12-FB. None of the environmental samples associated with these rinseate samples or field blanks contained detectable concentrations of methylene chloride or acetone that was attributable to rinseate or field blank contamination.

Several inorganics were detected in field blanks and rinseate blanks as shown in Table 3-5. Concentrations for all but one analyte are below their respective CRQLs. Blanks containing inorganic analytes below the CRQL are below any regulatory limit in water, but are considered in the evaluation of environmental samples. Tin was detected in one rinseate sample, BS-24-ER, at a concentration well above the CRQL of 200 micrograms per liter ($\mu g/l$). Tin was not detected in any other field or laboratory QC samples or in any associated environmental samples. Therefore, no qualification for tin contamination was required.

Analytical results for filtered samples collected from monitoring wells at Site 11 required qualification because of filter contamination. As shown in Table 3-5, barium, beryllium, cobalt, and vanadium were detected in the filter blank, BS-11-ER, but were not detected in the field blank representing the source water used to collect the filter blank (BS-10-ER). None of the filtered samples collected from Site 11 contained beryllium and, therefore, qualification for beryllium contamination was not required. However, several filtered samples contained barium, cobalt, and vanadium. Associated sample results for barium,

Table 3-4 Summary of Organic Analyses of Trip Blanks and Field Blanks

Compounds Detected	Trip Blanks (µg/l)		
	BT-25-FB	BT-26-FB	BT-27-FB
Methylene chloride	5 U	8	9 U
Acetone	9 J	8 J	10 U
Chloroform	1 J	1 J	1 J

	Rinseate Blanks (µg/l)		Field Blanks (µg/l)	
	BS-24-ER	BS-26-ER	BS-10-FB	BS-12-FB
Methylene chloride	4 J	5 U	5 U	5 U
Acetone	10 U	6 J	6 J	7 J

Notes:

* Trip Blanks analyzed for VOCs only
J = estimated value
U = not detected at the reported value
µg/l = micrograms per liter

Table 3-5 Summary of Inorganic Analyses of Rinseate Blanks and Field Blanks

Compounds Detected	Rinseate Blanks (µg/l)			Field Blanks (µg/l)		
	BS-24-ER	BS-25-ER	BS-26-ER	BS-10-FB	BS-11-FB	BS-12-FB
Antimony	22.6 J	12.4 U	12.4 U	12.4 U	12.4 U	12.4 U
Barium	4.5 J	0.63 J	0.81 U	1.1 U	38.9 J	1.2 U
Beryllium	0.24 U	0.24 U	0.24 U	0.24 U	0.47 J	0.24 U
Chromium	5.9 U	1.9 U	4.4 U	2.8 J	3.5 J	3.9 J
Cobalt	1.6 U	1.6 U	1.6 U	1.6 U	3.2 J	1.6 U
Copper	1.8 U	4.2 J	1.8 U	1.8 U	1.8 U	6.2 J
Silver	1.5 U	1.6 J	1.5 U	1.5 U	1.5 U	1.8 J
Tin	7420	26.4 U	26.4 U	26.4 U	26.4 U	26.4 U
Vanadium	1.3 U	1.3 U	1.3 U	1.3 U	6.3 J	1.3 J
Zinc	7.5 U	7.6 U	7.6 U	7.7 J	16.0 J	8.4 J

Notes:

J = estimated value
U = not detected at the reported value
µg/l = micrograms per liter

cobalt, and vanadium have been appropriately qualified as non-detected because sample concentrations were less than two times the filter blank concentrations.

Review of the field duplicates showed good agreement for groundwater samples. During field duplicate comparisons, where an analyte was not detected in one groundwater replicate, it was present at less than three times the quantitation limit in the duplicate. Variation in groundwater replicate results is common when an analyte is present in the replicate at or near the detection limit. Groundwater replication for inorganic analytes may also vary by factors of two to five times because of the variation in the amount of suspended solids in each sample and the nature of the inorganic constituents sorbed to those suspended solids.

4.0 RESULTS OF INVESTIGATIONS

Section 4.0 presents the analytical results from groundwater samples collected during the fourth groundwater sampling event at Site 5, Army Reserve Disposal Area, Towhee Trail, and Site 16, Army Reserve Disposal Area, Motor Missile Magazines, in September 1992. Technical Memorandum No. 1 (ABB-ES, 1992a) presents discussions of the RFI/SI field program, including analyses of soil samples from Sites 5 and 16 and groundwater sampling event No. 1. Technical Memorandum No. 2 (ABB-ES, 1992b) and Technical Memorandum No. 3 (ABB-ES, 1992c) presents results from the second and third groundwater sampling events.

The following subsections compare analytical data with data associated with previous sampling events at Sites 5 and 16. Appendix A contains tables of validated analytical data for samples collected in September 1992 at Sites 5 and 16. Analyses were performed by CH2M HILL Laboratories under subcontract to ABB-ES. Appendix B contains analytical data tables for compounds detected in groundwater samples collected during the first, second, and third sampling events.

4.1 SITE 5, ARMY RESERVE DISPOSAL AREA, TOWHEE TRAIL. On September 12 and 13, 1992, groundwater level measurements were taken from seven monitoring wells at Site 5. Figure 4-1 is a groundwater potentiometric surface map developed from these measurements. The configuration of the potentiometric surface and the groundwater flow direction are generally unchanged from February, May, and July of 1992, when sampling events Nos. 1, 2, and 3 were conducted.

The headspaces of monitoring wells were screened for VOCs using an FID. The headspace for one monitoring well at Site 5 contained detectable levels of VOCs, suspected of being naturally occurring methane (Table 4-1). The headspace screening concentration was greater than 5,000 parts per million (ppm) at monitoring well KBA-5-6. No VOCs were detected in the headspace at this monitoring well during previous sampling events and groundwater analytical data for the fourth sampling event do not indicate a source for the VOC headspace reading at KBA-5-6.

Field measurements of pH, specific conductance, and temperature were taken during monitoring well purging. Table 4-1 summarizes the field measurements collected during purging of monitoring wells at Site 5. Purging continued until at least three well volumes had been removed, and field parameters stabilized to within 10 percent. The final measurements of pH, specific conductance, and temperature are considered the measurements of record for the monitoring well (USEPA, 1991).

Nine groundwater samples, including two duplicate samples, were collected from seven monitoring wells at Site 5. Groundwater samples were analyzed for VOCs, PCBs, TDS, TSS, and inorganic analytes. Both filtered and unfiltered groundwater samples were collected for inorganic analysis. Table 3-2 lists specific compounds analyzed in groundwater samples collected during sampling event No. 4. Table 4-2 summarizes analytical data for compounds detected in groundwater at Site 5. Section 5.1 of this document describes the analytical program for sampling events Nos. 5 and 6.

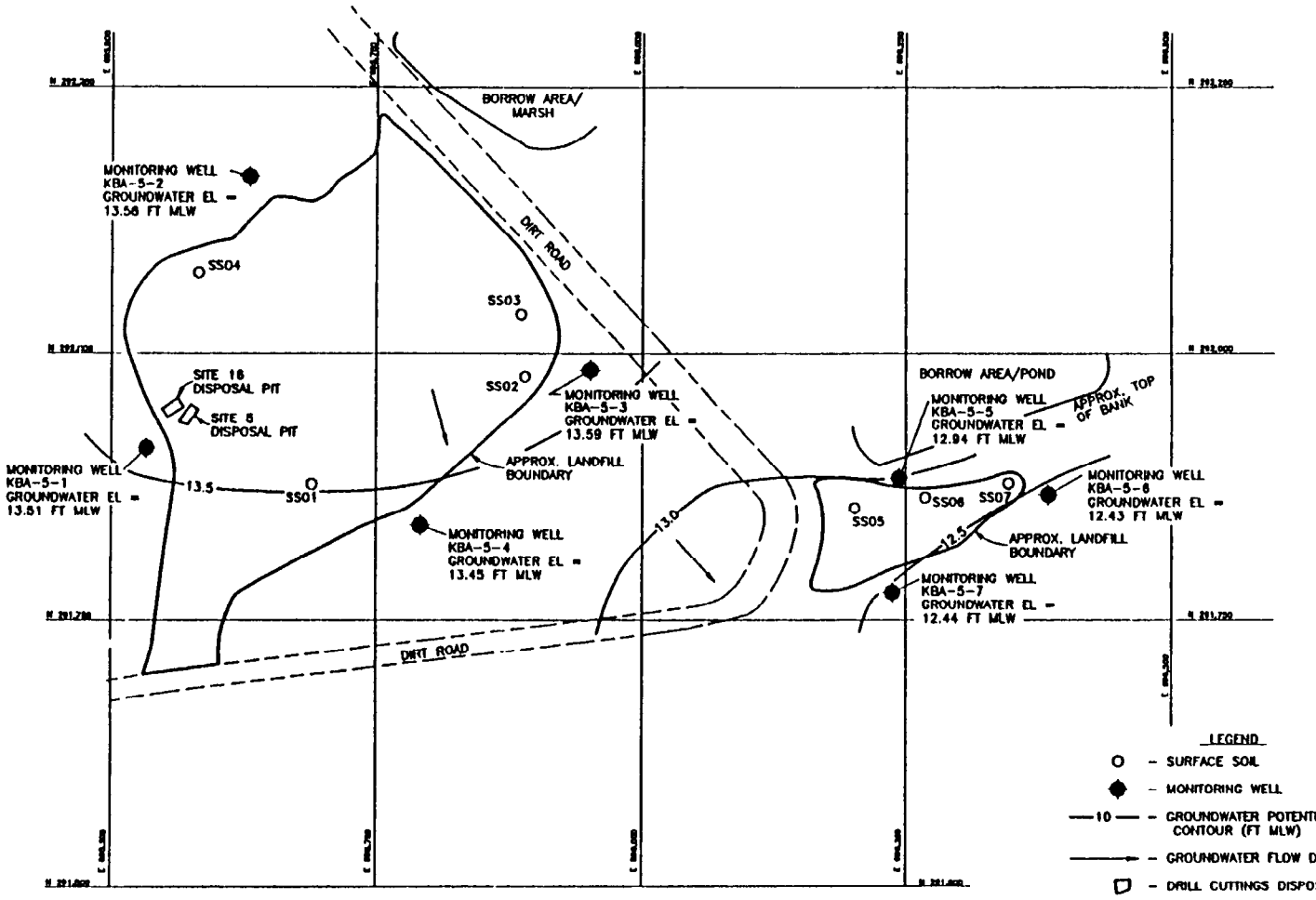

FIGURE 4-1
SITE 5
GROUNDWATER POTENTIOMETRIC
SURFACE MAP
SEPTEMBER 1992

RFI/SI TECHNICAL
MEMORANDUM NO. 4
NAVAL SUBMARINE
BASE
KINGS BAY, GEORGIA

Table 4-1 Summary of Field Measurements for Monitoring Wells at Site 5

Monitoring Well No.	FID Headspace Data (ppm)	Field Data[1]	Well Volume No. 1	2	3	4	Total Purge Vol. (gal)
KBA-5-1	0	pH	4.6	4.8	4.8		3.1
		Cond.	255	241	227		
		Temp.	error	error	error		
KBA-5-2	0	pH	5.0	4.7	4.7	5.1	4.1
		Cond.	351	333	423	390	
		Temp.	error	error	error	error	
KBA-5-3	0	pH	6.3	5.4	5.6		4.0
		Cond.	195	165	181		
		Temp.	error	error	error		
KBA-5-4	0	pH	5.1	5.1	4.8	4.8	3.5
		Cond.	631	510	781	700	
		Temp.	error	error	error	error	
KBA-5-5	0	pH	5.2	5.0	5.1	5.1	3.8
		Cond.	182	155	166	160	
		Temp.	error	error	error	error	
KBA-5-6	>5000	pH	5.7	5.6	5.7		3.0
		Cond.	288	269	292		
		Temp.	error	error	error		
KBA-5-7	0	pH	6.2	6.0	5.9		3.4
		Cond.	507	428	420		
		Temp.	error	error	error		

Notes: FID = flame ionization detector ppm = parts per million
error = analyzed, but readings were erroneous because of instrument malfunction. Instrument replaced.

1) Units are standard units (s.u.) for pH, micromhos per centimeter (umhos/cm) for specific conductance, and degrees Celsius (°C) for temperature.

Table 4-2 Summary of Compounds Detected in Groundwater Samples Collected from Site 5[1]

Compounds Detected		CRQL	Monitoring Well Number KBA-5-1	KBA-5-2	KBA-5-3	KBA-5-3D	KBA-5-4	KBA-5-5	KBA-5-5D	KBA-5-6	KBA-5-7
APPENDIX IX Inorganics (µg/l)											
Antimony[2]	unfiltered	60	12.4 U	12.4 U	12.4 U	12.4 U	12.4 U	17.0 J	-----	12.4 U	12.4 U
	filtered		12.4 U	12.4 U	12.4 U	-----	12.4 U	12.4 U	12.4 U	12.4 U	12.4 U
Arsenic[2]	unfiltered	10	5.5 J	5.3 J	10.4	7.6 J	3.9 J	9.9 J	-----	7.5 J	8.3 J
	filtered		1.0 J	3.3 J	1.7 J	-----	1.0 U	2.3 J	2.3 J	1.5 J	2.3 J
Barium[2]	unfiltered	200	146 J	124 J	124 J	119 J	53.4 J	93.6 J	-----	180 J	82.1 J
	filtered		64.2 U	109 U	49.6 U	-----	36.6 U	29.4 U	28.4 U	28.7 U	38.3 U
Beryllium[2]	unfiltered	5	0.76 J	0.89 J	1.0 J	0.66 J	0.24 U	0.72 J	-----	1.6 J	0.68 J
	filtered		0.31 U	0.74 U	0.24 U	-----	0.26 U	0.24 U	0.27 U	0.24 U	0.24 U
Cadmium[2]	unfiltered	5	2.7 U	2.7 U	2.7 U	2.7 U	4.1 J	2.7 U	-----	4.3 J	2.7 U
	filtered		2.7 U	2.7 U	2.7 U	-----	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U
Chromium[2]	unfiltered	10	16.8	4.3 J	24.6	17.2	5.6 J	21.6	-----	44.5	15.7
	filtered		2.0 J	2.7 J	1.9 U	-----	1.9 U	1.9 U	4.2 J	2.0 J	5.3 J
Cobalt[2]	unfiltered	50	5.5 J	6.8 J	7.2 J	4.8 J	5.6 J	6.4 J	-----	11.0 J	3.2 J
	filtered		2.1 U	6.6 U	1.6 U	-----	5.4 U	1.6 U	1.6 U	3.2 U	1.6 U
Copper[2]	unfiltered	25	17.6 J	7.4 J	14.9 J	18.7 J	4.5 J	14.5 J	-----	29.2	4.7 J
	filtered		4.8 J	10.1 J	5.0 J	-----	6.8 J	1.8 U	1.8 U	1.8 U	1.8 U
Lead[3]	unfiltered	5	5.3 J	2.4 J	5.2 J	4.7 J	2.4 J	9.6	-----	14.5	7.6
	filtered		1.4 UJ	7.2 J	3.1 J	-----	3.2 J	2.2 U	1.6 U	1.8 U	1.0 U
Mercury	unfiltered	0.2	0.49	0.49	0.37	0.26	0.37	0.26 U	-----	0.42 U	0.38 U
	filtered		0.37	0.03 J	0.61	-----	0.49	0.14 U	0.14 U	0.26 U	0.14 U
Nickel[4]	unfiltered	40	18.1 U	13.0 U	20.4 U	15.1 U	15.1 U	10.8 J	-----	25.1 J	10.7 U
	filtered		10.7 U	14.8 U	10.7 U	-----	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U
Silver[2]	unfiltered	5	1.6 J	1.5 U	1.5 U	1.5 U	1.6 J	1.5 U	-----	4.5 J	3.0 J
	filtered		1.5 U	1.5 U	1.5 U	-----	2.7 J	1.5 U	1.5 U	1.6 J	1.5 U

See notes at end of table.

Table 4-2 Summary of Compounds Detected in Groundwater Samples Collected from Site 5[1] (continued)

Compounds Detected		CRQL	Monitoring Well Number KBA-5-1	KBA-5-2	KBA-5-3	KBA-5-3D	KBA-5-4	KBA-5-5	KBA-5-5D	KBA-5-6	KBA-5-7
APPENDIX IX Inorganics (µg/l)											
Cyanide[5]	unfiltered	10	2.2 U	2.2 U	2.2 U	2.2 U	7.4 J	2.2 UJ	-----	3.6 J	2.2 UJ
	filtered		2.2 U	2.2 U	2.2 U	-----	2.2 U	3.8 J	2.2 UJ	2.2 UJ	2.2 UJ
Vanadium[2]	unfiltered	50	17.6 J	7.8 U	23.1 J	15.7 J	5.9 U	18.8 J	-----	32.7 J	13.0 J
	filtered		2.5 U	4.4 U	1.3 U	-----	3.8 U	1.3 U	1.3 U	1.3 U	1.3 U
Zinc[4]	unfiltered	20	50.2 J	78.1 J	54.5 J	48.4 J	39.9 J	45.2	-----	66.9	28.8
	filtered		14.6 J	89.4 J	12.4 J	-----	33.2 J	14.4 J	12.7 J	16.4 J	10.0 J
Sulfide	unfiltered	100	100	300	200	200	200	200	-----	200	300
	filtered		100	300	100 U	-----	100 U	100 U	100 U	200	100 U
PHYSICAL PARAMETERS											
Total Solids (mg/l)			515	314	517	488	847	405	-----	694	379
TDS (mg/l)			225	290	214	254	763	102	-----	122	212
TSS (mg/l)			290	24	303	234	84	303	-----	572	167
% TSS			56	8	59	48	10	75	-----	82	44

Notes:
CRQL = Contract Required Quantitation Limit
TSS = total suspended solids
TDS = total dissolved solids
U = not detected above or below CRQL
--- = Analysis not required/performed
[1] Groundwater samples were analyzed for VOCs, PCBs, and inorganic analytes only. No VOCs or PCBs were detected in groundwater samples.

Data Qualifiers

[2] Values flagged J as estimated because concentrations are less than the CRQL.
[3] Values flagged J and UJ as estimated because matrix spike recovery for lead was below QC limits.
[4] Values flagged J as estimated because matrix spike recovery for nickel and zinc was above QC limits.
[5] Values flagged J as estimated because matrix spike recovery for cyanide was outside QC limits.

4.1.1 Volatile Organic Compounds in Groundwater VOCs were not detected in groundwater samples collected from Site 5. VOCs were similarly not detected in groundwater samples collected during the second and third sampling events in May and July of 1992 at Site 5. VOCs will, however, continue to be monitored at Site 5.

4.1.2 Polychlorinated Biphenyls in Groundwater PCBs were not detected in groundwater samples collected from Site 5. PCBs were similarly not detected in groundwater samples collected during the first three sampling events at Site 5. PCBs will, however, continue to be monitored for at Site 5.

4.1.3 Inorganic Constituents in Groundwater With few exceptions, concentrations of inorganic constituents in groundwater samples from each monitoring well at Site 5 were similar to concentrations detected in samples collected in July 1992. Mercury and silver were detected in groundwater samples collected during sampling event No. 4 at concentrations above those detected in corresponding monitoring wells during sampling event No. 3. Increased concentrations were observed in groundwater samples from both upgradient and downgradient monitoring wells. Therefore, the increase in concentrations for these constituents are possibly caused by seasonal variations.

Copper, lead, and nickel were detected in groundwater samples collected during sampling event No. 4 at concentrations less than those detected in corresponding wells during sampling event No. 3. However, concentrations were similar to those detected in corresponding wells sampled during the second sampling event (May 1992). Increased concentrations during the third sampling event were observed in groundwater samples from both upgradient and downgradient monitoring wells. Therefore, the increase in concentrations of copper, lead, and nickel during the third sampling event was most likely caused by seasonal variations.

Both filtered and unfiltered groundwater samples were collected for inorganic analyses from the seven monitoring wells at Site 5. The purpose of collecting and analyzing filtered and unfiltered samples is to determine what fraction of the total concentration of inorganics in groundwater samples is attributable to suspended particulates. Groundwater samples from Site 5 were also analyzed for TDS and TSS to determine what percentage of the total solids in groundwater represent suspended particulates.

TDS and TSS results for groundwater samples are shown in Table 4-2. Total solids (the sum of TDS and TSS) in groundwater ranged from 314 milligrams per liter (mg/l) in KBA-5-2 to 847 mg/l in KBA-5-4. The fraction of total solids in groundwater that represents suspended solids ranged from 8 percent (24 mg/l) for KBA-5-2 to 82 percent (572 mg/l) for KBA-5-6. The total amount of solids and suspended solids in the upgradient monitoring wells, KBA-5-1 and KBA-5-2, were comparable to the total solids found in downgradient wells. However, the concentration of TSS in monitoring well KBA-5-6 was significantly higher than the concentrations found in the upgradient wells at Site 5.

The concentration of suspended solids in two downgradient wells, KBA-5-5 and KBA-5-7 (303 and 167 mg/l, respectively), significantly decreased when compared to concentrations detected in samples collected from these wells during the third sampling event (1,450 and 2,990 mg/l, respectively). Concentrations of several inorganic constituents in these two monitoring wells also significantly decreased when compared to concentrations detected in unfiltered samples collected from

these wells during the third sampling event. Concentrations of arsenic, barium, cadmium, chromium, and lead in the unfiltered sample collected from KBA-5-7 during sampling event No. 3 exceeded corresponding Federal Primary Drinking Water Standard Maximum Contaminant Levels (MCLs). However, no federal MCLs were exceeded at KBA-5-7 during sampling event No. 4. The decrease in suspended solids is most likely caused by seasonal variations in the aquifer.

The concentrations of inorganic constituents detected in unfiltered samples collected from downgradient monitoring wells were compared to concentrations detected in upgradient, unfiltered groundwater samples. The following paragraphs discuss general observations regarding the constituents and concentrations detected in samples collected in September 1992. Table 4-2 summarizes inorganic analytes detected in groundwater samples collected from Site 5.

Several inorganic constituents, including antimony, arsenic, beryllium, chromium, cyanide, cobalt, lead, nickel, silver, and vanadium, were detected in unfiltered groundwater samples collected from downgradient monitoring wells KBA-5-3, KBA-5-4, KBA-5-5, and KBA-5-7 at concentrations exceeding upgradient concentrations. However, concentrations of these analytes were less than two times upgradient concentrations and did not exceed corresponding federal MCLs. Concentrations of inorganic analytes detected in filtered samples collected from wells KBA-5-3, KBA-5-4, KBA-5-5, and KBA-5-7 were considerably lower and did not exceed concentrations in filtered samples from upgradient wells.

As shown in Table 4-2, 11 inorganic constituents were detected in the unfiltered groundwater sample collected from downgradient monitoring well KBA-5-6 at concentrations exceeding upgradient concentrations. However, concentrations for all analytes were less than three times upgradient concentrations and did not exceed corresponding federal MCLs. Except for silver, concentrations of inorganic analytes detected in filtered samples collected from KBA-5-6 were considerably lower and did not exceed concentrations in filtered samples from upgradient wells. Silver was detected in the filtered sample collected from KBA-5-6 at a concentration of 1.6 μg/l but was not detected in filtered samples from the two upgradient wells. Silver was not detected in KBA-5-6 during the first three groundwater sampling events at Site 5.

In general, the results for filtered groundwater samples are considered a more accurate representation of groundwater quality at Site 5 because of the presence and contribution of suspended solids to the total concentration of inorganics in unfiltered groundwater samples.

Concentrations of inorganic constituents in unfiltered groundwater samples collected from Site 5 were compared to Federal Primary Drinking Water Standard MCLs. Appendix C presents inorganic data for unfiltered groundwater samples collected at Site 5 during the first four sampling events. Data is presented in bar chart form for the seven inorganic constituents regulated under the Safe Drinking Water Act. None of the inorganic constituents detected in samples collected during the fourth sampling event were present at concentrations above their corresponding MCLs. Figure 4-2 summarizes concentrations of inorganics having MCLs for the filtered and unfiltered groundwater samples collected at Site 5 during the fourth sampling event.

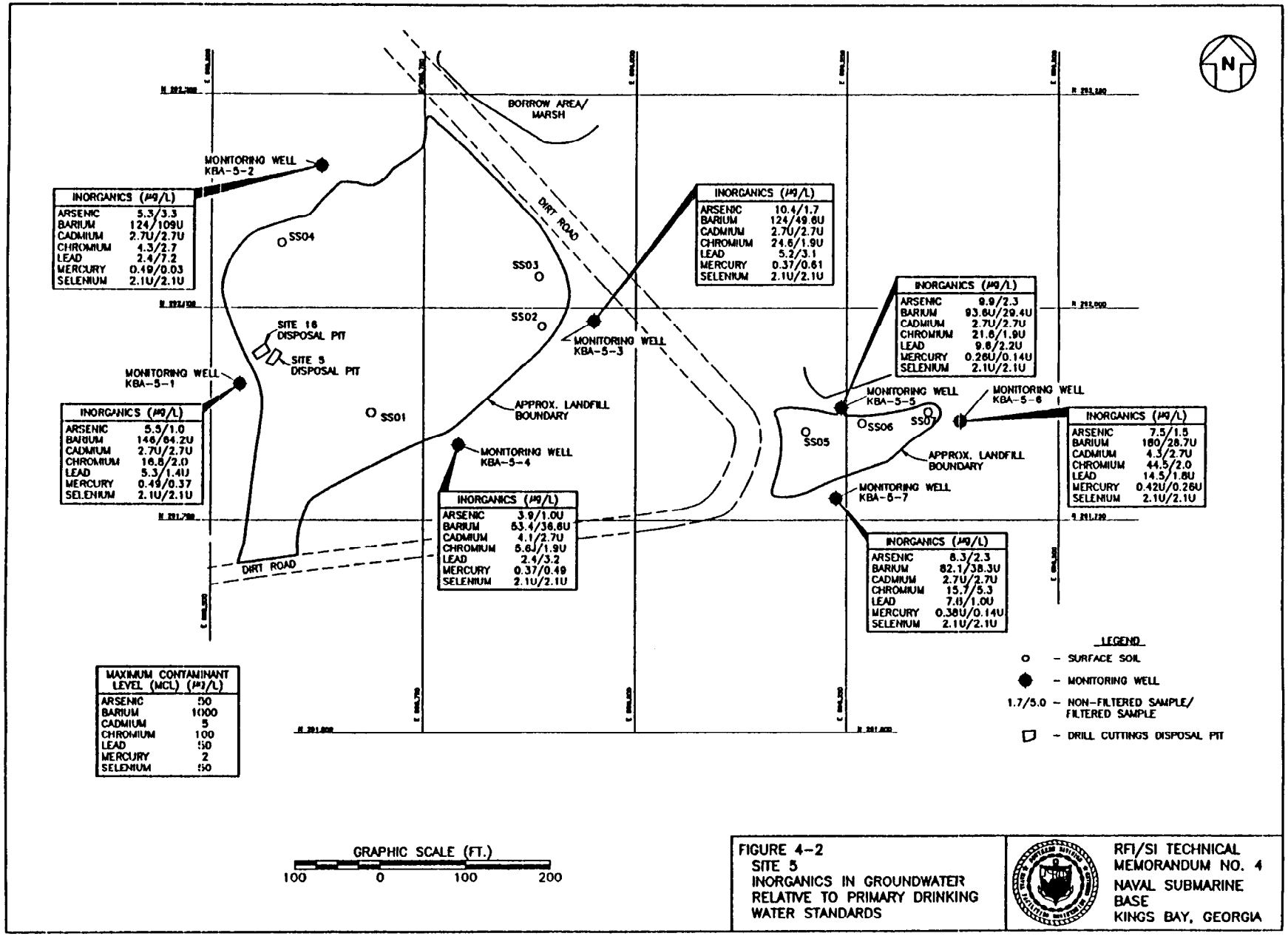

FIGURE 4-2
SITE 5
INORGANICS IN GROUNDWATER RELATIVE TO PRIMARY DRINKING WATER STANDARDS

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KINGS BAY, GEORGIA

4.2 SITE 16, ARMY RESERVE DISPOSAL AREA, MOTOR MISSILE MAGAZINES. On September 11, 1992, groundwater level measurements were taken from four monitoring wells at Site 16. Figure 4-3 is a groundwater potentiometric surface map developed from these measurements. The configuration of the potentiometric surface and the groundwater flow direction are generally unchanged from July 1992, when sampling event No. 3 was conducted.

The headspaces of monitoring wells were screened for VOCs using an FID. The headspaces of all four monitoring wells at Site 16 contained high levels of VOCs, suspected of being naturally occurring methane (Table 4-3). Headspace screening concentrations were greater than 5,000 ppm at all four monitoring wells. Headspace screening concentrations were similarly high during the second and third sampling events at Site 16. Review of groundwater sample analytical data did not indicate the presence of a source of VOCs.

Field measurements of pH, specific conductance, and temperature were taken during monitoring well purging. Table 4-3 summarizes field measurements during purging of monitoring wells at Site 16. Purging continued until at least three well volumes were removed, and field parameters stabilized to within 10 percent. The final measurements of pH, specific conductance, and temperature are considered the measurements of record for the monitoring wells (USEPA, 1991).

Five groundwater samples, including one duplicate sample, were collected from four monitoring wells at Site 16. Groundwater samples were analyzed for VOCs, SVOCs, TDS, TSS, and inorganic analytes. Both filtered and unfiltered groundwater samples were collected for inorganic analysis. Table 3-2 provides a list of specific compounds analyzed for during sampling event No. 3. Table 4-4 summarizes analytical data for compounds detected in groundwater samples collected from Site 16. Subsection 5.1 of this document describes the analytical program for sampling events Nos. 5 and 6.

4.2.1 Volatile Organic Compounds in Groundwater VOCs were not detected in groundwater samples collected from Site 16 during the fourth groundwater sampling event. VOCs were similarly not detected in groundwater samples collected during the second sampling event in May 1992 at Site 16. The VOC toluene was detected at 5 µg/l in a groundwater sample collected from monitoring well KBA-16-3 during the third groundwater sampling event but was not detected during the first two sampling events. No other groundwater samples collected from the site during groundwater sampling event No. 3 contained detectable levels of VOCs. VOCs will continue to be monitored for at this site. Subsection 5.1 of this document describes the analytical program for sampling events Nos. 5 and 6.

4.2.2 Semivolatile Organic Compounds in Groundwater Two SVOCs, bis(2-ethylhexyl)phthalate and naphthalene, were detected in groundwater samples collected from monitoring well KBA-16-2 during the fourth groundwater sampling event. As shown in Table 4-4, bis(2-ethylhexyl)phthalate and naphthalene were detected in one sample collected from KBA-16-2 at an estimated concentration of 1 J µg/l but were not detected in the replicate sample collected from this well. These levels are well below the CRQL of 10 µg/l and are near the instrument detection limit for these compounds. Values have been qualified as estimated and flagged with a J because the values are less than the CRQL and due to low surrogate recoveries during sample analysis.

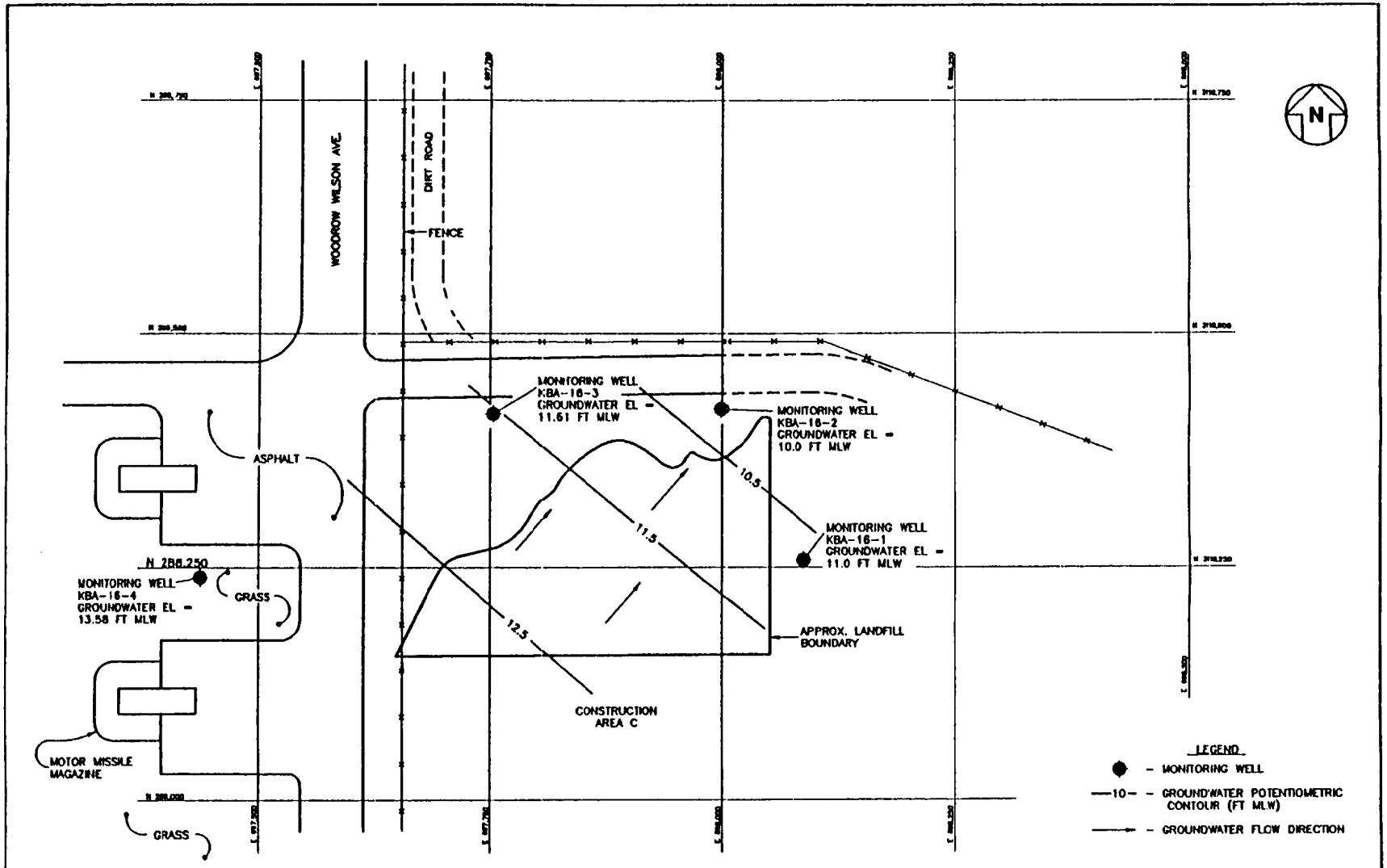

FIGURE 4-3
SITE 16
GROUNDWATER POTENTIOMETRIC SURFACE MAP
SEPTEMBER 1992

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Table 4-3 Summary of Field Measurements for Monitoring Wells at Site 16

Monitoring Well No.	FID Headspace Data (ppm)	Field Data[1]	Well Volume No. 1	2	3	4	Total Purge Vol. (gal)
KBA-16-1	>5000	pH	5.7	5.8	5.9		3.4
		Cond.	870	718	683		
		Temp.	error	error	error		
KBA-16-2	>5000	pH	7.4	7.2	6.9	7.2	4.2
		Cond.	843	731	673	735	
		Temp.	error	error	error	error	
KBA-16-3	>5000	pH	6.8	6.3	6.1	6.2	4.0
		Cond.	480	243	333	338	
		Temp.	error	error	error	error	
KBA-16-4	>5000	pH	8.0	7.2	7.1	7.0	4.7
		Cond.	969	860	929	912	
		Temp.	error	error	error	error	

Notes:
FID = flame ionization detector
ppm = parts per million
error = analyzed, but readings were erroneous because of instrument malfunction. Instrument replaced.

1) Units are standard units (s.u.) for pH, micromhos per centimeter (umhos/cm) for specific conductance, and degrees Celsius (°C) for temperature.

Table 4-4 Summary of Compounds Detected in Groundwater Samples Collected from Site 16[1]

Compounds Detected		CRQL	Monitoring Well Number KBA-16-1	KBA-16-2	KBA-16-2D	KBA-16-3	KBA-16-4
APPENDIX IX SVOCs (µg/l)							
Naphthalene[2]		10	10 UJ	1 J	10 U	10 UJ	10 UJ
bis(2-Ethylhexyl)Phthalate[2]		10	10 UJ	10 UJ	1 J	10 UJ	10 UJ
APPENDIX IX Inorganics (µg/l)							
Arsenic[3]	unfiltered	10	12.1	23.4	-----	63.2	5.4 J
	filtered		2.4 J	5.1 J	-----	4.2 J	1.0 U
Barium[3]	unfiltered	200	82.8 J	83.6 J	-----	538	109 J
	filtered		15.1 U	17.4 U	-----	1.4 U	26.8 U
Beryllium[3]	unfiltered	5	1.4 J	1.1 J	-----	15.9	2.0 J
	filtered		0.24 U	0.24 U	-----	0.24 U	0.24 U
Chromium[3]	unfiltered	10	38.6	41.6	-----	205	46.5
	filtered		1.9 U	3.5 J	-----	1.9 U	6.2 J
Copper[3]	unfiltered	25	53.4	5.9 J	-----	35.4	32.5
	filtered		1.8 U	1.8 U	-----	1.8 U	2.4 J
Cobalt[3]	unfiltered	50	6.7 J	12.0 J	-----	39.0 J	5.0 J
	filtered		1.6 U	1.6 U	-----	1.6 U	1.6 U
Lead	unfiltered	5	16.9	17.6	-----	40.5	13.4
	filtered		1.5 U	1.6 U	-----	0.71 U	1.1 U
Mercury	unfiltered	0.2	0.34 U	0.34 U	-----	0.80	0.42 U
	filtered		0.30 U	0.14 U	-----	0.14 U	0.14 U
Nickel[3]	unfiltered	40	20.2 J	30.6 J	-----	66.2	30.2 J
	filtered		10.7 U	10.7 U	-----	10.7 U	12.5 J
Silver[3]	unfiltered	10	3.6 J	1.5 U	-----	1.5 U	1.9 J
	filtered		1.5 U	1.5 U	-----	1.5 U	1.5 J
Vanadium[3]	unfiltered	50	51.2	44.1 J	-----	199	40.0 J
	filtered		1.9 U	2.2 U	-----	1.3 U	7.4 U
Zinc	unfiltered	20	39.3	61.0	-----	210	42.5
	filtered		10.0 J	7.6 U	-----	22.9	8.6 J
Cyanide[4]	unfiltered	10	2.2 UJ	2.2 UJ	-----	2.2 UJ	11.0 UJ
	filtered		3.7 J	4.0 J	-----	2.2 UJ	11.0 UJ
Sulfide	unfiltered	100	200	200	-----	300	500
	filtered		100 U	300	-----	100 U	500

See notes at end of table.

Table 4-4 Summary of Compounds Detected in Groundwater Samples Collected from Site 16[1] (continued)

Compounds Detected	CRQL	Monitoring Well Number KBA-16-1	KBA-16-2	KBA-16-2D	KBA-16-3	KBA-16-4
PHYSICAL PARAMETERS						
Total Solids (mg/l)		869	1104	-----	5150	1203
TDS		419	389	-----	630	623
TSS (mg/l)		450	715	-----	4520	580
% TSS		52	65	-----	88	48

Notes:
CRQL = Contract Required Quantitation Limit
U = not detected above or below CRQL
--- = Analysis not required/performed
TDS = total dissolved solids
TSS = total suspended solids

Data Qualifiers
[1] Groundwater samples were analyzed for VOCs, SVOCs, and inorganic constituents only. No VOCs were detected in groundwater samples.
[2] Sample values and quantitation limits flagged J and UJ as estimated due to low surrogate recoveries.
[3] Values flagged J as estimated because concentrations are less than the CRQL.
[4] Sample values and quantitation limits flagged J and UJ as estimated because duplicate analysis for cyanide was outside QC limits.

Bis(2-ethylhexyl)phthalate was also detected in monitoring wells during sampling events Nos. 2 and 3. However, samples results for bis(2-ethylhexyl)phthalate during the second sampling event were attributed to laboratory or sampling artifacts because of associated method blank contamination. Phthalates can easily be introduced into sampling media through sample containers, plastic gloves, coolers, and other plastic materials used in support of laboratory and sampling activities. While the concentrations of bis(2-ethylhexyl)phthalate detected in the groundwater samples collected from Site 16 during sampling events No. 3 and No. 4 cannot be directly attributed to blank contamination, they are also not considered to be directly attributed to waste disposal at the site.

Naphthalene was not detected in the four monitoring wells at Site 16 during the first three sampling events. Naphthalene is a polynuclear aromatic hydrocarbon (PAH) and its presence in monitoring well KBA-16-2 may be related to the detection of PAHs in the subsurface soil sample collected during the installation of this well in February 1992. Concentrations of PAHs detected in the soil boring sample from KBA-16-2 ranged from 61 micrograms per kilogram (µg/kg) to 1,700 µg/kg, and compounds detected include acenaphthene, fluorene, phenanthrene, fluoranthene, pyrene, chrysene, benzo(a)anthracene, benzo(b)anthracene, benzo(k)anthracene, and benzo(a)pyrene. No PAHs were detected in groundwater samples collected from Site 16 during the first three groundwater sampling events.

The base/neutral fraction of SVOCs will remain on the list of parameters to monitor at Site 16 because of the presence of site-related PAHs in the subsurface soil sample and groundwater sample collected from the downgradient soil boring and monitoring well KBA-16-2.

4.2.3 Inorganic Constituents in Groundwater Except for zinc, concentrations of all inorganic constituents detected in groundwater samples collected from two or more monitoring wells at Site 16 increased when compared to concentrations detected in groundwater samples collected during sampling event No. 3 (July 1992). Increased concentrations of inorganic constituents were observed in groundwater samples from both upgradient and downgradient monitoring wells. Therefore, the increase in concentrations for the constituents detected could be due to seasonal variations.

Both filtered and unfiltered groundwater samples were collected for inorganic analyses from the four monitoring wells at Site 16. The purpose of collecting and analyzing filtered and unfiltered samples is to determine what fraction of the total concentration of inorganics in groundwater samples is attributable to suspended particulates. Groundwater samples from Site 16 were also analyzed for TDS and TSS to establish what percentage of the total solids in groundwater are suspended particulates.

TDS and TSS results for groundwater samples are shown in Table 4-4. Total solids (the sum of TDS and TSS) in groundwater ranged from 869 mg/l for KBA-16-1 to 5,150 mg/l for KBA-16-3. The fraction of total solids in groundwater that represents suspended solids ranged from 48 percent for KBA-16-4 to 88 percent for KBA-16-3. The total amount of solids in the upgradient monitoring well KBA-16-4 (1,203 mg/l) was comparable to the total solids found in downgradient wells. However, the concentration of TSS in monitoring well KBA-16-3 was significantly higher than the concentration found in the upgradient well at Site 16.

The concentration of suspended solids in the upgradient well KBA-16-4 and one downgradient well KBA-16-3 (580 and 4,520 mg/l, respectively) significantly increased when compared to concentrations detected in samples collected from these wells during the third sampling event (171 and 326 mg/l, respectively). Concentrations of several inorganic constituents in these two monitoring wells also significantly increased when compared to concentrations detected in unfiltered samples collected from these wells during the third sampling event. The increase in suspended solids is most likely caused by seasonal variations in the aquifer.

The concentrations of inorganic constituents detected in unfiltered samples from downgradient monitoring wells KBA-16-1, KBA-16-2, and KBA-16-3 were compared to concentrations detected in the upgradient, unfiltered groundwater sample. Table 4-4 summarizes inorganic analytes detected in groundwater samples collected from Site 11. Thirteen inorganic constituents present at concentrations greater than the upgradient concentrations include arsenic, barium, beryllium, chromium, copper, cobalt, lead, mercury, nickel, vanadium, silver, zinc, and cyanide. Ten of these constituents, beryllium, barium, chromium, copper, cobalt, lead, mercury, nickel, silver, and vanadium, are considered to be artifacts of a silty aquifer because they were detected in unfiltered groundwater samples but were not detected in associated filtered samples collected from downgradient wells. The following is a general discussion of observations regarding the constituents and concentrations detected in samples collected in July 1992.

Arsenic concentrations in unfiltered samples from KBA-16-1, KBA-16-2, and KBA-16-3 were more than two times the concentration in the upgradient groundwater sample, being 12.1, and 23.4, and 63.2 µg/l, respectively. The concentration of arsenic detected in KBA-16-3 exceeded the Federal Primary Drinking Water Standard MCL of 50 µg/l. Arsenic concentrations in filtered downgradient samples were considerably lower and were well below the MCL for arsenic. Arsenic was not detected in the filtered, upgradient sample.

Zinc concentrations in unfiltered samples from KBA-16-2 and KBA-16-3 were more than two times the concentration in the upgradient groundwater sample, being 61.0 and 210 µg/l, respectively. Zinc was not detected in the filtered sample from KBA-16-2 but was detected at 22.9 µg/l in the filtered sample collected from KBA-16-3. This value exceeds the concentration of zinc in the filtered, upgradient sample.

Cyanide was detected in filtered samples from two downgradient monitoring wells, KBA-16-1 and KBA-16-2 at 3.7 and 4 J µg/l, respectively, but was not detected in the unfiltered samples collected from these wells. Cyanide was not detected in the filtered, upgradient monitoring well. None of the filtered or unfiltered samples collected during sampling event No. 3 contained cyanide but cyanide was detected in unfiltered samples collected from KBA-16-1 and KBA-16-2 during the second sampling event in May 1992.

In general, the results for filtered groundwater samples are considered to be a more accurate representation of groundwater quality at Site 16 because of the relatively high percentage of suspended solids in unfiltered samples.

Concentrations of inorganic constituents in unfiltered groundwater samples collected from Site 16 were compared to Federal Primary Drinking Water Standard MCLs. Appendix C presents inorganic data for unfiltered groundwater samples collected at Site 16 during the first four sampling events. Data is presented

in bar chart form for seven inorganic constituents regulated under the Safe Drinking Water Act. Figure 4-4 summarizes concentrations of inorganics having MCLs for the filtered and unfiltered groundwater samples collected at Site 16 during the fourth sampling event.

The concentration of arsenic (63.2 µg/l) and chromium (205 µg/l) in the unfiltered sample from downgradient well KBA-16-3 exceeded the MCLs for these two constituents (50 and 100 µg/l, respectively). However, arsenic and chromium were not detected in the filtered sample collected from this well. The significant difference in concentrations for the filtered and unfiltered samples is most likely due to the relatively high concentration of suspended solids in the unfiltered sample (4,520 mg/l). Arsenic and chromium were not detected above their corresponding MCLs in the unfiltered sample from KBA-16-3 during the third sampling event.

The concentrations of lead in unfiltered samples collected from all three downgradient wells at Site 16 did not exceed the current MCL for lead of 50 µg/l; however, concentrations did exceed the new MCL for lead of 15 µg/l that will be effective December 7, 1992. Lead was also detected in the upgradient well KBA-16-1 at a concentration of 13.4 µg/l, which is just below the MCL of 15 µg/l. As shown in Table 4-4, lead was not detected in any of the filtered samples collected from monitoring wells at Site 16. The significant difference in concentrations for the filtered and unfiltered samples is most likely due to the relatively high concentration of suspended solids in the unfiltered samples. Lead was not detected above the 15 µg/l MCL in the unfiltered samples collected from monitoring wells at Site 16 during the third sampling event.

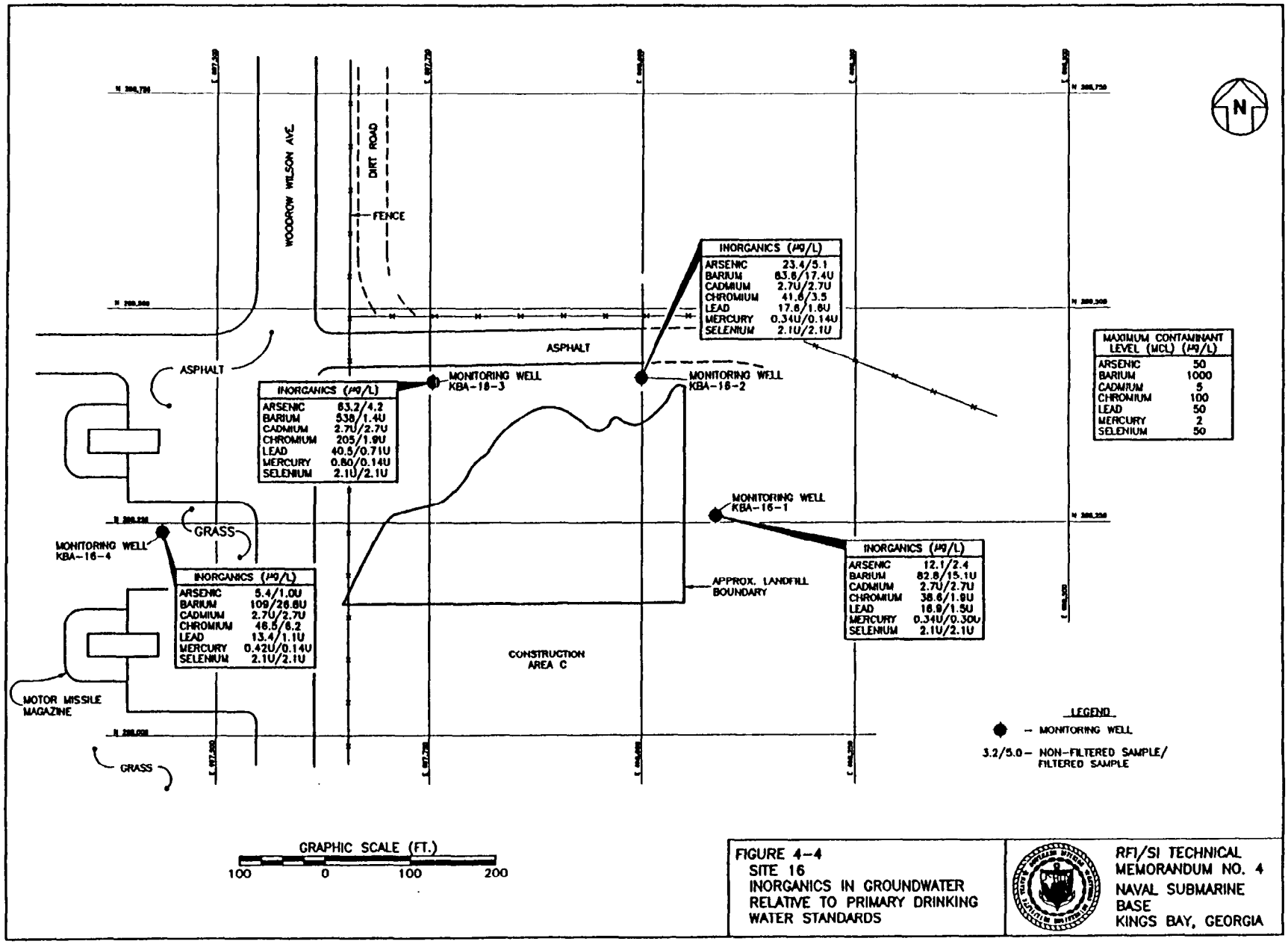

FIGURE 4-4
SITE 16
INORGANICS IN GROUNDWATER RELATIVE TO PRIMARY DRINKING WATER STANDARDS

RFI/SI TECHNICAL MEMORANDUM NO. 4
NAVAL SUBMARINE BASE
KINGS BAY, GEORGIA

5.0 SUMMARY

This section summarizes results from the fourth groundwater sampling event at Sites 5 and 16 and outlines the groundwater monitoring analytical program for groundwater sampling events Nos. 5 and 6 at Sites 5 and 16. The analytical program has been developed based on information obtained from analysis of soil samples collected during the RFI/SI field program and four groundwater sampling events at NSB, Kings Bay, Georgia.

5.1 SITE 5, ARMY RESERVE DISPOSAL AREA, TOWHEE TRAIL. Groundwater samples collected during the fourth groundwater sampling event at Site 5 were analyzed for a modified list of Appendix IX constituents, including VOCs, PCBs, inorganic constituents, TDS, and TSS.

VOCs were not detected in groundwater samples collected from monitoring wells at Site 5 during the fourth sampling event. VOCs will continue to be monitored at this site because of the presence of VOCs in groundwater samples collected during the first groundwater sampling event (February 1992).

PCBs were not detected in groundwater samples collected during the first three sampling events at Site 5 and were similarly not detected in September 1992. PCBs will continue to be monitored for because of the confirmation of low levels of the PCB Aroclor 1260 in surface soils at Site 5.

With few exceptions, concentrations of inorganic constituents in groundwater samples from each monitoring well at Site 5 were similar to concentrations detected in samples collected in July 1992. Both filtered and unfiltered groundwater samples were collected during the fourth sampling event at Site 5 to determine whether aquifer solids in groundwater contribute to the total concentration of inorganic constituents in groundwater. Unfiltered samples were also analyzed for TDS and TSS to determine what percentage of the total solids in groundwater represents suspended particulates.

Concentrations of inorganics were significantly lower for filtered groundwater samples than for unfiltered samples at Site 5. The results for filtered samples are generally considered to be a more accurate representation of groundwater quality at Site 5 because of the presence and contribution of suspended solids to the total concentration of inorganics in unfiltered groundwater samples.

Table 5-1 is a summary of the sampling and analysis program for groundwater sampling events No. 5 and 6 at Site 5. Table 5-2 lists the compounds and analytical methods included in the analytical program.

5.2 SITE 16, ARMY RESERVE DISPOSAL AREA, MOTOR MISSILE MAGAZINES. Groundwater samples collected during the fourth groundwater sampling event at Site 16 were analyzed for a modified list of Appendix IX constituents, including VOCs, SVOCs, inorganic constituents, TDS, and TSS.

VOCs were not detected in groundwater samples collected from monitoring wells at Site 16 during the fourth sampling event. VOCs will continue to be monitored at this site because of the presence of VOCs in groundwater samples collected during the first and third groundwater sampling events (February and July of 1992).

Table 5-1 Summary of Sampling and Analysis Program for Groundwater Sampling Event No. 5 and 6 at Sites 5 and 16

Location and Type of Sampling	Laboratory Analysis				
	A	B	C	D	E
Site 5					
Groundwater	7	0	7	14	7
Site 16					
Groundwater	4	4	0	8	4
Field Duplicates					
Groundwater	1	1	1	2	1
Quality Control Samples					
Trip Blanks	3	0	0	0	0
Rinseate Blanks	3	1	1	3	3
Field Blanks	2	2	2	3	2

A - Volatile Organic Compounds (VOCs)
B - Semivolatile Organic Compounds (SVOCs)
C - Polychlorinated Biphenyls (PCBs)
D - Inorganic constituents (including cyanide and sulfide)
E - Total Dissolved Solids (TDS) and Total Suspended Solids (TSS)

Table 5-2 Compounds and Analytical Methods for Groundwater Sampling Event Nos. 5 and 6 at Sites 5 and 16

Parameter:	**Volatile Organic Compounds (38 total) TCL List plus 4 additional compounds**
Method:	**SW-846 Method 8240**

Chloromethane	cis-1,3-Dichloropropene
Bromomethane	Trichloroethene
Vinyl Chloride	Dibromochloromethane
Chloroethane	1,1,2-Trichloroethane
Methylene Chloride	Benzene
Acetone	trans-1,3-Dichloropropene
Carbon Disulfide	Bromoform
Trichlorofluoromethane*	2-Hexanone
1,1-Dichloroethene	4-Methyl-2-Pentanone
1,1-Dichloroethane	Tetrachloroethene
1,2-Dichloroethene (total)	1,1,2,2-Tetrachloroethane
Chloroform	Toluene
1,2-Dichloroethane	Chlorobenzene
2-Butanone	Ethylbenzene
1,1,1-Trichloroethane	Styrene
Carbon Tetrachloride	Xylene (total)
Vinyl Acetate	1,3-Dichlorobenzene*
Bromodichloromethane	1,4-Dichlorobenzene*
1,2-Dichloropropane	1,2-Dichlorobenzene*

* Non-TCL compounds

Parameter:	**Polychlorinated Biphenyls (PCBs) (7 total)**
Method:	**SW-846 Method 8080**

Aroclor-1016	Aroclor-1221	Aroclor-1232
Aroclor-1242	Aroclor-1248	Aroclor-1254
	Aroclor-1260	

Parameter:	**Appendix IX Inorganic Analytes (19 total)**
Method:	**SW-846 Methods (listed in parentheses)**

Antimony (6010)	Copper (6010)	Thallium (7841)
Arsenic (7060)	Lead (7421)	Vanadium (6010)
Barium (6010)	Mercury (7470)	Zinc (6010)
Beryllium (6010)	Nickel (6010)	Tin (6010)
Cadmium (6010)	Selenium (7740)	Cyanide (9010)
Chromium (6010)	Silver (6010)	Sulfide (9030)
	Cobalt (6010)	

Table 5-2 Compounds and Analytical Methods for Groundwater Sampling Event Nos. 5 and 6 at Sites 5 and 16 (continued)

Parameter:	**Semivolatile Organic Compounds (base/neutral fraction) TCL List (base/neutral fraction)**
Method:	**SW-846 Method 8270 (50 total)**

bis(2-Chloroethyl)Ether	2,4-Dinitrotoluene
1,3-Dichlorobenzene	Diethylphthalate
1,4-Dichlorobenzene	4-Chlorophenylphenylether
Benzyl Alcohol	Fluorene
1,2-Dichlorobenzene	4-Nitroaniline
bis(2-Chloroisopropyl)Ether	N-Nitrosodiphenylamine
N-Nitroso-Di-n-Propylamine	4-Bromophenyl-phenylether
Hexachloroethane	Hexachlorobenzene
Nitrobenzene	Phenanthrene
Isophorone	Anthracene
bis(2-Chloroethoxy)Methane	Di-n-Butylphthalate
1,2,4-Trichlorobenzene	Fluoranthene
Naphthalene	Pyrene
4-Chloroaniline	Butylbenzylphthalate
Hexachlorobutadiene	3,3'-Dichlorobenzidine
2-Methylnaphthalene	Benzo(a)Anthracene
Hexachlorocyclopentadiene	Chrysene
2-Chloronaphthalene	bis(2-Ethylhexyl)Phthalate
2-Nitroaniline	Di-n-Octyl Phthalate
Dimethylphthalate	Benzo(b)Fluoranthene
Acenaphthylene	Benzo(k)Fluoranthene
2,6-Dinitrotoluene	Benzo(a)Pyrene
3-Nitroaniline	Indeno(1,2,3-cd)Pyrene
Acenaphthene	Dibenz(a,h)Anthracene
Dibenzofuran	Benzo(g,h,i)Perylene

Parameter:	**Total Dissolved Solids (TDS)/ Total Suspended Solids (TSS)**
Method:	**Standard Methods-- Methods 2540C and 2540D**

One possible site-related SVOC, naphthalene, was detected in a groundwater sample collected from a downgradient monitoring well (KBA-16-2) during the fourth groundwater sampling event. No site-related SVOCs, including naphthalene, were detected in the four monitoring wells at Site 16 during the first three sampling events at Site 16. Naphthalene is a PAH and its presence in monitoring well KBA-16-2 may be related to the detection of PAHs in the subsurface soil sample collected during the installation of this well in February 1992. The base/neutral fraction of SVOCs will remain on the list of parameters to monitor for at Site 16 because of the presence of site-related PAHs in the subsurface soil sample and groundwater sample collected from the downgradient soil boring and monitoring well KBA-16-2.

Except for zinc, concentrations of all inorganic constituents detected in groundwater samples collected from two or more monitoring wells at Site 16 increased when compared to concentrations detected in groundwater samples collected during sampling event No. 3 (July 1992). Increased concentrations of inorganic constituents were observed in groundwater samples from both upgradient and downgradient monitoring wells. Therefore, the increase in concentrations for the constituents detected could be due to seasonal variations.

Both filtered and unfiltered groundwater samples were collected during the third sampling event at Site 16 to determine whether aquifer solids in groundwater contribute to the total concentration of inorganic constituents in groundwater. Unfiltered samples were also analyzed for TDS and TSS to determine what percentage of the total solids in groundwater represents suspended particulates.

Concentrations of inorganics were significantly lower for filtered groundwater samples than for unfiltered samples at Site 16. The concentration of arsenic and chromium in the unfiltered sample from downgradient well KBA-16-3 exceeded the Federal Primary Drinking Water Standard MCLs for these two constituents; however, arsenic and chromium were not detected in the filtered sample collected from this well. The concentrations of lead in unfiltered samples collected from all three downgradient wells at Site 16 exceeded the new MCL for lead of 15 $\mu g/l$; however, lead was not detected in any of the filtered samples collected from monitoring wells at Site 16.

The results for filtered samples are generally considered to be a more accurate representation of groundwater quality at Site 16 due to the presence and contribution of suspended solids to the total concentration of inorganics in unfiltered groundwater samples.

Table 5-1 is a summary of the sampling and analysis program for groundwater sampling events No. 5 and 6 at Site 16. Table 5-2 lists the compounds and analytical methods included in the analytical program.

REFERENCES

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APPENDIX A
ANALYTICAL DATA VALIDATION SUMMARY TABLES SAMPLE EVENT NO. 4 SEPTEMBER 1992

DEFINITION OF DATA QUALIFIERS

Organic Data Qualifiers

J - Indicates an estimated concentration because results are either below the concentration required detection level (CRQL) or quality control criteria were not met.

U - Indicates that compound was analyzed but not detected.

UJ - Indicates that quantitation level was estimated because QC criteria were not met.

NJ - Presumptive evidence for the presence of a compound at an estimated value.

E - Indicates that the analyte concentration exceeded the calibration range of the GC/MS and re-analysis of diluted sample within calibration range.

D - Indicates that sample concentration was obtained by dilution to bring result within calibration range.

X - Total concentration of two indistinguishable isomers (i.e., 3-Methylphenol and 4-Methylphenol).

UR - Indicates that the reported detection limit is unusable because QA criteria were not met.

Inorganic Data Qualifiers

J - Indicates an estimated concentration because results are either below the concentration required detection level (CRQL) or quality control criteria were not met.

U - Indicates that compound was analyzed but not detected.

UJ - Indicates that quantitation level was estimated because QC criteria were not met.

E - The reported concentration is estimated because of the presence of an interference.

UR - Indicates that the reported detection limit is unusable because QC criteria were not met.

PROJECT: NSB KINGS BAY, GEORGIA	VOLATILE AQUEOUS ANALYSES (ug/l)					Validation/Summary Table	
SAMPLE LOCATION:	KBA-5-1	KBA-5-2	KBA-5-3	KBA-5-3D	KBA-5-4	KBA-5-5	KBA-5-6
LAB NUMBER:	22727005	22727006	22727007	22727008	22727001	22725003	22725006
DATE SAMPLED:	09/12/92	09/12/92	09/12/92	09/12/92	09/12/92	09/13/92	09/13/92
DATA ANALYZED:	09/24/92	09/24/92	09/24/92	09/24/92	09/23/92	09/24/92	09/24/92
DILUTION FACTOR:	1.0	1.0	1.0	1.0	1.0	1.0	1.0
VOLATILES -- METHOD 8240							
ANALYTE	CRQL						
Chloromethane	10	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	10 U	10 U	10 U
Methylene Chloride	5	7 U	7 U	5 U	8 U	5 U	7 U
Acetone	10	10 U	10 U	10 U	10 U	10 U	10 U
Carbon Disulfide	5	5 U	5 U	5 U	5 U	5 U	5 U
Trichlorofluoromethane	5	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethene (total)	5	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	5	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethane	5	5 U	5 U	5 U	5 U	5 U	5 U
2-Butanone	10	10 U	10 U	10 U	10 U	10 U	10 U
1,1,1-Trichloroethane	5	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	5	5 U	5 U	5 U	5 U	5 U	5 U
Vinyl Acetate	10	10 U	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	5	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	5	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	5	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	5	5 U	5 U	5 U	5 U	5 U	5 U
Benzene	5	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	5	5 U	5 U	5 U	5 U	5 U	5 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	10	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	5	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	5	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	5	5 U	5 U	5 U	5 U	5 U	5 U
Styrene	5	5 U	5 U	5 U	5 U	5 U	5 U
Xylene (total)	5	5 U	5 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	5	5 U	5 U	5 U	5 U	5 U	5 U
1,4-Dichlorobenzene	5	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichlorobenzene	5	5 U	5 U	5 U	5 U	5 U	5 U

VOLATILE AQUEOUS ANALYSES (ug/l) — Validation/Summary Table

PROJECT: NSB KINGS BAY, GEORGIA								
SAMPLE LOCATION:		KBA-5-7	KBA-16-1	KBA-16-2	KBA-16-3	KBA-16-4		
LAB NUMBER:		22725007	22723001	22723004	22723005	22723006		
DATE SAMPLED:		09/13/92	09/11/92	09/11/92	09/11/92	09/11/92		
DATE ANALYZED:		09/24/92	09/18/92	09/23/92	09/23/92	09/24/92		
DILUTION FACTOR:		1.0	1.0	1.0	1.0	1.0		
VOLATILES -- METHOD 8240								
ANALYTE	CRQL							
Chloromethane	10	10 U	10 U	10 U	10 U	10 U		
Bromomethane	10	10 U	10 U	10 U	10 U	10 U		
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U		
Chloroethane	10	10 U	10 U	10 U	10 U	10 U		
Methylene Chloride	5	6 U	5 U	9 U	6 U	5 U		
Acetone	10	10 U	10 U	10 U	28 U	10 U		
Carbon Disulfide	5	5 U	5 U	5 U	5 U	5 U		
Trichlorofluoromethane	5	5 U	5 U	5 U	5 U	5 U		
1,1-Dichloroethene	5	5 U	5 U	5 U	5 U	5 U		
1,1-Dichloroethane	5	5 U	5 U	5 U	5 U	5 U		
1,2-Dichloroethene (total)	5	5 U	5 U	5 U	5 U	5 U		
Chloroform	5	5 U	5 U	5 U	5 U	5 U		
1,2-Dichloroethane	5	5 U	5 U	5 U	5 U	5 U		
2-Butanone	10	10 U	10 U	10 U	10 U	10 U		
1,1,1-Trichloroethane	5	5 U	5 U	5 U	5 U	5 U		
Carbon Tetrachloride	5	5 U	5 U	5 U	5 U	5 U		
Vinyl Acetate	10	10 U	10 U	10 U	10 U	10 U		
Bromodichloromethane	5	5 U	5 U	5 U	5 U	5 U		
1,2-Dichloropropane	5	5 U	5 U	5 U	5 U	5 U		
cis-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U	5 U		
Trichloroethene	5	5 U	5 U	5 U	5 U	5 U		
Dibromochloromethane	5	5 U	5 U	5 U	5 U	5 U		
1,1,2-Trichloroethane	5	5 U	5 U	5 U	5 U	5 U		
Benzene	5	5 U	5 U	5 U	5 U	5 U		
trans-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U	5 U		
Bromoform	10	10 U	10 U	10 U	10 U	10 U		
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U		
4-Methyl-2-Pentanone	5	5 U	5 U	5 U	5 U	5 U		
Tetrachloroethene	5	5 U	5 U	5 U	5 U	5 U		
1,1,2,2-Tetrachloroethane	5	5 U	5 U	5 U	5 U	5 U		
Toluene	5	5 U	5 U	5 U	5 U	5 U		
Chlorobenzene	5	5 U	5 U	5 U	5 U	5 U		
Ethylbenzene	5	5 U	5 U	5 U	5 U	5 U		
Styrene	5	5 U	5 U	5 U	5 U	5 U		
Xylene (total)	5	5 U	5 U	5 U	5 U	5 U		
1,3-Dichlorobenzene	5	5 U	5 U	5 U	5 U	5 U		
1,4-Dichlorobenzene	5	5 U	5 U	5 U	5 U	5 U		
1,2-Dichlorobenzene	5	5 U	5 U	5 U	5 U	5 U		

PROJECT: NSB KINGS BAY, GEORGIA	SEMIVOLATILE AQUEOUS ANALYSES (ug/l)						Validation/Summary Table	
SAMPLE LOCATION:	KBA-16-1	KBA-16-2	KBA-16-2D	KBA-16-3	KBA-16-4			
LAB NUMBER:	22723001	22723004	22723009	22723005	22723006			
DATE SAMPLED:	09/11/92	09/11/92	09/11/92	09/11/92	09/11/92			
DATE EXTRACTED:	09/14/92	09/14/92	09/14/92	09/14/92	09/14/92			
DATE ANALYZED:	10/15/92	10/15/92	10/14/92	10/15/92	10/15/92			
DILUTION FACTOR:	1.0	1.0	1.0	1.0	1.0			
SEMIVOLATILES -- METHOD 8270								
ANALYTE	CRQL							
bis (2-Chloroethyl) Ether	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
1,3- Dichlorobenzene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
1,4- Dichlorobenzene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Benzyl Alcohol	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
1,2- Dichlorobenzene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
bis (2- Chloroisopropyl) Ether	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
N-Nitroso-Di-n-Propylamine	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Hexachloroethane	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Nitrobenzene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Isophorone	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
bis (2-Chloroethoxy) Methane	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
1,2,4-Trichlorobenzene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Naphthalene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
4-Chloroaniline	10	10 UJ	1 J	10 U	10 UJ	10 UJ		
Hexachlorobutadiene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
2-Methylnaphthalene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Hexachlorocyclopentadiene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
2-Chloronaphthalene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
2-Nitroaniline	50	50 UJ	50 UJ	50 U	50 UJ	50 UJ		
Dimethylphthalate	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Acenaphthylene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
2,6-Dinitrotoluene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
3-Nitroaniline	50	50 UJ	50 UJ	50 U	50 UJ	50 UJ		
Acenaphthene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Dibenzofuran	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
2,4-Dinitrotoluene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Diethylphthalate	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
4-Chlorophenyl-phenylether	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Fluorene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
4-Nitroaniline	50	50 UJ	50 UJ	50 U	50 UJ	50 UJ		
N-Nitrosodiphenylamine	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
4-Bromophenyl-phenylether	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Hexachlorobenzene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Phenanthrene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Anthracene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Di-n-Butylphthalate	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Fluoranthene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Pyrene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Butylbenzylphthalate	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
3,3'-Dichlorobenzidine	20	20 UJ	20 UJ	20 U	20 UJ	20 UJ		
Benzo (a) Anthracene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Chrysene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
bis (2-Ethylhexyl) Phthalate	10	10 UJ	10 UJ	1 J	10 UJ	10 UJ		
Di-n-Octyl Phthalate	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Benzo (b) Fluoranthene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Benzo (k) Fluoranthene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Benzo (a) Pyrene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Indeno (1,2,3-cd) Pyrene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Dibenz (a,h) Anthracene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		
Benzo (g,h,i) Perylene	10	10 UJ	10 UJ	10 U	10 UJ	10 UJ		

PCB AQUEOUS ANALYSES (ug/l) — Validation/Summary Table

PROJECT: NSB KINGS BAY, GEORGIA							
SAMPLE LOCATION:	KBA-5-1	KBA-5-2	KBA-5-3	KBA-5-3D	KBA-5-4	KBA-5-5	KBA-5-6
LAB NUMBER:	22727005	22727006	22727007	22727008	22727001	22725003	22725006
DATE SAMPLED:	09/12/92	09/12/92	09/12/92	09/12/92	09/12/92	09/13/92	09/13/92
DATE EXTRACTED:	09/14/92	09/14/92	09/14/92	09/14/92	09/14/92	09/15/92	09/15/92
DATE ANALYZED:	10/03/92	10/03/92	10/03/92	10/04/92	10/03/92	10/03/92	10/03/92
DILUTION:	1.0	1.0	1.0	1.0	1.0	1.0	1.0
POLYCHLORINATED BIPHENYLS (PCBs) -- METHOD 8080							
ANALYTE	CRQL						
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Arolcor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

PCB AQUEOUS ANALYSES (ug/l) — Validation/Summary Table

PROJECT: NSB KINGS BAY, GEORGIA							
SAMPLE LOCATION:	KBA-5-7						
LAB NUMBER:	22725007						
DATE SAMPLED:	09/13/92						
DATE EXTRACTED:	09/15/92						
DATE ANALYZED:	10/04/92						
DILUTION:	1.0						
POLYCHLORINATED BIPHENYLS (PCBs) -- METHOD 8080							
ANALYTE	CRQL						
Aroclor-1016	0.50	1.0 U					
Aroclor-1221	0.50	2.0 U					
Aroclor-1232	0.50	1.0 U					
Aroclor-1242	0.50	1.0 U					
Aroclor-1248	1.0	1.0 U					
Aroclor-1254	1.0	1.0 U					
Arolcor-1260							

PROJECT: NSB KINGS BAY, GEORGIA

INORGANIC AQUEOUS ANALYSES (ug/l)

Validation/Summary Table

SAMPLE LOCATION:		KBA-5-1	KBA-5-1F	KBA-5-2	KBA-5-2F	KBA-5-3	KBA-5-3D	KBA-5-3F
LAB NUMBER:		22727005	22727010	22727006	22727011	22727007	22727008	22727009
DATE SAMPLED:		09/12/92	09/12/92	09/12/92	09/12/92	09/12/92	09/12/92	09/12/92
ANALYTE	CRQL							
Antimony	60	12.4 U	12.4 U	12.4 U	12.4 U	12.4 U	12.4 U	12.4 U
Arsenic	10	5.5 J	1.0 J	5.3 J	3.3 J	10.4	7.6 J	1.7 J
Barium	200	146 J	64.2 U	124 J	109 U	124 J	119 J	49.6 U
Beryllium	5	0.76 J	0.31 U	0.89 J	0.74 U	1.0 J	0.66 J	0.24 U
Cadmium	5	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U
Chromium	10	16.8	2.0 J	4.3 J	2.7 J	24.6	17.2	1.9 U
Cobalt	50	5.5 J	2.1 U	6.8 J	6.6 U	7.2 J	4.8 J	1.6 U
Copper	25	17.6 J	4.8 J	7.4 J	10.1 J	14.9 J	18.7 J	5.0 J
Lead	5	5.3 J	1.4 UJ	2.4 J	7.2 J	5.2 J	4.7 J	3.1 J
Mercury	0.2	0.49	0.37	0.49	0.03 J	0.37	0.26	0.61
Nickel	40	18.1 U	10.7 U	13.0 U	14.8 U	20.4 U	15.1 U	10.7 U
Selenium	5	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ
Silver	10	1.6 J	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Thallium	10	1.6 UJ	1.6 UJ	1.6 UJ	1.6 UJ	1.6 UJ	1.6 UJ	1.6 UJ
Vanadium	50	17.6 J	2.5 U	7.8 U	4.4 U	23.1 J	15.7 J	1.3 U
Zinc	20	50.2 J	14.6 J	78.1 J	89.4 J	54.5 J	48.4 J	12.4 J
Cyanide	10	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
Tin	200	26.4 U	26.4 U	26.4 U	26.4U	26.4 U	26.4 U	26.4 U
Sulfide	100	100	100	300	300	200	200	100 U
Total Dissolved Solids (mg/L)		225	---	290	---	214	254	---
Total Suspended Solids (mg/L)		290	---	24	---	303	234	---

PROJECT: NSB KINGS BAY, GEORGIA

INORGANIC AQUEOUS ANALYSES (ug/l)

Validation/Summary Table

SAMPLE LOCATION:		KBA-5-4	KBA-5-4F	KBA-5-5	KBA-5-5D	KBA-5-5F	KBA-5-6	KBA-5-6F
LAB NUMBER:		22727001	22727002	22725003	22725004	22725005	22725006	22725011
DATE SAMPLED:		09/12/92	09/12/92	09/13/92	09/13/92	09/13/92	09/13/92	09/13/92
ANALYTE	CRQL							
Antimony	60	12.4 U	12.4 U	17.0 J	12.4 U	12.4 U	12.4 U	12.4 U
Arsenic	10	3.9 J	1.0 U	9.9 J	2.3 J	2.3 J	7.5 J	1.5 J
Barium	200	53.4 J	36.6 U	93.6 J	28.4 U	29.4 U	180 J	28.7 U
Beryllium	5	0.24 U	0.26 U	0.72 J	0.27 U	0.24 U	1.6 J	0.24 U
Cadmium	5	4.1 J	2.7 U	2.7 U	2.7 U	2.7 U	4.3 J	2.7 U
Chromium	10	5.6 J	1.9 U	21.6	4.2 J	1.9 U	44.5	2.0 J
Cobalt	50	5.6 J	5.4 U	6.4 J	1.6 U	1.6 U	11.0 J	3.2 U
Copper	25	4.5 J	6.8 J	14.5 J	1.8 U	1.8 U	29.2	1.8 U
Lead	5	2.4 J	3.2 J	9.6	1.6 U	2.2 U	14.5	1.8 U
Mercury	0.2	0.37	0.49	0.26 U	0.14 U	0.14 U	0.42 U	0.26 U
Nickel	40	15.1 U	10.7 U	10.8 J	10.7 U	10.7 U	25.1 J	10.7 U
Selenium	5	2.1 UJ	2.1 UJ	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U
Silver	10	1.6 J	2.7 J	1.5 U	1.5 U	1.5 U	4.5 J	1.6 J
Thallium	10	1.6 UJ	1.6 UJ	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U
Vanadium	50	5.9 U	3.8 U	18.8 J	1.3 U	1.3 U	32.7 J	1.3 U
Zinc	20	39.9 J	33.2 J	45.2	12.7 J	14.4 J	66.9	16.4 J
Cyanide	10	7.4 J	2.2 U	2.2 UJ	2.2 UJ	3.8 J	3.6 J	2.2 UJ
Tin	200	26.4 U	26.4 U	26.4 U	26.4 U	26.4 U	26.4 U	26.4 U
Sulfide	100	200	100 U	200	100 U	100 U	200	200
Total Dissolved Solids (mg/L)		763	---	102	---	---	122	---
Total Suspended Solids (mg/L)		84	---	303	---	---	572	---

INORGANIC AQUEOUS ANALYSES (ug/l) — Validation/Summary Table

PROJECT: NSB KINGS BAY, GEORGIA							
SAMPLE LOCATION:		KBA-5-7	KBA-5-7F	KBA-16-1	KBA-16-1F	KBA-16-2	KBA-16-2F	KBA-16-3
LAB NUMBER:		22725007	22725012	22723001	22723002	22723004	22723008	22723005
DATE SAMPLED:		09/13/92	09/13/92	09/11/92	09/11/92	09/11/92	09/11/92	09/11/92
ANALYTE	CRQL							
Antimony	60	12.4 U	12.4 U	12.4 U	12.4 U	12.4 U	12.4 U	12.4 U
Arsenic	10	8.3 J	2.3 J	12.1	2.4 J	23.4	5.1 J	63.2
Barium	200	82.1 J	38.3 U	82.8 J	15.1 U	83.6 J	17.4 U	538
Beryllium	5	0.68 J	0.24 U	1.4 J	0.24 U	1.1 J	0.24 U	15.9
Cadmium	5	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U
Chromium	10	15.7	5.3 J	38.6	1.9 U	41.6	3.5 J	205
Cobalt	50	3.2 J	1.6 U	6.7 J	1.6 U	12.0 J	1.6 U	39.0 J
Copper	25	4.7 J	1.8 U	53.4	1.8 U	5.9 J	1.8 U	35.4
Lead	5	7.6	1.0 U	16.9	1.5 U	17.6	1.6 U	40.5
Mercury	0.2	0.38 U	0.14 U	0.34 U	0.30 U	0.34 U	0.14 U	0.80
Nickel	40	10.7 U	10.7 U	20.2 J	10.7 U	30.6 J	10.7 U	66.2
Selenium	5	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U
Silver	10	3.0 J	1.5 U	3.6 J	1.5 U	1.5 U	1.5 U	1.5 U
Thallium	10	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U
Vanadium	50	13.0 J	1.3 U	51.2	1.9 U	44.1 J	2.2 U	199
Zinc	20	28.8	10.0 J	39.3	10.0 J	61.0	7.6 U	210
Cyanide	10	2.2 UJ	2.2 UJ	2.2 UJ	3.7 J	2.2 UJ	4.0 J	2.2 UJ
Tin	200	26.4 U	26.4 U	26.4 U	26.4 U	26.4 U	26.4 U	26.4 U
Sulfide	100	300	100 U	200	100 U	200	300	300
Total Dissolved Solids (mg/L)		212	---	419	---	389	---	630
Total Suspended Solids (mg/L)		167	---	450	---	715	---	4520

INORGANIC AQUEOUS ANALYSES (ug/l) — Validation/Summary Table

PROJECT: NSB KINGS BAY, GEORGIA							
SAMPLE LOCATION:		KBA-16-3F	KBA-16-4	KBA-16-4F			
LAB NUMBER:		22723010	22723006	22723011			
DATE SAMPLED:		09/11/92	09/11/92	09/11/92			
ANALYTE	CRQL						
Antimony	60	12.4 U	12.4 U	12.4 U			
Arsenic	10	4.2 J	5.4 J	1.0 U			
Barium	200	1.4 U	109 J	26.8 U			
Beryllium	5	0.24 U	2.0 J	0.24 U			
Cadmium	5	2.7 U	2.7 U	2.7 U			
Chromium	10	1.9 U	46.5	6.2 J			
Cobalt	50	1.6 U	5.0 J	1.6 U			
Copper	25	1.8 U	32.5	2.4 J			
Lead	5	0.71 U	13.4	1.1 U			
Mercury	0.2	0.14 U	0.42 U	0.14 U			
Nickel	40	10.7 U	30.2 J	12.5 J			
Selenium	5	2.1 U	2.1 U	2.1 U			
Silver	10	1.5 U	1.9 J	1.5 J			
Thallium	10	1.6 U	1.6 U	1.6 U			
Vanadium	50	1.3 U	40.0 J	7.4 U			
Zinc	20	22.9	42.5	8.6 J			
Cyanide	10	2.2 UJ	11.0 UJ	11.0 UJ			
Tin	200	26.4 U	26.4 U	26.4 U			
Sulfide	100	100 U	500	500			
Total Dissolved Solids (mg/L)		---	623	---			
Total Suspended Solids (mg/L)		---	580	---			

TRIP BLANKS
SOURCE WATER BLANKS
SAMPLE EVENT NO. 4
SEPTEMBER 1992

PROJECT: NSB KINGS BAY, GEORGIA	VOLATILE AQUEOUS ANALYSES (ug/l)					Validation/Summary Table	
SAMPLE LOCATION:	BT-25-FB	BT-26-FB	BT-27-FB	BS-24-ER	BS-25-ER	BS-26-ER	BS-10-FB
LAB NUMBER:	22723003	22727004	22725001	22723007	22727003	22725002	22725008
DATE SAMPLED:	09/11/92	09/12/92	09/13/92	09/11/92	09/12/92	09/13/92	09/13/92
DATE ANALYZED:	09/24/92	09/23/92	09/24/92	09/18/92	09/23/92	09/24/92	09/24/92
DILUTION FACTOR:	1.0	1.0	1.0	1.0	1.0	1.0	1.0
VOLATILES -- METHOD 8240							
ANALYTE	CRQL						
Chloromethane	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl Chloride	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	10	10 U	10 U	10 U	4 J	11 U	5 U	5 U
Methylene Chloride	5	5 U	8	9 U	10 U	10 U	6 J	6 J
Acetone	10	9 J	8 J	10 U	10 U	5 U	5 U	5 U
Carbon Disulfide	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichlorofluoromethane	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethene	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1-Dichloroethane	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloroethene (total)	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chloroform	5	1 J	1 J	1 J	5 U	5 U	5 U	5 U
1,2-Dichloroethane	5	5 U	5 U	5 U	5 U	10 U	10 U	10 U
2-Butanone	10	10 U	10 U	10 U	10 U	5 U	5 U	5 U
1,1,1-Trichloroethane	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Carbon Tetrachloride	5	5 U	5 U	5 U	5 U	10 U	10 U	10 U
Vinyl Acetate	10	10 U	10 U	10 U	10 U	5 U	5 U	5 U
Bromodichloromethane	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichloropropane	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
cis-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Trichloroethene	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Dibromochloromethane	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-Trichloroethane	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Benzene	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
trans-1,3-Dichloropropene	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Bromoform	5	5 U	5 U	5 U	10 U	10 U	10 U	10 U
2-Hexanone	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-Pentanone	10	10 U	10 U	10 U	5 U	5 U	5 U	5 U
Tetrachloroethene	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-Tetrachloroethane	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Toluene	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chlorobenzene	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Ethylbenzene	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Styrene	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylene (total)	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,3-Dichlorobenzene	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-Dichlorobenzene	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichlorobenzene	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U

PROJECT: NSB KINGS BAY, GEORGIA		VOLATILE AQUEOUS ANALYSES (ug/l)						
SAMPLE LOCATION:		BS-12-FB						
LAB NUMBER:		22725009						
DATE SAMPLED:		09/13/92						
DATE ANALYZED:		09/24/92						
DILUTION FACTOR:		1.0						
VOLATILES -- METHOD 8240								
ANALYTE	CRQL							
Chloromethane	10	10 U						
Bromomethane	10	10 U						
Vinyl Chloride	10	10 U						
Chloroethane	10	10 U						
Methylene Chloride	5	5 U						
Acetone	10	7 J						
Carbon Disulfide	5	5 U						
Trichlorofluoromethane	5	5 U						
1,1-Dichloroethene	5	5 U						
1,1-Dichloroethane	5	5 U						
1,2-Dichloroethene (total)	5	5 U						
Chloroform	5	5 U						
1,2-Dichloroethane	5	5 U						
2-Butanone	10	10 U						
1,1,1-Trichloroethane	5	5 U						
Carbon Tetrachloride	5	5 U						
Vinyl Acetate	10	10 U						
Bromodichloromethane	5	5 U						
1,2-Dichloropropane	5	5 U						
cis-1,3-Dichloropropene	5	5 U						
Trichloroethene	5	5 U						
Dibromochloromethane	5	5 U						
1,1,2-Trichloroethane	5	5 U						
Benzene	5	5 U						
trans-1,3-Dichloropropene	5	5 U						
Bromoform	5	5 U						
2-Hexanone	10	10 U						
4-Methyl-2-Pentanone	10	10 U						
Tetrachloroethene	5	5 U						
1,1,2,2-Tetrachloroethane	5	5 U						
Toluene	5	5 U						
Chlorobenzene	5	5 U						
Ethylbenzene	5	5 U						
Styrene	5	5 U						
Xylene (total)	5	5 U						
1,3-Dichlorobenzene	5	5 U						
1,4-Dichlorobenzene	5	5 U						
1,2-Dichlorobenzene	5	5 U						

Validation/Summary Table

PROJECT: NSB KINGS BAY, GEORGIA

SEMIVOLATILE AQUEOUS ANALYSES (ug/l)

SAMPLE LOCATION:	BS-24-ER	BS-10-FB	BS-12-FB
LAB NUMBER:	22723007	22725008	22725009
DATE SAMPLED:	09/11/92	09/13/92	09/13/92
DATE EXTRACTED:	09/14/92	09/14/92	09/14/92
DATE ANALYZED:	10/14/92	10/14/92	10/14/92
DILUTION FACTOR:	1.0	1.0	1.0

SEMIVOLATILES -- METHOD 8270 ANALYTE	CRQL			
bis (2-Chloroethyl) Ether	10	10 U	10 U	10 U
1,3- Dichlorobenzene	10	10 U	10 U	10 U
1,4- Dichlorobenzene	10	10 U	10 U	10 U
Benzyl Alcohol	10	10 U	10 U	10 U
1,2- Dichlorobenzene	10	10 U	10 U	10 U
bis (2- Chloroisopropyl) Ether	10	10 U	10 U	10 U
N-Nitroso-Di-n-Propylamine	10	10 U	10 U	10 U
Hexachloroethane	10	10 U	10 U	10 U
Nitrobenzene	10	10 U	10 U	10 U
Isophorone	10	10 U	10 U	10 U
bis (2-Chloroethoxy) Methane	10	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10	10 U	10 U	10 U
Naphthalene	10	10 U	10 U	10 U
4-Chloroaniline	10	10 U	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U	10 U
2-Chloronaphthalene	50	50 U	50 U	50 U
2-Nitroaniline	10	10 U	10 U	10 U
Dimethylphthalate	10	10 U	10 U	10 U
Acenaphthylene	10	10 U	10 U	10 U
2,6-Dinitrotoluene	50	50 U	50 U	50 U
3-Nitroaniline	10	10 U	10 U	10 U
Acenaphthene	10	10 U	10 U	10 U
Dibenzofuran	10	10 U	10 U	10 U
2,4-Dinitrotoluene	10	10 U	10 U	10 U
Diethylphthalate	10	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10	10 U	10 U	10 U
Fluorene	50	50 U	50 U	50 U
4-Nitroaniline	10	10 U	10 U	10 U
N-Nitrosodiphenylamine	10	10 U	10 U	10 U
4-Bromophenyl-phenylether	10	10 U	10 U	10 U
Hexachlorobenzene	10	10 U	10 U	10 U
Phenanthrene	10	10 U	10 U	10 U
Anthracene	10	10 U	10 U	10 U
Di-n-Butylphthalate	10	10 U	10 U	10 U
Fluoranthene	10	10 U	10 U	10 U
Pyrene	10	10 U	10 U	10 U
Butylbenzylphthalate	20	20 U	20 U	20 U
3,3'-Dichlorobenzidine	10	10 U	10 U	10 U
Benzo (a) Anthracene	10	10 U	10 U	10 U
Chrysene	10	10 U	10 U	10 U
bis (2-Ethylhexyl) Phthalate	10	10 U	10 U	10 U
Di-n-Octyl Phthalate	10	10 U	10 U	10 U
Benzo (b) Fluoranthene	10	10 U	10 U	10 U
Benzo (k) Fluoranthene	10	10 U	10 U	10 U
Benzo (a) Pyrene	10	10 U	10 U	10 U
Indeno (1,2,3-cd) Pyrene	10	10 U	10 U	10 U
Dibenz[a,h]anthracene	10	10 U	10 U	10 U
Benzo (g,h,i) Perylene				

PROJECT: NSB KINGS BAY, GEORGIA		PCB AQUEOUS ANALYSES (ug/l)					Validation/Summary Table	
SAMPLE LOCATION:		BS-25-ER	BS-26-ER	BS-10-FB	BS-12-FB			
LAB NUMBER:		22727003	22725002	22725008	22725009			
DATE SAMPLED:		09/12/92	09/13/92	09/13/92	09/13/92			
DATE EXTRACTED:		09/14/92	09/15/92	09/15/92	09/15/92			
DATE ANALYZED:		10/03/92	10/03/92	10/03/92	10/03/92			
DILUTION:		1.0	1.0	1.0	1.0			
POLYCHLORINATED BIPHENYLS (PCBs) -- METHOD 8080								
ANALYTE	CRQL							
Aroclor-1016	1.0	1.0 U	1.0 U	1.0 U	1.0 U			
Aroclor-1221	2.0	2.0 U	2.0 U	2.0 U	2.0 U			
Aroclor-1232	1.0	1.0 U	1.0 U	1.0 U	1.0 U			
Aroclor-1242	1.0	1.0 U	1.0 U	1.0 U	1.0 U			
Aroclor-1248	1.0	1.0 U	1.0 U	1.0 U	1.0 U			
Aroclor-1254	1.0	1.0 U	1.0 U	1.0 U	1.0 U			
Arolcor-1260	1.0	1.0 U	1.0 U	1.0 U	1.0 U			

PROJECT: NSB KINGS BAY, GEORGIA

INORGANIC AQUEOUS ANALYSES (ug/l)

Validation/Summary Table

SAMPLE LOCATION:		BS-24-ER	BS-25-ER	BS-26-ER	BS-10-FB	BS-11-FB	BS-12-FB
LAB NUMBER:		22723007	22727003	22725002	22725008	22725010	22725009
DATE SAMPLED:		09/11/92	09/12/92	09/13/92	09/13/92	09/13/92	09/13/92
ANALYTE	CRQL						
Antimony	60	22.6 J	12.4 U	12.4 U	12.4 U	12.4 U	12.4 U
Arsenic	10	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Barium	200	4.5 J	0.63 J	0.81 U	1.1 U	38.9 J	1.2 U
Beryllium	5	0.24 U	0.24 U	0.24 U	0.24 U	0.47 J	0.24 U
Cadmium	5	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U
Chromium	10	5.9 U	1.9 U	4.4 U	2.8 J	3.5 J	3.9 J
Cobalt	50	1.6 U	1.6 U	1.6 U	1.6 U	3.2 J	1.6 U
Copper	25	1.8 U	4.2 J	1.8 U	1.8 U	1.8 U	6.2 J
Lead	5	1.5 U	1.4 UJ	1.2 U	0.91 U	2.1 U	1.3 U
Mercury	0.2	0.14 U	0.03 U	0.14 U	0.22 U	0.03 U	0.18 U
Nickel	40	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U
Selenium	5	2.1 U	2.1 UJ	2.1 U	2.1 U	2.1 U	2.1 U
Silver	10	1.5 U	1.6 J	1.5 U	1.5 U	1.5 U	1.8 J
Thallium	10	1.6 U	1.6 UJ	1.6 U	1.6 U	1.6 U	1.6 U
Vanadium	50	1.3 U	1.3 U	1.3 U	1.3 U	6.3 J	1.3 J
Zinc	20	7.6 U	7.6 U	7.6 U	7.7 J	16.0 J	8.4 J
Cyanide	10	2.2 UJ	2.2 U	2.2 UJ	2.2 UJ	2.2 UJ	2.2 UJ
Tin	200	7420	26.4 U	26.4 U	26.4 U	26.4 U	26.4 U
Sulfide	100	100 U	100 U	100 U	100 U	100 U	100 U
Total Dissolved Solids (mg/L)		10 U	10 U	10 U	10 U	---	10 U
Total Suspended Solids (mg/L)		4 U	4 U	4 U	4 U	---	4 U

APPENDIX B
ANALYTICAL DATA FOR GROUNDWATER
SAMPLE EVENT NOs. 1, 2, AND 3
FEBRUARY 1992
MAY 1992
JULY 1992

Table B-1
Groundwater Sampling Event No. 1
Summary of Laboratory Analysis of Groundwater
Samples Collected from Site 5' - February 1992

RFI/SI Technical Memorandum No. 3
NSB Kings Bay

Compounds Detected	Monitoring Well Number								
	CRQL	KBA-5-1	KBA-5-2	KBA-5-3	KBA-5-4	KBA-5-4D	KBA-5-5	KBA-5-6	KBA-5-7
APPENDIX IX VOCs (µg/L)									
Acetone	10	72	12 U	10 U	10 U	12 U	12 U	14 U	10 U
Carbon Disulfide[2]	5	2 J	1 J	2 J	5 U	5 U	1 J	5 U	5 U
Trichlorofluoromethane	5	5 U	5 U	5 U	5 U	5 U	5 U	7	5 U
4-Methyl-2-Pentanone[2]	10	10 U	3 J	10 U	10 U	10 U	3 J	10 U	10 U
Ethylbenzene[2]	5	5 U	5 U	5 U	5 U	5 U	1 J	5 U	5 U
Xylene (total)[2]	5	5 U	4 J	5 U	5 U	5 U	6	5 U	5 U
APPENDIX IX Inorganics (µg/L)									
Antimony[2]	60	10.9 U	10.9 U	10.9 U	14.0 J	10.9 U	10.9 U	11.3 J	16.8 J
Arsenic	10	36.5	27.9	22.5	15.9	18.0	33.2	14.9	76.9
Barium[2]	200	742	459	161 J	601	588	332	640	748
Beryllium[2]	5	4.2 J	2.7 J	0.92 J	3.1 J	2.9 J	3.0 J	5.1	6.1
Cadmium[2]	5	2.9 U	2.9 U	2.9 U	2.9 U	3.7 J	2.9 U	25.4	25.9
Chromium	10	134	95.7	29.5	103	101	102	152	228
Cobalt[2]	50	36.4 J	21.3 J	11.8 J	28.5 J	29.1 J	29.2 J	30.4 J	48.4 J
Copper	25	37.8	51.5	77.6	31.7	36.9	77.4	63.3	73.4

Table B-1
Groundwater Sampling Event No. 1
Summary of Laboratory Analysis of Groundwater
Samples Collected from Site 5[1] - February 1992

RFI/SI Technical Memorandum No. 3
NSB Kings Bay

Lead	5	30.2	23.2	7.2	22.0	25.2	23.0	32.0	43.0
Mercury	0.2	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.40	0.16 U
Nickel[3]	40	49.0	50.3	79.8	40.2 J	42.7 J	77.2	59.8	84.4
Selenium[2]	5	1.3 U	1.4 J	1.3 U	2.0 J	1.6 J	2.2 J	1.3 U	1.7 J
Thallium[2]	10	1.4 U	1.4 U	1.4 U	1.6 J	1.5 J	1.6 J	1.6 J	2.2 J
Tin	208	208 U	208 U	208 U	232	208 U	208 U	208 U	208 U
Vanadium[2]	50	117	80.6	24.4 J	84.7	82.6	81.8	138	183
Zinc[4]	20	168 J	322 J	100 J	153 J	177 J	200 J	235 J	260 J
Cyanide[2]	10	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.9 J	5.6 J
Sulfide	100	300	300	200	300	400	200	2100	300

Notes:
CRQL = Contract Required Quantitation Limit
U = not detected above or below CRQL

[1] No Appendix IX SVOCs, pesticides, PCBs, herbicides, dioxins, or furans were detected in groundwater samples.

Data Qualifiers

[2] Values flagged J as estimated because concentrations are less than the CRQL.
[3] Values flagged J as estimated because preparation blank exhibited negative bias for nickel.
[4] Values flagged J as estimated because the duplicate analysis for zinc was outside QC limits.

Table B-2
Groundwater Sampling Event No. 1
Summary of Laboratory Analysis of Groundwater
Samples Collected from Site 16[1] - February 1992

RFI/SI Technical Memorandum No. 2
NSB Kings Bay

Compounds Detected	Monitoring Well Number				
	CRQL	KBA-16-1	KBA-16-2	KBA-16-3	KBA-16-4
APPENDIX IX VOCs (µg/L)					
4-Methyl-2-Pentanone[2]	10	10 U	3 J	10 U	10 U
Ethylbenzene[2]	5	5 U	2 J	5 U	5 U
Xylene (total)[2]	5	5 U	3 J	5 U	5 U
APPENDIX IX Inorganics (µg/L)					
Antimony[2]	60	18.5 J	13.3 J	11.4 J	10.9 U
Arsenic[2]	10	29.9	19.3	25.8	4.9 J
Barium[2]	200	171 J	478	519	386
Beryllium[2]	5	2.5 J	6.2	13.1	2.4 J
Chromium	10	84.6	256	194	34.0
Cobalt[2]	50	11.6 J	74.4	29.1 J	3.6 U
Lead	5	14.8 J	36.3 J	19.9 J	12.0 J
Mercury	0.2	0.16 U	0.60	0.82	0.16 U
Nickel	40	27.0 J	132	54.7	10.5 U
Selenium	5	3.2 J	8.0	1.3 U	2.3 J
Thallium	10	17.3 J	1.9 J	1.7 UJ	1.7 U
Vanadium	50	119	257	175	29.8 J
Zinc	20	50.0 U	297	182	43.6 U
Cyanide	10	3.4 J	2.6 J	1.9 J	1.8 U
Sulfide	100	400	1800	200	300

Notes:
CRQL = Contract Required Quantitation Limit U = not detected above or below CRQL

[1] No Appendix IX semivolatile compounds, pesticides, PCBs, herbicides, or dioxins/furans were detected in groundwat samples.

Data Qualifiers
[2] Value(s) flagged J as estimated because concentrations are less than the CRQL.
[3] Values flagged J as estimated because matrix spike recovery for lead was below QC limits.

'able B-3 Summary of Laboratory Analysis of Groundwater Samples Collected from Site 5[1] - **May 1992**

Compounds Detected	CRQL	Monitoring Well Number							
		KBA-5-1	KBA-5-2	KBA-5-3	KBA-5-4	KBA-5-5	KBA-5-5D	KBA-5-6	KBA-5-7
APPENDIX IX SVOCs (µg/l)									
Bis(2-Ethylhexyl)-Phthalate[2]	10	10 U	2 J	10 U	10 U	18	10 U	10 U	10 U
APPENDIX IX Inorganics (µg/l)									
Arsenic[3]	10	10.5 J	20.0 J	28.5	12.5	22.5 J	24.0 J	3.2 J	14.0 J
Barium[2]	200	417	181 J	366	274	187 J	187 J	208	203
Beryllium[2]	5	3.4 J	1.4 J	2.9 J	2.3 J	2.6 J	2.3 J	2.0 J	2.0 J
Cadmium[2,4]	5	1.3 J	1.0 UJ	2.2 J	1.8 J	1.3 J	3.1 J	7.5 J	5.5 J
Chromium	10	56.8	24.7	59.5	31.4	30.8	30.2	34.7	35.2
Cobalt[2]	50	16.8 J	7.8 U	14.1 J	7.8 U	14.7 J	13.0 J	7.8 U	7.8 U
Copper[2]	25	14.6 J	10.9 J	22.2 J	10.3 J	9.6 J	9.8 J	10.7 J	14.8 J
Lead	5	13.1	10.0	18.0	14.0	17.8	16.9	11.3	12.7
Nickel[2,4]	40	24.3 J	7.8 U	21.3 J	8.2 J	24.3 J	24.7 J	9.4 J	19.7 J
Selenium[2,3]	5	3.2 J	2.3 J	6.3	2.9 J	3.3 J	2.5 J	2.7 J	2.9 J
Thallium[2]	10	1.0 J	0.80 U	1.1 J	1.1 J	1.1 J	1.3 J	0.80 U	0.80 U
Vanadium[2,4]	50	63.5	21.4 J	52.3	31.5 J	42.1 J	37.6 J	34.6 J	34.3 J
Zinc	20	62.0	130	76.1	41.0	62.9	62.2	44.0	45.3

See notes at end of table.

Table B-3 Summary of Laboratory Analysis of Groundwater Samples Collected from Site 5[1] - **May 1992**

Compounds Detected	Monitoring Well Number								
	CRQL	KBA-5-1	KBA-5-2	KBA-5-3	KBA-5-4	KBA-5-5	KBA-5-5D	KBA-5-6	KBA-5-7
Cyanide[2]	10	1.8 U	1.8 U	1.8 U	7.8 J	1.8 U	1.8 U	10.3	5.7 J
Sulfide	100	1800	100 U	400	500	1200	3100	500	400

Notes:
CRQL = Contract Required Quantitation Limit
U = not detected above or below CRQL

[1] No Appendix IX VOCs, pesticides, PCBs, herbicides, dioxins, or furans were detected in groundwater samples.

Data Qualifiers

[2] Values flagged J as estimated because concentrations are less than the CRQL.
[3] Quantitation limits flagged UJ as estimated and values flagged J as estimated due to low matrix spike recovery for arsenic and selenium.
[4] Values flagged J as estimated because the preparation blank exhibited negative bias for cadmium, nickel, and vanadium.

Table B-4
Summary of Laboratory Analysis of Groundwater
Samples Collected from Site 16[1] - May 1992

RFI/SI Technical Memorandum No. 3
NSB Kings Bay

Compounds Detected	Monitoring Well Number				
	CRQL	KBA-16-1	KBA-16-2	KBA-16-3	KBA-16-4
APPENDIX IX SVOCs (µg/L)					
Di-n-Butylphthalate[2]	10	10 U	10 U	2 J	10 U
bis(2-Ethylhexyl) Phthalate	10	10 U	28	75	10 U
APPENDIX IX Inorganics (µg/L)					
Antimony[2]	60	11.0 U	11.0 U	11.0 U	11.3 J
Arsenic[2,3]	10	8.5 J	19.5	10.2 J	1.5 J
Barium[2]	200	70.8 J	82.2 J	119 J	37.1 J
Beryllium[2]	5	1.1 J	1.7 J	4.7 J	0.80 U
Cadmium[2,4]	5	1.5 J	1.6 J	1.0 UJ	1.0 UJ
Chromium	10	32.0	28.1	20.7	3.3 U
Cobalt[2]	50	7.8 U	9.1 J	7.8 U	7.8 U
Copper[2]	25	9.2 J	3.8 J	5.5 J	4.2 J
Lead[2]	5	7.6	11.5	4.3 J	2.5 U
Nickel[4,5]	40	7.8 UJ	19.4 J	7.8 U	7.8 U
Selenium[2]	5	10.6	1.6 J	1.1 J	0.88 J
Silver[2]	10	1.4 J	1.4 U	1.4 U	1.4 U
Thallium[2]	10	0.90 J	0.80 U	0.80 U	0.80 U
Vanadium[2]	50	44.4 J	48.0 J	33.6 J	12.0 J
Zinc	20	15.1 U	65.7	56.2	10.8 U
Cyanide[2]	10	8.4 J	8.5 J	1.8 U	18.5
Sulfide	100	100 U	2400	1400	200

Notes:
CRQL = Contract Required Quantitation Limit U = not detected above or below CRQL

[1] No Appendix IX VOCs, pesticides, PCBs, herbicides, or dioxins/furans were detected in groundwater samples.
Data Qualifiers
[2] Value(s) flagged J as estimated because concentrations are less than the CRQL.
[3] Values flagged J as estimated because matrix spike recovery for arsenic was below QC limits.
[4] Quantitation limits flagged UJ as estimated because the preparation blank exhibited negative bias for cadmium and nickel.
[5] Values flagged J as estimated because the preparation blank exhibited negative bias for and nickel

ble B-5 Summary of Laboratory Analysis of Groundwater Samples Collected from Site 5[1] - **July 1992**

Compounds Detected		CRQL	Monitoring Well Number KBA-5-1	KBA-5-2	KBA-5-3	KBA-5-3D	KBA-5-4	KBA-5-5	KBA-5-5D	KBA-5-6	KBA-5-7
APPENDIX IX Inorganics (µg/l)											
Arsenic[2]	non-filtered	10	5.1 J	21.4	6.7 J	5.8 J	5.9 J	37.0	---	6.3 J	135
	filtered		1.6 J	18.4	2.8 J	---	5.2 J	2.6 J	8.3 J	3.0 J	2.7 J
Barium[2]	non-filtered	200	132 J	115 J	92.8 J	82.6 J	132 J	207	---	131 J	1080
	filtered		62.2 J	15.9 U	46.1 J	---	23.2 U	51.8 J	22.9 U	30.3 J	32.0 J
Beryllium[2,3]	non-filtered	5	0.48 J	0.41 J	0.20 U	0.26 J	0.41 J	1.7 J	---	0.56 J	8.2
	filtered		0.20 U	0.20 U	0.20 U	---	0.24 UJ	0.24 UJ	0.24 UJ	0.24 UJ	0.24 UJ
Cadmium[2]	non-filtered	5	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	2.7 U	---	2.7 U	27.4
	filtered		3.1 J	2.7 U	2.7 U	---	2.7 U	2.7 U	2.7 U	3.0 J	2.7 U
Chromium[2,3]	non-filtered	10	13.0 J	21.2 J	13.5 J	12.9 J	18.4	46.4	---	23.0	271
	filtered		1.9 UJ	4.2 J	1.9 UJ	---	1.9 U	1.9 U	1.9 U	1.9 J	1.9 U
Cobalt[2,3]	non-filtered	50	4.8 J	4.0 J	3.3 J	1.6 U	1.6 UJ	10.8 J	---	1.6 UJ	62.6 J
	filtered		2.1 J	3.5 J	2.5 J	---	1.6 UJ	1.6 UJ	1.6 UJ	1.6 UJ	1.6 UJ
Copper[2,4]	non-filtered	25	26.2 J	37.3 J	61.8 J	89.9 J	76.5	38.2	---	19.1 J	249
	filtered		6.3 UJ	15.1 J	6.5 UJ	---	2.7 J	1.8 J	13.1 J	19.1 J	19.1 J
Lead[2,5]	non-filtered	5	9.1 J	10.0 J	6.1 J	14.7 J	7.0 U	36.9	---	10.7 U	68.9
	filtered		4.0 J	2.0 J	0.96 J	---	2.1 U	1.8 U	5.4 U	1.8 U	1.8 U
Mercury	non-filtered	0.2	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.27	---	0.16 U	0.41
	filtered		0.16 U	0.16 U	0.16 U	---	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Nickel[2]	non-filtered	40	15.4 J	10.7 U	109	30.2 J	42.6	56.9	---	25.0 J	128
	filtered		10.7 U	10.7 U	10.7 U	---	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U
Selenium[2]	non-filtered	5	1.9 U	2.4 J	1.9 U	1.9 U	1.9 U	1.9 U	---	1.9 U	1.9 U
	filtered		1.9 U	1.9 U	1.9 U	---	1.9 U	1.9 U	1.9 U	1.9 U	1.9 U
Thallium[2]	non-filtered	10	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	3.0 J	---	2.1 U	3.4 J
	filtered		2.1 U	2.1 U	2.1 U	---	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U

See notes at end of table.

ble B-5 Summary of Laboratory Analysis of Groundwater Samples Collected from Site 5[1] (continued)

Compounds Detected		CRQL	Monitoring Well Number KBA-5-1	KBA-5-2	KBA-5-3	KBA-5-3D	KBA-5-4	KBA-5-5	KBA-5-5D	KBA-5-6	KBA-5-7
APPENDIX IX Inorganics (µg/l)											
Vanadium[2]	non-filtered	50	13.6 J	20.6 J	12.7 J	9.2 J	12.1 J	42.1 J	---	18.4 J	251
	filtered		1.3 U	4.9 J	1.6 J	---	1.3 U	1.9 J	1.3 U	1.5 J	1.3 U
Zinc[4]	non-filtered	20	85.6 J	162 J	199 J	123 J	129	135	---	68.8	519
	filtered		20.5 J	132 J	26.6 J	---	20.0	30.8	23.9	27.2	40.4
Sulfide	non-filtered	100	200	200	100 U	200	300	300	---	300	300
	filtered		100 U	100 U	100 U	---	100 U	200	200	200	100 U
PHYSICAL PARAMETERS											
Total Solids (mg/l)			413	658	256	312	834	1557	---	471	3278
TSS (mg/l)			292	464	79	152	294	1450	---	355	2990
% TSS			71	71	31	49	35	93	---	75	91

Notes:
CRQL = Contract Required Quantitation Limit
TSS = total suspended solids
U = not detected above or below CRQL
--- = Analysis not required/performed
[1] Groundwater samples were analyzed for VOCs, PCBs, and inorganic analytes only. No VOCs or PCBs were detected in groundwater samples.

Data Qualifiers

[2] Values flagged J as estimated because concentrations are less than the CRQL.
[3] Values flagged J and UJ as estimated because the preparation blank exhibited negative bias for beryllium, chromium, and cobalt.
[4] Values flagged J and UJ as estimated because duplicate analysis for copper and zinc exceeded QC limits.
[5] Values flagged J as estimated because martix spike recovery for lead was outside QC limits.

Table B-6 Summary of Laboratory Analysis of Groundwater Samples Collected from Site 16[1] - **July 1992**

Compounds Detected		CRQL	Monitoring Well Number KBA-16-1	KBA-16-2	KBA-16-2D	KBA-16-3	KBA-16-4
APPENDIX IX VOCs (µg/l)							
Toluene		5	5 U	5 U	---	5	5 U
APPENDIX IX SVOCs (µg/l)							
bis(2-Ethylhexyl) Phthalate[2]		10	10 U	3 J	6 J	7 J	3 J
APPENDIX IX Inorganics (µg/l)							
Arsenic[2,3]	non-filtered	10	4.4 J	21.4 J	---	8.3 J	3.5 J
	filtered		1.1 J	3.2 J	---	6.2 J	1.00 UJ
Barium[2]	non-filtered	200	35.4 J	74.2 J	---	83.3 J	38.4 J
	filtered		18.2 J	17.4 J	---	19.5 J	24.9 J
Beryllium[2]	non-filtered	5	0.24 U	0.64 J	---	1.5 J	0.24 U
	filtered		0.24 U	0.24 U	---	0.24 U	0.24 U
Cadmium[2]	non-filtered	5	3.4 J	2.7 U	---	2.7 U	2.7 U
	filtered		2.7 U	2.7 U	---	2.7 U	2.7 U
Chromium	non-filtered	10	16.4	40.7	---	31.2	11.3 U
	filtered		4.1 U	4.0 U	---	4.7 U	4.0 U
Copper[2]	non-filtered	25	23.9 J	30.4	---	82.8	14.6 U
	filtered		18.6 J	24.8 J	---	15.8 U	11.8 U
Lead[2,3]	non-filtered	5	12.5 J	14.9 J	---	6.2 J	5.2 J
	filtered		1.4 J	0.94 UJ	---	0.94 UJ	1.0 J
Nickel[2]	non-filtered	40	10.7 U	24.3 J	---	274	10.9 J
	filtered		10.7 U	10.7 U	---	10.7 U	10.7 U
Selenium[2]	non-filtered	5	2.1 J	2.2 J	---	1.9 U	1.9 U
	filtered		1.9 U	1.9 U	---	1.9 U	1.9 U
Silver[2]	non-filtered	10	1.5 U	1.6 J	---	1.5 U	1.5 U
	filtered		1.5 J	1.5 J	---	1.5 U	1.5 U
Vanadium[2]	non-filtered	50	16.4 J	40.7 J	---	28.1 J	10.6 J
	filtered		2.4 J	2.9 J	---	5.3 J	5.7 J
Zinc	non-filtered	20	31.3 U	77.0	---	268	32.6 U
	filtered		55.5 U	41.7 U	---	31.6 U	35.2 U
Sulfide	non-filtered	100	200	500	---	200	400
	filtered		300	100 U	---	300	500
PHYSICAL PARAMETERS							
Total Solids (mg/l)			734	1016	---	606	830
TSS (mg/l)			304	716	---	326	171
% TSS			41	70	---	54	21

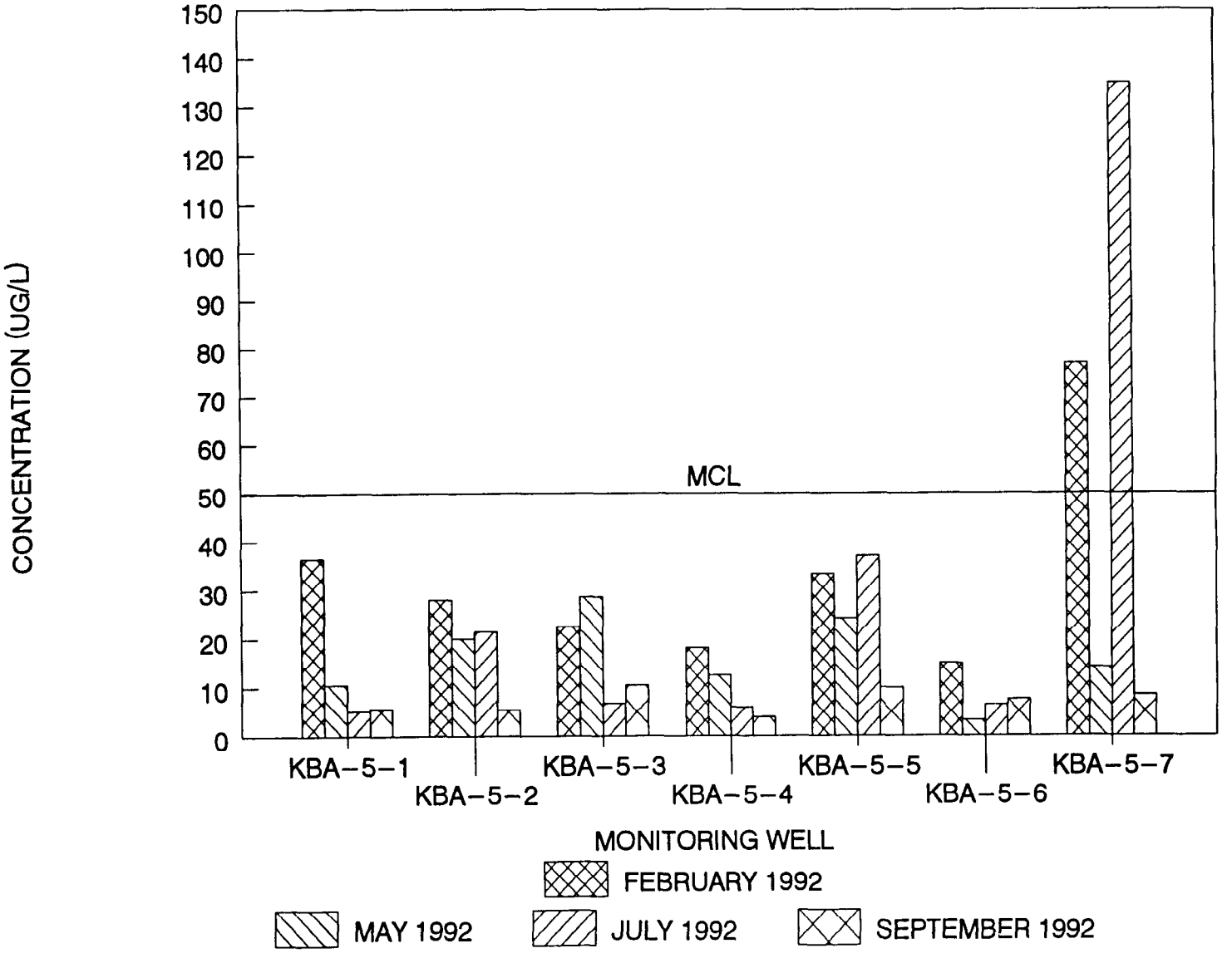
Notes:
CRQL = Contract Required Quantitation Limit
U = not detected above or below CRQL
--- = Analysis not required/performed
TSS = total suspended solids

Data Qualifiers
[1] Groundwater samples were analyzed for VOCs, SVOCs, and inorganic constituents only.
[2] Value(s) flagged J as estimated because concentrations are less than the CRQL.
[3] Values flagged J as estimated because matrix spike recovery for arsenic was below QC limits.

APPENDIX C
BAR-CHART GRAPHICS OF GROUNDWATER INORGANIC DATA

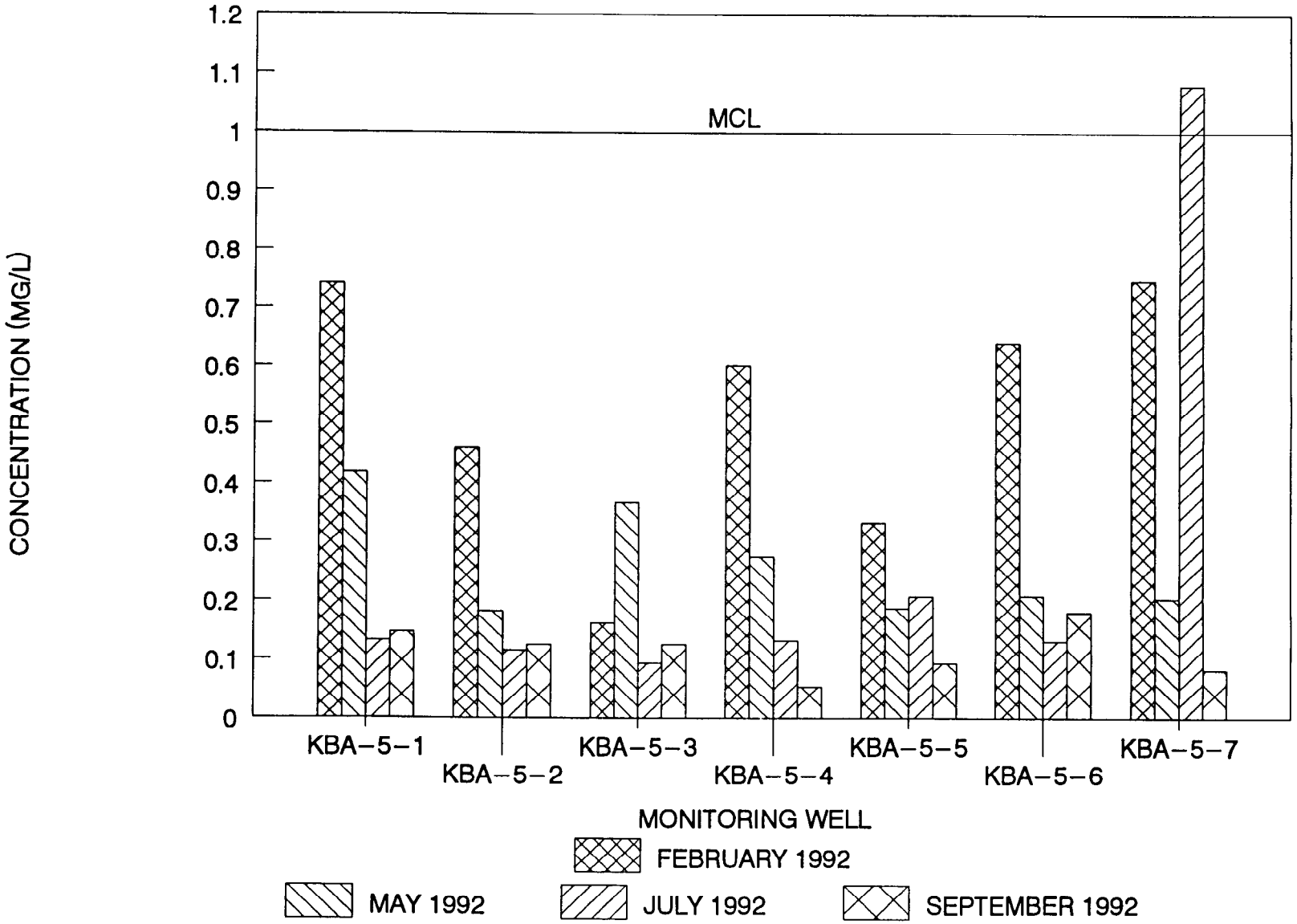
NSB KINGS BAY, GEORGIA

SITE 5 – ARSENIC IN GROUNDWATER



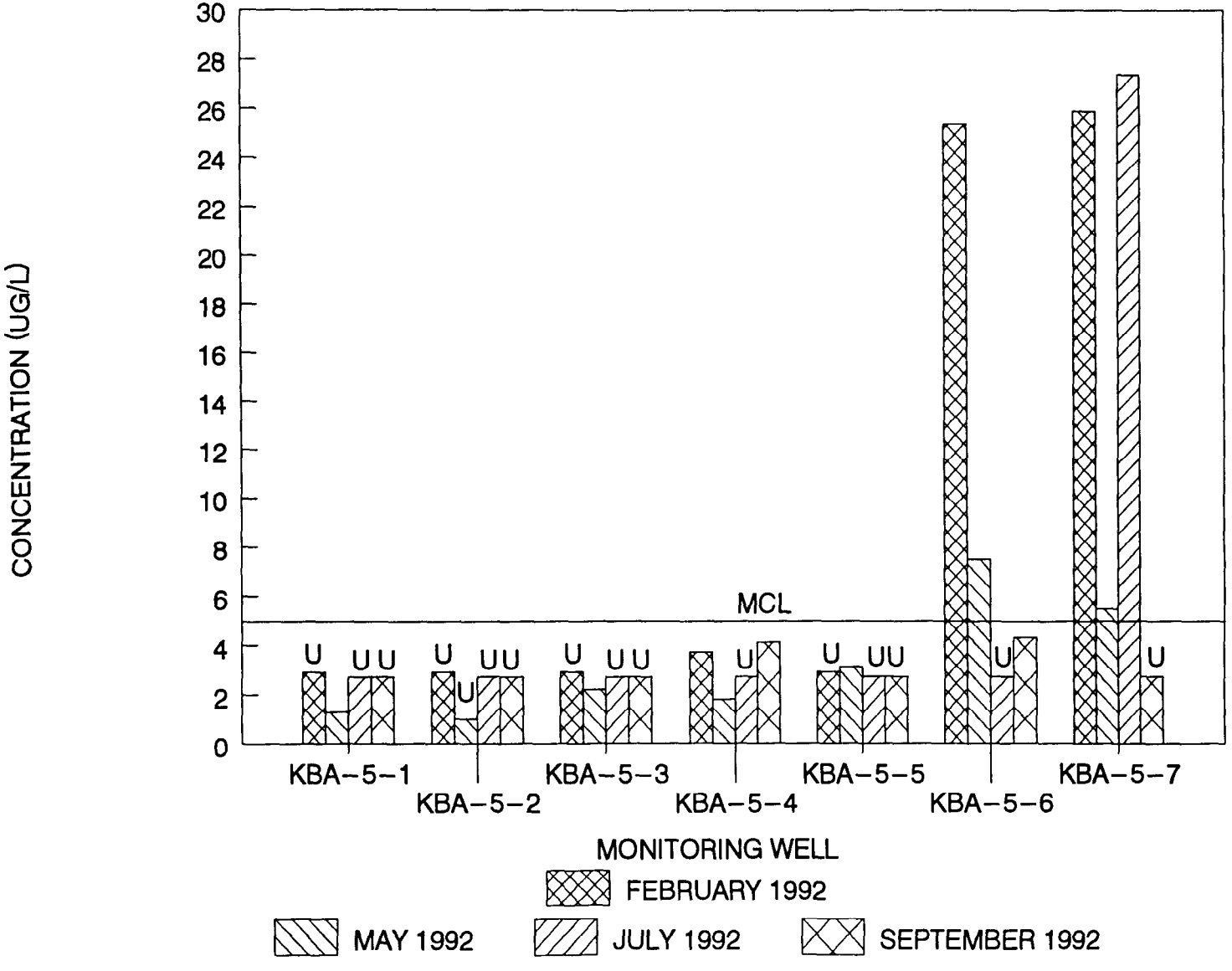
NSB KINGS BAY, GEORGIA

SITE 5 – BARIUM IN GROUNDWATER



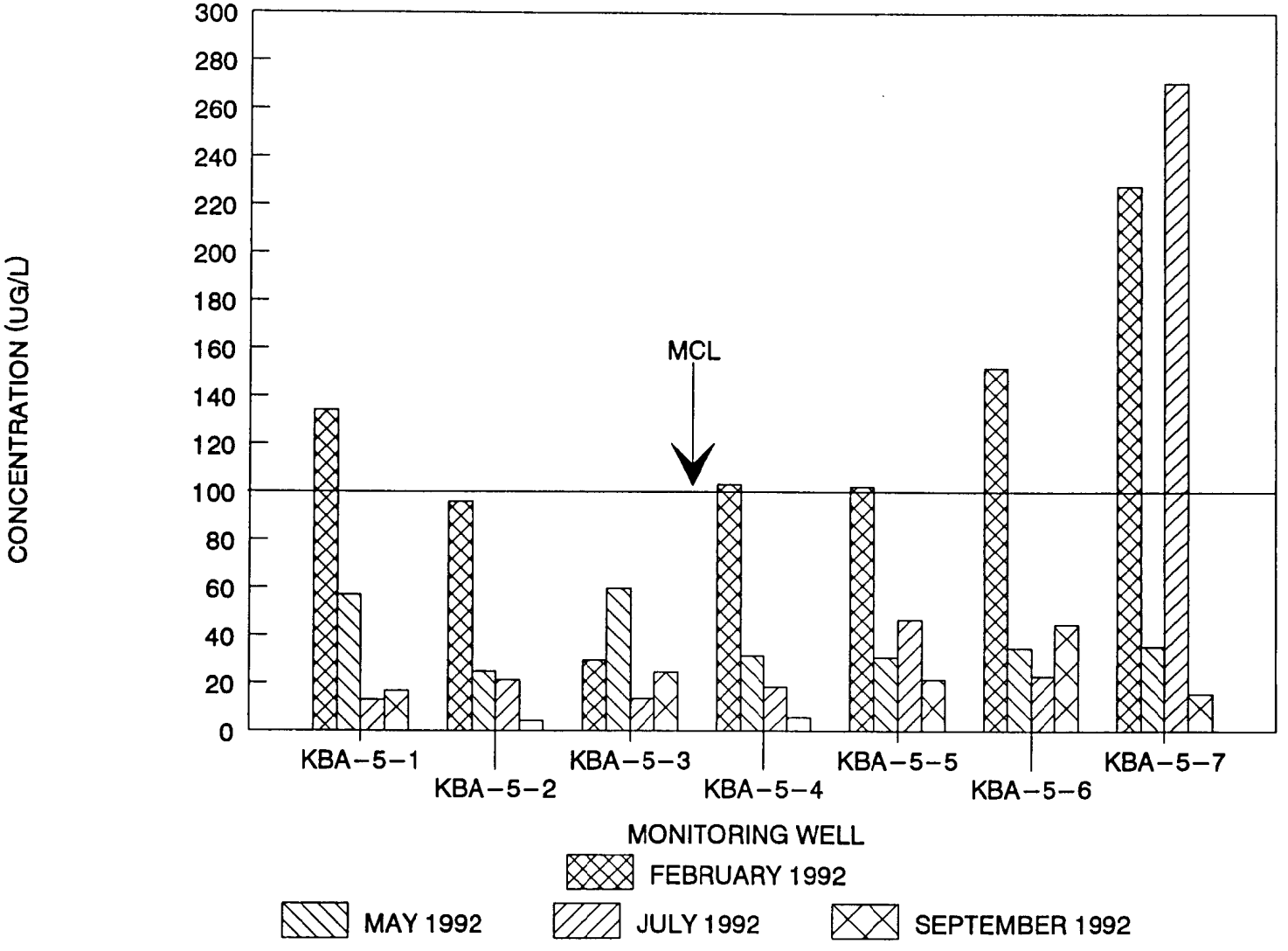
NSB KINGS BAY, GEORGIA

SITE 5 – CADMIUM IN GROUNDWATER



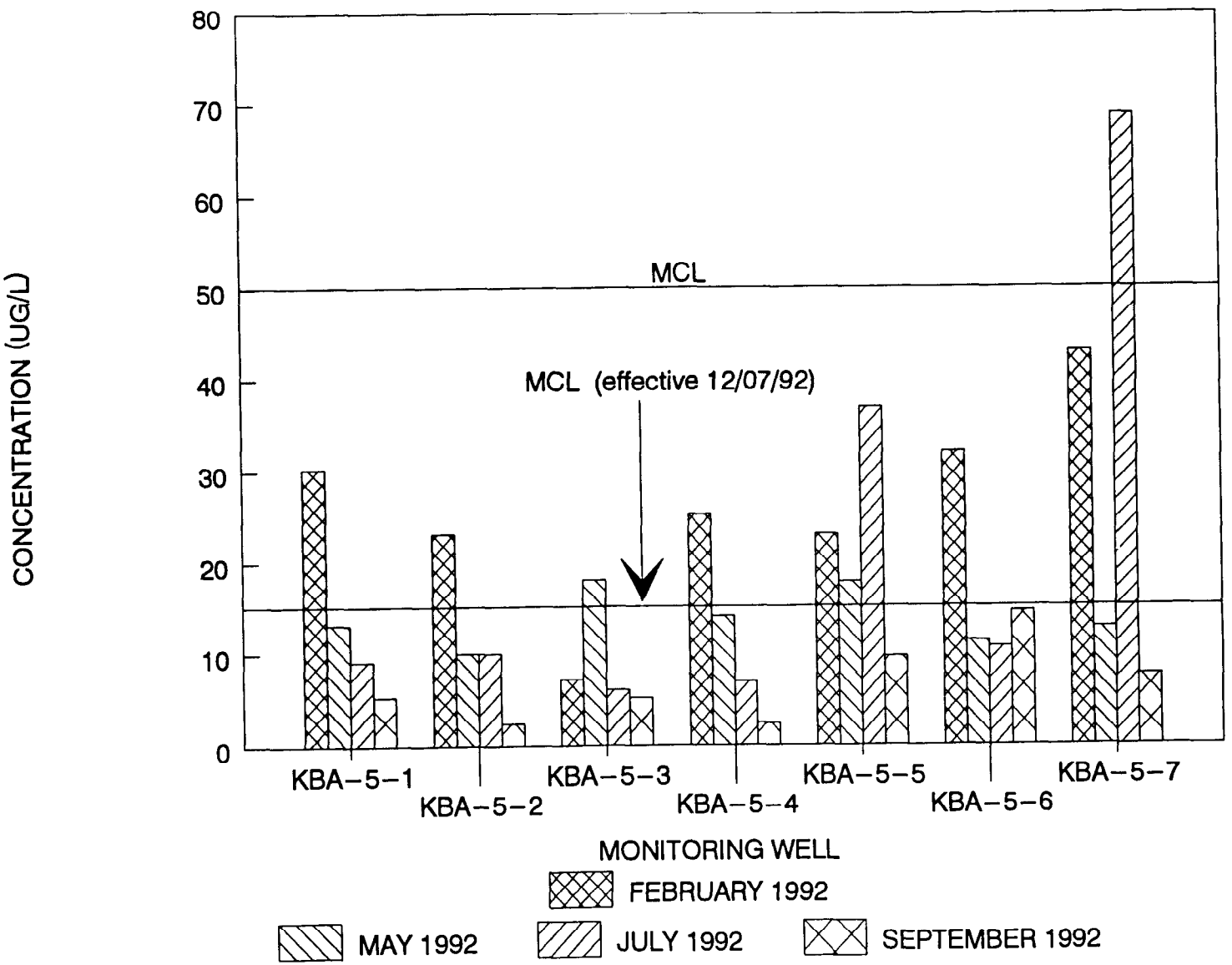
NSB KINGS BAY, GEORGIA

SITE 5 – CHROMIUM IN GROUNDWATER



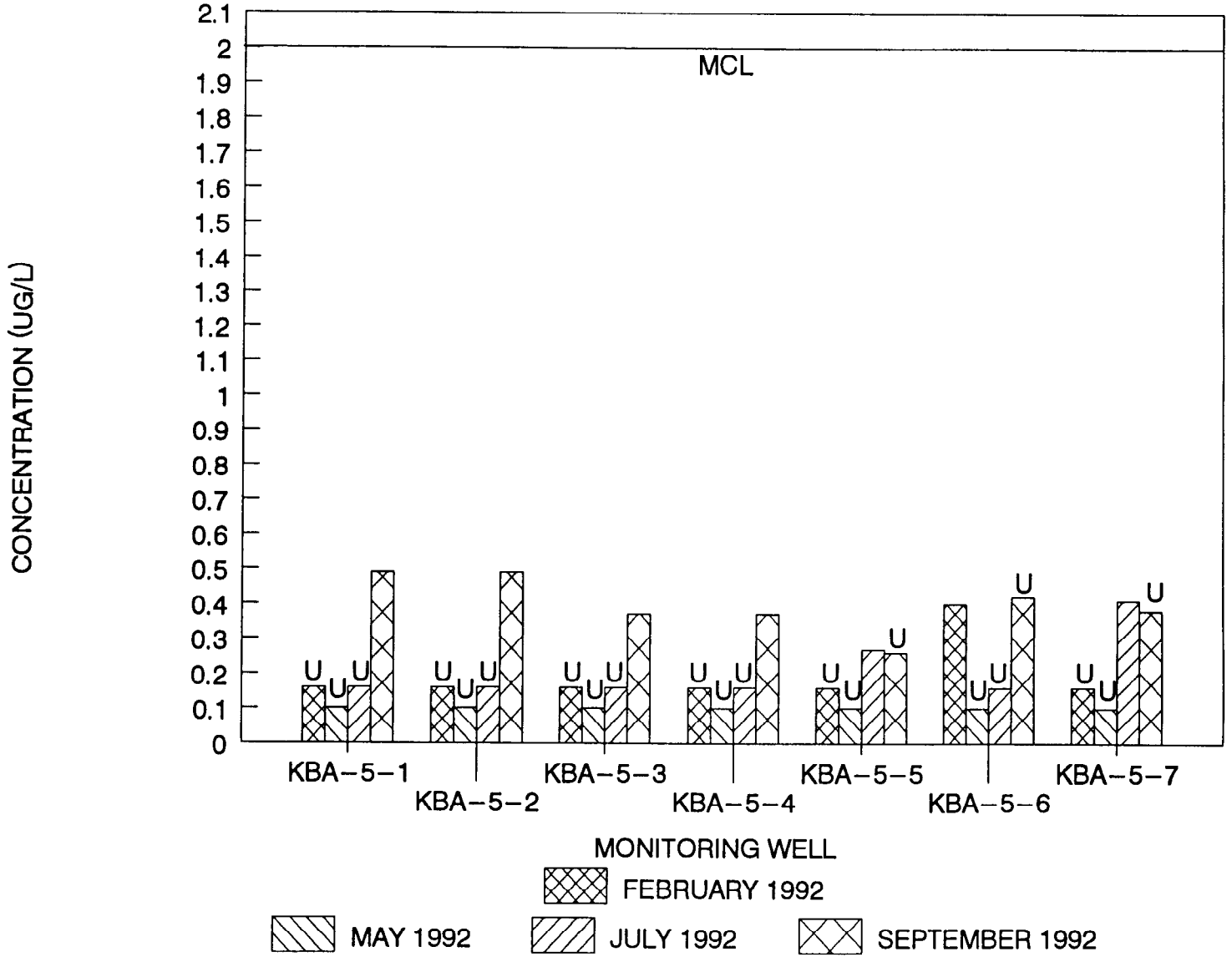
NSB KINGS BAY, GEORGIA

SITE 5 – LEAD IN GROUNDWATER



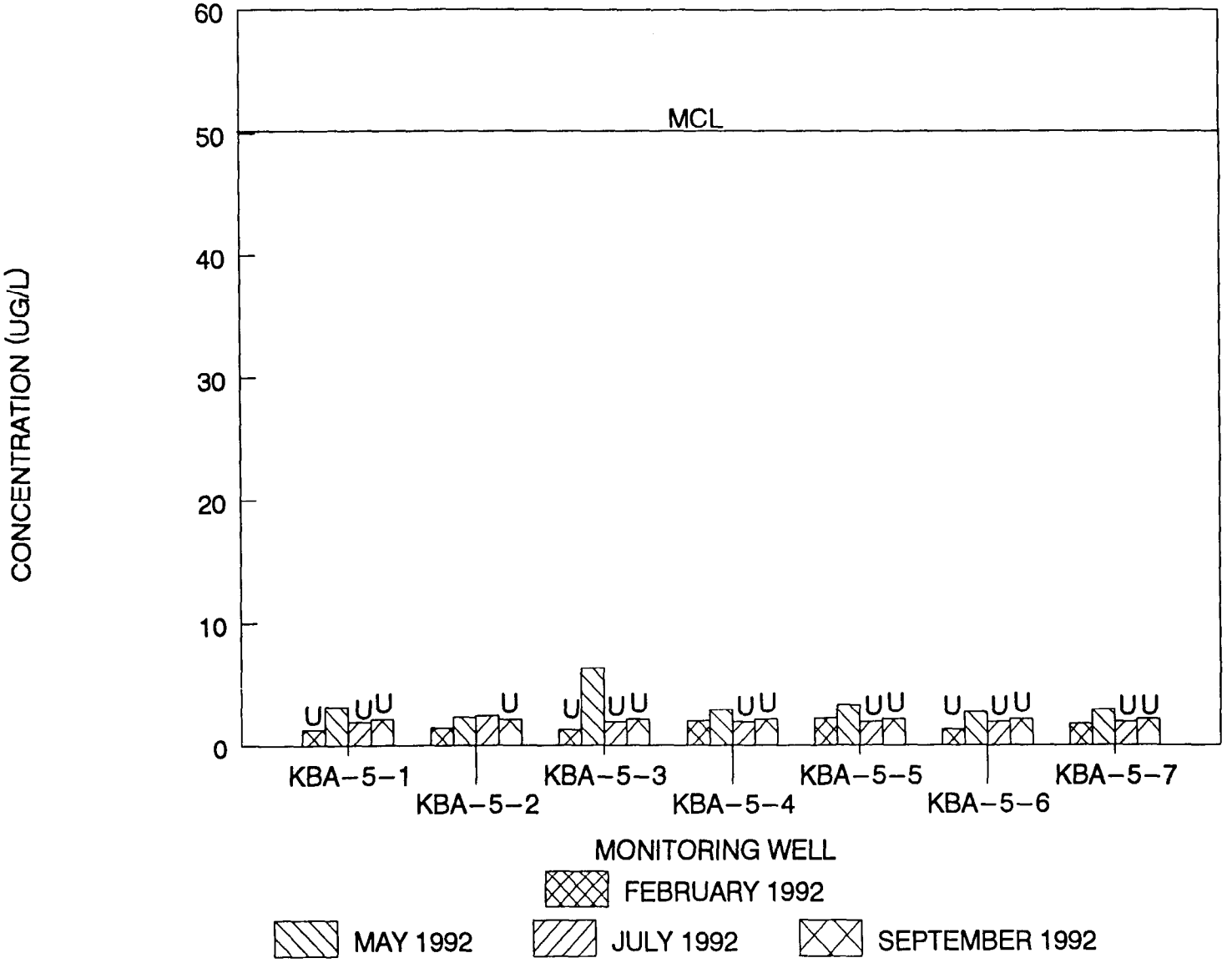
NSB KINGS BAY, GEORGIA

SITE 5 – MERCURY IN GROUNDWATER



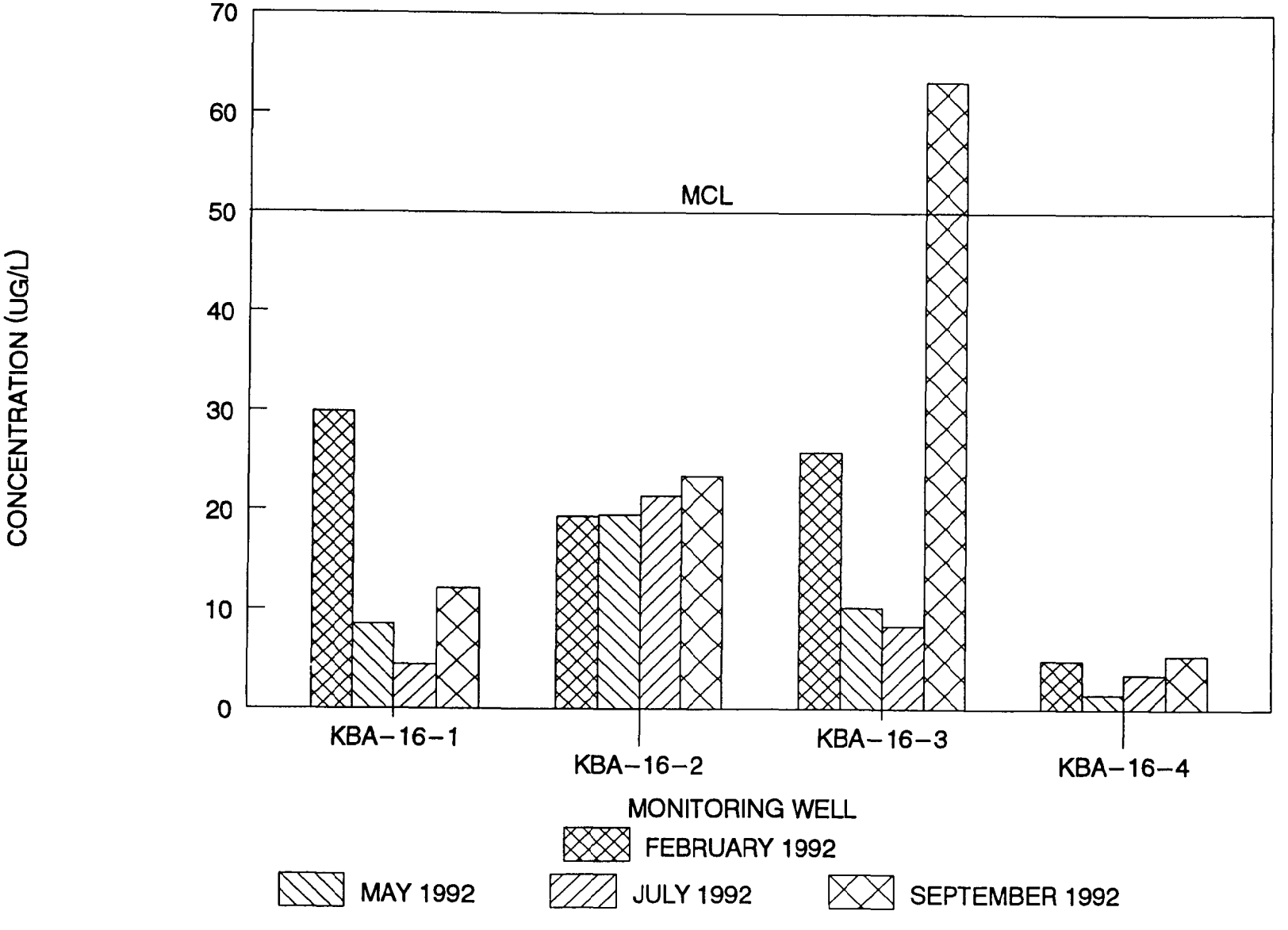
NSB KINGS BAY, GEORGIA

SITE 5 – SELENIUM IN GROUNDWATER



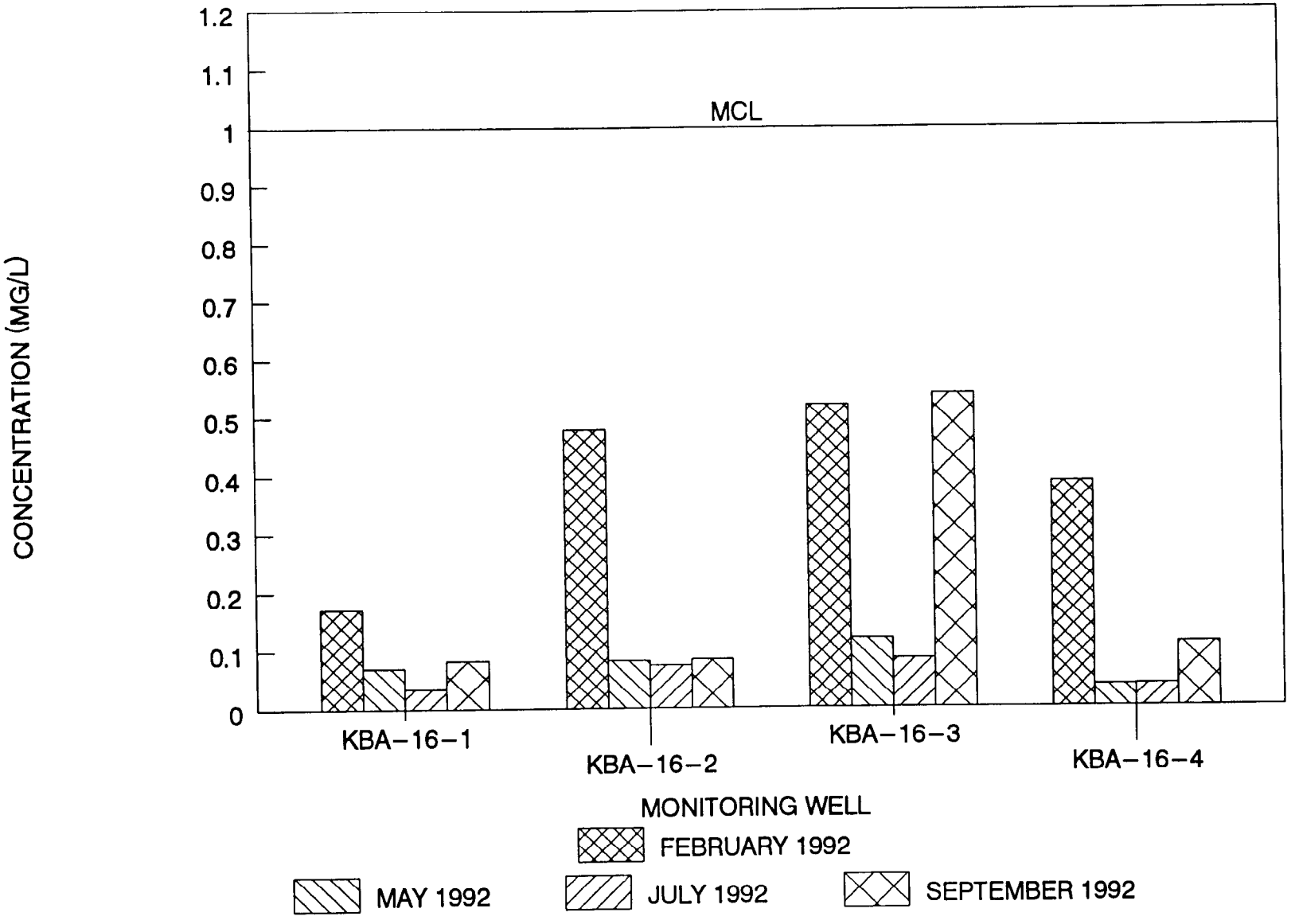
NSB KINGS BAY, GEORGIA

SITE 16 – ARSENIC IN GROUNDWATER



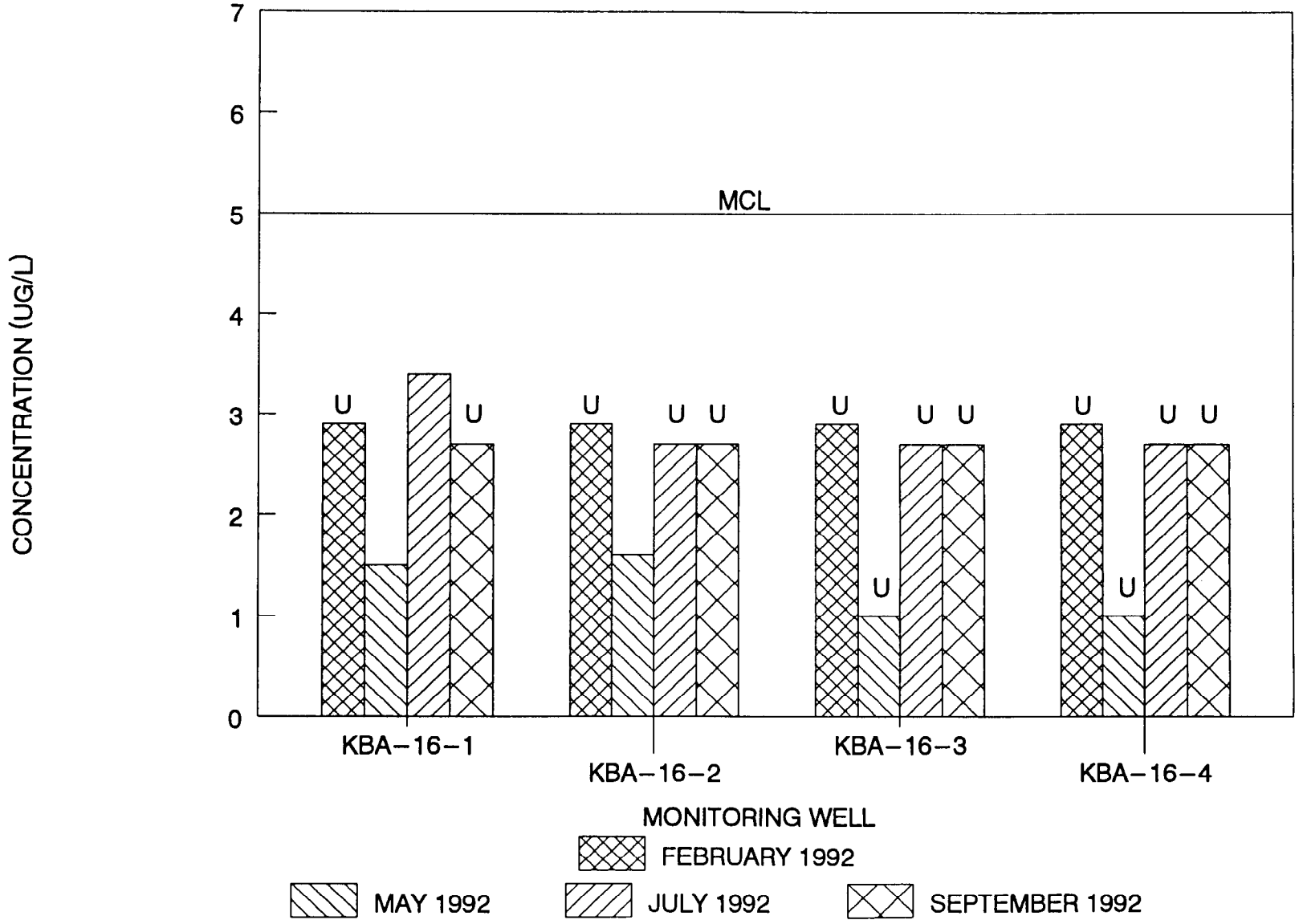
NSB KINGS BAY, GEORGIA

SITE 16 – BARIUM IN GROUNDWATER



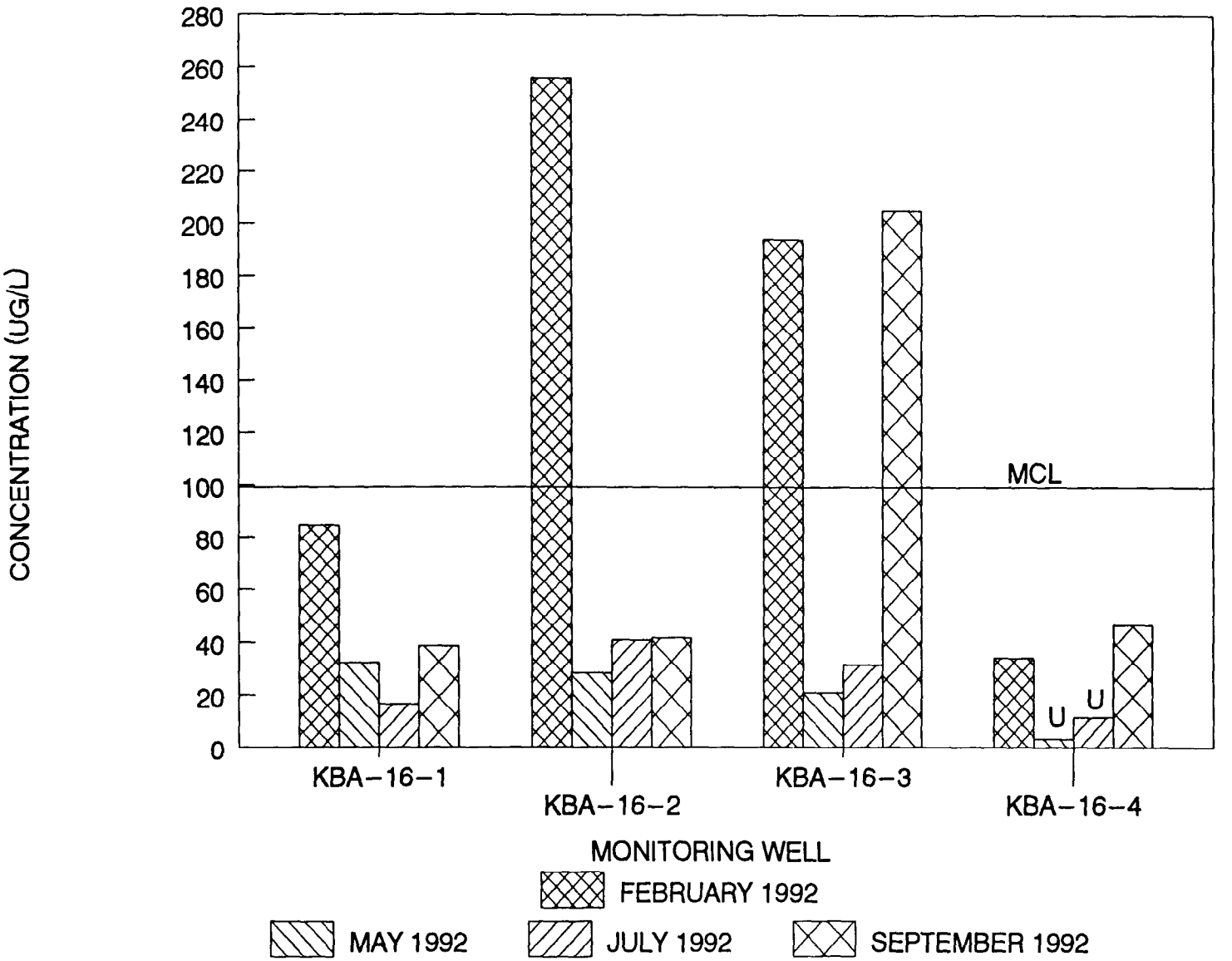
NSB KINGS BAY, GEORGIA

SITE 16 – CADMIUM IN GROUNDWATER



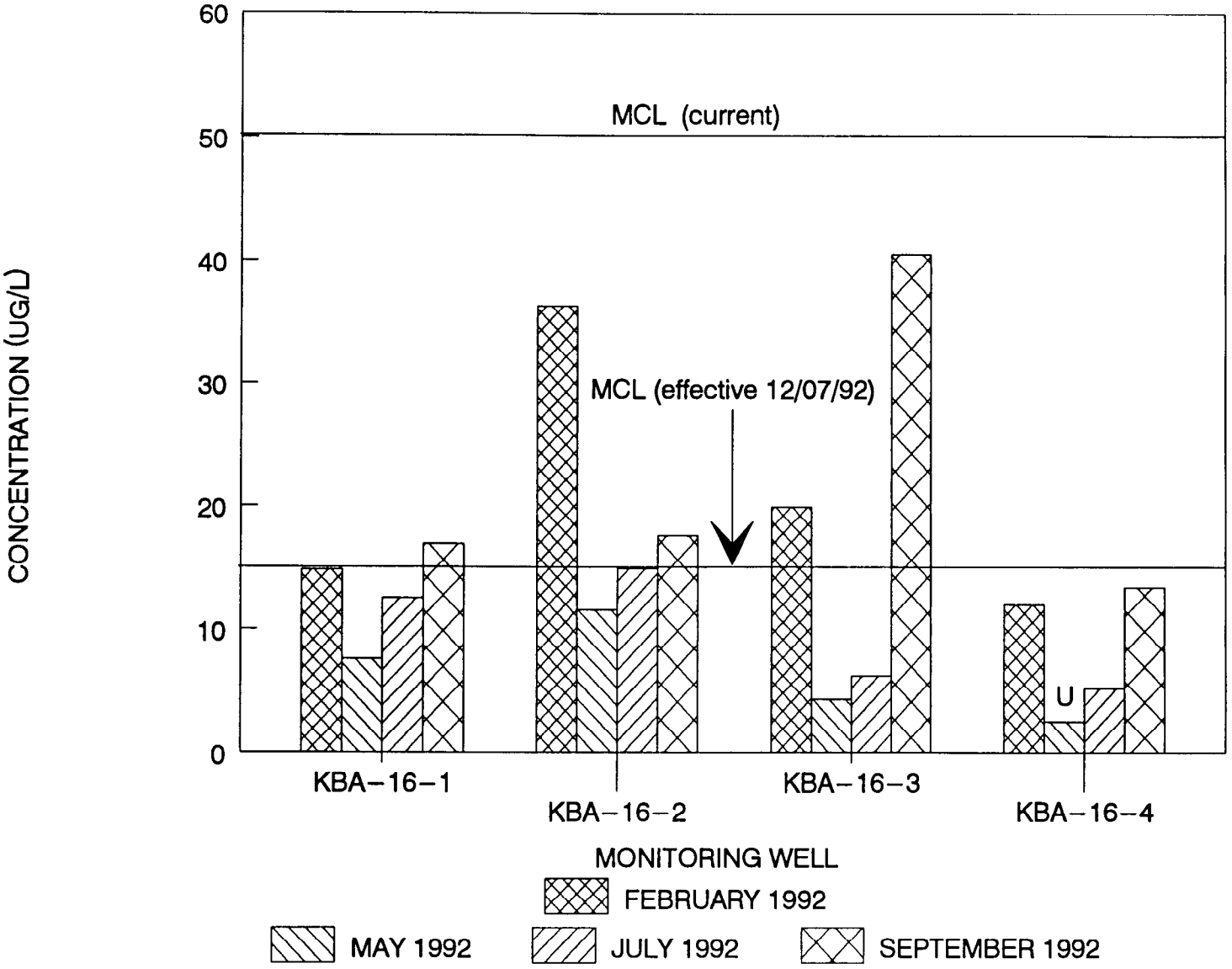
NSB KINGS BAY, GEORGIA

SITE 16 – CHROMIUM IN GROUNDWATER



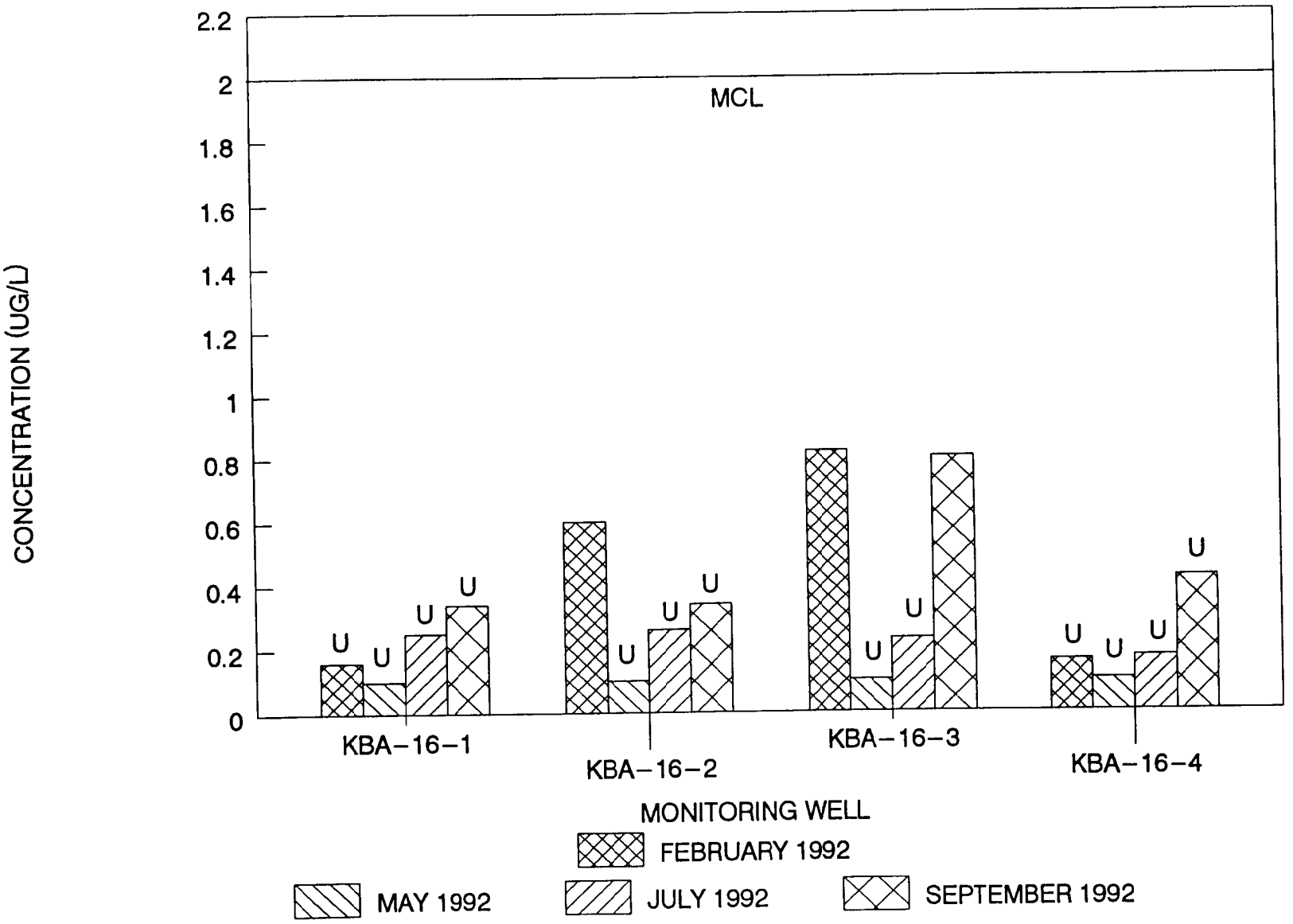
NSB KINGS BAY, GEORGIA

SITE 16 – LEAD IN GROUNDWATER



NSB KINGS BAY, GEORGIA

SITE 16 – MERCURY IN GROUNDWATER



NSB KINGS BAY, GEORGIA

SITE 16 – SELENIUM IN GROUNDWATER