FINAL

ADDENDUM TO

CORRECTIVE ACTION PLAN - PART A REPORT
FOR
FACILITY ID #9-089061
UNDERGROUND STORAGE TANKS 232 & 233
AT
BUILDING 4577
FORT STEWART, GEORGIA

Prepared for:

U.S. Army Corps of Engineers - Savannah District
and
Fort Stewart Directorate of Public Works
Under Contract Number DACA21-95-D-0022
Delivery Order 0016

Prepared by:

Science Applications International Corporation
800 Oak Ridge Turnpike
Oak Ridge, Tennessee 37831

June 1998

TABLE OF CONTENTS

ADDENDUM TABLES (includes only revised tables with data collected as part of this addendum)

ADDENDUM FIGURES (includes only revised figures with data collected as part of this addendum)

APPENDICES (includes only additional data collected as part of this addendum)

LIST OF ACRONYMS

ACLs	alternate concentration limits
ARAR	applicable, relevant, and appropriate requirement
ASTM	American Society for Testing and Materials
BGS	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAP	Corrective Action Plan
COC	chemicals of concern
CSF	cancer slope factor
DAF	dilution-attenuation factor
EPA	U.S. Environmental Protection Agency
GA EPD	Georgia Environmental Protection Division
GUST	Georgia Underground Storage Tank
HQ	hazard quotient
MCL	Maximum Contaminant Level
PAH	polynuclear aromatic hydrocarbon
QCSR	Quality Control Summary Report
SIP	site investigation plan
TOC	total organic carbon
TPH	total petroleum hydrocarbon
UST	underground storage tank

I. CORRECTIVE ACTION PLAN - PART A FORM & CERTIFICATION

This document represents the Addendum to the Corrective Action Plan (CAP)-Part A Report for underground storage tanks (USTs) 232 & 233 that were located at Building 4577 (Facility ID #9-089061), Fort Stewart, Georgia. The CAP-Part A site investigation for USTs 232 & 233 was originally conducted in September 1996 and December 1996. Results of this investigation were documented in the original CAP-Part A Report *Corrective Action Plan - Part A Report for Facility ID #9-089061, Underground Storage Tanks 232 & 233 at Building 4577, Fort Stewart, Georgia*, submitted to the Georgia Environmental Protection Division (GA EPD) in May 1997.

Horizontal delineation of contamination directly downgradient of the tank pit was not achieved during the 1996 investigation. Therefore, additional site investigation activities were conducted in November 1997 to determine the horizontal extent of contamination, as approved in correspondence dated March 13, 1998 (White 1998). Specifically, GA EPD approved the installation of a downgradient soil boring and fate and transport modeling. The letter also concurred with the Installation that the analytical results from the samples collected from soil borings installed during the CAP-Part A, which were all below soil threshold levels, sufficiently addressed the issued soil left in place at the site. These results are summarized in this addendum to the original CAP-Part A report. Based on the results of the fate and transport modeling, a no-further-action-required status is recommended for this site.

Part I of this addendum contains an updated CAP-Part A form, including re-certification of the plan (with addendums). Supporting documentation related to information indicated on the CAP-Part A form is presented in Parts II through VI of this addendum and in the original CAP-Part A Report submitted in May 1997.

THIS PAGE INTENTIONALLY BLANK

Georgia Department of Natural Resources

Environmental Protection Division

Underground Storage Tank Management Program
4244 International Parkway, Suite 104, Atlanta, Georgia 30354
Lonice C. Barrett, Commissioner
Harold Reheis, Director
(404)362-2687

CORRECTIVE ACTION PLAN
PART A

Facility Name: Building 4577 Area, USTs 232 & 233 Site

Street Address: Engineer Road west of Po Valley Road

City: Fort Stewart County: Liberty Facility ID: 9-089061

Submitted by UST Owner/Operator:	**Prepared by:**
Name: John H. Spears/Environmental Branch	Name: Patricia Stoll
Company: U.S. Army/HQ 3d Inf. Div. (Mech.)	Company: SAIC
Address: ATTN: DPW ENRD ENV. Br. (Spears) 1557 Frank Cochran Drive	Address: P.O. Box 2502
City: Fort Stewart State: Georgia	City: Oak Ridge State: Tennessee
Zip Code: 31314-4928	Zip Code: 37830

I. PLAN CERTIFICATION:

A. UST Owner/Operator

I hereby certify that the information contained in this plan and in all the attachments is true, accurate, and complete, and the plan satisfies all criteria and requirements of Rule 391-3-15-.09 of the Georgia Rules for Underground Storage Tank Management.

Name: John H. Spears

Signature: for Douglas H Swanson

Date: 7/30/98

B. Professional Engineer or Professional Geologist

I hereby certify that I have directed the field work and preparation of this plan, in accordance with State Rules and Regulations. As a registered geologist and/or engineer, I certify that I am a qualified groundwater professional, as defined by the Georgia State Board of Professional Geologists. All of the information and laboratory data in this plan and in all of the attachments are true, accurate, complete, and in accordance with applicable State Rules and Regulations.

Name: Patricia Stoll

Signature: Patricia A Stoll

Date: 7/20/98

22851
P. A. STOLL

Georgia Stamp or Seal

Please complete the following form, check all of the boxes below that apply, and attached supporting documentation (such as narrative, figures, tables, maps, boring/well logs, etc.) where specified and applicable. Supporting documentation should be three-hole punched and prepared in conformity with the attached guidance document "Underground Storage Tank (UST) Release: Corrective Action Plan - Part A (CAP-A) Content", GUST-7A.

II. INITIAL RESPONSE REPORT:

A. Initial Abatement:

☒ No Action Required

☐ Further Release or Migration of Contaminants Prevented

☐ Fire And Safety Hazards From Vapors And/Or Free Product Monitored and Mitigated

☐ Other (specify) ____

B. Free Product Removal:

☒ No Free Product Identified As Originating From Release

☐ Free Product (Non-Aqueous Phase Hydrocarbons) Removed by:

- ☐ Manual Bailing
- ☐ Passive Skimming
- ☐ Automated Skimming
- ☐ Automated Total Fluids Pumping, With Treatment System And Approved Wastewater Discharge
- ☐ Other (specify) ____

C. Tank History

☒ Site Map Attached Identifying Former and/or Existing USTs (see Figure II-1, CAP-Part A)

☐ Not Applicable

D. Initial Site Characterization:

☒ Site Map: include the following items on an attached site map

- Tank Pit Area
- Piping Trenches
- Dispensers
- Sewer Lines (if present)
- Water Lines
- North Arrow
- Sample Locations (with sample numbers and depths)
- Tanks with ID#s, corresponding to Notification Form 7530-1
- Scale 1 in = 40 ft

1. Regulated Substance Released

☐ Gasoline ☐ Diesel ☐ Kerosene ☒ Waste oil

☒ Other Antifreeze (waste)

2. Source of Contamination

Number of USTs: in use 0 ; closed/removed 2

☐ Existing UST System(s): ☐ piping ☐ tank ☐ other

☒ Former UST System(s): ☒ piping ☒ tank ☐ other

3. Impacted Environmental Media

☒ Groundwater

- ☐ Free product
- ☒ Dissolved (BTEX and/or PAH) contamination exceeding:
  - ☐ In-stream water quality standards
  - ☒ Drinking water Maximum Contaminant Levels (MCLs)

☒ Soil Exceeding:

- ☐ Laboratory Detection Limits, but TPH is vertically delineated to Below Detection Limits (BDL) above the groundwater table or a groundwater sample from the worst-case location has BTEX and/or PAHs below applicable Drinking and/or In-stream water quality standards.
- ☒ Thresholds listed in Table A, Rule 391-3-15-.09
- ☐ Thresholds listed in Table B, Rule 391-3-15-.09
- ☐ Alternate Threshold Levels (ATLs) (Reference Appendix I)

D. **Initial Site Characterization** (continued):

☐ Drinking Water Supply Impacted

☐ Surface Water Impacted

☒ Attach Laboratory Analytical Data: the following items must be included (see Appendix C)

- Laboratory Method
- Date of Analysis
- Signed Chain of Custody
- Date of Sampling
- Detection Limits
- Quality Control Data

4. Local Water Resources

☒ Drinking Water Supplies Located In:

High or average groundwater pollution susceptibility area:*

☒ Public water systems within 2.0 miles

☐ Non-public water systems within 0.5 mile

Low groundwater pollution susceptibility area:*

☐ Public water systems within 1.0 mile

☐ Non-public water systems within 0.25 mile

* As defined by the Groundwater Pollution Susceptibility Map of Georgia.

☒ Surface Water Bodies: Distance (nearest) 1140 feet (regardless of hydraulic gradient)

☒ Attach Documentation of Water Supply Survey and Field Reconnaissance

5. Other Hydrogeologic Data (specify values)

☒ Depth To Groundwater (shallowest) 6.06 feet BGS

☒ Groundwater Flow Direction East to West

☒ Hydraulic Gradient 0.0148 feet/feet

6. Corrective Action Completed Or In-Progress

☒ USTs/Source Removed (after confirmed release)

☐ Excavation And Treatment/Disposal Of Contaminated Backfill Materials & Native Soils
☐ Attach manifest of proper soil disposal

☐ Other (specify) ____________________

____

D. Initial Site Characterization (continued):

7. Conclusions And Recommendations

☒ No Further Action Required, including the preparation or implementation of a Site Investigation Plan. NOTE: Based on additional sampling required by GA EPD and the results of site-specific fate and transport modeling, no further action is required; however, a Site Investigation Plan has been prepared which provides justification for the NFAR status.

☐ OR

Prepare Corrective Action Plan - Part B, with a schedule for SIP implementation and submittal of CAP-Part B

8. Site Ranking

Environmental Sensitivity Score: 330
(see Appendix II)

III. SITE INVESTIGATION PLAN:

A. Horizontal And Vertical Extent Of Contaminants In:

- ☐ Soil
- ☐ Groundwater
  - ☐ Free product
  - ☐ Dissolved phase
- ☐ Surface Water
- ☒ Not applicable since horizontal and vertical extent have been determined.

B. Vadose Zone and Aquifer Characteristics:

- ☐ Vertical Soil Permeability (Optional)
- ☐ Infiltration Rate (Optional)
- ☐ Saturated Horizontal Hydraulic Conductivity
- ☐ Total Organic Carbon (Optional)
- ☐ Dissolved Iron (Optional)
- ☐ Effective Porosity
- ☐ Seepage Velocity
- ☐ Grain-size Distribution (Optional)
- ☐ Total Petroleum Hydrocarbons (Optional)
- ☐ Pilot Test(s) (Optional)
- ☒ Other (specify) No Further Investigation Required

IV. PUBLIC NOTICE:

☐ Certified Letters to Adjacent and Potentially Affected Property Owners and Local Officials

☒ Legal Notice in Newspaper, as pre-approved by EPD

☐ Other EPD Approved Method (specify): ______________________________

V. CLAIM FOR REIMBURSEMENT: (For GUST Trust Fund sites only)

- ☐ GUST Trust Fund Application (GUST-36), must be attached if applicable
- ☐ Cost Proposal
  - ☐ Non-Reimbursable Costs

    OR
  - ☐ Reimbursable Costs
    - ☐ Invoices and Proofs-of-Payment, per GUST-91
    - ☐ Total Projected Costs to implement the Site Investigation Report (SIR) and prepare data for the Site Investigation Review Meeting, per GUST-91
- ☐ Payment Schedule for Reimbursement
- ☒ Not Applicable

II. INITIAL RESPONSE REPORT

II.A Initial Abatement

No change from the original CAP-Part A Report submitted in May 1997, no action was required.

II.B Free Product Removal

Temporary piezometers were installed in the boreholes and screened across the water table to monitor for free product. No free product was detected during the 1996 or 1997 investigations.

II.C Tank History

No change from the original CAP-Part A Report submitted in May 1997.

II.D Initial Site Characterization

No change from the original CAP-Part A Report submitted in May 1997.

II.D.1 Regulated Substance Released

No change from the original CAP-Part A Report submitted in May 1997.

II.D.2 Source of Contamination

No change from the original CAP-Part A Report submitted in May 1997.

II.D.3 Impacted Environmental Media

II.D.3.a Soils

A summary of the analytical results for the soil samples collected during the September/December 1996 and November 1997 CAP-Part A site investigation activities at the site is presented in Addendum Table II-3. Laboratory data sheets for the September/December 1996 samples and the project Quality Control Summary Report (QCSR) were presented in Appendices C-1 and C-3 of the original CAP-Part A report submitted in May 1997. Laboratory data sheets and chain of custody forms for the November 1997 samples are presented in Appendix C of this addendum. Addendum Figure II-3 has been updated to illustrate all of the site investigation borehole locations (i.e., 1996 and 1997 investigations) and corresponding analytical results for soil samples collected at each location.

II.D.3.a.1 Initial Site Characterization

During the initial site characterization by Anderson Columbia, soil samples collected from the tank pit after the tank removal indicated concentrations of benzene above the soil threshold levels in the tank pit.

II.D.3.a.2 CAP-Part A Investigation (September 1996)

Trace concentrations of toluene were detected in three samples: 5301D1, 5303A1, and 5304D1. The concentrations of toluene were well below its corresponding GUST soil threshold limit in Table A, Column 2. Total petroleum hydrocarbon (TPH) was detected in one sample, 5304C1, at 23 mg/kg.

The extent of contamination appeared to be limited to the immediate vicinity of the tank pit area.

II.D.3.a.3 CAP-Part A Investigation (November 1997)

In August 1997, representatives from GA EPD, Fort Stewart Directorate of Public Works (DPW), and Science Applications International Corporation (SAIC) conducted a review of the available data on this site, visited the site, and determined that one additional downgradient boring would provide complete site characterization. In addition, all parties agreed that fate and transport modeling would be conducted for the site. Site specific geotechnical parameters were estimated from geological information from similar UST sites at Fort Stewart.

Therefore, a shallow soil boring (53-05) was drilled downgradient from the tank pit. No contaminants were detected in the soil sample obtained from boring 53-05 at concentrations above detection limits.

II.D.3.a.4 Soil Investigation Conclusions

The nature and extent of the soil contamination at the USTs 232 & 233 site was evaluated using analytical data from the CAP-Part A site investigations and the initial site characterization (i.e., tank removal). Although benzene was detected in the tank pit during closure activities at concentrations exceeding its respective threshold level, soil samples collected during the CAP-Part A investigations did not indicate the presence of benzene, ethylbenzene, xylene, and polynuclear aromatic hydrocarbon (PAH) compounds in the boreholes in and surrounding the tank pit. Toluene was detected in trace amounts in three samples: 5301D1, 5303A1, and 5304D1.

Therefore, it is concluded that the soil contamination is limited to the immediate area of the tank pit and that the horizontal and vertical extent of contamination has been delineated.

II.D.3.b Groundwater

A summary of the analytical results for the groundwater samples collected during the September/December 1996 and November 1997 CAP-Part A site investigation activities at the site is presented in Addendum Table II-4. Laboratory data sheets for the September/December 1996 samples and the project QCSR are presented in Appendices C-2 and C-3 of the CAP-Part A report submitted in May 1997. Laboratory data sheets and chain of custody forms for the November 1997 samples are presented in Appendix C of this addendum. Addendum Figure II-4 has been updated to illustrate the site investigation borehole locations and corresponding analytical results for groundwater samples collected at each location.

II.D.3.b.1 Initial Site Characterization

Groundwater samples were not collected during tank removal activities.

II.D.3.b.2 CAP-Part A Investigation (September/December 1996)

For the groundwater samples collected during the 1996 site investigation activities, concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) compounds were detected in soil boring 53-01; however, only benzene exceeded its corresponding maximum contaminant level (MCL). For this sample, the benzene concentrations was 13.9 µg/L with a corresponding MCL of 5 µg/L. No other BTEX compounds were detected above their respective MCLs.

II.D.3.b.3 CAP-Part A Investigation (November 1997)

As requested by GA EPD during a site visit in August 1997, a groundwater sample was collected from a downgradient boring (53-05). No BTEX compounds were detected above detection limits. These results were used to determine the extent of groundwater contamination.

Thus, following completion of field investigation activities in November 1997, the potential receptor survey, fate and transport modeling, and a risk screening were performed to assess contaminant migration and impacts. Site-specific geotechnical parameters, for use in the fate and transport modeling, were estimated based on geological information from similar UST sites at Fort Stewart. The results of the potential receptor survey, risk screening, and fate and transport modeling are presented in Appendix G.

II.D.3.b.4 Groundwater Investigation Conclusions

The extent of groundwater contamination was determined to be limited to the area immediately surrounding the tank pit. The results of the potential receptor survey, risk screening, and fate and transport modeling indicate a no-further-action-required status is warranted for this site.

II.D.3.c Surface Water Impacted

No change from the original CAP-Part A Report submitted in May 1997.

II.D.3.d Drinking Water Impacted

No change from the original CAP-Part A Report submitted in May 1997.

II.D.4 Local Water Resources

II.D.4.a Drinking Water Supplies

No change from the original CAP-Part A Report submitted in May 1997.

II.D.4.b Surface Water Bodies

No change from the original CAP-Part A Report submitted in May 1997.

II.D.5 Other Hydrogeologic Data

II.D.5.a Depth to Groundwater

No change from the original CAP-Part A Report submitted in May 1997.

II.D.5.b Groundwater Flow Direction

No change from original CAP-Part A Report submitted in May 1997.

II.D.5.c Hydraulic Gradient

No change from the original CAP-Part A Report submitted in May 1997.

II.D.5.d Total Organic Carbon (Optional)

Total organic carbon (TOC) was collected to support fate and transport modeling. In sample 530511, TOC was 1530 mg/kg.

II.D.5.e Grain Size Distribution

No changes from the original CAP-Part A Report submitted in May 1997.

II.D.5.f Total Petroleum Hydrocarbons (Optional)

Soil samples were analyzed for TPH and the results are presented in Addendum Table II-3 and are discussed in Section II.D.3.a.2 of this addendum.

II.D.6 Corrective Action Completed or In Progress

II.D.6.a USTs Removed

No change from the original CAP-Part A Report submitted in May 1997.

II.D.6.b Excavation and Treatment/Disposal of Backfill and Native Soils

No change from the original CAP-Part A Report submitted in May 1997.

II.D.7 Conclusions and Recommendations

II.D.7.a Summary of Conclusions

The USTs 232 & 233 site, Facility ID #9-089061, is located within an average or higher groundwater pollution susceptibility area. Public groundwater supply wells are located within a 2-mile radius of the site; however, the distance between the site and the nearest supply well is greater than 500 feet. Surface water bodies are located within a 1-mile radius of the site; however, the distance between the site and the nearest surface water body is greater than 500 feet. Based on this information, the applicable soil threshold levels for the site are those listed in Table A (GA EPD Rules for Underground Storage Tank Management, Chapter 391-3-15) for the Average or Higher Groundwater Pollution Susceptibility Area (Column 2) greater than 500 feet to a withdrawal point category. Regulatory limits (i.e., MCLs) for groundwater contamination at the site are in accordance with the Safe Drinking Water Act.

The site was characterized through soil sampling conducted during the removal of USTs 232 & 233, and a subsequent two-phase CAP-Part A site investigation that involved both soil and groundwater sampling. Twelve soil samples were collected from the tank pit excavation during removal activities. In 1996, four soil boreholes were drilled, two located within the former tank pit and two others around the perimeter of the pit. Two soil samples and one groundwater sample were collected from each of the four boreholes. In 1997, a shallow boring was installed directly downgradient of the tank pit. One soil sample and one groundwater sample were collected from this boring.

Soil analytical data from the tank removal sampling indicated that the soil from the tank pit was contaminated with benzene exceeding its applicable soil threshold level. The 1996 phase of the CAP-Part A investigation indicated no soil contamination was found in the soil borings in and around the tank pit exceeding applicable soil threshold levels. However, trace concentrations of toluene were detected in three samples: 5301D1, 5303A1, and 5304D1. The additional soil boring installed in 1997 showed no evidence of soil contamination downgradient and outside of the tank pit.

Groundwater analytical data from the site characterization of the CAP-Part A investigation indicate that benzene contamination in groundwater exceeds its respective MCL. However, this contamination was delineated and is limited to an area in the immediate vicinity of the tank pit. Waste oil and antifreeze analytes were not detected above detection limits or MCLs in groundwater samples collected from piezometers installed around the perimeter of the former tank pit (i.e., 53-02 through 53-05).

As a result of the risk screening, no COCs were selected for soils and benzene and lead were selected as COCs for groundwater. However, the lead concentrations in groundwater were attributed to the suspended particles in the samples. The benzene concentration in groundwater was below the ACL of 990 μg/L.

Results of the fate and transport modeling indicate that benzene will not reach Mill Creek located 1140 feet northeast of the site. Vertical migration of the contaminant plume to the Principal Artesian aquifer is improbable due to the thick and impermeable confining unit that separates the surficial aquifer from the Principal Artesian aquifer.

II.D.7.b Recommendations

Analytical results for soil and groundwater samples collected during the site investigation are sufficient to define the nature and extent of petroleum-related contamination at the site. Based on these findings, further investigation of the USTs 232 & 233 site, Facility ID #9-089061, is not required, and a no-further-action-required status is recommended for this site. The rationale for this recommendation is presented in Section III, Site Investigation Plan (SIP).

II.D.8 Site Ranking

No change from the original CAP-Part A Report submitted in May 1997.

III. SITE INVESTIGATION PLAN

This SIP presents the technical approach used to delineate the full extent of soil and/or groundwater contamination as a result of releases from USTs 232 & 233, Facility ID #9-089061 and provides justification for a no-further-action-required status for this site.

III.A Horizontal and Vertical Extent of Contamination

III.A.1 Soils

Soil contamination was delineated by analyzing soil collected during initial site characterization (i.e., tank removal) and CAP-Part A site investigations. The CAP-Part A investigations consisted of two boreholes in the tank pit, and three boreholes around the perimeter of the tank pit. Soil samples that were collected from the tank pit after the tank removal indicated concentrations of benzene above its soil threshold level. The depth at which the tank removal samples were collected is not known; however, given the fact that the groundwater table is located at a depth of approximately 6 to 7 feet BGS, it is unlikely that these samples were taken from a point at or below the groundwater table. Soil samples collected from boreholes 53-01 and 53-02 (September 1996 investigation) in the tank pit did not indicate the presence of BTEX or PAH compounds above applicable soil threshold levels. Soil samples collected from boreholes 53-03 through 53-05 that were located around the perimeter of the tank pit did not indicate the presence of benzene, ethylbenzene, xylene, or PAH compounds. Trace concentrations of toluene were detected in two perimeter borings, 53-03 and 53-04.

The horizontal extent of the soil contamination was determined during the CAP-Part A site investigations. Therefore, no additional soil borings are recommended as part of the SIP.

III.A.2 Groundwater

Groundwater contamination was delineated by analyzing groundwater from five temporary piezometers installed in and around the contamination source during the CAP-Part A site investigations. Groundwater samples collected from the three piezometers that were located around the perimeter of the tank pit did not indicate the presence of BTEX or PAH compounds. The groundwater samples collected from the two boreholes in the tank pit indicated that the concentration of benzene exceeded its respective MCL in only one boring, 53-01.

The extent of the groundwater contamination was determined during the CAP-Part A site investigation. The groundwater contamination is limited laterally to the immediate tank pit area so that extensive vertical migration is unlikely. Therefore, no monitoring wells are recommended as part of the SIP.

III.A.3 Surface Water

No changes from the original CAP-Part A Report submitted in May 1997.

III.B Vadose Zone and Aquifer Characteristics

No changes from the original CAP-Part A Report submitted in May 1997.

IV. PUBLIC NOTICE

No change from the original CAP-Part A Report submitted in May 1997.

THIS PAGE INTENTIONALLY LEFT BLANK

V. CLAIM FOR REIMBURSEMENT: GUST TRUST FUND

No change from the original CAP-Part A Report submitted in May 1997.

THIS PAGE INTENTIONALLY LEFT BLANK

VI. REFERENCES

White, Kenneth F. 1998. Letter to John Spears (Fort Stewart DPW ENRD Environmental Branch), March 13, 1998.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLES

THIS PAGE INTENTIONALLY LEFT BLANK

Addendum Table II-3. Analytical Results of Soil Samples Collected at the USTs 232 & 233 Site; Facility ID #9-089061

Station:		53-01	53-01	53-02	53-02	53-03	53-03
Sample ID:		5301A1	5301D1	5302B1	5302D1	5303A1	5303D1
Sample Interval:	Georgia UST	0.0' - 2.5'	7.5' - 8.5'	2.5' - 5.0'	7.5' - 8.5'	1.0' - 2.5'	7.5' - 10.0'
Media:	Corrective	Soil	Soil	Soil	Soil	Soil	Soil
Sample Type:	Action Levels	Grab	Grab	Grab	Grab	Grab	Grab
Collection Date:	for Soil[a]	08-Sep-96	08-Sep-96	7-Sep-96	7-Sep-96	13-Dec-96	13-Dec-96
Units:	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
2-Chloronaphthalene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Acenaphthene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Acenaphthylene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Anthracene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Benzene	0.008	0.006 U	0.0062 U	0.0056 U	0.0057 U	0.0056 U	0.0058 U
Benzo(a)anthracene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Benzo(a)pyrene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Benzo(b)fluoranthene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Benzo(g,h,i)perylene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Benzo(k)fluoranthene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Chrysene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Dibenzo(a,h)anthracene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 UJ	0.368 U	0.378 U
Ethylbenzene	10	0.006 U	0.0062 U	0.0056 U	0.0057 U	0.0056 U	0.0058 U
Fluoranthene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Fluorene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Indeno(1,2,3-cd)pyrene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Lead	--	6.1 =		4.4 =		4.2 =	
Naphthalene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Phenanthrene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Pyrene	N/A[b]	0.396 U	0.4 U	0.364 U	0.379 U	0.368 U	0.378 U
Toluene	6	0.006 U	0.0071 =	0.0056 U	0.0057 U	0.0188 =	0.0079 J
Total Organic Carbon	--						
Total Petroleum Hydrocarbons	--	7.57 U	23.5 U	27 J	31.4 U	1.3 U	12 U
Xylenes, Total	700	0.006 U	0.0062 U	0.0056 U	0.0057 U	0.0056 U	0.0058 U

[a] Average or higher groundwater pollution susceptability area (where public water supply is within 2.0 mi.).

[b] Not applicable.

10 Bold values indicate results exceeding Georgia UST action levels.

U Indicates that the compound was not detected above the reported sample quantitation limit

J Indicates that the value for the compound was an estimated value

UJ Indicates that the sample was not detected above an approximate sample quantitation limit

R Indicates that the sample results are unusable and the presence or absence of the compound could not be verified

= Indicates that the compound was detected at the concentration reported

Addendum Table II-3 (continued)

Station: Sample ID: Sample Interval: Media: Sample Type: Collection Date: Units:	Georgia UST Corrective Action Levels for Soil[a] (mg/kg)	53-04 5304C1 5.0' - 7.5' Soil Grab 13-Dec-96 (mg/kg)	53-04 5304D1 7.5' - 10.0' Soil Grab 13-Dec-96 (mg/kg)	53-05 530511 5.0' - 7.5' Soil Grab 14-Nov-97 (mg/kg)
2-Chloronaphthalene	N/A[b]	0.378 U	0.397 U	0.393 U
Acenaphthene	N/A[b]	0.378 U	0.397 U	0.393 U
Acenaphthylene	N/A[b]	0.378 U	0.397 U	0.393 U
Anthracene	N/A[b]	0.378 U	0.397 U	0.393 U
Benzene	0.008	0.0058 U	0.006 U	0.0024 U
Benzo(a)anthracene	N/A[b]	0.378 U	0.397 U	0.393 U
Benzo(a)pyrene	N/A[b]	0.378 U	0.397 U	0.393 U
Benzo(b)fluoranthene	N/A[b]	0.378 U	0.397 U	0.393 U
Benzo(g,h,i)perylene	N/A[b]	0.378 U	0.397 U	0.393 U
Benzo(k)fluoranthene	N/A[b]	0.378 U	0.397 U	0.393 U
Chrysene	N/A[b]	0.378 U	0.397 U	0.393 U
Dibenzo(a,h)anthracene	N/A[b]	0.378 U	0.397 U	0.393 U
Ethylbenzene	10	0.0058 U	0.006 U	0.0024 U
Fluoranthene	N/A[b]	0.378 U	0.397 U	0.393 U
Fluorene	N/A[b]	0.378 U	0.397 U	0.393 U
Indeno(1,2,3-cd)pyrene	N/A[b]	0.378 U	0.397 U	0.393 U
Lead	--	5.3 =		5.3 =
Naphthalene	N/A[b]	0.378 U	0.397 U	0.393 U
Phenanthrene	N/A[b]	0.378 U	0.397 U	0.393 U
Pyrene	N/A[b]	0.378 U	0.397 U	0.393 U
Toluene	6	0.0075 J	0.0261 =	2.4 U
Total Organic Carbon	--			1530 =
Total Petroleum Hydrocarbons	--	23 =	8.8 J	5.83 U
Xylenes, Total	700	0.0058 U	0.006 U	0.0048 U

[a] Average or higher groundwater pollution susceptibility area (where public water supply is within 2.0 mi.).

[b] Not applicable.

10 Bold values indicate results exceeding Georgia UST action levels.

U Indicates that the compound was not detected above the reported sample quantitation limit

J Indicates that the value for the compound was an estimated value

UJ Indicates that the sample was not detected above an approximate sample quantitation limit

R Indicates that the sample results are unusable and the presence or absence of the compound could not be verified

= Indicates that the compound was detected at the concentration reported

Addendum Table II-4. Analytical Results of Groundwater Samples Collected at the USTs 232 & 233 Site; Facility ID #9-089061

Station:		53-01	53-02	53-03	53-04	53-05
Sample ID:		5301W2	5302W2	5303W2	5304W2	5305W2
Media:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sample Type:	Federal	Grab	Grab	Grab	Grab	Grab
Collection Date:	SDWA MCLs	08-Sep-96	07-Sep-96	13-Dec-96	13-Dec-96	14-Nov-97
Units:	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
2-Chloronaphthalene		10 U	10 U	10 U	10 U	10 R
Acenaphthene		10 U	10 U	10 U	10 U	10 R
Acenaphthylene		10 U	10 U	10 U	10 U	10 R
Anthracene		10 U	10 U	10 U	10 U	10 R
Benzene	5	**13.9 =**	5 U	5 U	5 U	2 U
Benzo(a)anthracene		10 U	10 U	10 U	10 U	10 R
Benzo(a)pyrene	0.2	**10 U**	**10 U**	**10 U**	**10 U**	10 R
Benzo(b)fluoranthene		10 U	10 U	10 U	10 U	10 R
Benzo(g,h,i)perylene		10 U	10 U	10 U	10 U	10 R
Benzo(k)fluoranthene		10 U	10 U	10 U	10 U	10 R
Chrysene		10 U	10 U	10 U	10 U	10 R
Dibenzo(a,h)anthracene		10 U	10 U	10 U	10 U	10 R
Ethylbenzene	700	16.8 =	5 U	5 U	5 U	2 U
Fluoranthene		10 U	10 U	10 U	10 U	10 R
Fluorene		10 U	10 U	10 U	10 U	10 R
Indeno(1,2,3-cd)pyrene		10 U	10 U	10 U	10 U	10 R
Lead	15[a]			**202 =**	**70.8 =**	
Naphthalene		10 U	10 U	10 U	10 U	10 R
Phenanthrene		10 U	10 U	10 U	10 U	10 R
Pyrene		10 U	10 U	10 U	10 U	10 R
Toluene	1000	5 U	5 U	5 U	5 U	2 U
Xylenes, Total	10000	23.9 =	5 U	5 U	5 U	4 U

[a] Technology Action Level (Federal Register Vol. 56. No. 110, June 7, 1991)

10 Bold values indicate results exceeding Federal Safe Drinking Water Act Maximum Contaminant Levels.

U Indicates that the compound was not detected above the reported sample quantitation limit

J Indicates that the value for the compound was an estimated value

UJ Indicates that the sample was not detected above an approximate sample quantitation limit

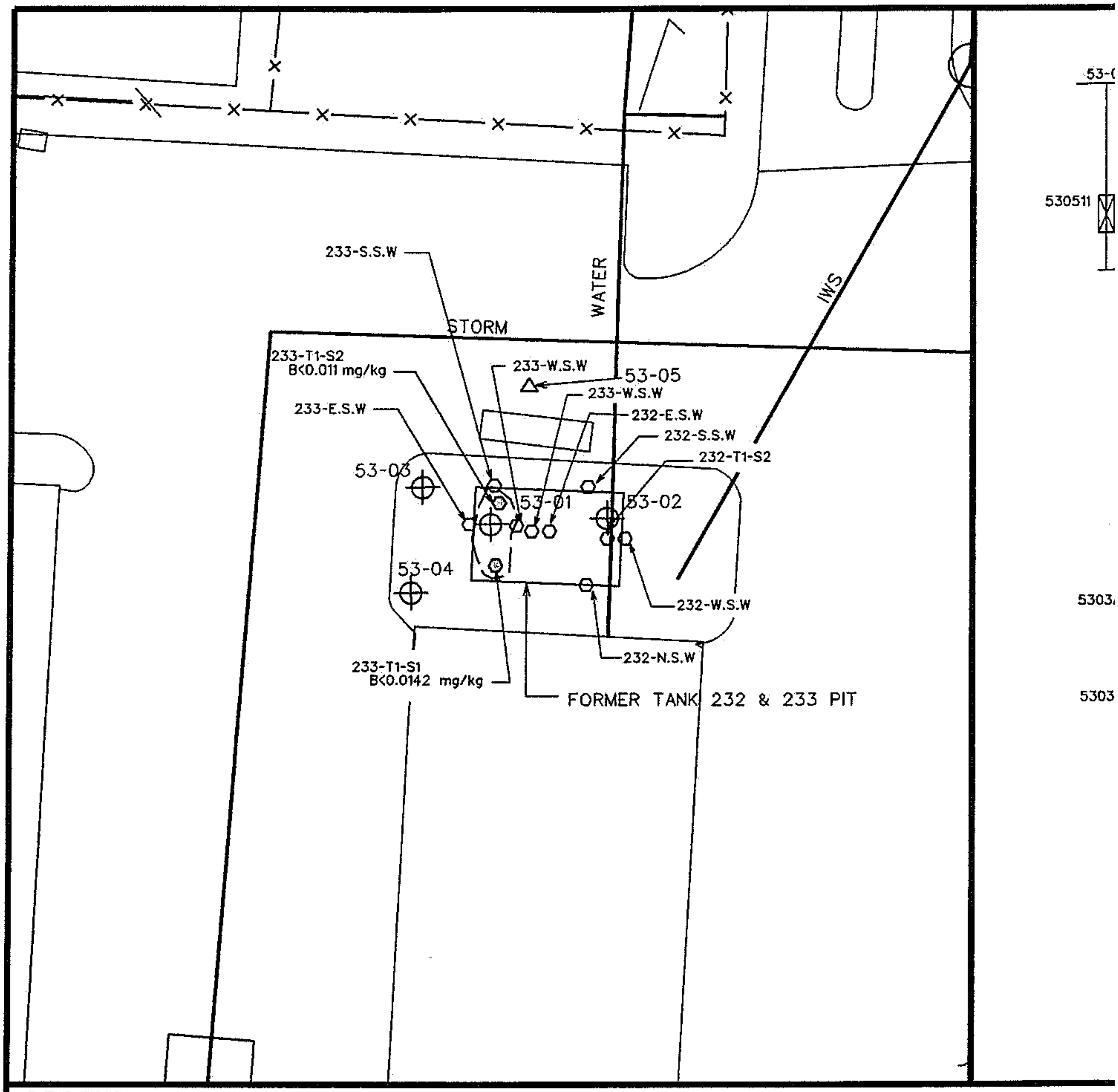
R Indicates that the sample results are unusable and the presence or absence of the compound could not be verified

= Indicates that the compound was detected at the concentration reported

THIS PAGE INTENTIONALLY LEFT BLANK

FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

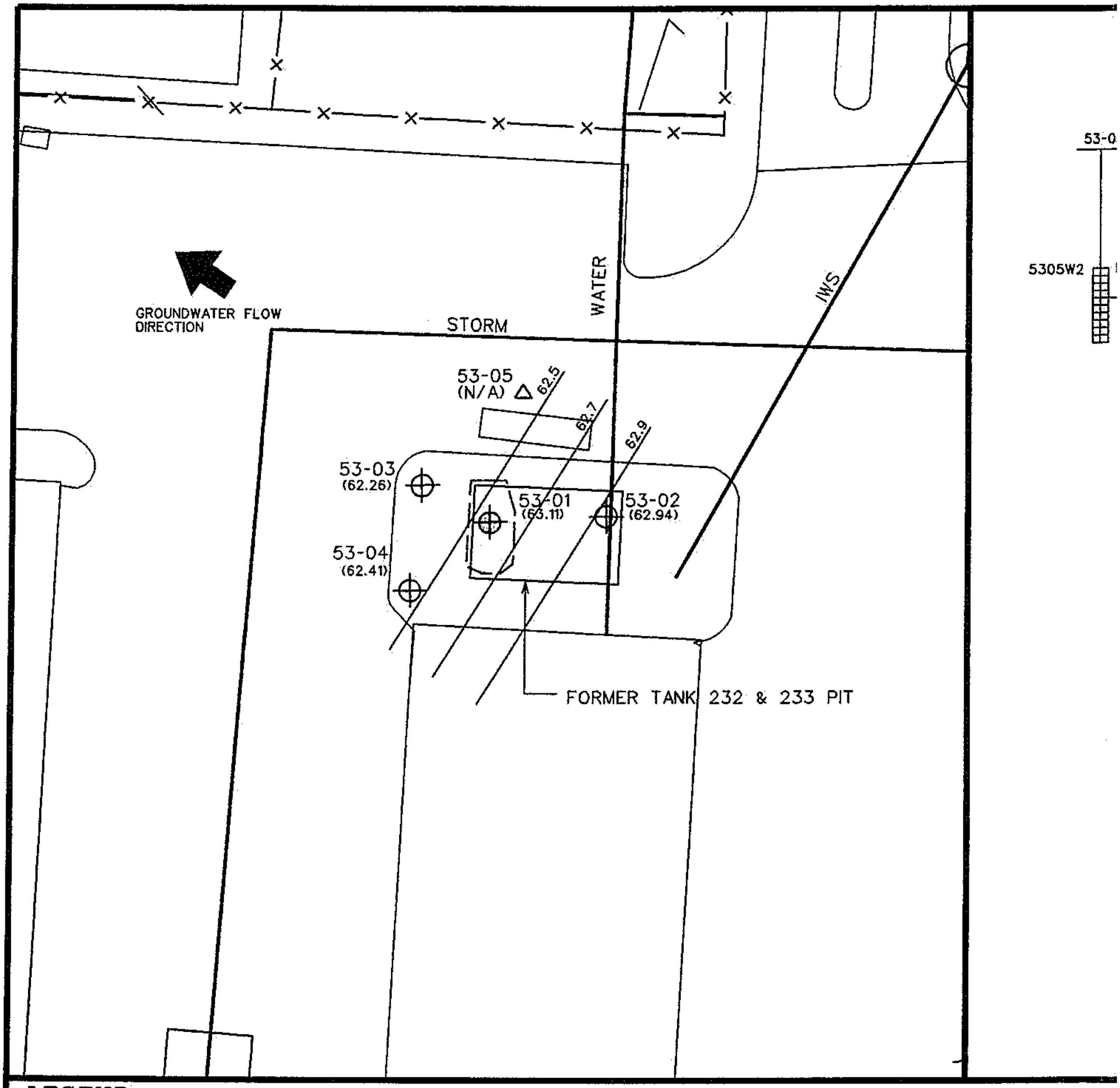


LEGEND

⊕	CAP-PART A INVESTIGATION BOREHOLE	△	CAP PART A ADDENDUM SAMPLE LOCATION	B	BENZENE
⊕	SOIL SAMPLE LOCATION EXCEEDING THRESHOLD LEVELS	▲	CAP PART A ADDENDUM SAMPLE LOCATION EXCEEDING THRESHOLD LEVELS	T	TOLUENE
⬡	TANK REMOVAL SAMPLE LOCATION			E	ETHYLBENZENE
⬢	TANK REMOVAL SAMPLE LOCATION EXCEEDING THRESHOLD LEVELS			X	XYLENES, TOTAL
☒	SOIL SAMPLE INTERVAL AND SAMPLE ID			BTL	BELOW THRESHOLD LEVELS
☒	SOIL SAMPLE INTERVAL EXCEEDING THRESHOLD LEVELS			▽	APPROXIMATE WATER LEVEL
⊂⊃	ESTIMATED LIMIT OF SOIL CONTAMINATION				

Addend

THIS PAGE INTENTIONALLY LEFT BLANK



LEGEND

⊕	CAP-PART A INVESTIGATION BOREHOLE
⊕	GROUNDWATER SAMPLE LOCATION EXCEEDING MCLs
☐	SCREENED GROUNDWATER SAMPLE INTERVAL AND SAMPLE ID
▨	GROUNDWATER SAMPLE INTERVAL EXCEEDING MCLs
⊂⊃	ESTIMATED LIMIT OF GROUNDWATER CONTAMINATION

△	CAP PART A ADDENDUM SAMPLE LOCATION
▲	CAP PART A ADDENDUM SAMPLE LOCATION EXCEEDING MCLs
N/A	NOT APPLICABLE

—— 69.75	09/97 EQUIPOTENTIAL CONTOUR (FEET ABOVE MEAN SEA LEVEL)
B	BENZENE
T	TOLUENE
E	ETHYLBENZENE
X	XYLENES, TOTAL
BMCL	BELOW MCLs
▽	APPROXIMATE WATER LEVEL

MAXIMUM

B - 5 u

T - 100

E - 700

X - 10,0

Addend

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A

SOIL BORING LOGS

THIS PAGE INTENTIONALLY LEFT BLANK

HTRW DRILLING LOG

PROJECT: Fort Stewart USTs

INSPECTOR C. Grubbs

HOLE NUMBER 53-05

SHEET 1 OF 2

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		CONCRETE				
	1	silty SAND, (SM), fine grained, dry, dark gray (2.5Y 4/1) with some light gray mix (fill material)	0.0 ppm			
	2					
	3		2.0 ppm			
	4					
	5	SAND, (SW), light gray (2.5Y 7/1)				
	6	sandy CLAY, (CL), firm, with iron oxides, yellowish brown (10 YR 5/8), mottling	3.0 ppm		Soil Sample 530511	
	7					
	8					
	9		8.0 ppm			
	10					▼ WET BELOW 10.0 FT BGS

HTRW DRILLING LOG

HOLE NUMBER 53-05

INSPECTOR C. Grubbs

SHEET 2 OF 2

PROJECT: Fort Stewart USTs

ELEV. (A)	DEPTH (B)	DESCRIPTION OF MATERIALS (C)	FIELD SCREENING RESULTS	GEOTECH SAMPLE OR CORE BOX	ANALYTICAL SAMPLE NO. (F)	REMARKS (G)
		clayey SAND, (SC), fine grained, little clay, greenish gray (6/5GY), saturated				
	11					
	12					
						END OF DRILLING AT 12.5 FT BGS GROUNDWATER SAMPLE 5305W2 COLLECTED FROM 7.5-12.5 FT BGS
	13					
	14					
	15					
	16					
	17					
	18					
	19					
	20					

No changes from the original CAP-Part A submitted to GA EPD in May 1997.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C

ANALYTICAL DATA SHEETS

THIS PAGE INTENTIONALLY LEFT BLANK

GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

STATEMENT ON LABORATORY DETECTION LIMITS

General Engineering has been performing chemical analysis on soil and groundwater samples for SAIC managed Ft. Stewart, GA, UST CAP Part-A and CAP Part-B Investigations for the past two years.

In the course of these studies GEL has employed appropriate EPA SW-846 protocols according to Methods 8020 for BTEX compounds, 8270 for PAH compounds, and modified 8015 for TPH-GRO and TPH-DRO components.

In performance of these methods the laboratory has consistently maintained analyte reporting levels of:

Analyte	Soil ug/Kg	Water ug/L
Benzene	5	5
Toluene	5	5
Ethylbenzene	5	5
Xylenes	10	10
PAHs	330	10
	mg/Kg	mg/L
TPH-GRO	5	0.1
TPH-DRO	4	0.1
TPH	10	0.2

Analytical method detection levels (MDLs) have been maintained at the following levels:

Analyte	Soil ug/Kg	Water ug/L
Benzene	2	2
Toluene	2	2
Ethylbenzene	2	2
Xylenes	4	4
PAHs	70	2
	mg/Kg	mg/L
TPH-GRO	2	0.05
TPH-DRO	2	0.05
TPH	4	0.1

P O Box 30712 • Charleston, SC 29417 • 2040 Savage Road • 29414
(803) 556-8171 • Fax (803) 766-1178

When an analyte was observed between the laboratory MDL and the reporting level, an estimated ("J") value was reported. If an analyte is not determined above the MDL, the laboratory will report the reporting level as a "U" (undetected). The above reporting levels and MDLs are applicable for all values reported for these analyses. For example, when a Benzene concentration of 500 ug/Kg is reported the associated reporting level is 5 ug/Kg and the associated MDL is 2 ug/Kg.

Soil data has been reported on a dry weight basis. This introduces a correction factor based on the moisture content found in each sample for both positive values and for the reporting level and MDL. For example, when a soil sample's reporting level is corrected for its percent moisture (say 10% moisture), the dry weight reporting level for benzene becomes 5.5 ug/gm and the MDL becomes 2.2 ug/gm. Therefore soil reporting levels will vary based on the moisture.

These reporting protocols follow current EPA direction.

GEL attempted in every sample analysis to achieve the requirements of GUST for soil and groundwater analyses. However, in some cases, it was not possible to achieve standard MDLs and reporting levels for each individual analyte. When a single analyte is found in the sample at high concentrations (example: xylenes at 5,000 ug/Kg), the sample must be diluted to properly quantify the level of that analyte. Dilution of the sample for one analyte will dilute the sample for all other analytes, raising the reporting levels for those analytes by the multiple of the dilution factor (example: a dilution of 1:10 will raise reporting levels of benzene to 50 ug/Kg). At other times concentrations of undetermined contaminants will require samples to be diluted, causing reporting levels and MDLs to become elevated.

The data produced for these Ft. Stewart UST Investigations was determined using approved EPA methodology by qualified analytical chemists. It has been reviewed by the laboratory and is considered technically sound and defensible.

Name: Robert L. Pullano

Title: Quality Systems Manager

Signature:

Date: 1 April 98

FORM 1
VOLATILE ORGANICS ANALYSIS DATA SHEET

530511

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: FS2012S

Matrix: (soil/water) SOIL Lab Sample ID: 9711552-06

Sample wt/vol: 10.0 (g/mL) G Lab File ID: 2K207

Level: (low/med) LOW Date Received: 11/17/97

% Moisture: not dec. 16 Date Analyzed: 11/25/97

GC Column: J&W DB-624(PID) ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume:_________(ml) Soil Aliquot Volume: _________(uL

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
71-43-2	---------Benzene	2.4	U	U
108-88-3	--------Toluene	2.4	U	↓
100-41-4	--------Ethylbenzene	2.4	U	
1330-20-7	-------Xylenes (total)	4.8	U	

DATA VALIDATION
COPY

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

530511

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: FS2012S

Matrix: (soil/water) SOIL Lab Sample ID: 9711552-06

Sample wt/vol: 30.3 (g/mL) G Lab File ID: 8X408

Level: (low/med) LOW Date Received: 11/17/97

% Moisture: 16 decanted: (Y/N) N Date Extracted: 11/28/97

Concentrated Extract Volume: 1.00 (mL) Date Analyzed: 12/11/97

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
91-20-3	naphthalene	393	U
91-58-7	2-chloronaphthalene	393	U
208-96-8	acenaphthylene	393	U
83-32-9	acenaphthene	393	U
86-73-7	fluorene	393	U
85-01-8	phenanthrene	393	U
120-12-7	anthracene	393	U
206-44-0	fluoranthene	393	U
129-00-0	pyrene	393	U
56-55-3	benzo(a)anthracene	393	U
218-01-9	chrysene	393	U
205-99-2	benzo(b)fluoranthene	393	U
207-08-9	benzo(k)fluoranthene	393	U
50-32-8	benzo(a)pyrene	393	U
193-39-5	indeno(1,2,3-cd)pyrene	393	U
53-70-3	dibenz(a,h)anthracene	393	U
191-24-2	benzo(g,h,i)perylene	393	U

U ↓

FORM I SV-1

OLM03.

DATA [illegible]

1

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

530511

Lab Name: GENERAL_ENGINEERING_LABS_ Contract: SAIC01097_
Lab Code: _______ Case No.: ______ SAS No.: _______ SDG No.: FS2012S
Matrix (soil/water): SOIL_ Lab Sample ID: 9711552-06
Level (low/med): LOW__ Date Received: 11/17/97
% Solids: _84.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7439-92-1	Lead_	5.3			P_

Color Before: ________ Clarity Before: ______ Texture: ______
Color After: ________ Clarity After: ______ Artifacts: ______

Comments:

Client:	Science Applications International Corp. P.O. Box 2502 800 Oak Ridge Turnpike Oak Ridge, Tennessee 37831
Contact:	Ms. Kristi Anderson
Project Description:	Option 1 to CAP-Part B (UST Sites)

cc: SAIC01097 Report Date: December 12, 1997 Page 1 of 2

Sample ID : 530511
Lab ID : 9711552-06
Matrix : Soil
Date Collected : 11/14/97
Date Received : 11/17/97
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Organic Prep											
Evaporative Loss @ 105 C		16.0	1.00	1.00	wt%	1.0	ERH	11/28/97	1734	112112	1
General Chemistry											
TOTAL REC. PETRO. HYDROCARBONS		5.83 U F01,F06	2.36	11.9	mg/kg	1.0	JLP	12/01/97	1300	112201	2
TOTAL ORGANIC CARBON (TOC)		1530 =	24.1	100	mg/kg	1.0	MWD	12/06/97	1347	112521	3

The following prep procedures were performed:

	Analyst	Date	Time	Batch	M
GC/MS Base/Neutral Compounds	GWL	11/28/97	2345	112074	1
TRACE	FGD	12/03/97	1230	111987	4

Surrogate Recovery	Test	Percent%	Acceptable Limits
n-propylbenzene	BTEX-GC	101.	(51.9 - 133.)

M = Method	Method-Description
M 1	EPA 3550
M 2	EPA 418.1 Modified
M 3	SW846 9060 modified
M 4	EPA 3050

9711552-06

FORM 1
VOLATILE ORGANICS ANALYSIS DATA SHEET

5305W2

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: FS2014W

Matrix: (soil/water) WATER

Lab Sample ID: 9711546-01

Sample wt/vol: 10.0 (g/mL) ML

Lab File ID: 2K307

Level: (low/med) LOW

Date Received: 11/17/97

% Moisture: not dec. ______

Date Analyzed: 11/26/97

GC Column: J&W DB-624(PID) ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: ______ (uL)

Soil Aliquot Volume: ______ (uL

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q	
71-43-2	Benzene	2.0	U	U
108-88-3	Toluene	2.0	U	↓
100-41-4	Ethylbenzene	2.0	U	↓
1330-20-7	Xylenes (total)	4.0	U	↓

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

5305W2

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: FS2014W

Matrix: (soil/water) GROUNDH2O Lab Sample ID: 9711546-01

Sample wt/vol: 1000 (g/mL) ML Lab File ID: 2W307

Level: (low/med) LOW Date Received: 11/17/97

% Moisture: ______ decanted: (Y/N) ___ Date Extracted: 11/20/97

Concentrated Extract Volume: 1.00 (mL) Date Analyzed: 12/03/97

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
91-20-3	naphthalene	10.0	U
91-58-7	2-chloronaphthalene	10.0	U
209-96-8	acenaphthylene	10.0	U
83-32-9	acenaphthene	10.0	U
86-73-7	fluorene	10.0	U
85-01-8	phenanthrene	10.0	U
120-12-7	anthracene	10.0	U
206-44-0	fluoranthene	10.0	U
129-00-0	pyrene	10.0	U
56-55-3	benzo(a)anthracene	10.0	U
218-01-9	chrysene	10.0	U
205-99-2	benzo(b)fluoranthene	10.0	U
207-08-9	benzo(k)fluoranthene	10.0	U
50-32-8	benzo(a)pyrene	10.0	U
193-39-5	indeno(1,2,3-cd)pyrene	10.0	U
53-70-3	dibenz(a,h)anthracene	10.0	U
191-24-2	benzo(g,h,i)perylene	10.0	U

R G04

DATA VALIDATION COPY

CHAIN OF CUSTODY FORMS

THIS PAGE INTENTIONALLY LEFT BLANK

SAIC An Employee-Owned Company
Science Applications International Corporation
0 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423) 481-4600

CHAIN OF CUSTODY RECORD

COC NO.: PB11005

OJECT NAME: Fort Stewart CAP Part B-Option 1-UST Investigation

OJECT NUMBER: 01-0331-04-8358-300

OJECT MANAGER: Patty Stoll

mpler (Signature) (Printed Name) JULIAGARBEFF

LABORATORY NAME: General Engineering Laboratory

LABORATORY ADDRESS:
2040 Savage Road
Charleston, SC 29417

PHONE NO: (803) 556-8171

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	BTEX	BTEX, DRO	PAH	PAH,DRO	PAH, DRO, LEAD, TOC	DRO	DISSOLVED IRON	LEAD	TPH	TOC	No. of Bottles/ Vials	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
480721	11-14-97	1635	soil		X			X						2	9711552 -01 3.1
320811	11-14-97	1850	soil	X		X					X	X	X	2	-02
320721	11-14-97	1715	soil	X		X					X	X	X	2	-03
320711	11-14-97	1710	Soil	X		X						X		2	-04 .3
141021	11-14-97	1550	soil	X		X					X	X	X	2	-05
530511	11-14-97	0915	soil	X		X					X	X	X	2	-06
140911	11-14-97	1520	soil	X		X						X		2	-07
5305W2	11-14-97	0930	water	X		X								4	9711546 -01 30138.1
TBA011	11-14-97	0745	water	X										2	546 -02 .2
140711	11-14-97	1230	soil	X		X						X		2	~~-08~~ 19
141011	11-14-97	1550	soil	X		X						X		2	-20
3008R5	11-15-97	1400	water		X		X							5	546-03 .3

DG 11/17/97

ELINQUISHED BY:	Date/Time 11/17/97 1430	RECEIVED BY:	Date/Time	TOTAL NUMBER OF CONTAINERS:	Cooler Temperature:
OMPANY NAME: SAIC		COMPANY NAME:		Cooler ID:	FEDEX NUMBER:
ECEIVED BY:	Date/Time 11/17/97 1430	RELINQUISHED BY:	Date/Time		
OMPANY NAME: GEL		COMPANY NAME:			
ELINQUISHED BY:	Date/Time 11/17/97 1645	RECEIVED BY:	Date/Time 11/17/97 1645		
OMPANY NAME: GEL		COMPANY NAME: GEL			

Temp 5°C

THIS PAGE INTENTIONALLY LEFT BLANK

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D

DOCUMENTATION OF WATER SUPPLY SURVEY FOR THE FORT STEWART GARRISON AREA

THIS PAGE INTENTIONALLY LEFT BLANK

No changes from the original CAP-Part A submitted to GA EPD in May 1997.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX E

SITE RANKING FORM FOR FACILITY ID #9-089061

THIS PAGE INTENTIONALLY LEFT BLANK

No changes from the original CAP-Part A submitted to GA EPD in May 1997.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX F

PUBLIC NOTIFICATION NEWSPAPER ANNOUNCEMENT FOR FACILITY ID #9-089061

THIS PAGE INTENTIONALLY LEFT BLANK

No changes from the original CAP-Part A submitted to GA EPD in May 1997.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX G

RISK-BASED CORRECTIVE ACTION

THIS PAGE INTENTIONALLY LEFT BLANK

G. PROVIDE RISK-BASED CORRECTIVE ACTION

G.1 Approach

A risk-based approach was utilized to determine the need for further action at the USTs 232 & 233 site. Due to the nature of the contamination (petroleum hydrocarbon contamination of groundwater), the risk-based approach was limited to human health concerns. Ecological risk concerns are negligible as a result of the lack of habitat available for ecological receptors due to 6 inches of gravel surrounded by concrete overlying the site.

The methods for assessing human health concerns for the site were derived primarily from recent Georgia Environmental Protection Division (GA EPD) guidance (GA EPD 1996) and the *Supplemental Guidance to RAGS: Region IV Bulletin Human Health Risk Assessment* (EPA 1994); these were supplemented by additional guidance documents on risk assessment methods referenced in this section. Risk-based remediation threshold levels were identified in two steps: (1) screening against risk-based and applicable, relevant, and appropriate requirement (ARAR)-based screening levels for chemicals of concern (COCs), and (2) development of site-specific alternate concentration limits (ACLs) for the COCs identified during the screening. The following sections present the conceptual model of the exposure setting and potential receptors and the general methodology employed to perform the screening for COCs and the development of ACLs.

G.2 Potential Receptor Survey

G.2.1 Exposure Assessment

The exposure assessment identifies any potentially complete pathways between the contaminant source and potential receptors. This involves identifying potential current and future receptors, release mechanisms through which contamination may come into contact with the receptors, and the routes of exposure through which the receptors may be exposed.

The site is located within an active military installation. The USTs 232 & 233 site is located within an access-controlled fence of a secured motorpool The land use at the site is currently military industrial. An Installation housing area is located approximately 1.5 miles to the northeast. Mill Creek is located approximately 1140 feet northeast of the site.

No current on-site receptors have been identified for the site. Potential current off-site receptors include military residents and children. Potential future on-site receptors may include industrial workers and residential receptors.

No connection between site contamination and current off-site receptors has been identified. It is unlikely that Installation residents will come in contact with contaminated groundwater due to the depth at which drinking water is pumped from the Floridan aquifer and the thick confining layer located between this aquifer and the surficial aquifer. No basements have been identified in the area that could potentially be affected by vapor intrusion from chemicals in the groundwater. None of the Installation's water supply wells are located downgradient of the USTs 232 & 233 site. The water supply wells are separated from the surficial aquifer by the Hawthorn Group, a thick and highly effective confining unit.

Potential future on-site industrial receptors may come in direct contact with site soil contamination during construction or excavation activities. Potential future residential receptors may come in direct contact with groundwater contamination during household water use.

Exposure from *direct contact pathways* represents exposure via direct contact with the source media. For direct contact pathways the exposure point concentration is the concentration source term (EPA 1994) and is represented by data collected at the site. Screening for the direct contact pathways utilizes the results of the data collected at the USTs 232 & 233 site to perform the screens.

Exposure pathways that incorporate chemical migration to a secondary media (groundwater, surface water, sediments, air, and biota) or to an off-site receptor are referred to as *indirect contact pathways*. The exposure point concentrations for the secondary media will be determined using mathematical models that take into consideration chemical-specific and media-specific properties to estimate the chemical concentration in the secondary exposure media.

G.2.2 Screening for Chemicals of Concern

The purpose of a risk evaluation screen is to identify the COCs and areas of concern at a site, and possibly identify sites for which no further action is needed. The first step in the risk process uses screening levels that are readily obtainable and, due to their conservative nature, can be used with a high degree of confidence to indicate sites for which no further action is required.

An American Society for Testing and Materials (ASTM) (ASTM 1995) Tier 1-type risk evaluation process will be applied to the data collected for the USTs 232 & 233 site to identify any COCs and media for which no further action is needed. The risk evaluation screen involves the following steps:

- Identify potential migration and exposure pathways associated with the site and identify potential exposure scenarios that should be used to select screening levels.

- Identify risk-based and ARAR-based screening levels for each contaminant.

- Compare site-related concentrations to screening levels to determine if any chemicals of potential concern exist at the site.

- Compare detection limits to screening levels to identify potential false negative screening results.

The screening levels for the USTs 232 & 233 site data have been taken from the following sources based on GA EPD guidance (GA EPD 1996):

- Federal MCLs (EPA 1989);
- GUST Soil Threshold Levels (Table A, Column 2);

- Soil screening levels developed by U.S. Environmental Protection Agency (EPA 1996); and
- Soil and groundwater risk-based concentrations developed by EPA Region 3 (EPA 1996).

These values reflect screening levels based on a combination of ARARs (i.e., MCLs and GUST Soil Threshold Levels), and calculated risk-based values (i.e., EPA Region 3 risk-based concentrations). Soil and groundwater screening levels reflect a combination of both ARAR-based and risk-based values.

Screening levels inherently incorporate assumptions about land use. In identifying COCs, it is generally accepted that screening levels will reflect any potential future land uses and, thus, reflect a conservative residential use scenario (EPA 1991; EPA 1996; ASTM 1995). Based on GA EPD guidance, risk-based screening levels reflect residential land use for groundwater and industrial land use for deep soils (GA EPD 1996).

Default residential exposure scenarios for groundwater assume that use of the land could someday be residential, and that the following exposures could occur:

- Ingestion of groundwater, and
- Inhalation of volatiles during showering.

The default industrial exposure assumptions for deep soils assume that the following exposures could occur:

- Incidental ingestion of soil, and
- Inhalation of volatiles and dust.

The EPA Soil Screening Guidance (EPA 1996) provides two options for selecting soil values that address protection of groundwater. One value assumes no contaminant dilution or attenuation would occur between the soil and groundwater; a second value assumes a 20-fold dilution-attenuation factor (DAF). A DAF of 20 was used to develop soil screening values protective of groundwater at the USTs 232 & 233 site.

If ARAR- or risk-based values are not available, it generally reflects (1) that the chemical is not considered to be toxic except perhaps at extremely high concentrations (e.g., aluminum, sodium, etc.); (2) no dose-response data indicate a toxic effect; or (3) EPA is currently reviewing toxicity information and no reference dose or cancer slope factor currently is available.

G.2.3 Results

The risk screening process is a systematic screening of sample results to determine site-related COCs. Chemical concentrations below risk- or ARAR-based screening levels are not considered COCs and are not evaluated further. Addendum Tables G.1 and G.2 present the results of the risk-based screening for the Part A SI soil and groundwater data, respectively.

Addendum Table G.1. Comparison of Fort Stewart CAP A USTs 232 & 233 Soil Results to Screening Levels

Station:	Screening Levels			53-01	53-01	53-02	53-02	53-03	53-03
Sample ID:	Georgia UST Corrective Action Levels for Soil[a]	Risk-based Screening Level[b]	Leaching to Groundwater[c]	5301A1	5301D1	5302B1	5302D1	5303A1	5303D1
Sample Interval:				0.0' - 2.5'	7.5' - 8.5'	2.5' - 5.0'	7.5' - 8.5'	1.0' - 2.5'	7.5' - 10.0'
Media:				Soil	Soil	Soil	Soil	Soil	Soil
Sample Type:				Grab	Grab	Grab	Grab	Grab	Grab
Collection Date:				08-Sep-96	08-Sep-96	7-Sep-96	7-Sep-96	13-Dec-96	13-Dec-96
Units:	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
2-Chloronaphthalene[d]	N/A[e]	82000000	84000	396 U	400 U	364 U	379 U	368 U	378 U
Acenaphthene	N/A[e]	120000000	570000	396 U	400 U	364 U	379 U	368 U	378 U
Acenaphthylene	N/A[e]	61000000	4200000	396 U	400 U	364 U	379 U	368 U	378 U
Anthracene	N/A[e]	610000000	12000000	396 U	400 U	364 U	379 U	368 U	378 U
Benzene	8	200000	30	6 U	6.2 U	5.6 U	5.7 U	5.6 U	5.8 U
Benzo(a)anthracene	N/A[e]	7800	2000	396 U	400 U	364 U	379 U	368 U	378 U
Benzo(a)pyrene	N/A[e]	780	8000	396 U	400 U	364 U	379 U	368 U	378 U
Benzo(b)fluoranthene	N/A[e]	7800	5000	396 U	400 U	364 U	379 U	368 U	378 U
Benzo(g,h,i)perylene	N/A[e]			396 U	400 U	364 U	379 U	368 U	378 U
Benzo(k)fluoranthene	N/A[e]	78000	49000	396 U	400 U	364 U	379 U	368 U	378 U
Chrysene	N/A[e]	780000	160000	396 U	400 U	364 U	379 U	368 U	378 U
Dibenzo(a,h)anthracene	N/A[e]	780	2000	396 U	400 U	364 U	379 UJ	368 U	378 U
Ethylbenzene	10000	200000000	13000	6 U	6.2 U	5.6 U	5.7 U	5.6 U	5.8 U
Fluoranthene	N/A[e]	82000000	4300000	396 U	400 U	364 U	379 U	368 U	378 U
Fluorene	N/A[e]	82000000	560000	396 U	400 U	364 U	379 U	368 U	378 U
Indeno(1,2,3-cd)pyrene	N/A[e]	7800	14000	396 U	400 U	364 U	379 U	368 U	378 U
Lead	--	5000000	--	6100 =		4400 =		4200 =	
Naphthalene	N/A[e]	82000000	84000	396 U	400 U	364 U	379 U	368 U	378 U
Phenanthrene[f]	N/A[e]	61000000	4200000	396 U	400 U	364 U	379 U	368 U	378 U
Pyrene	N/A[e]	61000000	4200000	396 U	400 U	364 U	379 U	368 U	378 U
Toluene	6000	410000000	12000	6 U	7.1 =	5.6 U	5.7 U	18.8 =	7.9 J
Total Organic Carbon	--	--	--						
Total Petroleum Hydrocarbons	--	--	--	7570 U	23500 U	27000 J	31400 U	1300 U	12000 U
Xylenes, Total	700000	1000000000	190000	6 U	6.2 U	5.6 U	5.7 U	5.6 U	5.8 U

[a] Average or higher groundwater pollution susceptability area (where public water supply is within 2.0 mi.)

[b] Protective of soil exposure during Industrial Land Use

[c] Protective of groundwater ingestion. Used a dilution attenuation factor of 20

[d] Values based on naphthalene as a surrogate chemical

[e] Not applicable. The screening level exceeds the expected soil concentration under free product condition

[f] Values based on pyrene as a surrogate chemical

10 Bold values indicate results exceeding Georgia UST action levels.

10 Italicized values indicate results exceeding risk-based screening levels

10 Underlined values indicate results exceeding leaching to groundwater screening levels

U Indicates that the compound was not detected above the reported sample quantitation limit

J Indicates that the value for the compound was an estimated value

UJ Indicates that the sample was not detected above an approximate sample quantitation limit

R Indicates that the sample results are unusable and the presence or absence of the compound could not be verified

= Indicates that the compound was detected at the concentration reported

Addendum Table G.1 (continued)

Station:	Screening Levels			53-04		53-04		53-05	
Sample ID:				5304C1		5304D1		530511	
Sample Interval:	Georgia UST Corrective Action Levels for Soil[a]	Risk-based Screening Level[b]	Leaching to Groundwater[c]	5.0' - 7.5'		7.5' - 10.0'		5.0' - 7.5'	
Media:				Soil		Soil		Soil	
Sample Type:				Grab		Grab		Grab	
Collection Date:				13-Dec-96		13-Dec-96		14-Nov-97	
Units:	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)		(ug/kg)		(ug/kg)	
2-Chloronaphthalene[d]	N/A[e]	82000000	84000	378	U	397	U	393	U
Acenaphthene	N/A[e]	120000000	570000	378	U	397	U	393	U
Acenaphthylene	N/A[e]	61000000	4200000	378	U	397	U	393	U
Anthracene	N/A[e]	610000000	12000000	378	U	397	U	393	U
Benzene	8	200000	30	5.8	U	6	U	2.4	U
Benzo(a)anthracene	N/A[e]	7800	2000	378	U	397	U	393	U
Benzo(a)pyrene	N/A[e]	780	8000	378	U	397	U	393	U
Benzo(b)fluoranthene	N/A[e]	7800	5000	378	U	397	U	393	U
Benzo(g,h,i)perylene	N/A[e]			378	U	397	U	393	U
Benzo(k)fluoranthene	N/A[e]	78000	49000	378	U	397	U	393	U
Chrysene	N/A[e]	780000	160000	378	U	397	U	393	U
Dibenzo(a,h)anthracene	N/A[e]	780	2000	378	U	397	U	393	U
Ethylbenzene	10000	200000000	13000	5.8	U	6	U	2.4	U
Fluoranthene	N/A[e]	82000000	4300000	378	U	397	U	393	U
Fluorene	N/A[e]	82000000	560000	378	U	397	U	393	U
Indeno(1,2,3-cd)pyrene	N/A[e]	7800	14000	378	U	397	U	393	U
Lead	--	5000000	--	5300	=			5300	=
Naphthalene	N/A[e]	82000000	84000	378	U	397	U	393	U
Phenanthrene[f]	N/A[e]	61000000	4200000	378	U	397	U	393	U
Pyrene	N/A[e]	61000000	4200000	378	U	397	U	393	U
Toluene	6000	410000000	12000	7.5	J	26.1	=	2.4	U
Total Organic Carbon	--	--	--					1530000	=
Total Petroleum Hydrocarbons	--	--	--	23000	=	8800	J	5830	U
Xylenes, Total	700000	1000000000	190000	5.8	U	6	U	4.8	U

[a] Average or higher groundwater pollution susceptability area (where public water supply is within 2.0 mi.)

[b] Protective of soil exposure during Industrial Land Use.

[c] Protective of groundwater ingestion. Used a dilution attenuation factor of 20.

[d] Values based on naphthalene as a surrogate chemical.

[e] Not applicable. The screening level exceeds the expected soil concentration under free product condition.

[f] Values based on pyrene as a surrogate chemical.

10 Bold values indicate results exceeding Georgia UST action levels.

10 Italicized values indicate results exceeding risk-based screening levels

10 Underlined values indicate results exceeding leaching to groundwater screening levels.

U Indicates that the compound was not detected above the reported sample quantitation limit

J Indicates that the value for the compound was an estimated value

UJ Indicates that the sample was not detected above an approximate sample quantitation limit

R Indicates that the sample results are unusable and the presence or absence of the compound could not be verified

= Indicates that the compound was detected at the concentration reported

Table G.2. Risk-based Screening of Groundwater Date at the USTs 232 & 233 Site, Facility ID #9-089061

Station:	Screening Levels		53-01	53-02	53-03	53-04	53-05
Sample ID:			5301W2	5302W2	5303W2	5304W2	5305W2
Media:		Risk-based	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
Sample Type:	Federal	Screening	Grab	Grab	Grab	Grab	Grab
Collection Date:	SDWA MCLs	Level[a]	08-Sep-96	07-Sep-96	13-Dec-96	13-Dec-96	14-Nov-97
Units:	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
2-Chloronaphthalene[b]		1500	10 U	10 U	10 U	10 U	10 R
Acenaphthene		2200	10 U	10 U	10 U	10 U	10 R
Acenaphthylene		1100	10 U	10 U	10 U	10 U	10 R
Anthracene		11000	10 U	10 U	10 U	10 U	10 R
Benzene	5	0.36	13.9 =	5 U	5 U	5 U	2 U
Benzo(a)anthracene		0.092	10 U	10 U	10 U	10 U	10 R
Benzo(a)pyrene	0.2	0.0092	**10 U**	**10 U**	**10 U**	**10 U**	**10 R**
Benzo(b)fluoranthene		0.092	10 U	10 U	10 U	10 U	10 R
Benzo(g,h,i)perylene			10 U	10 U	10 U	10 U	10 R
Benzo(k)fluoranthene		0.92	10 U	10 U	10 U	10 U	10 R
Chrysene		9.2	10 U	10 U	10 U	10 U	10 R
Dibenzo(a,h)anthracene		0.0092	10 U	10 U	10 U	10 U	10 R
Ethylbenzene	700	1300	16.8 =	5 U	5 U	5 U	2 U
Fluoranthene		1500	10 U	10 U	10 U	10 U	10 R
Fluorene		1500	10 U	10 U	10 U	10 U	10 R
Indeno(1,2,3-cd)pyrene		0.092	10 U	10 U	10 U	10 U	10 R
Lead	15[d]				202 =	70.8 =	
Naphthalene		1500	10 U	10 U	10 U	10 U	10 R
Phenanthrene[c]		1100	10 U	10 U	10 U	10 U	10 R
Pyrene		1100	10 U	10 U	10 U	10 U	10 R
Toluene	1000	750	5 U	5 U	5 U	5 U	2 U
Xylenes, Total	10000	12000	23.9 =	5 U	5 U	5 U	4 U

[a] Protective of tap water ingestion by a resident.

[b] Values based on naphthalene as a surrogate chemical.

[c] Values based on pyrene as a surrogate chemical.

[d] Technology Action Level (Federal Register Vol. 56. No. 110, June 7. 1991)

10 Bold values indicate results exceeding Federal Safe Drinking Water Act Maximum Contaminant Levels.

10 Underlined values indicate results exceeding risk-based screening levels.

U Indicates that the compound was not detected above the reported sample quantitation limit

J Indicates that the value for the compound was an estimated value

UJ Indicates that the sample was not detected above an approximate sample quantitation limit

R Indicates that the sample results are unusable and the presence or absence of the compound could not be verified

= Indicates that the compound was detected at the concentration reported

Lead, toluene, and TPH were detected below screening levels. No COCs were selected for USTs 232 & 233 area soils.

Detection limits for soil samples were below screening values. No COCs for soils were selected based on a detection limit screening.

Benzene was detected above the MCL and risk-based screening level for USTs 232 & 233 area groundwater in sample 5301W2. Lead was sampled for and detected in two samples. These detections exceeded the technology action level of lead (15 µg/L); one detection exceeded the criteria by an order of magnitude. Ethylbenzene and xylenes were detected below screening levels. Benzene and lead were selected as COCs for groundwater.

Detection limits for benzene and several PAHs exceeded risk-based screening levels. For these chemicals, risk-based values represent values below analytically achievable levels. The detection limits for one PAH, benzo(a)pyrene, also exceeded the federal MCL of 0.2 ppb by two orders of magnitude. The PAH analysis results for sample 5305W2 were rejected ("R" qualified) because the surrogate recovery was zero. No additional COCs for groundwater were selected based on the detection limit screening.

G.2.4 Uncertainties

Groundwater samples collected during the CAP-Part A investigations were collected from hydropunch sampling devices or temporary piezometers and contained a high amount of suspended solids and were very turbid. The lead concentrations in these samples above the technology action level is attributed to the suspended particles and not the contaminated groundwater.

G.2.5 Alternate Concentration Limits

Detections exceeding the conservative generic screening levels are considered COCs. ACLs are developed for the COCs using site-specific information. GA EPD recommends developing risk-based remediation levels using a risk goal at least 1×10^{-6} and not to exceed 1×10^{-4} for all carcinogens, and a hazard quotient (HQ) of 3 for noncarcinogens (GA EPD 1996).

No COCs were identified for USTs 232 & 233 area soils and thus no soil ACLs were developed.

Benzene and lead were selected as COCs for USTs 232 & 233 area groundwater. No risk-based methodology can be employed to develop site-specific cleanup levels for lead in the groundwater at the site. The default screening level of 15 µg/L for lead based on the technology action level will be used as the ACL for the site. The ACL for benzene was developed using a target risk of 1×10^{-4}. No current receptor for groundwater contamination exists at the site. The most likely potential future exposure would be ingestion of groundwater by an industrial worker. An ACL for an industrial drinking water receptor was calculated using a target risk of 1×10^{-4} or an HQ of 3 and EPA methodology (EPA 1994). The groundwater ACL calculated for benzene is 990 µg/L. ACL calculations are in Section G.5

G.3 Fate and Transport Model

The AT123D model was used to determine the impact of dissolved hydrocarbons on potential receptors. Modeling of the leaching of soil contamination to the groundwater was not performed because there was no soil contamination above the water table. Site-specific geotechnical parameters were estimated based on geological information from similar UST sites at Fort Stewart. Mill Creek was evaluated as the potential receptor. Vertical migration of the contaminant plume through the confining unit to the Principal Artesian aquifer is improbable. The confining unit has a vertical hydraulic conductivity on the order of 10^{-8} cm/sec and ranges from 15- to 90-feet thick. The surficial aquifer where the contaminant plume is located is not used as a source of drinking water.

The modeling results for benzene are provided in Section G.6 of this appendix. A potential downgradient location where a receptor may encounter migrating groundwater contamination was modeled. Mill Creek approximately 1140 feet northeast of the site is the nearest possible location where a receptor may encounter migrating groundwater contamination due to a possible hydraulic connection between the groundwater and the surface water in the creek. Contaminant migration modeling for 100 years of groundwater migrating to surface water in the creek, when accounting for biodegradation, indicates that benzene will not reach the surface water in detectable levels. If biodegradation and natural attenuation is ignored, benzene will still not reach Mill Creek in detectable levels. Soil and groundwater samples taken downgradient between the tank pit and the ditch do not indicate any BTEX compounds above detection levels, therefore, the identified contamination is limited to the immediate area of the former USTs.

G.4 Conclusions and Recommendations

The following conclusions are based on a review of the CAP-Part A site investigation results using a risk-based approach:

- Risk-based screening results show that benzene exceeded initial risk-based screening level. Using a site-specific scenario of an industrial worker exposure, benzene does not exceed the ACL of 990 µg/L in one sample (5301W2).

- The extent of soil and groundwater contamination was determined during the CAP-Part A investigation.

- Fate and transport modeling indicates that contamination from current site conditions at Facility ID #9-089061 will never exceed MCLs at a conservatively defined downgradient receptor.

Considering the site characteristics, natural attenuation will provide the best corrective action. Therefore, based on the results of the risk screening and fate and transport modeling, a no-further-action-required status is recommended for this site. A monitoring program is not recommended to confirm the modeling predictions, since all additional requirements of GA EPD as stated in correspondence dated March 13, 1998, ave been completed. In addition, permanent monitoring wells do not exist at the site, as they were not required by GA EPD.

G.5 Alternate Concentration Limits Calculations

Alternate Cleanup Level (ACL) Calculation for Benzene

CSF	Benzene oral Cancer Slope Factor	= 0.029 $(\text{mg/kg-day})^{-1}$
IR	Ingestion rate	= 1 L/day
EF	Exposure frequency	= 250 days/year
ED	Exposure duration	= 25 years
BW	Body weight	= 70 kg
AT	Averaging time = 70 years × 365 days/year	= 25550 days
TR	Target Risk	= 1×10^{-4}

$$\text{ACL} = \frac{\text{TR} \times \text{BW} \times \text{AT}}{\text{IR} \times \text{EF} \times \text{ED} \times \text{CSF}} = \frac{10^{-4} \times 70 \times 25550}{1 \times 250 \times 25 \times 0.029}$$

$= 0.987$ mg/L

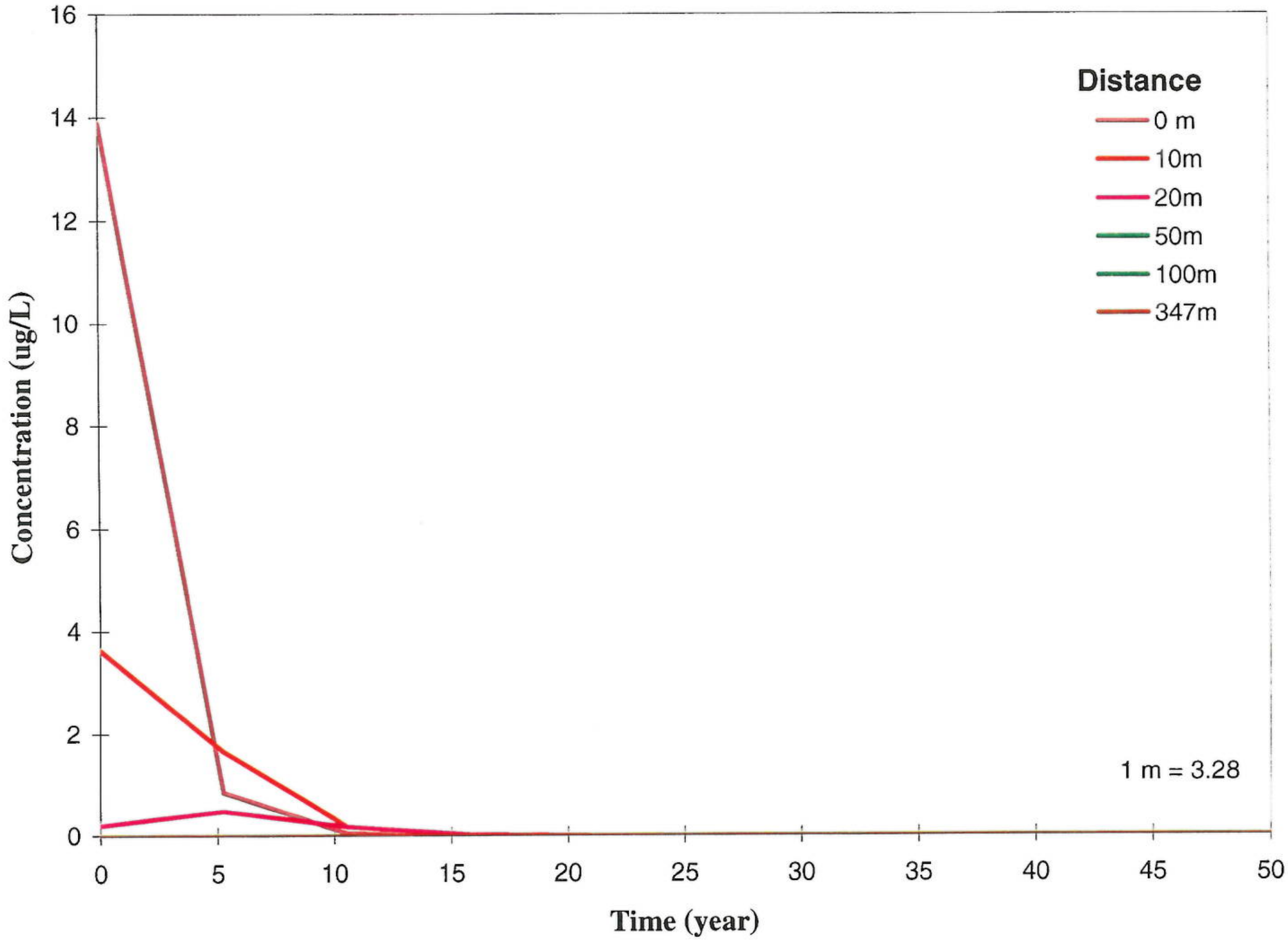
~ 0.990 mg/L

~ 990 µg/L

G.6 Fate and Transport Modeling Results

Following are the data for fate and transport modeling.

AT123D modeled concentration of benzene in groundwater at different distances from the source (USTs 232 and 233 Site)



```
Ft Stewart, USTs 232 & 233, Benzene  (calibrated plume)


NO. OF POINTS IN X-DIRECTION .......................    9
NO. OF POINTS IN Y-DIRECTION .......................    5
NO. OF POINTS IN Z-DIRECTION .......................    1
NO. OF ROOTS: NO. OF SERIES TERMS .................   400
NO. OF BEGINNING TIME STEP .........................   122
NO. OF ENDING TIME STEP ........................... 1220
NO. OF TIME INTERVALS FOR PRINTED OUT SOLUTION ....   64
INSTANTANEOUS SOURCE CONTROL = 0 FOR INSTANT SOURCE    1
SOURCE CONDITION CONTROL = 0 FOR STEADY SOURCE ....    0
INTERMITTENT OUTPUT CONTROL = 0 NO SUCH OUTPUT ....    1
CASE CONTROL =1 THERMAL, = 2 FOR CHEMICAL, = 3 RAD     2

AQUIFER DEPTH, = 0.0 FOR INFINITE DEEP (METERS) ...  0.1036E+02
AQUIFER WIDTH, = 0.0 FOR INFINITE WIDE (METERS) ...  0.0000E+00
BEGIN POINT OF X-SOURCE LOCATION (METERS) ......... -0.6100E+01
END POINT OF X-SOURCE LOCATION (METERS) ...........  0.6100E+01
BEGIN POINT OF Y-SOURCE LOCATION (METERS) ......... -0.3810E+01
END POINT OF Y-SOURCE LOCATION (METERS) ...........  0.3810E+01
BEGIN POINT OF Z-SOURCE LOCATION (METERS) .........  0.0000E+00
END POINT OF Z-SOURCE LOCATION (METERS) ...........  0.2000E+01

POROSITY ..........................................  0.2000E+00
HYDRAULIC CONDUCTIVITY (METER/HOUR) ...............  0.7200E-02
HYDRAULIC GRADIENT ................................  0.1480E-01
LONGITUDINAL DISPERSIVITY (METER) .................  0.2000E+01
LATERAL DISPERSIVITY (METER) ......................  0.1000E+01
VERTICAL DISPERSIVITY (METER) .....................  0.1000E+01
DISTRIBUTION COEFFICIENT, KD (M**3/KG) ............  0.3410E-03
HEAT EXCHANGE COEFFICIENT (KCAL/HR-M**2-DEGREE C)..  0.0000E+00

MOLECULAR DIFFUSION MULTIPLY BY POROSITY (M**2/HR)   0.3530E-05
DECAY CONSTANT (PER HOUR) .........................  0.4012E-04
BULK DENSITY OF THE SOIL (KG/M**3) ................  0.1596E+04
ACCURACY TOLERANCE FOR REACHING STEADY STATE ......  0.1000E-02
DENSITY OF WATER (KG/M**3) ........................  0.1000E+04
TIME INTERVAL SIZE FOR THE DESIRED SOLUTION (HR) ..  0.7200E+03
DISCHARGE TIME (HR) ...............................  0.8760E+05
WASTE RELEASE RATE (KCAL/HR), (KG/HR), OR (CI/HR) .  0.1680E-06

RETARDATION FACTOR ................................  0.3721E+01
RETARDED DARCY VELOCITY (M/HR) ....................  0.1432E-03
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/HR) ..  0.2911E-03
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/HR) .  0.1479E-03
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/HR).  0.1479E-03
```

```
DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.0000E+00 HRS
  (ADSORBED CHEMICAL CONC. =   0.3410E+00 * DISSOLVED CHEMICAL CONC.)
              Z =       0.00
                                                  X
Y         0.         2.         5.        10.        20.        50.       100.       150.       347.

5.   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
4.   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
3.   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
2.   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00
0.   0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00  0.000E+00


DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.8712E+05 HRS
  (ADSORBED CHEMICAL CONC. =   0.3410E+00 * DISSOLVED CHEMICAL CONC.)
              Z =       0.00
                                                  X
Y         0.         2.         5.        10.        20.        50.       100.       150.       347.

5.   0.329E-02  0.359E-02  0.347E-02  0.146E-02  0.118E-03  0.101E-09  0.000E+00  0.000E+00  0.000E+00
4.   0.663E-02  0.705E-02  0.661E-02  0.208E-02  0.145E-03  0.118E-09  0.000E+00  0.000E+00  0.000E+00
3.   0.105E-01  0.110E-01  0.102E-01  0.271E-02  0.170E-03  0.133E-09  0.000E+00  0.000E+00  0.000E+00
2.   0.127E-01  0.133E-01  0.123E-01  0.322E-02  0.191E-03  0.144E-09  0.000E+00  0.000E+00  0.000E+00
0.   0.139E-01  0.146E-01  0.136E-01  0.364E-02  0.209E-03  0.154E-09  0.000E+00  0.000E+00  0.000E+00


DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.1332E+06 HRS
  (ADSORBED CHEMICAL CONC. =   0.3410E+00 * DISSOLVED CHEMICAL CONC.)
              Z =       0.00
                                                  X
Y         0.         2.         5.        10.        20.        50.       100.       150.       347.

5.   0.191E-03  0.263E-03  0.362E-03  0.424E-03  0.163E-03  0.244E-07  0.000E+00  0.000E+00  0.000E+00
4.   0.398E-03  0.540E-03  0.728E-03  0.808E-03  0.258E-03  0.289E-07  0.000E+00  0.000E+00  0.000E+00
3.   0.639E-03  0.863E-03  0.115E-02  0.125E-02  0.361E-03  0.329E-07  0.000E+00  0.000E+00  0.000E+00
2.   0.773E-03  0.104E-02  0.139E-02  0.150E-02  0.431E-03  0.361E-07  0.000E+00  0.000E+00  0.000E+00
0.   0.845E-03  0.114E-02  0.153E-02  0.166E-02  0.480E-03  0.389E-07  0.000E+00  0.000E+00  0.000E+00
```

```
 DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.1793E+06 HRS
   (ADSORBED CHEMICAL CONC. =   0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                  Z =        0.00
                                                X
Y          0.         2.         5.        10.        20.        50.       100.       150.       347.

5.   0.110E-04  0.162E-04  0.261E-04  0.443E-04  0.503E-04  0.179E-06  0.000E+00  0.000E+00  0.000E+00
4.   0.228E-04  0.334E-04  0.532E-04  0.882E-04  0.922E-04  0.223E-06  0.000E+00  0.000E+00  0.000E+00
3.   0.365E-04  0.533E-04  0.847E-04  0.139E-03  0.140E-03  0.265E-06  0.000E+00  0.000E+00  0.000E+00
2.   0.441E-04  0.645E-04  0.102E-03  0.168E-03  0.168E-03  0.299E-06  0.000E+00  0.000E+00  0.000E+00
0.   0.482E-04  0.705E-04  0.112E-03  0.184E-03  0.186E-03  0.328E-06  0.000E+00  0.000E+00  0.000E+00


 DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.2254E+06 HRS
   (ADSORBED CHEMICAL CONC. =   0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                  Z =        0.00
                                                X
Y          0.         2.         5.        10.        20.        50.       100.       150.       347.

5.   0.669E-06  0.101E-05  0.175E-05  0.359E-05  0.732E-05  0.336E-06  0.500E-15  0.000E+00  0.000E+00
4.   0.138E-05  0.208E-05  0.358E-05  0.723E-05  0.141E-04  0.484E-06  0.579E-15  0.000E+00  0.000E+00
3.   0.220E-05  0.332E-05  0.571E-05  0.115E-04  0.219E-04  0.638E-06  0.648E-15  0.000E+00  0.000E+00
2.   0.266E-05  0.402E-05  0.690E-05  0.139E-04  0.264E-04  0.748E-06  0.703E-15  0.000E+00  0.000E+00
0.   0.291E-05  0.440E-05  0.755E-05  0.152E-04  0.291E-04  0.831E-06  0.750E-15  0.000E+00  0.000E+00


 DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.2714E+06 HRS
   (ADSORBED CHEMICAL CONC. =   0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                  Z =        0.00
                                                X
Y          0.         2.         5.        10.        20.        50.       100.       150.       347.

5.   0.419E-07  0.645E-07  0.116E-06  0.265E-06  0.774E-06  0.240E-06  0.244E-12  0.000E+00  0.000E+00
4.   0.860E-07  0.132E-06  0.238E-06  0.538E-06  0.153E-05  0.390E-06  0.289E-12  0.000E+00  0.000E+00
3.   0.137E-06  0.211E-06  0.379E-06  0.854E-06  0.239E-05  0.555E-06  0.330E-12  0.000E+00  0.000E+00
2.   0.166E-06  0.255E-06  0.458E-06  0.103E-05  0.289E-05  0.663E-06  0.362E-12  0.000E+00  0.000E+00
0.   0.182E-06  0.279E-06  0.501E-06  0.113E-05  0.317E-05  0.735E-06  0.390E-12  0.000E+00  0.000E+00
```

```
 DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.3175E+06 HRS
   (ADSORBED CHEMICAL CONC. =    0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                     Z =        0.00
                                                      X
Y            0.          2.          5.         10.         20.         50.        100.        150.        347.

5.    0.267E-08   0.416E-08   0.770E-08   0.189E-07   0.699E-07   0.858E-07   0.232E-11   0.000E+00   0.000E+00
4.    0.548E-08   0.853E-08   0.157E-07   0.383E-07   0.139E-06   0.150E-06   0.286E-11   0.000E+00   0.000E+00
3.    0.875E-08   0.136E-07   0.251E-07   0.609E-07   0.220E-06   0.222E-06   0.338E-11   0.000E+00   0.000E+00
2.    0.106E-07   0.164E-07   0.303E-07   0.737E-07   0.265E-06   0.266E-06   0.379E-11   0.000E+00   0.000E+00
0.    0.116E-07   0.180E-07   0.332E-07   0.807E-07   0.291E-06   0.295E-06   0.414E-11   0.000E+00   0.000E+00

 DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.3636E+06 HRS
   (ADSORBED CHEMICAL CONC. =    0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                     Z =        0.00
                                                      X
Y            0.          2.          5.         10.         20.         50.        100.        150.        347.

5.    0.173E-09   0.271E-09   0.511E-09   0.132E-08   0.578E-08   0.195E-07   0.761E-11   0.000E+00   0.000E+00
4.    0.354E-09   0.556E-09   0.105E-08   0.268E-08   0.116E-07   0.356E-07   0.101E-10   0.000E+00   0.000E+00
3.    0.565E-09   0.886E-09   0.167E-08   0.426E-08   0.183E-07   0.539E-07   0.126E-10   0.000E+00   0.000E+00
2.    0.684E-09   0.107E-08   0.201E-08   0.515E-08   0.222E-07   0.649E-07   0.145E-10   0.000E+00   0.000E+00
0.    0.748E-09   0.117E-08   0.220E-08   0.564E-08   0.243E-07   0.716E-07   0.160E-10   0.000E+00   0.000E+00

 DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.4097E+06 HRS
   (ADSORBED CHEMICAL CONC. =    0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                     Z =        0.00
                                                      X
Y            0.          2.          5.         10.         20.         50.        100.        150.        347.

5.    0.113E-10   0.179E-10   0.341E-10   0.911E-10   0.454E-09   0.331E-08   0.119E-10   0.000E+00   0.000E+00
4.    0.232E-10   0.365E-10   0.697E-10   0.186E-09   0.914E-09   0.621E-08   0.172E-10   0.000E+00   0.000E+00
3.    0.369E-10   0.582E-10   0.111E-09   0.295E-09   0.145E-08   0.951E-08   0.227E-10   0.000E+00   0.000E+00
2.    0.447E-10   0.704E-10   0.134E-09   0.357E-09   0.175E-08   0.115E-07   0.266E-10   0.000E+00   0.000E+00
0.    0.489E-10   0.770E-10   0.147E-09   0.391E-09   0.192E-08   0.126E-07   0.295E-10   0.000E+00   0.000E+00
```

```
 DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.4558E+06 HRS
   (ADSORBED CHEMICAL CONC. =   0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                  Z =       0.00
                                                     X
Y          0.         2.         5.        10.        20.        50.       100.       150.       347.

5.   0.746E-12  0.118E-11  0.228E-11  0.627E-11  0.344E-10  0.458E-09  0.105E-10  0.213E-16  0.000E+00
4.   0.153E-11  0.242E-11  0.466E-11  0.128E-10  0.696E-10  0.876E-09  0.162E-10  0.252E-16  0.000E+00
3.   0.243E-11  0.385E-11  0.743E-11  0.203E-10  0.110E-09  0.135E-08  0.224E-10  0.288E-16  0.000E+00
2.   0.294E-11  0.466E-11  0.898E-11  0.246E-10  0.133E-09  0.163E-08  0.266E-10  0.317E-16  0.000E+00
0.   0.322E-11  0.510E-11  0.982E-11  0.269E-10  0.146E-09  0.180E-08  0.295E-10  0.342E-16  0.000E+00

 DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.5018E+06 HRS
   (ADSORBED CHEMICAL CONC. =   0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                  Z =       0.00
                                                     X
Y          0.         2.         5.        10.        20.        50.       100.       150.       347.

5.   0.495E-13  0.787E-13  0.153E-12  0.430E-12  0.255E-11  0.551E-10  0.585E-11  0.127E-15  0.000E+00
4.   0.101E-12  0.161E-12  0.313E-12  0.877E-12  0.517E-11  0.107E-09  0.956E-11  0.162E-15  0.000E+00
3.   0.161E-12  0.256E-12  0.498E-12  0.140E-11  0.821E-11  0.166E-09  0.136E-10  0.195E-15  0.000E+00
2.   0.195E-12  0.310E-12  0.602E-12  0.169E-11  0.992E-11  0.200E-09  0.163E-10  0.221E-15  0.000E+00
0.   0.213E-12  0.339E-12  0.659E-12  0.185E-11  0.109E-10  0.220E-09  0.180E-10  0.243E-15  0.000E+00

 DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.5479E+06 HRS
   (ADSORBED CHEMICAL CONC. =   0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                  Z =       0.00
                                                     X
Y          0.         2.         5.        10.        20.        50.       100.       150.       347.

5.   0.330E-14  0.526E-14  0.103E-13  0.295E-13  0.187E-12  0.598E-11  0.229E-11  0.314E-15  0.000E+00
4.   0.674E-14  0.107E-13  0.210E-13  0.602E-13  0.378E-12  0.117E-10  0.390E-11  0.428E-15  0.000E+00
3.   0.107E-13  0.171E-13  0.335E-13  0.957E-13  0.600E-12  0.183E-10  0.569E-11  0.545E-15  0.000E+00
2.   0.130E-13  0.207E-13  0.405E-13  0.116E-12  0.726E-12  0.220E-10  0.682E-11  0.631E-15  0.000E+00
0.   0.142E-13  0.226E-13  0.443E-13  0.127E-12  0.795E-12  0.242E-10  0.755E-11  0.697E-15  0.000E+00
```

```
 DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.5940E+06 HRS
   (ADSORBED CHEMICAL CONC. =    0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                 Z =        0.00
                                                   X
Y          0.          2.          5.         10.         20.         50.        100.        150.         347.

5.    0.221E-15   0.353E-15   0.695E-15   0.202E-14   0.135E-13   0.600E-12   0.680E-12   0.461E-15   0.000E+00
4.    0.451E-15   0.721E-15   0.142E-14   0.412E-14   0.273E-13   0.118E-11   0.119E-11   0.664E-15   0.000E+00
3.    0.719E-15   0.115E-14   0.226E-14   0.656E-14   0.434E-13   0.185E-11   0.177E-11   0.878E-15   0.000E+00
2.    0.869E-15   0.139E-14   0.273E-14   0.793E-14   0.525E-13   0.224E-11   0.213E-11   0.103E-14   0.000E+00
0.    0.951E-15   0.152E-14   0.299E-14   0.868E-14   0.575E-13   0.245E-11   0.235E-11   0.114E-14   0.000E+00

 DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.6401E+06 HRS
   (ADSORBED CHEMICAL CONC. =    0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                 Z =        0.00
                                                   X
Y          0.          2.          5.         10.         20.         50.        100.        150.         347.

5.    0.148E-16   0.238E-16   0.470E-16   0.138E-15   0.964E-15   0.568E-13   0.162E-12   0.447E-15   0.000E+00
4.    0.303E-16   0.485E-16   0.960E-16   0.282E-15   0.196E-14   0.112E-12   0.292E-12   0.678E-15   0.000E+00
3.    0.483E-16   0.772E-16   0.153E-15   0.449E-15   0.311E-14   0.177E-12   0.438E-12   0.926E-15   0.000E+00
2.    0.584E-16   0.934E-16   0.185E-15   0.543E-15   0.376E-14   0.213E-12   0.527E-12   0.109E-14   0.000E+00
0.    0.639E-16   0.102E-15   0.202E-15   0.595E-15   0.412E-14   0.234E-12   0.582E-12   0.121E-14   0.000E+00

 DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.6862E+06 HRS
   (ADSORBED CHEMICAL CONC. =    0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                 Z =        0.00
                                                   X
Y          0.          2.          5.         10.         20.         50.        100.        150.         347.

5.    0.100E-17   0.160E-17   0.319E-17   0.949E-17   0.686E-16   0.513E-14   0.326E-13   0.308E-15   0.000E+00
4.    0.204E-17   0.327E-17   0.650E-17   0.193E-16   0.139E-15   0.102E-13   0.597E-13   0.487E-15   0.000E+00
3.    0.325E-17   0.521E-17   0.104E-16   0.308E-16   0.222E-15   0.160E-13   0.904E-13   0.682E-15   0.000E+00
2.    0.393E-17   0.630E-17   0.125E-16   0.372E-16   0.268E-15   0.194E-13   0.109E-12   0.811E-15   0.000E+00
0.    0.430E-17   0.690E-17   0.137E-16   0.407E-16   0.293E-15   0.213E-13   0.120E-12   0.899E-15   0.000E+00
```

```
 DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.7322E+06 HRS
   (ADSORBED CHEMICAL CONC. =   0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                 Z =       0.00
                                                 X
Y          0.         2.         5.        10.        20.        50.       100.       150.       347.

5.    0.676E-19  0.108E-18  0.216E-18  0.650E-18  0.486E-17  0.447E-15  0.568E-14  0.159E-15  0.000E+00
4.    0.138E-18  0.221E-18  0.441E-18  0.133E-17  0.987E-17  0.891E-15  0.106E-13  0.261E-15  0.000E+00
3.    0.220E-18  0.352E-18  0.703E-18  0.211E-17  0.157E-16  0.140E-14  0.161E-13  0.373E-15  0.000E+00
2.    0.266E-18  0.426E-18  0.850E-18  0.255E-17  0.190E-16  0.170E-14  0.194E-13  0.445E-15  0.000E+00
0.    0.291E-18  0.466E-18  0.930E-18  0.279E-17  0.208E-16  0.186E-14  0.214E-13  0.493E-15  0.000E+00

 DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.7783E+06 HRS
   (ADSORBED CHEMICAL CONC. =   0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                 Z =       0.00
                                                 X
Y          0.         2.         5.        10.        20.        50.       100.       150.       347.

5.    0.457E-20  0.736E-20  0.147E-19  0.446E-19  0.343E-18  0.378E-16  0.882E-15  0.650E-16  0.000E+00
4.    0.933E-20  0.150E-19  0.300E-19  0.909E-19  0.697E-18  0.755E-16  0.166E-14  0.109E-15  0.000E+00
3.    0.148E-19  0.239E-19  0.478E-19  0.145E-18  0.111E-17  0.119E-15  0.255E-14  0.159E-15  0.000E+00
2.    0.180E-19  0.289E-19  0.578E-19  0.175E-18  0.134E-17  0.144E-15  0.307E-14  0.190E-15  0.000E+00
0.    0.196E-19  0.316E-19  0.632E-19  0.191E-18  0.147E-17  0.158E-15  0.338E-14  0.210E-15  0.000E+00

 DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.8244E+06 HRS
   (ADSORBED CHEMICAL CONC. =   0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                 Z =       0.00
                                                 X
Y          0.         2.         5.        10.        20.        50.       100.       150.       347.

5.    0.313E-21  0.499E-21  0.100E-20  0.306E-20  0.241E-19  0.311E-17  0.125E-15  0.217E-16  0.000E+00
4.    0.637E-21  0.102E-20  0.204E-20  0.623E-20  0.490E-19  0.624E-17  0.237E-15  0.374E-16  0.000E+00
3.    0.101E-20  0.163E-20  0.325E-20  0.992E-20  0.779E-19  0.985E-17  0.365E-15  0.549E-16  0.000E+00
2.    0.122E-20  0.197E-20  0.393E-20  0.120E-19  0.942E-19  0.119E-16  0.440E-15  0.659E-16  0.000E+00
0.    0.134E-20  0.215E-20  0.430E-20  0.131E-19  0.103E-18  0.131E-16  0.484E-15  0.728E-16  0.000E+00
STEADY STATE SOLUTION HAS NOT BEEN REACHED BEFORE FINAL SIMULATING TIME
```

```
DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.8705E+06 HRS
  (ADSORBED CHEMICAL CONC. =   0.3410E+00 * DISSOLVED CHEMICAL CONC.)
                 Z =       0.00
                                                  X
Y         0.        2.        5.        10.       20.       50.       100.      150.      347.

5.   0.204E-22 0.340E-22 0.683E-22 0.210E-21 0.169E-20 0.252E-18 0.163E-16 0.609E-17 0.000E+00
4.   0.420E-22 0.696E-22 0.139E-21 0.427E-21 0.344E-20 0.505E-18 0.311E-16 0.107E-16 0.000E+00
3.   0.671E-22 0.111E-21 0.222E-21 0.680E-21 0.547E-20 0.799E-18 0.482E-16 0.159E-16 0.000E+00
2.   0.811E-22 0.134E-21 0.269E-21 0.822E-21 0.661E-20 0.965E-18 0.581E-16 0.191E-16 0.000E+00
0.   0.888E-22 0.147E-21 0.294E-21 0.900E-21 0.724E-20 0.106E-17 0.639E-16 0.211E-16 0.000E+00
```

G.7 References

ASTM (American Society for Testing and Materials), 1995. Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites, ASTM E 1739-95, approved September 10, 1995.

EPA (U.S. Environmental Protection Agency), 1989. "Risk Assessment Guidance for Superfund: Human Health Evaluation Manual, Part A, Interim Final," EPA/540/1-89/002, EPA, Office of Emergency and Remedial Response, Washington, DC.

EPA, 1991. "Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance, Standard Default Exposure Factors, Interim Final," OSWER Directive 9285.6-03, EPA, Office of Emergency and Remedial Response, Washington, DC.

EPA, 1994. Supplemental Guidance to RAGS: Region IV Bulletin: Development of Health based Preliminary Remediation Goals, Remedial Options and Remediation Levels, U.S. EPA Region IV, Waste Management Division.

EPA, 1996. Soil Screening Guidance, Office of Solid Waste and Emergency Response, EPA/540/R-94/101, available from U.S. Government Printing Office, Washington, DC.

GA EPD (Georgia Environmental Protection Division), 1992. Groundwater Pollution Susceptibility Map of Georgia.

THIS PAGE INTENTIONALLY LEFT BLANK