THIRD SEMIANNUAL MONITORING ONLY REPORT
FOR
UNDERGROUND STORAGE TANK 29
FACILITY ID #9-089088
BUILDING 1633

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:

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May 2000

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List of Abbreviations and Acronyms

ACL	alternate concentration limit
BGS	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CAP	Corrective Action Plan
DAF	dilution attenuation factor
GA EPD	Georgia Environmental Protection Division
IWQS	In-Stream Water Quality Standard
PAH	polynuclear aromatic hydrocarbon
SAIC	Science Applications International Corporation
UST	underground storage tank
USTMP	Underground Storage Tank Management Program

MONITORING ONLY REPORT

Submittal Date: May 2000 Monitoring Report Number: 3rd Semiannual

For Period Covering: July 1999 to January 2000

Facility Name: UST 29, Building 1633 Street Address: McFarland Avenue between Divarty Avenue and W. 8th Street

Facility ID: 9-089088 City: Fort Stewart County: Liberty Zip Code: 31314

Latitude: 32° 15′ 57″ Longitude: 82° 05′ 14″

Submitted by UST Owner/Operator:		Prepared by Consultant/Contractor:	
Name:	Thomas C. Fry/ Environmental Branch	Name:	Patricia A. Stoll
Company:	U.S. Army/HQ 3d, Inf. Div. (Mech)	Company:	SAIC
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City:	Fort Stewart State: GA	City:	Oak Ridge State: TN
Zip Code:	31314-4927	Zip Code:	37831
Telephone:	(912) 767-2010	Telephone:	(865) 481-8792

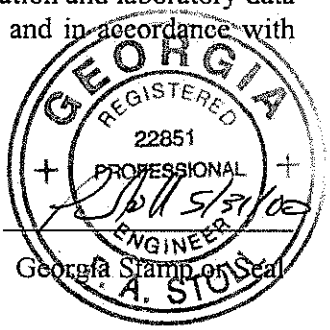
I. REGISTERED PROFESSIONAL ENGINEER OR PROFESSIONAL GEOLOGIST CERTIFICATION

I hereby certify that I have directed and supervised the fieldwork and preparation of this plan, in accordance with State Rules and Regulations. As a registered professional geologist and/or professional 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 A. Stoll

Signature: Patricia A. Stoll

Date: 5/31/00



Georgia Stamp or Seal

II. PROJECT SUMMARY

(Appendix I, Figure 1: Site Location Map)

Provide a brief description or explanation of the site and a brief chronology of environmental events leading up to this report.

Former Underground Storage Tank (UST) 29, Facility ID #9-089088, was located near Building 1633 at Fort Stewart, Georgia. One UST containing used oil was removed from the site in 1995. Science Applications International Corporation (SAIC) performed a Corrective Action Plan (CAP)-Part A investigation in 1996 and a CAP-Part B investigation in 1997 to determine the extent of petroleum contamination at the site. Five monitoring wells and seven soil borings were installed during these investigations. The CAP-Part B Report (SAIC 1999a) was submitted in March 1999 and recommended semiannual monitoring of four of the seven monitoring wells: 14-08, 14-09, 14-11, and 14-12. The report was approved in correspondence dated June 1, 1999 (McAllister 1999). Two additional monitoring wells (14-13 and 14-14) were installed following the first semiannual monitoring event.

The fate and transport modeling performed as part of the CAP-Part B Report (SAIC 1999a) reflected a continuous source of contamination. The results were summarized in the First Annual Monitoring Only Report (SAIC 1999c) and are provided in Attachment A of this document. Upon completion of the fourth semiannual monitoring event in July 2000, the fate and transport modeling results will be revised using the results from the semiannual monitoring events to calibrate the model.

The purpose of the semiannual monitoring, summarized in this report, is to confirm the results of the fate and transport modeling and that natural attenuation is taking place at the site. The measured benzene concentrations have been below the benzene alternate concentration limit (ACL) for the last three sampling events (i.e., since January 1999). However, the benzene concentrations in well 14-09 have been increasing at a rate not predicted by the fate and transport modeling, which indicates that there is either a new source or an additional source that was not determined during the CAP-Part A and CAP-Part B investigations. Recommendations regarding further action will be made upon completion of the July 2000 sampling event.

III. ACTIVITIES AND ASSESSMENT OF EXISTING CONDITIONS

A. Potentiometric Data:

(Appendix I, Figure 2a and 2b: Potentiometric Surface Maps)
(Appendix II, Table 1: Groundwater Elevations)

Discuss groundwater flow at this site and implications for this project.

During the third semiannual sampling event in February 2000, groundwater elevations were measured in all of the monitoring wells to determine the groundwater flow direction. In February 2000, the groundwater flow direction was toward the west, and the groundwater gradient was approximately 0.0085 foot/foot.

B. Analytical Data:

(Appendix I, Figure 3a and 3b: Groundwater Quality Maps)
(Appendix I, Figure 4: Trend of Contaminant Concentrations)
(Appendix II, Table 2: Groundwater Analysis Results)
(Appendix III: Laboratory Analysis Results)

Discuss groundwater analysis results, trend of contaminant concentrations, and implications for this project.

During the third semiannual sampling event in January 2000, monitoring wells 14-07, 14-08, 14-09, 14-11, 14-12, 14-13, and 14-14 were sampled for benzene, toluene, ethylbenzene, and xylenes (BTEX). Analytical results from the third sampling event showed estimated concentrations below the analytical reporting limits or no detectable BTEX concentrations in well 14-11, 14-13, and 14-14. BTEX compounds were present in wells 14-07, 14-08, 14-09, and 14-12. However, benzene was the only constituent to exceed its In-Stream Water Quality Standard (IWQS) and was detected at 2 µg/L in well 14-07, 66.6 µg/L in well 14-08, 249J µg/L in well 14-09, and 7 µg/L in well 14-12. The benzene concentrations in these wells are all below the ACL of 550 µg/L. Figure 4 shows the variation in benzene concentrations in groundwater for all the wells.

The benzene concentrations in well 14-08 have been steadily decreasing since the CAP-Part B investigation in 1997, and the January 2000 concentration was below that predicted by the fate and transport modeling. However, the benzene concentrations in well 14-09 have been increasing since the 1997 CAP-Part B investigation, and the January 2000 concentration was above that predicted by the fate and transport modeling. The increasing benzene concentrations in well 14-09 indicate that there is another source of contamination that was not defined in the CAP-Part B investigation and subsequently not included in the fate and transport modeling.

As recommended in the First Annual Monitoring Only Report (SAIC 1999c), polynuclear aromatic hydrocarbon (PAH) analysis was discontinued for the site beginning with the second semiannual sampling event in July 1999.

IV. SITE RANKING (Note: re-rank site after each monitoring event)
(Appendix IV: Site Ranking Form)

Environmental Site Sensitivity Score:	510 (Jan. 1999 – First Semiannual Monitoring Event)
(April 1999 version of the Site Ranking Form was used for January 2000 score.)	510 (July 1999 – Second Semiannual Monitoring Event)
	2760 (Jan. 2000 – Third Semiannual Monitoring Event)

V. CONCLUSIONS/RECOMMENDATIONS

Provide justification of no-further-action-required recommendation or briefly discuss future monitoring plans for this site.

The Monitoring Only Plan is being conducted in accordance with Section III.D of the CAP-Part B Report (SAIC 1999a) and approved by the Georgia Environmental Protection Department (GA EPD) Underground Storage Tank Management Program (USTMP) in correspondence dated June 1, 1999 (McAllister 1999). Termination conditions approved in the CAP-Part B Report (SAIC 1999a) and the First Annual Monitoring Only Report (SAIC 1999c) in

correspondence date January 25, 2000 (Logan 2000) indicated that termination would be requested after 2 years. The request would be made if the measured benzene concentrations were below the concentrations predicted by the fate and transport modeling. However, with the increasing benzene concentrations in well 14-09, recommendations regarding further action will be made upon completion of the July 2000 sampling event and revision of the fate and transport model.

Semiannual monitoring will continue in wells 14-07, 14-08, 14-09, 14-11, 14-12, 14-13, and 14-14, and groundwater samples will be collected for BTEX only. Water level measurements will be collected during the fourth semiannual monitoring event in July 2000.

VI. REIMBURSEMENT

Attached _____ N/A X

(Appendix V: Reimbursement Application)

Fort Stewart is a federally owned facility and has funded the investigation for the UST 29 site, Building 1633, Facility ID #9-089088, using U.S. Department of Defense Environmental Restoration Account Funds. Application for Georgia Underground Storage Tank Trust Fund reimbursement is not being pursued at this time.

APPENDIX I

REPORT FIGURES

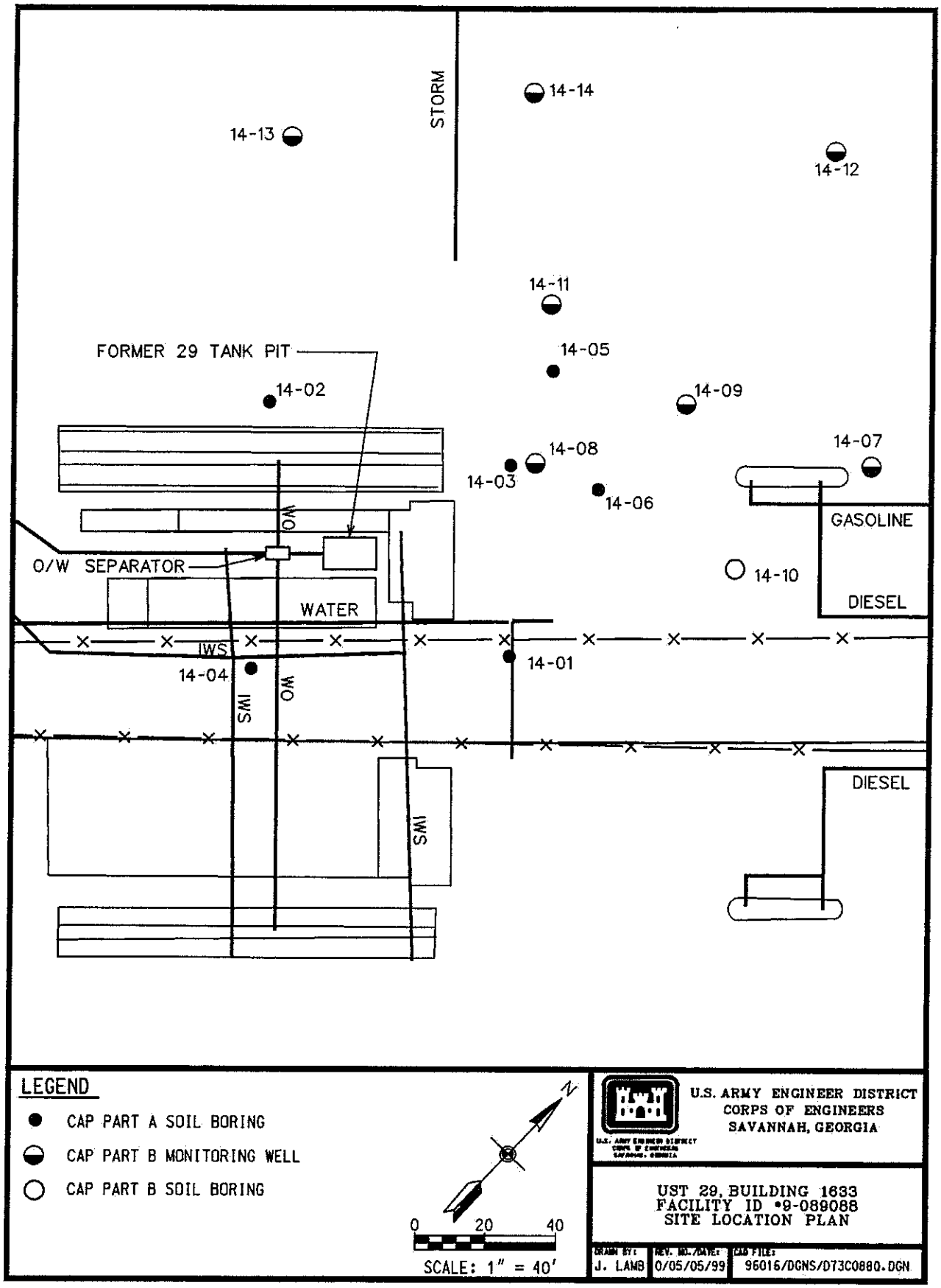


Figure 1. Location Map of UST 29 at Fort Stewart, Liberty County, Georgia

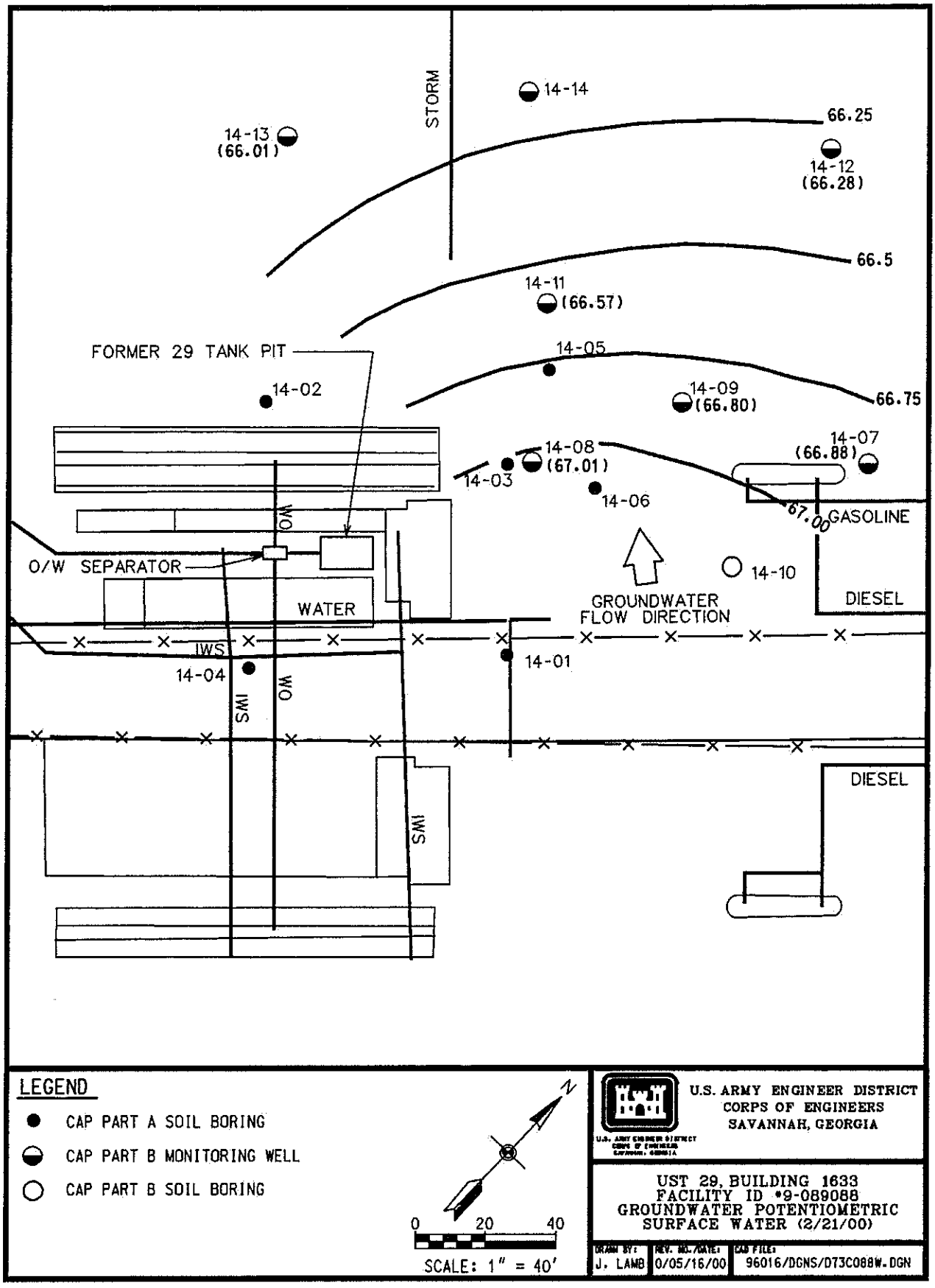


Figure 2. Potentiometric Surface Map of the UST 29 Site (February 2000)

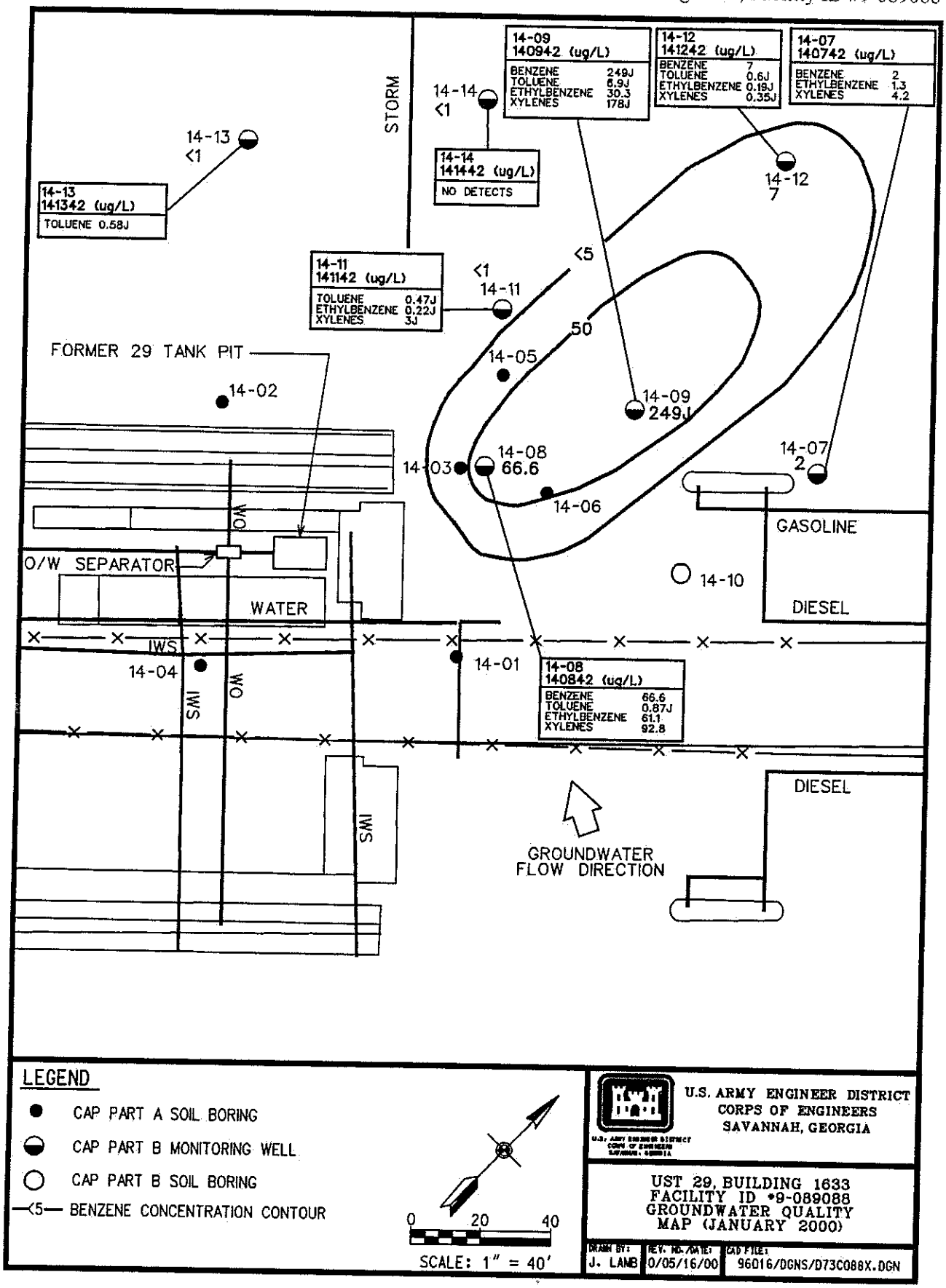


Figure 3. Groundwater Quality Map for the UST 29 Site (January 2000)

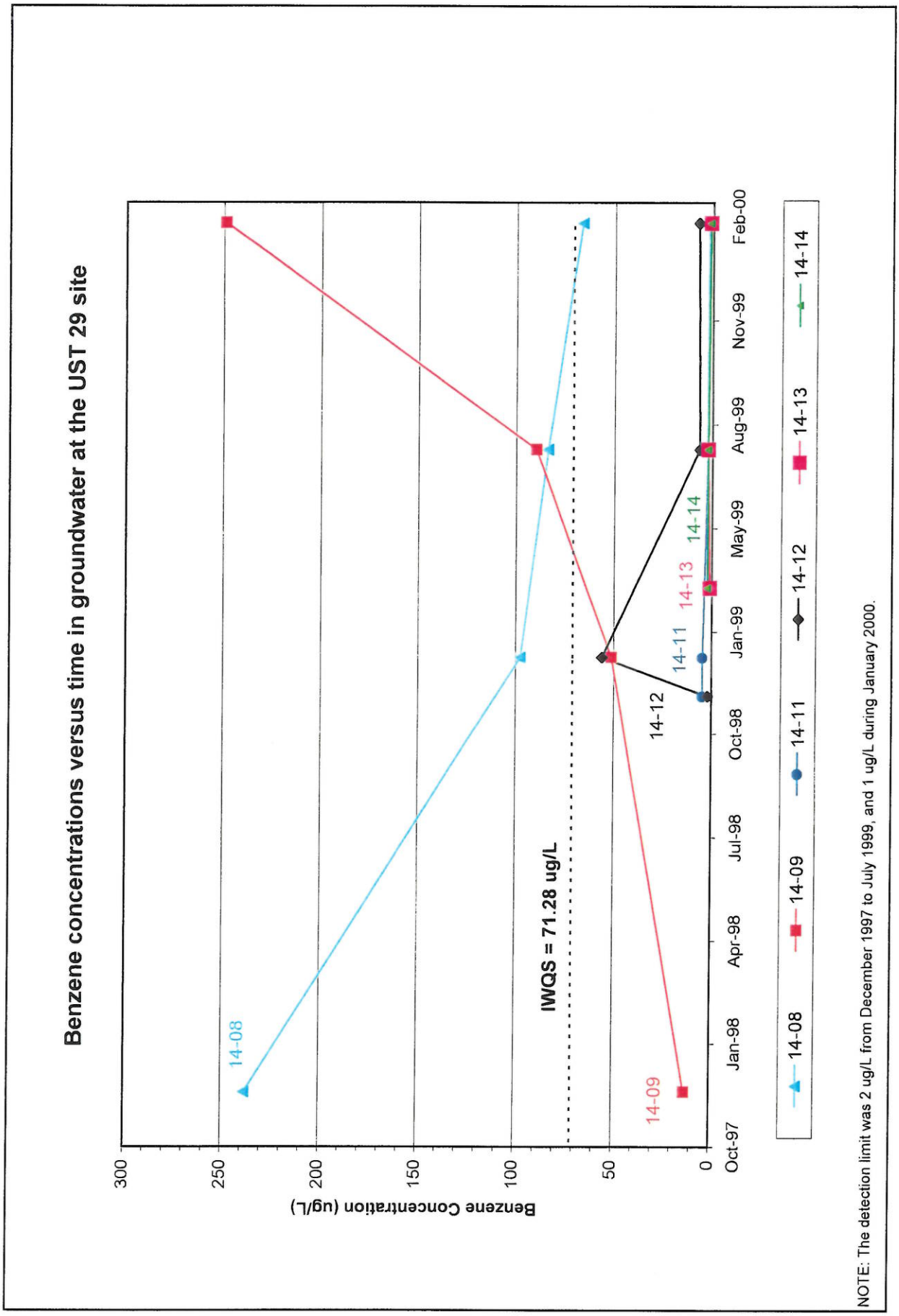


Figure 4. Trend of Contaminant Concentrations for the UST 29 Site

APPENDIX II

REPORT TABLES

Table 1. Groundwater Elevations

Well Number	Date of Measurement	Top of Casing Elevation (feet AMSL)	Screened Interval (feet BGS)	Water Depth (feet BTOC)	Groundwater Elevation (feet AMSL)
First Semiannual Monitoring Event – January 1999					
14-07	1/7/99	70.97	3.0 – 13.0	4.80	66.17
14-08	1/7/99	70.06	3.0 – 13.0	4.10	65.96
14-09	1/7/99	70.47	3.0 – 13.0	4.57	65.90
14-11	1/7/99	69.78	4.7 – 14.7	3.98	65.80
14-12	1/7/99	70.62	9.7 – 19.7	4.74	65.88
Second Semiannual Monitoring Event – July 1999					
14-07	8/23/99	70.97	3.0 – 13.0	3.30	67.67
14-08	8/23/99	70.06	3.0 – 13.0	2.54	67.52
14-09	8/23/99	70.47	3.0 – 13.0	3.28	67.19
14-11	8/23/99	69.78	4.7 – 14.7	2.62	67.16
14-12	8/23/99	70.62	9.7 – 19.7	3.43	67.19
14-13	8/23/99	69.64	3.2 – 13.2	2.32	67.32
14-14	8/23/99	69.96	3.5 – 13.5	2.54	67.42
Third Semiannual Monitoring Event – January/February 2000					
14-07	2/21/00	70.97	3.0 – 13.0	4.09	66.88
14-08	2/21/00	70.06	3.0 – 13.0	3.05	67.01
14-09	2/21/00	70.47	3.0 – 13.0	3.67	66.80
14-11	2/21/00	69.78	4.7 – 14.7	3.21	66.57
14-12	2/21/00	70.62	9.7 – 19.7	4.34	66.28
14-13	2/21/00	69.64	3.2 – 13.2	3.63	66.01
14-14	2/21/00	69.96	3.5 – 13.5	not measured"	not measured"

" Well temporarily inaccessible during water level measurements, located under a military vehicle.
AMSL Above mean sea level
BGS Below ground surface
BTOC Below top of casing

Table 2. Groundwater Analytical Results

Sample Location	Sample ID	Date Sampled	Benzene (µg/L)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Xylenes (µg/L)	Total BTEX (µg/L)	Total PAH (µg/L)
First Semiannual Monitoring Event – January 1999								
14-08	140822	1/7/99	**97.7 =**	20 U	75.7 =	177 =	350.4	32.7
14-09	140922	1/6/99	51.2 =	0.69 J	0.59 J	11.1 =	63.58	ND
14-11	141122	1/7/99	4.5 =	0.52 J	2 U	0.52 J	5.02	0.85
14-12	141222	1/7/99	56.2 =	2 U	2 U	4.2 J	60.4	ND
Additional Well Installation – March 1999								
14-13	141312	3/10/99	0.86 J	1.8 J	2 U	0.95 J	3.61	2.0
14-14	141412	3/10/99	2 U	1.2 J	2 U	0.89 J	2.09	ND
Second Semiannual Monitoring Event – July 1999								
14-07	140732	7/9/99	2.4 =	0.65 J	1 J	6.7 =	10.75	NA
14-08	140832	7/9/99	**83.9 =**	2.6 =	77.5 =	203 J	367	NA
14-09	140932	7/9/99	**89.7 =**	2.5 =	4.5 =	27.6 =	124.3	NA
14-11	141132	7/9/99	2 U	0.85 J	2 U	3.8 J	4.65	NA
14-12	141232	7/9/99	6.4 =	0.54 J	2 U	3.9 J	4.44	NA
14-13	141332	7/9/99	2 U	2 U	2 U	6 U	ND	NA
14-14	141432	7/9/99	2 U	0.67 J	2 U	6 U	0.67	NA
Third Semiannual Monitoring Event – January/February 2000								
14-07	140742	1/28/00	2 =	1 U	1.3 =	4.2 =	7.5	NA
14-08	140842	1/27/00	66.6 =	0.87 J	61.1 =	92.8 =	221.37	NA
14-09	140942	1/28/00	**249 J**	6.9 J	30.3 J	178 J	464.2	NA
14-11	141142	1/27/00	1 U	0.47 J	0.22 J	3 J	3.8	NA
14-12	141242	1/27/00	7 =	0.6 J	0.19 J	0.35 J	8.14	NA
14-13	141342	1/27/00	1 U	0.58 J	1 U	3 U	0.58	NA
14-14	141442	1/27/00	1 U	1 U	1 U	3 U	ND	NA
In Stream Water Quality Standard (GA EPD Chapter 391-3-6)			72.18	200,000	28,718	NRC	NRC	NRC
Alternate Concentration Limit			550	—	—	—	—	—

NOTE:

Bold values exceed IWQSs.

Italic values exceed ACLs.

BGS Below ground surface

BTEX Benzene, toluene, ethylbenzene, and xylenes

NA Not analyzed; PAH compounds were not required as part of the Monitoring Only Plan.

ND Not detected

NRC No regulatory criteria

PAH Polynuclear aromatic hydrocarbon

Laboratory Qualifiers

U Indicates the compound was not detected at the concentration reported.

UJ Indicates that the compound was not detected above an approximated sample quantitation limit.

J Indicates the value for the compound is an estimated value.

= Indicates the compound was detected at the concentration reported.

APPENDIX III

LABORATORY ANALYTICAL RESULTS

The laboratory analytical results for the first and second semiannual monitoring events were presented in the First Annual Monitoring Only Report for UST 29, Facility ID #9-089088 (SAIC 1999c).

THIRD SEMIANNUAL MONITORING EVENT

JANUARY 2000

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

140742

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: FSBLTM05W

Matrix: (soil/water) WATER Lab Sample ID: 21155006

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 2U420

Level: (low/med) LOW Date Received: 01/30/00

% Moisture: not dec. _____ Date Analyzed: 02/03/00

GC Column: DB-624 ID: 0.25 (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
108-88-3	Toluene	1.0 ~~0.38~~	J	U FO4, FO6
100-41-4	Ethylbenzene	1.3		U
1330-20-7	Xylenes (total)	4.2		U

VS 7/7/00

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

140342

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: FSBLTM04W

Matrix: (soil/water) WATER Lab Sample ID: 21144007

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 8U339

Level: (low/med) LOW Date Received: 01/28/00

% Moisture: not dec. _____ Date Analyzed: 02/03/00

GC Column: DB-624 ID: 0.25 (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	66.6		
108-88-3	Toluene	0.87	J	
100-41-4	Ethylbenzene	61.1		
1330-20-7	Xylenes (total)	92.8		

FORM I VOA

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

140942

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: FSBLTM05W

Matrix: (soil/water) WATER Lab Sample ID: 21155107

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 2U421

Level: (low/med) LOW Date Received: 01/31/00

% Moisture: not dec. _____ Date Analyzed: 02/03/00

GC Column: DB-624 ID: 0.25 (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	249	XD	J ABS
108-88-3	Toluene	6.9		J
100-41-4	Ethylbenzene	30.3		J
1330-20-7	Xylenes (total)	178		J

.F04, F05

use

FORM I VOA

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

141142

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: FSBLTM04W

Matrix: (soil/water) WATER Lab Sample ID: 01144008

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 6U340

Level: (low/med) LOW Date Received: 01/28/00

% Moisture: not dec. _____ Date Analyzed: 02/03/00

GC Column: DB-624 ID: 0.25 (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	1.0	U
108-88-3	Toluene	0.47	J
100-41-4	Ethylbenzene	0.22	J
1330-20-7	Xylenes (total)	3.0	U

FORM I VOA

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

141242

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: FSBLTM04W

Matrix: (soil/water) WATER Lab Sample ID: 21144010

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 8C408

Level: (low/med) LOW Date Received: 01/28/00

% Moisture: not dec. _____ Date Analyzed: 02/03/00

GC Column: DB-624 ID: 0.25 (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	7.0	
108-88-3	Toluene	0.60	J
100-41-4	Ethylbenzene	0.19	J
1330-20-7	Xylenes (total)	0.35	J

FORM I VOA

DUPLICATE

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

141244

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: FSBLTM04W

Matrix: (soil/water) WATER Lab Sample ID: 31144009

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 3U407

Level: (low/med) LOW Date Received: 01/28/00

% Moisture: not dec. _____ Date Analyzed: 02/03/00

GC Column: DB-624 ID: 0.25 (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	6.7	
108 88 3	Toluene	0.56	J
100-41-4	Ethylbenzene	0.16	J
1330-20-7	Xylenes (total)	0.32	J

FORM I VOA

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

141342

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: FSBLTM04W

Matrix: (soil/water) WATER Lab Sample ID: 21144011

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 8U409

Level: (low/med) LOW Date Received: 01/28/00

% Moisture: not dec. _____ Date Analyzed: 02/03/00

GC Column: DB-624 ID: 0.25 (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	1.0	U
108-88-3	Toluene	0.59	J
100-41-4	Ethylbenzene	1.0	U
1330-20-7	Xylenes (total)	3.0	U

FORM I VOA

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

141442

Lab Name: GENERAL ENGINEERING LABOR Contract: N/A

Lab Code: N/A Case No.: N/A SAS No.: N/A SDG No.: FSE.(TM04W

Matrix: (soil/water) WATER Lab Sample ID: 21144012

Sample wt/vol: 5.000 (g/ml) ML Lab File ID: 8U410

Level: (low/med) LOW Date Received: 01/28/00

% Moisture: not dec. _____ Date Analyzed: 02/03/00

GC Column: DB-624 ID: 0.25 (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	1.0	U
108-88-3	Toluene	1.0	U
100-41-4	Ethylbenzene	1.0	U
1330-20-7	Xylenes (total)	3.0	U

US ADS

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

1 of 2

CHAIN OF CUSTODY RECORD

COC NO.: SLTM 02

PROJECT NAME: Ft. Stewart CAP B LTM

PROJECT NUMBER: 01-1624-04-8358-700

PROJECT MANAGER: Patty Stoll

Sampler (Signature) / (Printed Name): Laura Lumley

LABORATORY NAME: General Engineering Laboratory

LABORATORY ADDRESS: 2040 Savage Raod, Charleston, SC 29417

PHONE NO: (803) 556-8171

REQUESTED PARAMETERS

Sample ID	Date Collected	Time Collected	Matrix	BTEX	No. of Bottles/ Vials:	OVA SCREENING	OBSERVATIONS COMMENTS SPECIAL INSTRUCTIONS
TBB031	1/27/00	0745	water	2	2		21144-001
030554	1/27/00	1520		2	2		-002
030552	1/27/00	1520		2	2		-003
030852	1/27/00	1305		2	2		-004
030952	1/27/00	1400		2	2		-005
031252	1/27/00	1655		2	2		-006
140842	1/27/00	1632		2	2		-007
141142	1/27/00	1532		2	2		-008
141244	1/27/00	1417		2	2		-009
141242	1/27/00	1417		2	2		-010
141342	1/27/00	1600		2	2		-011
141442	1/27/00	1450		2	2		-012
150952	1/27/00	1100		2	2		-013

RELINQUISHED BY: Laura Lumley	Date/Time 1/28/00 1215	RECEIVED BY:	Date/Time 1/28/00 1500	TOTAL NUMBER OF CONTAINERS:	Cooler Temperature: 4°C
COMPANY NAME: SAIC		COMPANY NAME:		Cooler ID: SAIC #33	FEDEX NUMBER:
RELINQUISHED BY:	Date/Time 1/28/00 1215	RELINQUISHED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			
RELINQUISHED BY:	Date/Time 1/28/00 1500	RECEIVED BY:	Date/Time		
COMPANY NAME:		COMPANY NAME:			

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

1 of 2 21155%

CHAIN OF CUSTODY RECORD

COC NO. SLTM03

PROJECT NAME: Ft Stewart CAP B LTM

PROJECT NUMBER: 01-1624-04-8358-700

PROJECT MANAGER: Patty Stoll

Sampler (Signature): Laura Lumley (Printed Name): Laura Lumley

LABORATORY NAME: General Engineering Laboratory

LABORATORY ADDRESS: 2040 Savage Raod, Charleston, SC 29417

PHONE NO: (803) 556 8171

Sample ID	Date Collected	Time Collected	Matrix	REQUESTED PARAMETERS: BTEX	PAH	No. of Bottles/ Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
030259	1/26/00	1140	water	2	2	4		
031152	1/26/00	1050		2		2		
320742	1/26/00	1325		2		2		
321042	1/26/00	1515		2		2		
321142	1/26/00	1620		2		2		
140742	1/26/00	1105		2		2		
140942	1/26/00	0945		2		2		
330642	1/26/00	1157		2		2		
330742	1/26/00	1203		2		2		
330642	1/26/00	0945		2		2		
331042	1/26/00	1326		2		2		
331044	1/26/00	1326		2		2		
TB0032	1/26/00	0745	✓	2		2		

RELINQUISHED BY:	Date/Time	RECEIVED BY:	Date/Time	TOTAL NUMBER OF CONTAINERS:	Cooler Temperature: 4°C
Laura Lumley	1/30/00				
COMPANY NAME: SAIC	1045	COMPANY NAME: GEL	1/31/00 1330	Cooler ID: #60	FEDEX NUMBER:
RECEIVED BY: Amy C Jarmin	Date/Time 1/29/00	RELINQUISHED BY:	Date/Time		
COMPANY NAME: GEL	1045	COMPANY NAME:			
RELINQUISHED BY: Amy Jarmin	Date/Time 1/30/00	RECEIVED BY:	Date/Time		
COMPANY NAME: GEL	1330	COMPANY NAME:			

III-13

APPENDIX IV

SITE RANKING FORM

THIRD SEMIANNUAL MONITORING EVENT

JANUARY 2000

SITE RANKING FORM

Facility Name: UST 29, Building 1633 **Ranked by:** S. Stoller

County: Liberty **Facility ID #:** 9-089088 **Date Ranked:** 5/16/00

SOIL CONTAMINATION

A. Total PAHs –
Maximum Concentration found on the site
(Assume <0.660 mg/kg if only gasoline was stored on site)

- ☐ ≤0.660 mg/kg = 0
- ☐ >0.66 - 1 mg/kg = 10
- * ☒ >1 - 10 mg/kg = 25
- ☐ >10 mg/kg = 50

* *CAP Part B sample 141021 (1997)*

B. Total Benzene -
Maximum Concentration found on the site

- ☐ ≤0.005 mg/kg = 0
- * ☒ >0.005 - .05 mg/kg = 1
- ☐ >0.05 - 1 mg/kg = 10
- ☐ >1 - 10 mg/kg = 25
- ☐ >10 - 50 mg/kg = 40
- ☐ >50 mg/kg = 50

* *CAP-Part A sample 1403A1 (1996)*

C. Depth to Groundwater
(bls = below land surface)

- ☐ >50' bls = 1
- ☐ >25' - 50' bls = 2
- ☐ >10' - 25' bls = 5
- ☒ ≤10' bls = 10

Fill in the blanks: **(A. 25) + (B. 1) = (26) x (C. 10) = (D. 260)**

GROUNDWATER CONTAMINATION

E. Free Product (Nonaqueous-phase liquid hydrocarbons; See Guidelines For definition of "sheen").

- ☒ No free product = 0
- ☐ Sheen - 1/8" = 250
- ☐ >1/8" - 6" = 500
- ☐ >6" - 1ft. = 1,000
- ☐ For every additional inch, add another 100 points = 1,000 +

F. Dissolved Benzene -
Maximum Concentration at the site
(One well must be located at the source of the release.)

- ☐ ≤5 µg/L = 0
- ☐ >5 - 100 µg/L = 5
- * ☒ >100 - 1,000 µg/L = 50
- ☐ >1,000 - 10,000 µg/L = 500
- ☐ >10,000 µg/L = 1500

* *LTM sample 140942 (January 2000)*

Fill in the blanks: **(E. 0) + (F. 50) = (G. 50)**

Facility Name: UST 29, Building 1633 **County:** Liberty **Facility ID #:** 9-089088

POTENTIAL RECEPTORS (MUST BE FIELD-VERIFIED)

Distance from nearest contaminant plume boundary to the nearest downgradient and hydraulically connected Point of Withdrawal for water supply. **If the point of withdrawal is not hydraulically connected, evidence as outlined in the CAP-A guidance document MUST be presented to substantiate this claim.**

H. Public Water Supply

☐	Impacted	= 2000
☐	≤500'	= 500
☐	>500' - ¼ mi	= 25
☐	¼ mi - 1 mi	= 10
☐	>1 mi - 2 mi	= 2
* ☒	> 2 mi	= 0

For lower susceptibility areas only:

☐	>1 mi	= 0

I. Non-Public Water Supply

☐	Impacted	= 1000
☐	≤100'	= 500
☐	>100' - 500'	= 25
☐	>500' - ¼ mi	= 5
☐	>¼ - ½ mi	= 2
☒	>½ mi	= 0

For lower susceptibility areas only:

☐	>¼ mi	= 0

Note: If site is in lower susceptibility area, do not use the shaded areas.

* For justification that withdrawal point is not hydraulically connected, see attached text.

J. Distance from nearest Contaminant Plume boundary to downgradient Surface Waters **OR UTILITY TRENCHES & VAULTS** (a utility trench may be omitted from ranking if its invert elevation is more than 5 feet above the water table)

☐	Impacted	= 500
☒	≤500'	= 50
☐	>500' - 1,000'	= 5
☐	>1,000'	= 2

K. Distance from any Free Product to basements and crawl spaces

☐	Impacted	= 500
☐	<500'	= 50
☐	>500' - 1,000'	= 5
☒	>1,000' or no free product.	= 0

Fill in the blanks: (H. 0) + (I. 0) + (J. 50) + (K. 0) = L. 50

(G. 50) x (L. 50) = M. 2500

(M. 2500) + (D. 260) = N. 2760

P. **SUSCEPTIBILITY AREA MULTIPLIER**

☐ If site is located in a Low Ground-Water Pollution Susceptibility Area = 0.5

☒ All other sites = 1

Q. **EXPLOSION HAZARD**

Have any explosive petroleum vapors, possibly originating from this release, been detected in any subsurface structure (e.g., utility trenches, basements, vaults, crawl spaces, etc.)?

☐ Yes = 200,000

☒ No = 0

Fill in the blanks: (N. 2760) x (P. 1) = (2760) + (Q. 0)

= 2760 (January 2000 - third semiannual sampling event)
ENVIRONMENTAL SENSITIVITY SCORE

OTHER GEOLOGIC AND HYDROLOGIC DATA

The following information is presented to provide supplemental information to Item H of the Site Ranking Form and provides detailed information relating to the geologic and hydrogeologic conditions at Fort Stewart to support determinations of groundwater flow pathway(s) or direction(s) and contaminant transport.

1.0 REGIONAL AND LOCAL GEOLOGY

Fort Stewart is located within the coastal plain physiographic province. This province is typified by nine southeastward-dipping strata that increase in thickness from 0 feet at the fall line, located approximately 150 miles inland from the Atlantic coast, to approximately 4,200 feet at the coast. State geologic records describe a probable petroleum exploration well (the No. 1 Jelks-Rogers) located in the region as encountering crystalline basement rocks at a depth of 4,254 feet below ground surface (BGS). This well provides the most complete record for Cretaceous, Tertiary, and Quaternary sedimentary strata in the region.

The Cretaceous section was found to be approximately 1,970 feet thick and dominated by clastics. The Tertiary section was found to be approximately 2,170 feet thick and dominated by limestone with a 175-foot-thick cap of dark green phosphatic clay. This clay is regionally extensive and is known as the Hawthorn Group. The interval from approximately 110 feet to the surface is Quaternary in age and composed primarily of sand with interbeds of clay or silt. This section is undifferentiated into separate formations (Herrick and Vochis 1963).

State geologic records contain information regarding a well drilled in October 1942, 1.8 miles north of Flemington at Liberty Field of Camp Stewart (now known as Fort Stewart). This well is believed to be an artesian well located approximately one-quarter mile north of the runway at Wright Army Airfield within the Fort Stewart Military Reservation. The log for this well describes a 410-foot section, the lowermost 110 feet of which consisted predominantly of limestone sediments, above which 245 feet of dark green phosphatic clay typical of the Hawthorn Group were encountered. The uppermost portion of the section was found to be Quaternary-age interbedded sands and clays. The top 15 feet of these sediments were described as sandy clay (Herrick and Vochis 1963).

The surface soil located throughout the Fort Stewart garrison area consists of Stilson loamy sand. The surface layer of this soil is typically dark grayish-brown loamy sand measuring approximately 6 inches in depth. The surface layer is underlain by material consisting of pale yellow loamy sand and extends to a depth of approximately 29 inches. The subsoil is predominantly sandy clay loam and extends to a depth of 72 inches or more (Herrick and Vochis 1963).

2.0 REGIONAL AND LOCAL HYDROGEOLOGY

The hydrogeology in the vicinity of Fort Stewart is dominated by two aquifers referred to as the Principal Artesian and the surficial aquifers. The Principal Artesian aquifer is the lowermost hydrologic unit and is regionally extensive from South Carolina through Georgia, Alabama, and most of Florida. Known elsewhere as the Floridan, this aquifer is composed primarily of Tertiary-age limestone, including the Bug Island Formation, the Ocala Group, and the Suwannee Limestone. These formations are approximately 800 feet thick, and groundwater from this aquifer is used primarily for drinking water (Arora 1984).

The uppermost hydrologic unit is the surficial aquifer, which consists of widely varying amounts of sand and clay ranging from 55 feet to 150 feet in thickness. This aquifer is primarily used for domestic lawn and agricultural irrigation. The top of the water table ranges from approximately 2 feet to 10 feet BGS (Geraghty and Miller 1993). The base of the aquifer corresponds to the top of the underlying dense clay of the Hawthorn Group. The Hawthorn Group was not encountered during drilling at this site but is believed to be located at 40 feet to 50 feet BGS; thus, the effective aquifer thickness would be approximately 35 feet to 45 feet. Soil surveys for Liberty and Long counties describe the occurrence of a perched water table within the Stilson loamy sands present within Fort Stewart (Looper 1980).

The confining layer for the Principal Artesian aquifer is the phosphatic clay of the Hawthorn Group and ranges in thickness from 15 feet to 90 feet. The vertical hydraulic conductivity of this confining unit is on the order of 10^{-8} cm/sec. There are minor occurrences of aquifer material within the Hawthorn Group; however, they have limited utilization (Miller 1990). The Hawthorn Group has been divided into three formations: Coosawhatchie Formation, Markshead Formation, and Parachula Formation, which are listed from youngest to oldest.

The Coosawhatchie Formation is composed predominantly of clay but also has sandy clay, argillaceous sand, and phosphorite units. The formation is approximately 170 feet thick in the Savannah, Georgia, area. This unit disconformably overlies the Markshead Formation and is distinguished from the underlying unit by dark phosphatic clays or phosphorite in the lower part and fine-grained sand in the upper part.

The Markshead Formation is approximately 70 feet thick in the Savannah, Georgia, area and consists of light-colored phosphatic, slightly dolomitic, argillaceous sand to fine-grained sandy clay with scattered beds of dolostone and limestone.

The Parachula Formation consists of sand, clay, limestone, and dolomite and is approximately 10 feet thick in the Savannah, Georgia, area. The Parachula Formation generally overlies the Suwannee Limestone in Georgia.

Groundwater encountered at all the UST investigation sites is part of the surficial aquifer system. Based on the fact that all public and non-public water supply wells draw water from the Principal Artesian (Floridan) aquifer and that the Hawthorn confining unit separates the Principal Artesian aquifer from the surficial aquifer, it is concluded that there is no hydraulic interconnection between the surficial aquifer (and associated groundwater plumes, if applicable) located beneath former UST sites and identified water supply withdrawal points at Fort Stewart.

APPENDIX V

REIMBURSEMENT APPLICATION

Fort Stewart is a federally owned facility and has funded the investigation for the UST 29 site, Building 1633, Facility ID #9-089088, using U.S. Department of Defense Environmental Restoration Account Funds. Application for Georgia Underground Storage Tank Trust Fund reimbursement is not being pursued at this time.

ATTACHMENT A

SUMMARY OF FATE AND TRANSPORT MODELING RESULTS

A.1 FATE AND TRANSPORT MODELING

The fate and transport modeling that was performed as part of the CAP-Part B Report (SAIC 1999a) is based on the assumption of a continuous source of contamination of infinite duration at the site based on the maximum observed benzene concentration in groundwater (i.e., 238 µg/L at well 14-08 during the CAP-Part A investigation in December 1997). In summary, the Analytical Transient 1-, 2-, 3-Dimensional (AT123D) Model was used to model contaminant migration to two potential downgradient receptors: a drainage ditch located approximately 500 feet west of the site and Mill Creek located approximately 2,000 feet west of the site. A catch basin for a storm drain is located approximately 60 feet downgradient of the site; the depth of the basin is approximately 2.0 feet BGS. Thus, the storm drain is above the water table and is not a potential preferential pathway for contaminant migration. The modeling results indicated that, due to dilution attenuation, benzene would not reach the drainage ditch at concentrations above the IWQS. No detectable concentrations of benzene are predicted to reach Mill Creek.

Based on modeling results, the estimated dilution attenuation factor (DAF) for benzene at the drainage ditch was 110, and the DAF at Mill Creek was 400,000. Simulations of a 2-year period were also performed to predict the maximum concentrations of benzene in the downgradient wells that will be used for long-term monitoring. The predicted 2-year maximum concentrations in the wells are presented in Table A-1. The ACLs for the site are presented in Table A-2.

Table A-1. Predicted Two-Year Maximum Concentrations in Groundwater at the UST 29 Site

Well	Predicted Maximum Concentration (µg/L)
14-08	90
14-09	35
14-11	43
14-12	10

Table A-2. Revised ACLs for the UST 29 Site

Contaminant	MCL (µg/L)	DAF[a] (sanitary sewer)	ACL[b] (µg/L)
Benzene	5	110	550

[a] DAF = Maximum observed benzene concentration ÷ predicted benzene concentration at the receptor
= 239 ÷ 2.2 = 110 at the drainage ditch.
[b] ACL = MCL × DAF.
MCL = Maximum contaminant level.

A.2 FATE AND TRANSPORT MODELING CONCLUSIONS

The conclusions below are based on a fate and transport model that assumes a continuous source of contamination of infinite duration at the site based on the maximum observed benzene concentration (238 µg/L) in groundwater during the CAP-Part A and CAP-Part B investigations.

- Benzene concentrations in groundwater do not exceed the ACL of 550 µg/L in any of the wells at the site, indicating that the benzene concentrations at the site are not high enough to reach the sanitary sewer at concentrations above the IWQS.

- The benzene concentrations in well 14-09 exceed the respective predicted 2-year maximum concentrations of benzene expected to occur within the first 2 years of the initial sampling in December 1997.

ATTACHMENT B

REFERENCES

REFERENCES

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Herrick, S.M., and R.C. Vochis 1963. *Subsurface Geology of the Georgia Coastal Plain*, Georgia Geologic Survey Information Circular 25.

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