1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN3101

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-06

Sample wt/vol: 10.0 (g/mL) G Lab File ID: 1E3013

Level: (low/med) LOW Date Received: 04/03/98

% Moisture: not dec. 7 Date Analyzed: 04/15/98

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

Soil Extract Volume:________(uL) Soil Aliquot Volume: ________(uL

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
----------------	Gasoline Range Organics_____	538	U	U

[illegible]

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN3101

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-06

Sample wt/vol: 30.1 (g/mL) G Lab File ID: 20318

Level: (low/med) LOW Date Received: 04/03/98

% Moisture: 7 decanted: (Y/N) N Date Extracted:04/04/98

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 04/09/98

Injection Volume: 1.0(uL) Dilution Factor: 2.0

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	714	U	U
91-58-7	2-chloronaphthalene	714	U	
209-96-8	acenaphthylene	714	U	
83-32-9	acenaphthene	714	U	
86-73-7	fluorene	714	U	
85-01-8	phenanthrene	714	U	
120-12-7	anthracene	714	U	↓
206-44-0	fluoranthene	1250		=
129-00-0	pyrene	994		=
56-55-3	benzo(a)anthracene	714	U	U
218-01-9	chrysene	714	U	
205-99-2	benzo(b)fluoranthene	714	U	
207-08-9	benzo(k)fluoranthene	714	U	↓
50-32-8	benzo(a)pyrene	1320		=
193-39-5	indeno(1,2,3-cd)pyrene	714	U	U
53-70-3	dibenz(a,h)anthracene	714	U	
191-24-2	benzo(g,h,i)perylene	714	U	↓

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN3105

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-07

Sample wt/vol: 10.0 (g/mL) G Lab File ID: 2E509

Level: (low/med) LOW Date Received: 04/03/98

% Moisture: not dec. 9 Date Analyzed: 04/17/98

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	2.2	U	U
108-88-3	Toluene	4.3		=
100-41-4	Ethylbenzene	2.2	U	U
1330-20-7	Xylenes (total)	6.6	U	U

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FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

Science Applications03-APR-1998 SA

HN3105

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-07

Sample wt/vol: 30.1 (g/mL) G Lab File ID: 4B30047

Level: (low/med) LOW Date Received: 04/03/98

% Moisture: 9 decanted: (Y/N) N Date Extracted:04/07/98

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 04/10/98

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) MG/KG	Q
	--------------Diesel Range Organics______	3.5	B

=> F01, F08

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN3105

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-07

Sample wt/vol: 10.0 (g/mL) G Lab File ID: 1E505

Level: (low/med) LOW Date Received: 04/03/98

% Moisture: not dec. 9 Date Analyzed: 04/17/98

GC Column: J&W DB-624(FID) 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/KG	Q	
	Gasoline Range Organics	549	U	U

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.
HN3105

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-07

Sample wt/vol: 30.1 (g/mL) G Lab File ID: 20319

Level: (low/med) LOW Date Received: 04/03/98

% Moisture: 9 decanted: (Y/N) N Date Extracted:04/04/98

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 04/09/98

Injection Volume: 1.0(uL) Dilution Factor: 2.0

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	730	U	U
91-58-7	2-chloronaphthalene	730	U	
209-96-8	acenaphthylene	730	U	
83-32-9	acenaphthene	730	U	
86-73-7	fluorene	730	U	
85-01-8	phenanthrene	730	U	
120-12-7	anthracene	730	U	
206-44-0	fluoranthene	730	U	
129-00-0	pyrene	730	U	
56-55-3	benzo(a)anthracene	730	U	
218-01-9	chrysene	730	U	
205-99-2	benzo(b)fluoranthene	730	U	
207-08-9	benzo(k)fluoranthene	730	U	
50-32-8	benzo(a)pyrene	730	U	
193-39-5	indeno(1,2,3-cd)pyrene	522	J	J
53-70-3	dibenz(a,h)anthracene	730	U	U
191-24-2	benzo(g,h,i)perylene	730	U	

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN3110

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-08

Sample wt/vol: 10.0 (g/mL) G Lab File ID: 2E5010

Level: (low/med) LOW Date Received: 04/03/98

% Moisture: not dec. 10 Date Analyzed: 04/17/98

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

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

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/KG

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q	
71-43-2	Benzene	2.2	U	U
108-88-3	Toluene	2.2	U	↓
100-41-4	Ethylbenzene	2.2	U	
1330-20-7	Xylenes (total)	6.7	U	

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FORM 1 Science Applications03-APR-1998 SA
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

HN3110

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-08

Sample wt/vol: 30.5 (g/mL) G Lab File ID: 4B30048

Level: (low/med) LOW Date Received: 04/03/98

% Moisture: 10 decanted: (Y/N) N Date Extracted:04/07/98

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 04/10/98

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) MG/KG	Q	
--------------	Diesel Range Organics	2.6	B	u Fϕ1, Fϕ7

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN3110

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-08

Sample wt/vol: 10.0 (g/mL) G Lab File ID: 1E506

Level: (low/med) LOW Date Received: 04/03/98

% Moisture: not dec. 10 Date Analyzed: 04/17/98

GC Column: J&W DB-624(FID) 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/KG	Q	
	Gasoline Range Organics	556	U	U

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN3110

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-08

Sample wt/vol: 30.1 (g/mL) G Lab File ID: 20320

Level: (low/med) LOW Date Received: 04/03/98

% Moisture: 10 decanted: (Y/N) N Date Extracted:04/04/98

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 04/09/98

Injection Volume: 1.0(uL) Dilution Factor: 2.0

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	738	U	U
91-58-7	2-chloronaphthalene	738	U	
209-96-8	acenaphthylene	738	U	
83-32-9	acenaphthene	738	U	
86-73-7	fluorene	738	U	
85-01-8	phenanthrene	738	U	
120-12-7	anthracene	738	U	
206-44-0	fluoranthene	738	U	↓
129-00-0	pyrene	1120		=
56-55-3	benzo(a)anthracene	1180		=
218-01-9	chrysene	557	J	J
205-99-2	benzo(b)fluoranthene	738	U	U
207-08-9	benzo(k)fluoranthene	738	U	
50-32-8	benzo(a)pyrene	738	U	↓
193-39-5	indeno(1,2,3-cd)pyrene	1200		=
53-70-3	dibenz(a,h)anthracene	738	U	U
191-24-2	benzo(g,h,i)perylene	738	U	↓

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.
HN4101

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-16

Sample wt/vol: 10.0 (g/mL) G Lab File ID: 2E5016

Level: (low/med) LOW Date Received: 04/04/98

% Moisture: not dec. 8 Date Analyzed: 04/17/98

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	2.2	U	U
108-88-3	Toluene	2.2	U	
100-41-4	Ethylbenzene	2.2	U	
1330-20-7	Xylenes (total)	6.5	U	

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FORM 1 Science Applications04-APR-1998 SA
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

HN4101DL1

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-16

Sample wt/vol: 30.2 (g/mL) G Lab File ID: 4B30064

Level: (low/med) LOW Date Received: 04/04/98

% Moisture: 8 decanted: (Y/N) N Date Extracted:04/07/98

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 04/10/98

Injection Volume: 1.0(uL) Dilution Factor: 2.0

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

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) MG/KG	Q
---------------	Diesel Range Organics	9.6	B

= F01, F08

FORM I SV

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN4101

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA0C3S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-16

Sample wt/vol: 10.0 (g/mL) G Lab File ID: 1E4012

Level: (low/med) LOW Date Received: 04/04/98

% Moisture: not dec. 8 Date Analyzed: 04/16/98

GC Column: J&W DB-624 (FID) 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/KG	Q	
----------------	Gasoline Range Organics	543	U	V

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN4101

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-16

Sample wt/vol: 30.0 (g/mL) G Lab File ID: 2Q112

Level: (low/med) LOW Date Received: 04/04/98

% Moisture: 8 decanted: (Y/N) N Date Extracted: 04/16/98

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 04/20/98

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	362	U	u
91-58-7	2-chloronaphthalene	362	U	
209-96-8	acenaphthylene	362	U	
83-32-9	acenaphthene	362	U	
86-73-7	fluorene	362	U	↓
85-01-8	phenanthrene	36.7	J	J
120-12-7	anthracene	362	U	U
206-44-0	fluoranthene	103	J	J
129-00-0	pyrene	112	J	
56-55-3	benzo(a)anthracene	75.7	J	↓
218-01-9	chrysene	106	J	J cφ2
205-99-2	benzo(b)fluoranthene	141	J	J
207-08-9	benzo(k)fluoranthene	81.9	J	J cφ2
50-32-8	benzo(a)pyrene	89.2	J	J
193-39-5	indeno(1,2,3-cd)pyrene	67.7	J	J
53-70-3	dibenz(a,h)anthracene	362	U	U
191-24-2	benzo(g,h,i)perylene	56.4	J	J

FORM I SV-1 OLM03.0

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN4105

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-17

Sample wt/vol: 10.0 (g/mL) G Lab File ID: 2E5017

Level: (low/med) LOW Date Received: 04/04/98

% Moisture: not dec. 7 Date Analyzed: 04/17/98

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	2.2	U
108-88-3	--------Toluene	2.2	U
100-41-4	--------Ethylbenzene	2.2	U
1330-20-7	-------Xylenes (total)	6.4	U

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FORM 1
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET Science Applications04-APR-1998 SA

HN4105

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-17

Sample wt/vol: 30.2 (g/mL) G Lab File ID: 4B30062

Level: (low/med) LOW Date Received: 04/04/98

% Moisture: 7 decanted: (Y/N) N Date Extracted:04/07/98

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 04/10/98

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) MG/KG	Q	
---------------	Diesel Range Organics	3.2	B	= F01, F08

FORM I SV

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN4105

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-17

Sample wt/vol: 10.0 (g/mL) G Lab File ID: 1E4013

Level: (low/med) LOW Date Received: 04/04/98

% Moisture: not dec. 7 Date Analyzed: 04/16/98

GC Column: J&W DB-624(FID) 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/KG	Q	
----------------	Gasoline Range Organics	538	U	U

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN4105

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA003S

Matrix: (soil/water) SOIL Lab Sample ID: 9804105-17

Sample wt/vol: 30.0 (g/mL) G Lab File ID: 2Q113

Level: (low/med) LOW Date Received: 04/04/98

% Moisture: 7 decanted: (Y/N) N Date Extracted:04/16/98

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 04/20/98

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	358	U	U
91-58-7	2-chloronaphthalene	358	U	
209-96-8	acenaphthylene	358	U	
83-32-9	acenaphthene	358	U	
86-73-7	fluorene	358	U	↓
85-01-8	phenanthrene	82.4	J	J
120-12-7	anthracene	358	U	U
206-44-0	fluoranthene	228	J	J
129-00-0	pyrene	328	J	
56-55-3	benzo(a)anthracene	198	J	↓
218-01-9	chrysene	313	J	J cφ2
205-99-2	benzo(b)fluoranthene	232	J	J
207-08-9	benzo(k)fluoranthene	119	J	J cφ2
50-32-8	benzo(a)pyrene	172	J	J
193-39-5	indeno(1,2,3-cd)pyrene	111	J	J
53-70-3	dibenz(a,h)anthracene	358	U	U
191-24-2	benzo(g,h,i)perylene	105	J	J

FORM I SV-1 OLM03.0

APPENDIX VI

ALTERNATE THRESHOLD LEVEL (ATL) CALCULATIONS

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Calculations of alternate threshold levels are not indicated for the Former Heating Oil Tanks (HOTs) A & B, Building 850 site because soil concentrations did not exceed the Georgia Environmental Protection Division (GA EPD) applicable soil threshold levels (i.e., Table A, column 2).

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1.0 FATE AND TRANSPORT MODEL

Further evaluation of the groundwater at the Former Heating Oil Tanks A & B, Building 850 site is necessary because concentrations of benzene were above the maximum contaminant level (MCL) of 5.0 µg/L (Appendix II, Table 3a). To assist in evaluating site conditions, simulation of fate and transport of benzene in the water table aquifer was conducted to determine the impact of existing site conditions on potential downgradient receptors. The following sections present the model selection, application, and results.

1.1 MODEL SELECTION

For the fate and transport analysis of this site, analytical model AT123D was selected. The model was chosen in accordance with Appendix I of the Georgia Department of Natural Resources (GA DNR) UST Corrective Action Plan (CAP)-Part B guidance document (GA DNR 1995). The following criteria were used in selecting the model:

- capability of treating adsorption, organic decay, and longitudinal and transverse dispersion;
- capability of calculating concentrations at extended times and distances;
- availability of codes;
- degree of code documentation;
- degree of code verification;
- adequate peer review; and
- conservative predictions.

The Analytical Transient 1-, 2-, 3-Dimensional Model, AT123D, meets all of the above criteria and was selected for performing fate and transport analysis for this site. AT123D is a well-known and commonly used analytical groundwater pollutant fate and transport model. This model computes the spatial-temporal concentration distribution of chemicals in the aquifer system and predicts the transient spread of a chemical plume through a groundwater aquifer. The fate and transport processes accounted for in AT123D are advection, dispersion, adsorption/retardation, and decay. This model can be used as a tool for estimating the dissolved concentration of a chemical in one, two, or three dimensions in the groundwater resulting from a mass release (either continuous or instant or depleting source) over a source area (i.e., point, line, area, or volume source).

1.2 MODEL APPLICATION

A two-dimensional calibrated transport model was developed using AT123D to predict benzene concentrations at receptor locations in the future. The model was calibrated by varying the release of benzene into the source and assuming that the source is constant. It was observed that a constant source of 68 µg/hour produces a benzene peak concentration of 5.7 µg/L in the groundwater, which matched the observed maximum concentration detected in groundwater collected from boring N-3 at the site in April 1998 (Appendix II, Table 3a). The model was applied to perform long-term simulation to predict the peak concentration at different distances downgradient from the source.

The aquifer was calculated to be 50 feet thick and corresponded to the water table down to the first confining clay member of the Hawthorne Group. The average water table level determined by field measurements at the site was 9.8 feet below ground surface (Appendix II, Table 4). Based on the size of the tanks and their locations, the source area was estimated to have an area of 1,548 square feet (43 feet × 36 feet).

Undisturbed soil samples were not collected as part of this investigation. However, geotechnical soil samples at several sites located at HAAF were collected during other CAP-Part A Investigation activities (Appendix VI, Table VI-A). These samples were used to determine average geotechnical parameters which, combined with literature values presented in both the GA DNR UST CAP-Part A and B guidance documents, provided the input parameter values used in the model. Soil parameter values used were as follows: moisture content, 17.14 percent; soil type, silty sand; porosity, 0.51; specific gravity, 2.64; permeability, 1.92E-04 cm/second; total organic content, 3,105 mg/kg; and saturated hydraulic conductivity of 1.92E-04 cm/second. The average slope of the surface was determined to be 0.0068, and ground cover was sand. To be conservative, the model was run with the lowest biodegradation available in literature (Howard et al. 1991).

1.3 MODEL RESULTS

The results of the fate and transport model are illustrated in Figure VI-A. The model predicts that benzene will never reach the nearest receptor, which is Hunter Army Airfield public water supply Well 2 located 1,440 feet downgradient (southeast) from the source (Figure 3b, Appendix I).

Therefore, benzene found in the groundwater at the Former HOTs A & B, Building 850 site poses no threat to the potential receptor. Based on the results of the fate and transport model, further investigation activities are not recommended for this site.

TABLES

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Former HOTs A & B, Building 850
Hunter Army, Chatham County

TABLE VI-A. AVERAGE GEOTECHNICAL PARAMETERS[1]

Building ID	Tank IDs	Facility ID	Sample ID	Sample Depth	Classification	Moisture Content (%)	Total Organic Carbon (%)	Specific Gravity	Porosity, n	Permeability (cm/s)
850	A & B	NA	NA	2.0 to 4.0	SM	17.14	0.3105	2.64	0.51	1.92E-4

NOTE: HOT = Heating Oil Tank.
NA = Not applicable.
SM = Silty sand.

[1] The geotechnical parameters reported on this table represent an average value obtained by using the geotechnical data collected at eight separate sites located throughout Hunter Army Airfield.

Former HOTs A & B, Building 850
Hunter Army, Chatham County

TABLE VI-B. AT123D FATE AND TRANSPORT MODEL INPUT PARAMETERS AND OUTPUT VALUES FOR BENZENE AT THE FORMER HOTs A&B, BUILDING 850 SITE

MODEL INPUT PARAMETERS

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 180
NO. OF ENDING TIME STEP 400
NO. OF TIME INTERVALS FOR PRINTED OUT SOLUTION 12
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) ... 0.1524E+02
AQUIFER WIDTH, = 0.0 FOR INFINITE WIDE (METERS) ... 0.0000E+00
BEGIN POINT OF X-SOURCE LOCATION (METERS) .... -0.1310E+02
END POINT OF X-SOURCE LOCATION (METERS) .... 0.0000E+01
BEGIN POINT OF Y-SOURCE LOCATION (METERS) .... -0.5500E+01
END POINT OF Y-SOURCE LOCATION (METERS) .... 0.5500E+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) 0.6900E-02
HYDRAULIC GRADIENT 0.3000E-02
LONGITUDINAL DISPERSIVITY (METER) .... 0.6000E+01
LATERAL DISPERSIVITY (METER) .... 0.2000E+01
VERTICAL DISPERSIVITY (METER) .... 0.6000E+00
DISTRIBUTION COEFFICIENT, KD (M**3/KG) 0.2520E-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) 0.4010E-04
BULK DENSITY OF THE SOIL (KG/M**3) .... 0.1300E+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) .. 0.7300E+03
DISCHARGE TIME (HR) .... 0.8760E+06
WASTE RELEASE RATE (KCAL/HR), (KG/HR), OR (CI/HR) . 0.6800E-07

RETARDATION FACTOR .... 0.2638E+01
RETARDED DARCY VELOCITY (M/HR) 0.3923E-04
RETARDED LONGITUDINAL DISPERSION COEF. (M**2/HR) .. 0.2421E-03
RETARDED LATERAL DISPERSION COEFFICIENT (M**2/HR) . 0.8516E-04
RETARDED VERTICAL DISPERSION COEFFICIENT (M**2/HR). 0.3023E-04

TABLE VI-B (continued)

```
DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.0000E+00 HRS
 (ADSORBED CHEMICAL CONC. =  0.2520E+00 * DISSOLVED CHEMICAL CONC.)

          Z =      0.00
                              X
 Y        0.          5.         10.         15.         20.         25.         30.         55.        439.

20.  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
15.  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
10.  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
 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
 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  0.1307E+06 HRS
 (ADSORBED CHEMICAL CONC. =  0.2520E+00 * DISSOLVED CHEMICAL CONC.)

          Z =      0.00
                              X
 Y        0.          5.         10.         15.         20.         25.         30.         55.        439.

20.  0.365E-07  0.251E-07  0.119E-07  0.389E-08  0.884E-09  0.141E-09  0.157E-10  0.000E+00  0.000E+00
15.  0.246E-05  0.148E-05  0.586E-06  0.160E-06  0.311E-07  0.439E-08  0.447E-09  0.000E+00  0.000E+00
10.  0.112E-03  0.478E-04  0.127E-04  0.251E-05  0.391E-06  0.476E-07  0.441E-08  0.000E+00  0.000E+00
 5.  0.372E-02  0.548E-03  0.835E-04  0.123E-04  0.162E-05  0.180E-06  0.157E-07  0.000E+00  0.000E+00
 0.  0.568E-02  0.895E-03  0.134E-03  0.191E-04  0.247E-05  0.268E-06  0.231E-07  0.000E+00  0.000E+00

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.1394E+06 HRS
 (ADSORBED CHEMICAL CONC. =  0.2520E+00 * DISSOLVED CHEMICAL CONC.)

          Z =      0.00
                              X
 Y        0.          5.         10.         15.         20.         25.         30.         55.        439.

20.  0.430E-07  0.302E-07  0.149E-07  0.515E-08  0.127E-08  0.224E-09  0.284E-10  0.000E+00  0.000E+00
15.  0.258E-05  0.157E-05  0.643E-06  0.184E-06  0.385E-07  0.597E-08  0.687E-09  0.000E+00  0.000E+00
10.  0.113E-03  0.485E-04  0.131E-04  0.268E-05  0.444E-06  0.591E-07  0.616E-08  0.000E+00  0.000E+00
 5.  0.372E-02  0.550E-03  0.847E-04  0.128E-04  0.179E-05  0.215E-06  0.210E-07  0.000E+00  0.000E+00
 0.  0.568E-02  0.898E-03  0.136E-03  0.199E-04  0.270E-05  0.318E-06  0.307E-07  0.000E+00  0.000E+00

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.1482E+06 HRS
 (ADSORBED CHEMICAL CONC. =  0.2520E+00 * DISSOLVED CHEMICAL CONC.)

          Z =      0.00
                              X
 Y        0.          5.         10.         15.         20.         25.         30.         55.        439.

20.  0.489E-07  0.350E-07  0.178E-07  0.648E-08  0.171E-08  0.329E-09  0.467E-10  0.000E+00  0.000E+00
15.  0.268E-05  0.165E-05  0.690E-06  0.206E-06  0.456E-07  0.768E-08  0.983E-09  0.000E+00  0.000E+00
10.  0.114E-03  0.490E-04  0.134E-04  0.282E-05  0.491E-06  0.704E-07  0.811E-08  0.000E+00  0.000E+00
 5.  0.372E-02  0.552E-03  0.856E-04  0.132E-04  0.192E-05  0.247E-06  0.267E-07  0.000E+00  0.000E+00
 0.  0.569E-02  0.900E-03  0.137E-03  0.205E-04  0.289E-05  0.364E-06  0.386E-07  0.000E+00  0.000E+00
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TABLE VI-B (continued)

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.1570E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.2520E+00 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

	X								
Y	0.	5.	10.	15.	20.	25.	30.	55.	439.
20.	0.541E-07	0.394E-07	0.206E-07	0.781E-08	0.218E-08	0.455E-09	0.711E-10	0.000E+00	0.000E+00
15.	0.275E-05	0.171E-05	0.730E-06	0.224E-06	0.522E-07	0.943E-08	0.132E-08	0.000E+00	0.000E+00
10.	0.114E-03	0.494E-04	0.136E-04	0.294E-05	0.531E-06	0.810E-07	0.102E-07	0.000E+00	0.000E+00
5.	0.372E-02	0.553E-03	0.863E-04	0.135E-04	0.203E-05	0.277E-06	0.323E-07	0.000E+00	0.000E+00
0.	0.569E-02	0.901E-03	0.138E-03	0.209E-04	0.304E-05	0.404E-06	0.465E-07	0.000E+00	0.000E+00

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.1657E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.2520E+00 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

	X								
Y	0.	5.	10.	15.	20.	25.	30.	55.	439.
20.	0.585E-07	0.433E-07	0.232E-07	0.910E-08	0.267E-08	0.596E-09	0.101E-09	0.000E+00	0.000E+00
15.	0.280E-05	0.176E-05	0.761E-06	0.240E-06	0.583E-07	0.112E-07	0.170E-08	0.000E+00	0.000E+00
10.	0.114E-03	0.496E-04	0.138E-04	0.302E-05	0.565E-06	0.906E-07	0.122E-07	0.000E+00	0.000E+00
5.	0.372E-02	0.553E-03	0.868E-04	0.138E-04	0.212E-05	0.302E-06	0.378E-07	0.000E+00	0.000E+00
0.	0.569E-02	0.902E-03	0.139E-03	0.212E-04	0.317E-05	0.439E-06	0.540E-07	0.000E+00	0.000E+00

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.1745E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.2520E+00 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

	X								
Y	0.	5.	10.	15.	20.	25.	30.	55.	439.
20.	0.623E-07	0.466E-07	0.254E-07	0.103E-07	0.316E-08	0.747E-09	0.137E-09	0.264E-15	0.000E+00
15.	0.285E-05	0.180E-05	0.786E-06	0.253E-06	0.636E-07	0.128E-07	0.209E-08	0.288E-14	0.000E+00
10.	0.115E-03	0.498E-04	0.139E-04	0.309E-05	0.592E-06	0.992E-07	0.142E-07	0.148E-13	0.000E+00
5.	0.372E-02	0.554E-03	0.871E-04	0.139E-04	0.219E-05	0.324E-06	0.430E-07	0.377E-13	0.000E+00
0.	0.569E-02	0.903E-03	0.139E-03	0.215E-04	0.326E-05	0.469E-06	0.610E-07	0.511E-13	0.000E+00

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT 0.1832E+06 HRS
(ADSORBED CHEMICAL CONC. = 0.2520E+00 * DISSOLVED CHEMICAL CONC.)

Z = 0.00

	X								
Y	0.	5.	10.	15.	20.	25.	30.	55.	439.
20.	0.653E-07	0.494E-07	0.274E-07	0.114E-07	0.363E-08	0.902E-09	0.177E-09	0.911E-15	0.000E+00
15.	0.288E-05	0.183E-05	0.806E-06	0.264E-06	0.683E-07	0.144E-07	0.248E-08	0.922E-14	0.000E+00
10.	0.115E-03	0.499E-04	0.140E-04	0.314E-05	0.615E-06	0.107E-06	0.161E-07	0.453E-13	0.000E+00
5.	0.372E-02	0.554E-03	0.873E-04	0.141E-04	0.225E-05	0.343E-06	0.477E-07	0.113E-12	0.000E+00
0.	0.569E-02	0.903E-03	0.139E-03	0.216E-04	0.334E-05	0.494E-06	0.673E-07	0.152E-12	0.000E+00

TABLE VI-B (continued)

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DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.1920E+06 HRS
 (ADSORBED CHEMICAL CONC. = 0.2520E+00 * DISSOLVED CHEMICAL CONC.)

         Z =     0.00
                                X
  Y       0.        5.        10.        15.        20.        25.        30.        55.        439.

 20.  0.678E-07  0.517E-07  0.291E-07  0.123E-07  0.406E-08  0.106E-08  0.219E-09  0.223E-14  0.000E+00
 15.  0.290E-05  0.185E-05  0.821E-06  0.273E-06  0.722E-07  0.157E-07  0.286E-08  0.211E-13  0.000E+00
 10.  0.115E-03  0.500E-04  0.141E-04  0.318E-05  0.632E-06  0.113E-06  0.179E-07  0.988E-13  0.000E+00
  5.  0.372E-02  0.554E-03  0.875E-04  0.142E-04  0.229E-05  0.358E-06  0.518E-07  0.241E-12  0.000E+00
  0.  0.569E-02  0.904E-03  0.140E-03  0.218E-04  0.339E-05  0.514E-06  0.728E-07  0.323E-12  0.000E+00

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.2008E+06 HRS
 (ADSORBED CHEMICAL CONC. = 0.2520E+00 * DISSOLVED CHEMICAL CONC.)

         Z =     0.00
                                X
  Y       0.        5.        10.        15.        20.        25.        30.        55.        439.

 20.  0.698E-07  0.535E-07  0.304E-07  0.132E-07  0.445E-08  0.120E-08  0.262E-09  0.464E-14  0.000E+00
 15.  0.291E-05  0.186E-05  0.832E-06  0.280E-06  0.754E-07  0.170E-07  0.322E-08  0.408E-13  0.000E+00
 10.  0.115E-03  0.501E-04  0.141E-04  0.321E-05  0.646E-06  0.118E-06  0.194E-07  0.183E-12  0.000E+00
  5.  0.372E-02  0.555E-03  0.876E-04  0.142E-04  0.232E-05  0.370E-06  0.554E-07  0.438E-12  0.000E+00
  0.  0.569E-02  0.904E-03  0.140E-03  0.219E-04  0.343E-05  0.530E-06  0.775E-07  0.582E-12  0.000E+00

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.2095E+06 HRS
 (ADSORBED CHEMICAL CONC. = 0.2520E+00 * DISSOLVED CHEMICAL CONC.)

         Z =     0.00
                                X
  Y       0.        5.        10.        15.        20.        25.        30.        55.        439.

 20.  0.713E-07  0.550E-07  0.316E-07  0.139E-07  0.480E-08  0.134E-08  0.306E-09  0.854E-14  0.000E+00
 15.  0.293E-05  0.187E-05  0.841E-06  0.285E-06  0.780E-07  0.180E-07  0.355E-08  0.704E-13  0.000E+00
 10.  0.115E-03  0.502E-04  0.142E-04  0.323E-05  0.657E-06  0.122E-06  0.207E-07  0.304E-12  0.000E+00
  5.  0.372E-02  0.555E-03  0.877E-04  0.143E-04  0.235E-05  0.379E-06  0.584E-07  0.711E-12  0.000E+00
  0.  0.569E-02  0.904E-03  0.140E-03  0.219E-04  0.347E-05  0.542E-06  0.815E-07  0.938E-12  0.000E+00

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.2183E+06 HRS
 (ADSORBED CHEMICAL CONC. = 0.2520E+00 * DISSOLVED CHEMICAL CONC.)

         Z =     0.00
                                X
  Y       0.        5.        10.        15.        20.        25.        30.        55.        439.

 20.  0.725E-07  0.562E-07  0.325E-07  0.145E-07  0.511E-08  0.147E-08  0.347E-09  0.144E-13  0.000E+00
 15.  0.293E-05  0.188E-05  0.847E-06  0.289E-06  0.802E-07  0.189E-07  0.384E-08  0.112E-12  0.000E+00
 10.  0.115E-03  0.502E-04  0.142E-04  0.325E-05  0.666E-06  0.126E-06  0.219E-07  0.464E-12  0.000E+00
  5.  0.373E-02  0.555E-03  0.877E-04  0.143E-04  0.237E-05  0.387E-06  0.610E-07  0.107E-11  0.000E+00
  0.  0.569E-02  0.904E-03  0.140E-03  0.220E-04  0.349E-05  0.552E-06  0.848E-07  0.140E-11  0.000E+00
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TABLE VI-B (continued)

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DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.2270E+06 HRS
 (ADSORBED CHEMICAL CONC. =  0.2520E+00 * DISSOLVED CHEMICAL CONC.)

        Z =     0.00
                               X
 Y        0.         5.         10.        15.        20.        25.        30.        55.        439.

20.  0.734E-07  0.571E-07  0.332E-07  0.149E-07  0.536E-08  0.158E-08  0.387E-09  0.227E-13  0.000E+00
15.  0.294E-05  0.189E-05  0.852E-06  0.292E-06  0.819E-07  0.196E-07  0.410E-08  0.166E-12  0.000E+00
10.  0.115E-03  0.502E-04  0.142E-04  0.326E-05  0.672E-06  0.128E-06  0.228E-07  0.667E-12  0.000E+00
 5.  0.373E-02  0.555E-03  0.878E-04  0.144E-04  0.238E-05  0.393E-06  0.631E-07  0.150E-11  0.000E+00
 0.  0.569E-02  0.904E-03  0.140E-03  0.220E-04  0.351E-05  0.560E-06  0.874E-07  0.196E-11  0.000E+00
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```
DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.2358E+06 HRS
 (ADSORBED CHEMICAL CONC. =  0.2520E+00 * DISSOLVED CHEMICAL CONC.)

        Z =     0.00
                               X
 Y        0.         5.         10.        15.        20.        25.        30.        55.        439.

20.  0.741E-07  0.578E-07  0.338E-07  0.153E-07  0.558E-08  0.168E-08  0.423E-09  0.339E-13  0.000E+00
15.  0.295E-05  0.189E-05  0.856E-06  0.295E-06  0.832E-07  0.202E-07  0.433E-08  0.235E-12  0.000E+00
10.  0.115E-03  0.502E-04  0.142E-04  0.327E-05  0.677E-06  0.131E-06  0.236E-07  0.912E-12  0.000E+00
 5.  0.373E-02  0.555E-03  0.878E-04  0.144E-04  0.239E-05  0.397E-06  0.647E-07  0.202E-11  0.000E+00
 0.  0.569E-02  0.904E-03  0.140E-03  0.220E-04  0.352E-05  0.566E-06  0.896E-07  0.262E-11  0.000E+00
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DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.2446E+06 HRS
 (ADSORBED CHEMICAL CONC. =  0.2520E+00 * DISSOLVED CHEMICAL CONC.)

        Z =     0.00
                               X
 Y        0.         5.         10.        15.        20.        25.        30.        55.        439.

20.  0.747E-07  0.583E-07  0.343E-07  0.157E-07  0.576E-08  0.176E-08  0.456E-09  0.481E-13  0.000E+00
15.  0.295E-05  0.189E-05  0.858E-06  0.296E-06  0.843E-07  0.207E-07  0.452E-08  0.318E-12  0.000E+00
10.  0.115E-03  0.502E-04  0.143E-04  0.328E-05  0.680E-06  0.132E-06  0.243E-07  0.120E-11  0.000E+00
 5.  0.373E-02  0.555E-03  0.878E-04  0.144E-04  0.240E-05  0.401E-06  0.661E-07  0.260E-11  0.000E+00
 0.  0.569E-02  0.904E-03  0.140E-03  0.220E-04  0.353E-05  0.570E-06  0.913E-07  0.336E-11  0.000E+00
```

```
DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.2533E+06 HRS
 (ADSORBED CHEMICAL CONC. =  0.2520E+00 * DISSOLVED CHEMICAL CONC.)

        Z =     0.00
                               X
 Y        0.         5.         10.        15.        20.        25.        30.        55.        439.

20.  0.751E-07  0.587E-07  0.346E-07  0.159E-07  0.591E-08  0.183E-08  0.485E-09  0.655E-13  0.000E+00
15.  0.295E-05  0.190E-05  0.860E-06  0.298E-06  0.851E-07  0.211E-07  0.468E-08  0.414E-12  0.000E+00
10.  0.115E-03  0.502E-04  0.143E-04  0.328E-05  0.683E-06  0.134E-06  0.248E-07  0.151E-11  0.000E+00
 5.  0.373E-02  0.555E-03  0.878E-04  0.144E-04  0.240E-05  0.404E-06  0.672E-07  0.325E-11  0.000E+00
 0.  0.569E-02  0.904E-03  0.140E-03  0.221E-04  0.354E-05  0.573E-06  0.927E-07  0.417E-11  0.000E+00
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TABLE VI-B (continued)

```
DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.2621E+06 HRS
 (ADSORBED CHEMICAL CONC. =  0.2520E+00 * DISSOLVED CHEMICAL CONC.)

          Z =     0.00
                                X
  Y       0.          5.        10.         15.         20.         25.         30.         55.        439.

 20.  0.754E-07  0.590E-07  0.349E-07  0.161E-07  0.602E-08  0.189E-08  0.510E-09  0.860E-13  0.000E+00
 15.  0.295E-05  0.190E-05  0.862E-06  0.299E-06  0.857E-07  0.214E-07  0.481E-08  0.522E-12  0.000E+00
 10.  0.115E-03  0.502E-04  0.143E-04  0.329E-05  0.685E-06  0.135E-06  0.253E-07  0.186E-11  0.000E+00
  5.  0.373E-02  0.555E-03  0.878E-04  0.144E-04  0.241E-05  0.406E-06  0.680E-07  0.393E-11  0.000E+00
  0.  0.569E-02  0.904E-03  0.140E-03  0.221E-04  0.354E-05  0.576E-06  0.937E-07  0.503E-11  0.000E+00

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.2708E+06 HRS
 (ADSORBED CHEMICAL CONC. =  0.2520E+00 * DISSOLVED CHEMICAL CONC.)

          Z =     0.00
                                X
  Y       0.          5.        10.         15.         20.         25.         30.         55.        439.

 20.  0.756E-07  0.593E-07  0.351E-07  0.162E-07  0.612E-08  0.194E-08  0.532E-09  0.109E-12  0.000E+00
 15.  0.295E-05  0.190E-05  0.863E-06  0.300E-06  0.862E-07  0.217E-07  0.492E-08  0.639E-12  0.000E+00
 10.  0.115E-03  0.502E-04  0.143E-04  0.329E-05  0.686E-06  0.135E-06  0.256E-07  0.222E-11  0.000E+00
  5.  0.373E-02  0.555E-03  0.878E-04  0.144E-04  0.241E-05  0.407E-06  0.687E-07  0.463E-11  0.000E+00
  0.  0.569E-02  0.904E-03  0.140E-03  0.221E-04  0.355E-05  0.578E-06  0.945E-07  0.590E-11  0.000E+00

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.2796E+06 HRS
 (ADSORBED CHEMICAL CONC. =  0.2520E+00 * DISSOLVED CHEMICAL CONC.)

          Z =     0.00
                                X
  Y       0.          5.        10.         15.         20.         25.         30.         55.        439.

 20.  0.758E-07  0.594E-07  0.352E-07  0.164E-07  0.619E-08  0.198E-08  0.550E-09  0.135E-12  0.000E+00
 15.  0.295E-05  0.190E-05  0.863E-06  0.300E-06  0.866E-07  0.219E-07  0.501E-08  0.762E-12  0.000E+00
 10.  0.115E-03  0.503E-04  0.143E-04  0.329E-05  0.687E-06  0.136E-06  0.259E-07  0.259E-11  0.000E+00
  5.  0.373E-02  0.555E-03  0.879E-04  0.144E-04  0.241E-05  0.408E-06  0.692E-07  0.534E-11  0.000E+00
  0.  0.569E-02  0.904E-03  0.140E-03  0.221E-04  0.355E-05  0.579E-06  0.952E-07  0.678E-11  0.000E+00

STEADY STATE SOLUTION HAS NOT BEEN REACHED BEFORE FINAL SIMULATING TIME

DISTRIBUTION OF DISSOLVED CHEMICALS IN PPM AT  0.2884E+06 HRS
 (ADSORBED CHEMICAL CONC. =  0.2520E+00 * DISSOLVED CHEMICAL CONC.)

          Z =     0.00
                                X
  Y       0.          5.        10.         15.         20.         25.         30.         55.        439.

 20.  0.759E-07  0.596E-07  0.354E-07  0.165E-07  0.625E-08  0.202E-08  0.566E-09  0.163E-12  0.000E+00
 15.  0.295E-05  0.190E-05  0.864E-06  0.301E-06  0.868E-07  0.220E-07  0.508E-08  0.889E-12  0.000E+00
 10.  0.115E-03  0.503E-04  0.143E-04  0.329E-05  0.688E-06  0.136E-06  0.261E-07  0.296E-11  0.000E+00
  5.  0.373E-02  0.555E-03  0.879E-04  0.144E-04  0.241E-05  0.409E-06  0.696E-07  0.603E-11  0.000E+00
  0.  0.569E-02  0.904E-03  0.140E-03  0.221E-04  0.355E-05  0.580E-06  0.957E-07  0.764E-11  0.000E+00
```

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FIGURES

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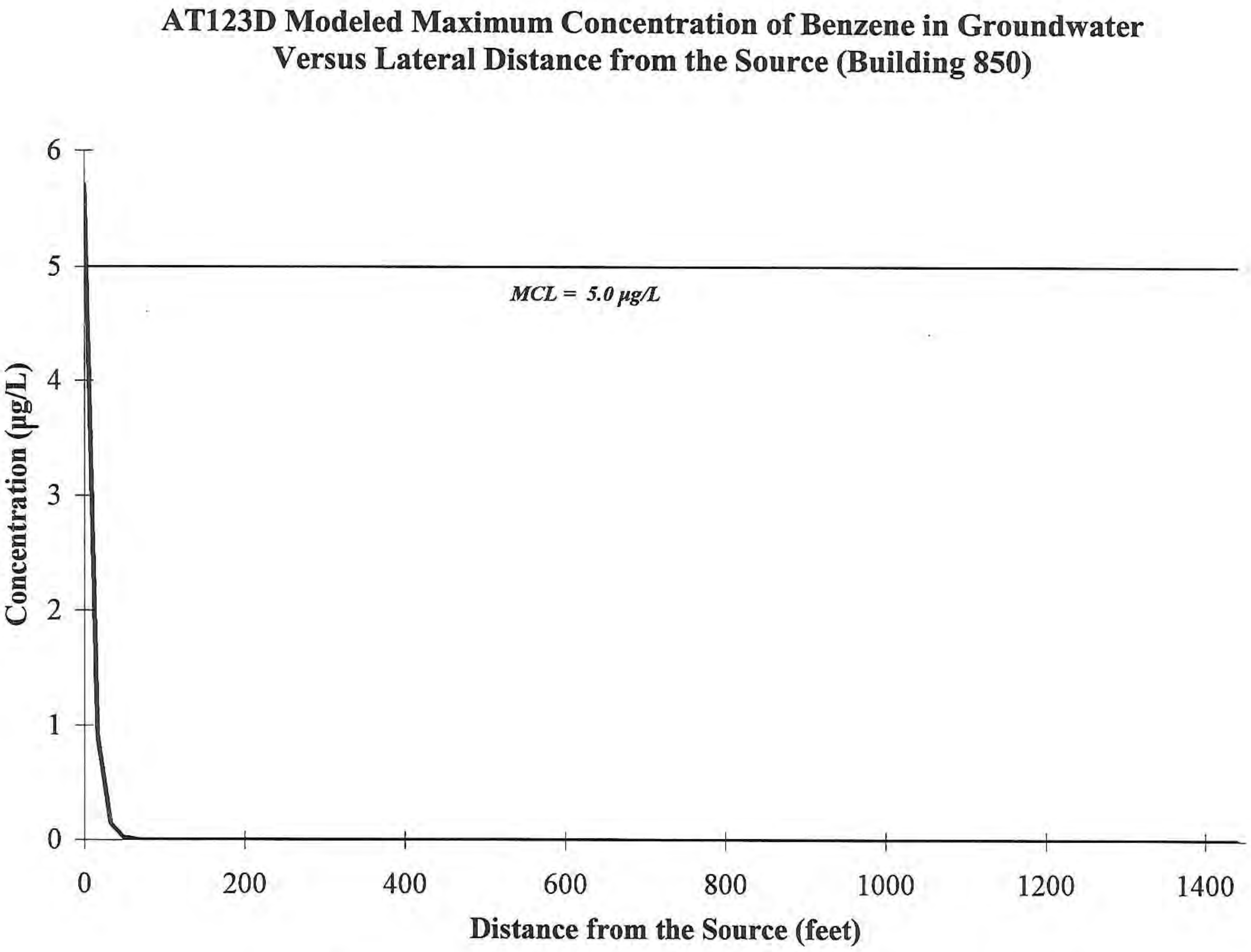

Figure VI-A. Modeled Concentration of Benzene in the Groundwater at the Former HOTs A & B, Building 850 Site

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APPENDIX VII

MONITORING WELL DETAILS

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Monitoring wells were not installed as part of the Corrective Action Plan-Part A investigation. Temporary piezometers were installed at the Former Heating Oil Tanks (HOTs) A & B, Building 850 site. Refer to Appendix IV for temporary piezometer installation details.

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APPENDIX VIII

GROUNDWATER LABORATORY RESULTS

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Former HOTs A & B, Building 850
Hunter Army Airfield
Chatham County, Facility ID: N/A

TABLE VIII-A. SUMMARY OF GROUNDWATER ANALYTICAL RESULTS[2]

Location Sample ID Date Collected Depth (ft BGS)	Applicable Standards[1]	N-1 HN1200 04/06/98 10.0 to 14.0	N-2 HN2200 04/06/98 11.0 to 15.0	N-3 HN3200 04/03/98 10.5 to 14.5	N-4 HN4200 04/03/98 10.5 to 14.5
VOCs	µg/L	µg/L	µg/L	µg/L	µg/L
Benzene	5	2 U	2 UJ	**5.7 =**	2 U
Toluene	1,000	2 U	2.2 J	2 U	2 U
Ethylbenzene	700	2 U	24.4 J	8.7 =	2 U
Xylenes	10,000	6 U	21.3 J	5.9 J	6 U
PAHs	µg/L	µg/L	µg/L	µg/L	µg/L
2-Chloronaphthalene	NRC	9.9 UJ	10.9 R	10.5 U	10.3 UJ
Acenaphthene	NRC	9.9 UJ	25.1 J	10.5 U	10.3 UJ
Acenaphthylene	NRC	9.9 UJ	10.9 R	10.5 U	10.3 UJ
Anthracene	NRC	9.9 UJ	10.9 R	10.5 U	10.3 UJ
Benzo(a)anthracene	NRC	9.9 UJ	10.9 R	10.5 U	10.3 UJ
Benzo(a)pyrene	0.2	9.9 UJ	10.9 R	10.5 U	10.3 UJ
Benzo(b)fluoranthene	NRC	9.9 UJ	10.9 R	10.5 U	10.3 UJ
Benzo(g,h,i)perylene	NRC	9.9 UJ	10.9 R	10.5 U	10.3 UJ
Benzo(k)fluoranthene	NRC	9.9 UJ	10.9 R	10.5 U	10.3 UJ
Chrysene	NRC	9.9 UJ	10.9 R	10.5 UJ	10.3 UJ
Dibenzo(a,h)anthracene	NRC	9.9 UJ	10.9 R	10.5 U	10.3 UJ
Fluoranthene	NRC	9.9 UJ	10.9 R	10.5 U	10.3 UJ
Fluorene	NRC	9.9 UJ	11.6 J	10.5 U	10.3 UJ
Indeno(1,2,3-cd)pyrene	NRC	9.9 UJ	10.9 R	10.5 U	10.3 UJ
Naphthalene	NRC	9.9 UJ	37.6 J	10.5 U	10.6 J
Phenanthrene	NRC	9.9 UJ	7.6 J	10.5 U	10.3 UJ
Pyrene	NRC	9.9 UJ	10.9 R	10.5 U	10.3 UJ

NOTE: [1] U.S. Environmental Protection Agency maximum contaminant level.

[2] **All field work and analytical sampling were performed prior to the release of the new Georgia Department of Natural Resources (GA DNR) Corrective Action Plan (CAP)-Part A Guidance (i.e., May 1998); therefore, the new analytical methods specified were not used.**

BGS - Below ground surface.
NRC - No regulatory criteria.
PAHs - Polynuclear aromatic hydrocarbons.
VOCs - Volatile organic compounds.

Laboratory Qualifiers
U - Indicates the compound was not detected at the concentration reported.
J - Indicates the value for the compound is an estimated value.
UJ - Indicates the compound was not detected at the reported concentration and the concentration was estimated.
= - Indicates the compound was detected at the concentration reported.
R - Indicates the data for this compound were rejected. The rejected data are due to surrogate compound recoveries being zero. Re-extracted results confirmed that matrix interferences caused surrogate loss. Therefore, the non-detect laboratory qualifier (U) is not valid in this case, and the data for this compound are qualified as rejected (R).

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

CHAIN OF CUSTODY RECORD

COC NO.: 40898A

PROJECT NAME: CAP - Hunter AFB - Part A

PROJECT NUMBER: 0019

PROJECT MANAGER: Allison Bailey

Sampler (Signature) Mitchell Hall (Printed Name) Mitchell Hall

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	PAH	DRP	GRO	TOC	No. of Bottles/ Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS SPECIAL INSTRUCTIONS
HTB006	4/7/98	0800	water	X					2	NA	ASTM TYPE II DS 9804216 03
HN1200	4/6/98	1305	water	X					2	NA	NA 04
HN2200	4/6/98	1400	water	X					2	NA	NA 05
HG1200	4/6/98	1500	water	X					2	NA	NA 06
HG2200	4/6/98	1520	water	X					2	NA	NA 07
HG3200	4/6/98	1550	water	X					2	NA	NA 08
HG4200	4/6/98	1615	water	X					2	NA	NA 09
HG5301	4/7/98	0805	water	X					2	NA	NA 10
HG5302	4/7/98	0820	water	X					2	NA	NA 10
HG5303	4/7/98	0845	water	X					2	NA	NA 12
HG5304	4/7/98	0910	water	X					2	NA	NA 13
HG5305	4/7/98	1010	water	X					2	NA	NA 14
HN4200	4/3/98	1325	water	X					2	NA	NA 15

RELINQUISHED BY: Mitchell Hall
Date/Time 4/8/98 1330
RECEIVED BY:
Date/Time 4-8-98 1630
COMPANY NAME: SAIC
COMPANY NAME: GEL

TOTAL NUMBER OF CONTAINERS: 26
Cooler ID: 63
Cooler Temperature: 4°C
FEDEX NUMBER: NA

RECEIVED BY:
Date/Time 4/8/98 1330
RELINQUISHED BY:
Date/Time
COMPANY NAME: GEL
COMPANY NAME:

RELINQUISHED BY:
Date/Time 4/8/98 1630
RECEIVED BY:
Date/Time
COMPANY NAME: GEL
COMPANY NAME:

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800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423) 481-4600

CHAIN OF CUSTODY RECORD

COC NO.: 40798 B

PROJECT NAME: CAP - Hunter AFB - Part A

PROJECT NUMBER: 0019

PROJECT MANAGER: Allison Bailey

Sampler (Signature) Mitchell Hall (Printed Name) Mitchell Hall

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	PAH	DRP	GRO	TOC	No. of Bottles/ Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
HN1200	4/6/98	1305	water		X				2	NA	9804129 - 13
HN2200	4/6/98	1400	water		X				2	NA	14
HG1200	4/6/98	1500	water		X				2	NA	15
HG 2200	4/6/98	1520	water		X				2	NA	16
HG 3200	4/6/98	1550	water		X				2	NA	17
HG 4200	4/6/98	1615	water		X				2	NA	18
									~~2~~	~~NA~~	~~mth 4/7/98~~

mth 4/7/98

RELINQUISHED BY: Mitchell Hall COMPANY NAME: SAIC	Date/Time 4/7/98 ~~1300~~ 1333	RECEIVED BY: COMPANY NAME: GEL	Date/Time 4-7-98 1645	TOTAL NUMBER OF CONTAINERS: 12 Cooler ID: 558	Cooler Temperature: 4°C FEDEX NUMBER: NA
RECEIVED BY: Bob Nichols COMPANY NAME: GEL	Date/Time 4-7-98 1335	RELINQUISHED BY: COMPANY NAME:	Date/Time		
RELINQUISHED BY: B. Nichols COMPANY NAME: GEL	Date/Time 4-7-98 1645	RECEIVED BY: COMPANY NAME:	Date/Time		

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CHAIN OF CUSTODY RECORD

COC NO.: 40398 A

PROJECT NAME: CAP - Hunter AFB - Part A
PROJECT NUMBER: 0019
PROJECT MANAGER: Allison Bailey
Sampler (Signature) Mitchell H Hall (Printed Name) Mitchell H. Hall

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	PAH	DRP	GRO	TOC	No. of Bottles/ Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
HTB002	4/3/98	0900	water	X					2	NA	9804064-18
HA 1200	4/2/98	1440	water	X					2	NA	9804064-16 Quick Turnaround
HA 2200	4/2/98	1520	water	X					2	NA	QT 9804064-17
HH 1200	4/2/98.	1615	water	X					2	NA	19
HH 2200	4/3/98	0830	water	X					2	NA	20
HH 3200	4/3/98	0905	water.	X					2	NA	9804106-[illegible]
HH 4200	4/3/98	0945	water.	X					2	NA	9804106-[illegible]
HN 3200	4/3/98	1140	water.	X					2	NA	9804106-[illegible]
HA 1101	4/2/98	1415	soil	X	X	X	X		2	~~44~~ 0 ppm	9804063-13 16
HA 1103	4/2/98	1425	soil	X	X	X	X		2	0 ppm	9804063-14 9804063-17
HA 2101	4/2/98	1500	Soil	X	X	X	X		2	370 ppm	9804063-15 9804063-18
HH 1101	4/2/98	1605	Soil	X	X	X	X		2	1118 ppm	9804063-19
HH 2101	4/3/98	0805	soil	X	X	X	X		2	0 ppm	9804063-20

RELINQUISHED BY: Mitchell H Hall	Date/Time 4/3/98 1340	RECEIVED BY:	Date/Time 4-3-98 1640	TOTAL NUMBER OF CONTAINERS:	Cooler Temperature: 4°C
COMPANY NAME: SAIC		COMPANY NAME: GEL		Cooler ID: # 253	FEDEX NUMBER: NA
RECEIVED BY:	Date/Time 4/3/98 1340	RELINQUISHED BY:	Date/Time		
COMPANY NAME: GEL		COMPANY NAME:			
RELINQUISHED BY:	Date/Time 4/3/98 1440	RECEIVED BY:	Date/Time		
COMPANY NAME: GEL		COMPANY NAME:			

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CHAIN OF CUSTODY RECORD

COC NO.: 40398C

PROJECT NAME: CAP - Hunter AFB - Part A

PROJECT NUMBER: 0019

PROJECT MANAGER: Allison Bailey

Sampler (Signature) Mitchell Hall **(Printed Name)** Mitchell Hall

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	PAH	DRP	GRO	TOC	No. of Bottles/ Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
HH4200	4/3/98	0945	water		X					NA	9804106-05
HN3200	4/3/98	1140	water		X					NA	-06
HH3200	4/3/98	~~1140~~ 0905	water		X					NA	-07
HH 3210	4/3/98	~~H~~ 0905	water		X					NA	Duplicate [illegible]

mh 4/3/98

RELINQUISHED BY: Mitchell Hall	Date/Time 4/3/98 1340	RECEIVED BY:	Date/Time 4-3-98 1640	TOTAL NUMBER OF CONTAINERS:	Cooler Temperature: 4°C
COMPANY NAME: SAIC		COMPANY NAME: GEL		Cooler ID: #394	FEDEX NUMBER:
RECEIVED BY:	Date/Time 4/3/98 1340	RELINQUISHED BY:	Date/Time		
COMPANY NAME: GEL		COMPANY NAME:			
RELINQUISHED BY:	Date/Time 4/3/98 1640	RECEIVED BY:	Date/Time		
COMPANY NAME: GEL		COMPANY NAME:			

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Science Applications International Corporation
800 Oak Ridge Turnpike, Oak Ridge, TN 37831 (423) 481-4600

CHAIN OF CUSTODY RECORD

COC NO.: 4049813

PROJECT NAME: CAP - Hunter AFB - Part A

PROJECT NUMBER: 0019

PROJECT MANAGER: Allison Bailey

Sampler (Signature) Mitchell A Hall (Printed Name) MITCHELL HALL

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	PAH	DRP	GRO	TOC	No. of Bottles/ Vials:	OVA SCREENING	OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS
HL3200	4/3/98	1615	water		X				2	NA	NA 9804121-02
HH5304	4/3/98	1135	water		X				2	NA	verified 9804121-03
HL1200	4/3/98	1450	water		X				2	NA	NA " 04
HN4200	4/3/98	1325	water		X				2	NA	NA " 05
HL2200	4/3/98	1530	water		X				2	NA	NA " 06
HH5304				X							
HH5305				X							

4/4/98

RELINQUISHED BY: Mitchell A Hall COMPANY NAME: SAIC	Date/Time 4/4/98 1350	RECEIVED BY: [illegible] COMPANY NAME: GEL	Date/Time 4-6-98 07:06	TOTAL NUMBER OF CONTAINERS: 10 Cooler ID: #553
RECEIVED BY: Carol Sandel COMPANY NAME: General Engineering	Date/Time 4/4/98 1350	RELINQUISHED BY: 4/4/98 COMPANY NAME:	Date/Time	Cooler Temperature: 4°C FEDEX NUMBER: NA
RELINQUISHED BY: Carol Sandel COMPANY NAME: General Engineering	Date/Time 4/4/98 1600	RECEIVED BY: COMPANY NAME:	Date/Time	

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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN1200

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA009W

Matrix: (soil/water) GROUNDH2O Lab Sample ID: 9804216-04

Sample wt/vol: 10.00 (g/ml) ML Lab File ID: 2E307

Level: (low/med) LOW Date Received: 04/08/98

% Moisture: not dec. ________ Date Analyzed: 04/15/98

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/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)	6.0	U	↓

FORM I VOA

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN1200RE

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA007W

Matrix: (soil/water) GROUNDH2O Lab Sample ID: 9804129-13

Sample wt/vol: 1010 (g/mL) ML Lab File ID: 7P513

Level: (low/med) LOW Date Received: 04/07/98

% Moisture: ______ decanted: (Y/N)___ Date Extracted: 04/16/98

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 04/17/98

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	9.9	U	UJ A01
91-58-7	2-chloronaphthalene	9.9	U	
208-96-8	acenaphthylene	9.9	U	
83-32-9	acenaphthene	9.9	U	
86-73-7	fluorene	9.9	U	
85-01-8	phenanthrene	9.9	U	
120-12-7	anthracene	9.9	U	
206-44-0	fluoranthene	9.9	U	
129-00-0	pyrene	9.9	U	
56-55-3	benzo(a)anthracene	9.9	U	
218-01-9	chrysene	9.9	U	
205-99-2	benzo(b)fluoranthene	9.9	U	
207-08-9	benzo(k)fluoranthene	9.9	U	
50-32-8	benzo(a)pyrene	9.9	U	
193-39-5	indeno(1,2,3-cd)pyrene	9.9	U	
53-70-3	dibenz(a,h)anthracene	9.9	U	
191-24-2	benzo(g,h,i)perylene	9.9	U	

FORM I SV-1 OLM03.0

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN2200

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA009W

Matrix: (soil/water) GROUNDH2O Lab Sample ID: 9804216-05

Sample wt/vol: 10.00 (g/ml) ML Lab File ID: 2E308

Level: (low/med) LOW Date Received: 04/08/98

% Moisture: not dec. ________ Date Analyzed: 04/15/98

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/L	Q	
71-43-2	---------Benzene	2.0	U	UJ G01
108-88-3	--------Toluene	2.2	P	J G01, M08
100-41-4	--------Ethylbenzene	24.4		J G01
1330-20-7	-------Xylenes (total)	21.3	P	J G01, M08

USE

FORM I VOA

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN2200

Lab Name: GENERAL ENGINEERING LABOR   Contract: NA

Lab Code: NA   Case No.: NA   SAS No.: NA   SDG No.: HA007W

Matrix: (soil/water) GROUNDH2O   Lab Sample ID: 9804129-14

Sample wt/vol: 920.0 (g/mL) ML   Lab File ID: 7P213

Level: (low/med) LOW   Date Received: 04/07/98

% Moisture: ______ decanted: (Y/N)___   Date Extracted: 04/08/98

DATA VALIDATION COPY

Concentrated Extract Volume: 1.00(mL)   Date Analyzed: 04/14/98

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	37.6		J	G-04
91-58-7	2-chloronaphthalene	10.9	U	R	
208-96-8	acenaphthylene	10.9	U	R	
83-32-9	acenaphthene	25.1		J	
86-73-7	fluorene	11.6		J	
85-01-8	phenanthrene	7.6	J	J	
120-12-7	anthracene	10.9	U	R	
206-44-0	fluoranthene	10.9	U		
129-00-0	pyrene	10.9	U		
56-55-3	benzo(a)anthracene	10.9	U		
218-01-9	chrysene	10.9	U		
205-99-2	benzo(b)fluoranthene	10.9	U		
207-08-9	benzo(k)fluoranthene	10.9	U		
50-32-8	benzo(a)pyrene	10.9	U		
193-39-5	indeno(1,2,3-cd)pyrene	10.9	U		
53-70-3	dibenz(a,h)anthracene	10.9	U		
191-24-2	benzo(g,h,i)perylene	10.9	U		

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN3200

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA0C4W

Matrix: (soil/water) GROUNDH2O Lab Sample ID: 9804106-03

Sample wt/vol: 10.00 (g/ml) ML Lab File ID: 2D3010

Level: (low/med) LOW Date Received: 04/03/98

% Moisture: not dec. ______ Date Analyzed: 04/08/98

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/L	Q	
71-43-2	Benzene	5.7		=
108-88-3	Toluene	2.0	U	U
100-41-4	Ethylbenzene	8.7		=
1330-20-7	Xylenes (total)	5.9	J	J

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN3200

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA004W

Matrix: (soil/water) GROUNDH2O Lab Sample ID: 9804106-06

Sample wt/vol: 950.0 (g/mL) ML Lab File ID: 20510

Level: (low/med) LOW Date Received: 04/03/98

% Moisture: ______ decanted: (Y/N)___ Date Extracted:04/04/98

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 04/10/98

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	10.5	U	U
91-58-7	2-chloronaphthalene	10.5	U	
209-96-8	acenaphthylene	10.5	U	
83-32-9	acenaphthene	10.5	U	
86-73-7	fluorene	10.5	U	
85-01-8	phenanthrene	10.5	U	
120-12-7	anthracene	10.5	U	
206-44-0	fluoranthene	10.5	U	
129-00-0	pyrene	10.5	U	
56-55-3	benzo(a)anthracene	10.5	U	↓
218-01-9	chrysene	10.5	U	UJ C05
205-99-2	benzo(b)fluoranthene	10.5	U	U
207-08-9	benzo(k)fluoranthene	10.5	U	
50-32-8	benzo(a)pyrene	10.5	U	
193-39-5	indeno(1,2,3-cd)pyrene	10.5	U	
53-70-3	dibenz(a,h)anthracene	10.5	U	
191-24-2	benzo(g,h,i)perylene	10.5	U	↓

FORM I SV-1 OLM03.0

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.
HN4200

Lab Name: GENERAL ENGINEERING LABOR Contract: NA
Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA009W
Matrix: (soil/water) GROUNDH2O Lab Sample ID: 9804216-15
Sample wt/vol: 10.00 (g/ml) ML Lab File ID: 2E3019
Level: (low/med) LOW Date Received: 04/08/98
% Moisture: not dec. ______ Date Analyzed: 04/15/98
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/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)	6.0	U	

FORM I VOA

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

HN4200

Lab Name: GENERAL ENGINEERING LABOR Contract: NA

Lab Code: NA Case No.: NA SAS No.: NA SDG No.: HA005W

Matrix: (soil/water) GROUNDH2O Lab Sample ID: 9804121-05

Sample wt/vol: 970.0 (g/mL) ML Lab File ID: 7P317

Level: (low/med) LOW Date Received: 04/04/98

% Moisture: ______ decanted: (Y/N)___ Date Extracted:04/08/98

Concentrated Extract Volume: 1.00(mL) Date Analyzed: 04/15/98

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	10.6		J	G02
91-58-7	2-chloronaphthalene	10.3	U	UJ	G02
208-96-8	acenaphthylene	10.3	U		
83-32-9	acenaphthene	10.3	U		
86-73-7	fluorene	10.3	U		
85-01-8	phenanthrene	10.3	U		
120-12-7	anthracene	10.3	U		
206-44-0	fluoranthene	10.3	U		
129-00-0	pyrene	10.3	U		
56-55-3	benzo(a)anthracene	10.3	U		
218-01-9	chrysene	10.3	U		
205-99-2	benzo(b)fluoranthene	10.3	U		
207-08-9	benzo(k)fluoranthene	10.3	U		
50-32-8	benzo(a)pyrene	10.3	U		
193-39-5	indeno(1,2,3-cd)pyrene	10.3	U		
53-70-3	dibenz(a,h)anthracene	10.3	U		
191-24-2	benzo(g,h,i)perylene	10.3	U		

use

FORM I SV-1 OLM03.0

APPENDIX IX

CONTAMINATED SOIL DISPOSAL MANIFESTS

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All contaminated soil removed during the entire project [i.e., all underground storage tanks (USTs) removed under contract with Anderson Columbia Environmental, Inc., to include clean and non-clean closures] was tested in accordance with the disposal facility requirements and transported to Kedesh, Inc., Highway 84, Ludowici, GA 31316. The Installation has records of all manifests and weight tickets for this project. However, site-specific information is not available.

I certify that the above information is true and accurate. If the Georgia Environmental Protection Division (GA EPD), Underground Storage Tank Management Program (USTMP), would like copies of all manifests and weight tickets for the numerous UST removal contracts that we have conducted, we will gladly forward copies to the USTMP.

Name: Thomas C. Fry

Title: Chief, Environmental Branch

Signature: Thomas C. Fry

Date: 03/05/99

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APPENDIX X

SITE RANKING FORM

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SITE RANKING FORM

Facility Name: Former HOTs A & B, Building 850

Ranked by: C. Allison Bailey

County: Chatham **Facility ID #:** N/A

Date Ranked: 12/7/98

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

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

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._0_) = (_25_) x (C._10_) = (D._250_)**

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 = 100
☐ >10,000 µg/L = 250

Fill in the blanks: **(E._0_) + (F._5_) = (G._5_)**

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.

* Note: Please see Section 1.0, "Other Geologic and Hydrogeologic Data," page X-5, for justification of this evaluation.

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' = 1

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.__5__) x (L.__50__) = M.__250

(M.__250__) + (D.__250__) = N.__500

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.__500__) x (P.__1__) = (__500__) + (Q.__0__)

= 500

ENVIRONMENTAL SENSITIVITY SCORE

1.0 OTHER GEOLOGIC AND HYDROGEOLOGIC DATA

The following information is presented to provide supporting documentation to Appendix X (Site Ranking Form) of the Corrective Action Plan (CAP)-Part A Form and provides detailed information relating to the geologic and hydrogeologic conditions at Hunter Army Airfield (HAAF) to support determinations of groundwater flow pathway(s) or direction(s) and contaminant transport.

1.1 REGIONAL GEOLOGY

Southeast Georgia is located within the Coastal Plain Physiographic Province of the Southeast United States (Clark and Zisa 1976). In this region, the thickness of southeastward dipping, subsurface strata ranges from 0 feet at the fall line, located approximately 350 miles inland from the Atlantic coast, to approximately 4200 feet below land surface (BLS) at the coast. Herrick (1961) provides detailed lithologic descriptions of the stratigraphic units encountered during the installation of water and petroleum exploration wells in Chatham County. The well log of GGS Well 125, located on White Bluff Road, 700 feet west and 0.3 miles north of Buckhalter Road, Savannah, provides one of the more complete lithologic descriptions of upper Eocene, Miocene, and Pliocene to Recent sedimentary strata in Chatham County.

The upper Eocene (Ocala Limestone) section of GGS Well 125 is approximately 225 feet thick and dominated by light-gray to white, fossiliferous limestone. The Miocene section is approximately 250 feet thick and consists of limestone with a 160-feet-thick cap of dark green phosphatic clay. This clay is regionally extensive and is known to occupy the Coosawatchie Formation of the Hawthorn Group (Furlow 1969; Arora 1984; Huddlestun 1988). The interval from approximately 80 feet to the surface is Pliocene to Recent in age and composed primarily of sand interbedded with clay and silt. This section is occupied by the Satilla and Cypresshead Formations (Huddlestun 1988).

1.2 LOCAL GEOLOGY

HAAF is located within the Barrier Island Sequence District of the Coastal Plain Physiographic Province of the Southeast United States (Clark and Zisa 1976). The Barrier Island Sequence District in Chatham and Bryan Counties is characterized by the existence of several marine terraces (step-like topographic surfaces that decrease in elevation toward the coast). These marine terraces, and their associated deposits, are the results of sea level fluctuations that occurred during the Pleistocene Epoch. The surficial (Quaternary) deposits in Chatham and Bryan Counties, in decreasing elevation and age, are part of the Okefenokee, Wicomico, Penholoway, Pamlico, and Silver Bluff terrace complexes (Wilkes et al. 1974; GA DNR 1976; Huddlestun 1988).

HAAF, as well as most of Chatham County, is underlain by the Pleistocene Pamlico Terrace. The Pleistocene Satilla Formation (formerly known as the Pamlico Formation) consists of deposits of the Pamlico Terrace complex and other terrace complexes in the region (Huddlestun 1988). The Satilla Formation is a lithologically heterogeneous unit that consists of variably bedded to nonbedded sand and variably bedded silty to sandy clay. During the Pleistocene, these sand and clay deposits were formed in offshore and inner continental shelf, barrier island, and marsh/lagoonal-type environments (Huddlestun 1988). According to the Geologic Map of Georgia (GA DNR 1976), clay beds of marsh origin, which were deposited on the northwest side of the former Pamlico Barrier Island complex, exist in the western quarter of HAAF. Very fine- to coarse-grained sand deposits of barrier island origin are more common throughout the remaining areas of HAAF.

Based on the coring and sampling of unconsolidated strata at HAAF during the CAP-Part A investigations, it is concluded that all former heating oil tanks (HOTs) and underground storage tanks (USTs) were buried within the Satilla Formation, which is overlain by various soil types. Soil groups at HAAF include the Chipley, Leon, Ellabelle, Kershaw, Pelham, Albany, Wahee, and Ogeechee (Wilkes et al. 1974).

1.3 REGIONAL AND LOCAL HYDROGEOLOGY

The hydrogeology in the vicinity of HAAF is mostly influenced by two aquifer systems. These are referred to as the Principal (Floridan) Aquifer and the Surficial Aquifer (Miller 1990). The Principal 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, approximately 800 feet in total thickness, is composed primarily of Tertiary age limestone including the Bug Island Formation, the Ocala Group, and the Suwannee Limestone. Groundwater from the Floridan is used primarily for drinking water (Arora 1984). According to Miller (1990), one of the largest cones of depression produced in the Upper Floridan Aquifer exists directly beneath Savannah, Georgia. Net water-level decline in the Floridan system, between the predevelopment period and 1980, exceeded 80 feet beneath Savannah. In addition, according to 1980 estimates, more than 500 million gallons of water per day were withdrawn from the Floridan for public and industrial use in southeast Georgia, more than any other region.

The confining layer for the Principal (Floridan) Aquifer is the phosphatic clay of the Hawthorn Group. There are minor occurrences of aquifer material within the Hawthorn Group; however, they have limited utilization (Miller 1990). The Surficial Aquifer overlies the Hawthorn confining unit.

The Surficial Aquifer consists of widely varying amounts of sand and clay, ranging from 55 to 150 feet in thickness, and is composed primarily of the Satilla and Cypresshead Formations in the Savannah vicinity (Arora 1984). This aquifer is primarily used for domestic lawn and agricultural irrigation. The top of the water table ranges from approximately 2 to 10 feet below ground level (Miller 1990). Groundwater in the Surficial Aquifer system is under unconfined, or water table, conditions. However, locally, thin clay beds create confined or semiconfined conditions, as is the case at HAAF where thin, surficial clay beds are present in the west quadrant (GA DNR 1976).

Groundwater encountered at all the UST/HOT 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 (Floridan) Aquifer, and that the Hawthorn confining unit separates the Principal Floridan Aquifer from the Surficial Aquifer, it is concluded that there is no hydraulic interconnection between the HOT sites (and associated plumes, if applicable) and water supply withdrawal points (Figure X-A).

1.4 GEOLOGIC AND HYDROGEOLOGIC CONDITIONS AT THE FORMER HOTs A & B, BUILDING 850 SITE

According to Wilkes et al. (1974), the soil common in the area occupied by Building 850 consists of the Chipley-Urban land complex (Cuc). This complex contains 40 to 70 percent Chipley soils and 20 to 40 percent Urban Land soils. The surface layer of this complex is very dark grayish brown to gray, with the underlying layer being olive brown to light yellowish brown mottled with gray. A seasonal high water table is 15 to 36 inches below the surface. In places, the soil profile has been altered due to the cutting, filling, and grading activities resulting from urban development (Wilkes et al. 1974).

During direct-push soil sampling events at the site, three major unconsolidated sediment types were encountered (Figure 4, Appendix I). These include: (1) native and non-native sand fill in the former tank pit; (2) organic-rich sand (OL/OH); and (3) brownish-yellow, fine-grained sandy clay.

A localized groundwater depression exists in the vicinity of the former excavation area (Figure 4, Appendix I). This depression is likely a result of the excavation fill flow properties in relation to the surrounding native soil. For the purpose of determining groundwater flow direction, the water level measured in the piezometer (N-2) installed in the excavation fill was not used. The exclusive use of piezometers installed in native soil to determine groundwater flow direction gives a more realistic flow direction across the site. Piezometers N-1, N-3, and N-4 were used to determine a flow direction to the southeast for the site.

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FIGURES

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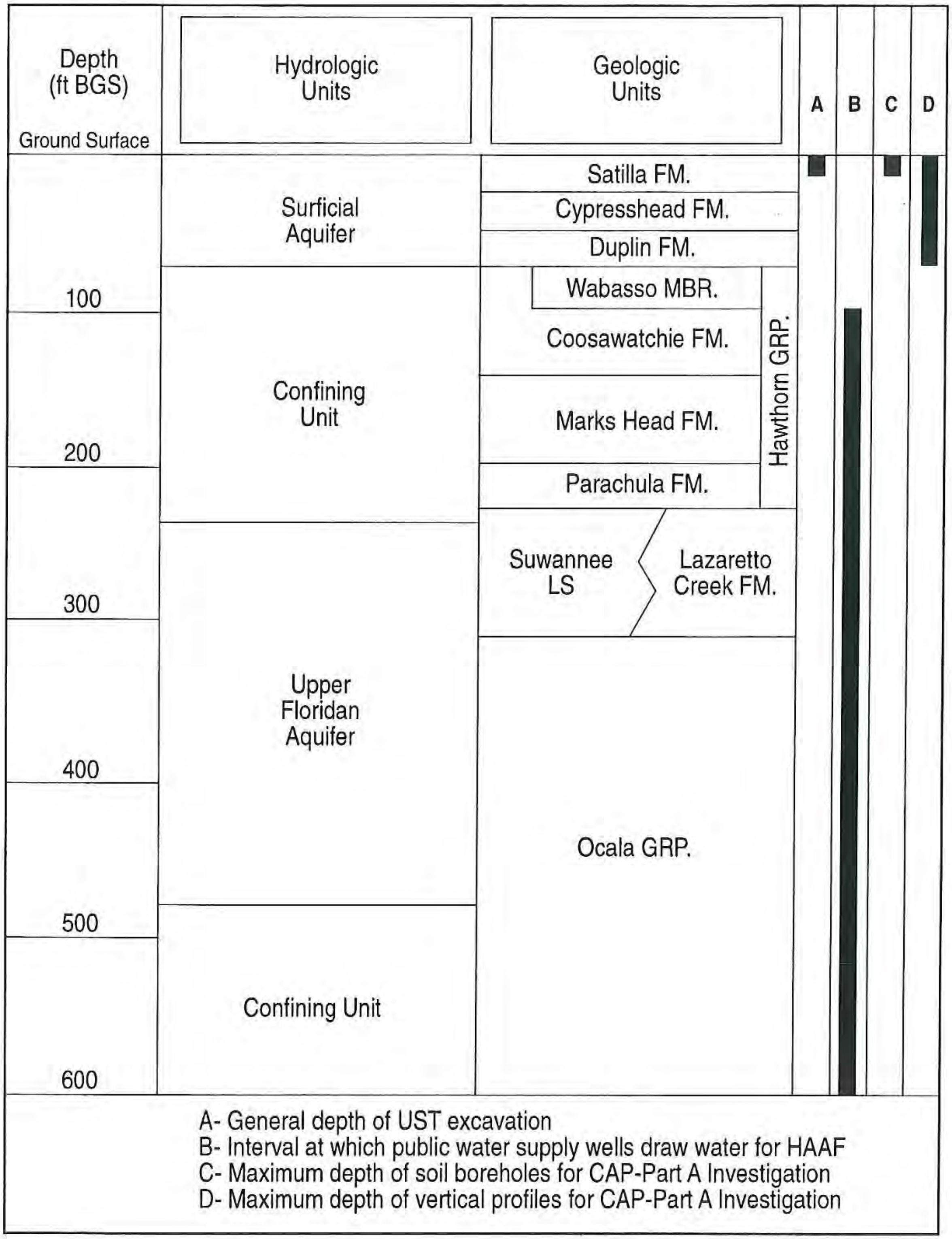

31-102797-063

Figure X-A. Generalized Stratigraphy of Chatham County, Georgia

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APPENDIX XI

COPIES OF PUBLIC NOTIFICATION LETTERS AND CERTIFIED RECEIPTS OR NEWSPAPAPER NOTICE

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Public notification letters are not required for the Former Heating Oil Tanks (HOTs) A & B, Building 850 site because heating oil tanks are not regulated as defined by Georgia Department of Natural Resources (GA DNR) guidance.

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APPENDIX XII

GUST TRUST FUND REIMBURSEMENT APPLICATION AND CLAIM FOR REIMBURSEMENT

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The Hunter Army Airfield is a federally owned facility and has funded the investigation for the Former Heating Oil Tanks (HOTs) A & B, Building 850 site, which is unregulated as defined by Georgia Department of Natural Resources (GA DNR) guidance and has no Facility Identification Number, using Environmental Restoration Account funds. Application for Georgia Underground Storage Tank Trust Fund reimbursement is not being pursued at this time.

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ATTACHMENT A

TECHNICAL APPROACH

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TECHNICAL APPROACH

1.0 INTRODUCTION

The overall objective of this project was to provide the services required to produce Corrective Action Plans (CAPs) for the subject heating oil tank (HOT) sites per the requirement of the Georgia Environmental Protection Division (EPD). The field activities included the installation of temporary piezometers, soil borings, and soil and groundwater sampling. Upon completion of the field activities, this CAP-Part A report was prepared to meet requirements of the Georgia EPD, Fort Stewart Directorate of Public Works (FS DPW), and the U.S. Army Corps of Engineers (USACE)-Savannah District.

2.0 FIELD ACTIVITIES

The following sections detail the methodologies used for direct-push sampling and piezometer installation. All boreholes were drilled and piezometers installed by R. E. Wright [Science Applications International Corporation (SAIC), Drilling Services Division], a drilling firm licensed in the state of Georgia. A geologist from SAIC, working under the direction of a registered professional engineer, was on site at all times. No drilling activities were undertaken until all utility clearances and permits were obtained from Hunter Army Airfield (HAAF) utility personnel.

2.1 SUBSURFACE SOIL SAMPLING

2.1.1 Borehole Installation

A truck-mounted direct-push Geoprobe was used for installation of soil boreholes. All sampling devices were pushed to required depths using 4.0- and 3.0-foot push rods. During all borehole drilling, 4.0-foot soil cores were collected continuously from ground surface to the top of the water table.

2.1.2 Sample Collection

Soil samples were collected from boreholes using a 4.0-foot acetate-lined, steel macrocoring device. Upon retrieval of the sampling device, the acetate liner containing the soil core was removed from the steel macrocoring device and removed from the core using a truck-mounted, acetate-liner cutting device. The exposed soil core was split into two 2.0-foot sections using a stainless steel knife. A portion of each 2.0-foot section was collected for possible laboratory analysis. The remaining portion of each 2.0-foot section was used for field measurements.

Samples designated for possible laboratory analysis were collected from the cores using a stainless steel spoon. Soil was collected from along the entire length of the core in order to collect a representative sample. The portion of the sample designated for volatile organic analyses was placed into laboratory sample containers first, followed by placement of the remaining portion of the sample into the containers designated for other types of analyses. Sample containers designated for volatile organic analyses were filled so that minimal headspace was present. Headspace gas concentration measurements were made using a field organic vapor meter (OVM). Initially, soil from each 2.0-foot interval was placed into a glass jar, leaving some air space, and covered with aluminum foil to create an air-tight seal. The sample was allowed to volatilize for a minimum of 15 minutes. The sealed jar was punctured with the OVM probe and headspace gas drawn until the meter reading was stable. The concentration of the headspace gas was recorded to the nearest 0.1 parts per million (ppm).

Immediately following collection of each sample and completion of bottle label information, each potential analytical sample container was placed into an ice-filled cooler to ensure preservation. A clean acetate-lined, steel macrocore sampling device was used to collect soil core from each interval of the project boreholes. Information regarding the soil sample selection criteria for off-site shipment to a laboratory for chemical analysis is presented in Section 3.1.3 of the project Sampling and Analysis Plan. Soil samples, which were not selected for laboratory analysis, were disposed of as investigation-derived waste (IDW).

2.2 GROUNDWATER SAMPLING

2.2.1 Groundwater Collection

Collection of groundwater samples from soil boreholes was accomplished through the use of a 3.5-foot-long, 1.0-inch-diameter steel slotted screen encased in a 3.5-foot-long, 1.5-inch-diameter stainless steel sleeve attached to an expendable 1.5-inch length, 1.5-inch-diameter steel drive point. The entire device was pushed 5 feet below the water table. The 3.5-foot steel sleeve was subsequently raised 4.0 feet from the bottom while discarding the steel drive point and exposing the entire length of the screen to groundwater. By raising the steel sleeve 4.0 feet, the steel slotted screen was raised 0.5 feet from the bottom of the borehole. As a result, the groundwater was collected from a 4.0-foot interval. Water was brought to the surface using a peristaltic pump attached to a clean acetate tube, which was cut to desired length prior to sampling and discarded following each sampling event. Enough water was extracted for laboratory sample containment and for water quality parameters to be measured with a Horiba U-10. Following groundwater sample collection, subsurface sampling devices were removed from the borehole, and a temporary piezometer was installed. Temporary piezometers were constructed of 1.0-inch inside diameter (ID) polyvinyl chloride (PVC) casing with a 5-foot screened interval.

2.2.2 Field Measurements

Groundwater field measurements performed during the project included measurement of static groundwater level, pH, specific conductance, and temperature. Groundwater levels were measured inside the temporary PVC piezometers. A summary of the procedures and criteria to be used for groundwater field measurements is presented in the following sections.

Static Groundwater Level

Static groundwater level measurements were made using an electronic water-level indicator. Initially, the indicator probe was lowered into each temporary piezometer casing until the alarm sounded and/or the indicator light illuminated. The probe was withdrawn several feet and slowly lowered again until the groundwater surface was contacted as indicated by the alarm and/or light. Water-level measurements were estimated to the nearest 0.01 foot based on the difference between the nearest probe cord mark to the top of the piezometer casing.

The distance between the top of the casing and the surrounding ground surface was taken into account in measuring the water level to within 0.01 foot. The static water level measurement procedure was repeated two or three times to ensure that the water level measurements were consistent (plus or minus 0.01 foot).

Free Product Thickness

Free product layer thickness measurements were collected at applicable sites using an electric interface probe. Initially, the interface probe was lowered into each temporary piezometer casing until the alarm sounded and/or the indicator light was illuminated. The probe was withdrawn and then slowly lowered again until the liquid surface was contacted as noted by the alarm and/or indicator light. The meter was lowered until the alarm indicated the water surface. The thickness of the product was determined by subtracting the measurement of the free product layer surface from the measurement of the water surface. The water/product level measurements were estimated to the nearest 0.01 foot based on the difference between the nearest probe cord mark to the top of the piezometer casing.

The free product measurement was repeated two or three times to ensure that the measurements were consistent (plus or minus 0.01 foot).

pH, Specific Conductance, and Temperature

The pH, specific conductance, and temperature measurements were recorded for groundwater during groundwater sampling. The pH, temperature, and conductivity measurements were made using a Horiba U-10 designed to measure these parameters. A portion of each groundwater sample was retrieved from the sampler and poured into the collection cup. With the combination meter set in the pH mode, the meter electrode was swirled at a slow, constant rate within the sample until the meter reading reached equilibrium. The sample pH was recorded to the nearest 0.1 pH unit.

Upon completion of the pH measurement, conductivity and temperature measurements were made on a groundwater sample collected in the same manner as described above. With the combination meter set in the conductivity mode, the meter electrode was swirled at a slow, constant rate until the meter reading reached equilibrium. Concurrently, a temperature probe was placed into the sample and allowed to reach equilibrium. The sample conductivity was recorded to the nearest 10 mS/cm and the temperature to the nearest 0.1°C. All recorded conductivity values were converted to conductance at 25°C.

2.3 TEMPORARY PIEZOMETER INSTALLATION

Following the collection of the groundwater sample, a 2-inch PVC piezometer, with a 5-foot screened section, was installed to prevent the borehole from collapsing. The piezometer remained in the borehole at least 24 hours, after which time the static water level was measured.

2.4 BOREHOLE ABANDONMENT

Once static water levels were measured, the temporary piezometers were removed, and the boreholes were abandoned. Abandonment was conducted in a manner preventing any current, or subsequent, fluid media from entering, or migrating within, the subsurface environment along the axis or from the endpoint of the borehole. Abandonment was accomplished by filling the entire volume of the borehole with bentonite powder.

Boreholes located in concrete-covered areas were capped with grout. After a 24-hour period, the abandoned borehole was checked for grout and bentonite settlement.

2.5 SURVEYING

A topographic survey of the horizontal and vertical locations of all soil boreholes was conducted after completion of field activities. The topographic survey was conducted by a surveyor registered in the state of Georgia.

The horizontal coordinates for each soil borehole were surveyed to the closest 1.0 foot and referenced to the State Plane Coordinate System. Ground elevations were surveyed to the closest 0.01 foot. Elevations were referenced to the National Geodetic Vertical Datum of 1983.

2.6 DECONTAMINATION PROCEDURES

Decontamination of equipment used for soil and groundwater sampling was conducted at each investigation site. Non-dedicated equipment was decontaminated after each use. The direct-push sampling equipment was decontaminated by removing soil and other contaminants with potable water, phosphate-free detergent, and scrub brushes. This was followed by a potable water rinse, American Society for Testing and Materials (ASTM) Type I or equivalent water rinse, methanol rinse, and ASTM Type I or equivalent water rinse. The sampling equipment was then allowed to air dry and was wrapped in plastic or aluminum foil.

In addition to the sampling equipment, field measurement instruments were also decontaminated between uses. Only those portions of each instrument that came into contact with environmental media were decontaminated. Because of the delicate nature of these instruments, the decontamination procedure only involved initial rinsing of the instrument probes with ASTM Type I or equivalent water.

2.7 INVESTIGATION-DERIVED WASTE MANAGEMENT

Soil cuttings obtained during the installation of each borehole, and water collected for the measurement of water quality parameters, were the only indigenous IDW generated during the project. Non-indigenous IDW included solid compactible trash, decontamination solutions, and sludges.

2.7.1 Waste Collection and Containment

All soil waste was contained in a 55-gallon U.S. Department of Transportation (DOT) Specification 17C drums at the point of generation. At each site, water waste was contained in four 55-gallon DOT specification 17E drums. All containers were appropriately labeled with generation point information and transported to the Central Staging Area. Sanitary waste was placed in trash bags at the point of generation.

2.7.2 Waste Characterization

Soil IDW was characterized by collecting a representative soil aliquot from each drum and creating a single homogenized composite sample. The sample was analyzed for Resource Conservation and Recovery Act Toxicity Characteristic Leaching Procedure (TCLP) analytes. Soil was considered non-contaminated if the TCLP results were below the regulatory criteria, and the analytical results for the associated field samples indicated all of the following:

- benzene, toluene, ethylbenzene, and xylene (BTEX) and polynuclear aromatic hydrocarbon (PAH) concentrations below applicable Table A or B Threshold Levels as defined in Rules of Georgia Department of Natural Resources, Environmental Protection Division, rule 391-3-15-.09;
- total petroleum hydrocarbon (TPH) concentrations below 100 ppm; and
- total lead concentrations below 100 ppm.

Water IDW was characterized by collecting one sample from each drum. Each sample was analyzed for BTEX, pH, oil and grease, phenols, and TCLP metals.

2.7.3 Waste Disposal

All of the soil IDW was characterized as being non-contaminated and approved for disposal by FS DPW personnel. The soil was spread in an area designated by FS DPW personnel.

All of the water IDW was characterized as meeting the acceptance criteria of the FS Industrial Waste Treatment Plant (IWTP) and approved for disposal by FS DPW personnel at the IWTP.

2.8 DOCUMENTATION OF FIELD ACTIVITIES

All information pertinent to drilling and sampling activities, including instrument calibration data, was recorded in field logbooks. The logbooks were bound and the pages consecutively numbered. Entries in the logbooks were made in black permanent ink and included, at a minimum, a description of all activities, individuals involved in drilling and sampling activities, date and time of drilling and sampling, weather conditions, problems encountered, and field measurements. Lot numbers, manufacturers' names, and expiration dates of standard solutions used for field instrument calibration were also recorded. Sufficient information was recorded in the logbooks to permit reconstruction of direct-push and sampling activities.

3.0 SAMPLE HANDLING AND ANALYSIS

3.1 ANALYTICAL PROGRAM

Soil samples were screened for the presence of volatile vapors using a PhotoVac photoionization detector. The PhotoVac was calibrated daily using 100 ppm isobutylene. The headspace of each sample was measured approximately 15 minutes after collection.

Soil samples were analyzed for BTEX by method SW 846-8020, for PAH by method SW 846-8270, and for TPH by method SW 846-8015 (modified). TPH analysis included both gasoline-range organics and diesel-range organics. Groundwater samples were analyzed for BTEX by method SW 846-8240 and PAH by method SW 846-8270. The groundwater and soil sample containers, preservatives, and holding times are summarized in Table 1.1 of the Quality Assurance

Project Plan of the SAP (SAIC 1998). All samples were shipped to General Engineering Laboratories (GEL), Charleston, South Carolina.

Duplicate samples of soil and groundwater were collected throughout the project and represented approximately 10 percent of the total sample population. Rinsate blanks, which represented approximately 5 percent of the total sample population, were collected to detect sample cross-contamination. Duplicates and rinsates were submitted to GEL.

Split samples were collected in addition to the other quality control samples but were sent to the USACE quality assurance laboratory in Marietta, Georgia, as an independent quality check.

3.2 SAMPLE PACKAGING AND SHIPMENT

Each sample container was labeled and taped shut with electrical tape (except those containing samples designated for volatile organic analysis), and an initialed/dated custody seal was placed over the lid. Each sample bottle was placed into a separate plastic bag and sealed. The samples were placed upright in thermally insulated rigid-body coolers and surrounded by vermiculite to prevent breakage during shipment. In addition, samples were cooled to approximately 4°C with wet ice. These measures were taken to slow the decomposition and volatilization of contaminants during shipping and handling. The sample coolers were shipped to the analytical laboratory via courier service provided by the laboratory.

ATTACHMENT B

REFERENCES

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Anderson Columbia Environmental, Inc. (ACE), 1997. *Field Report for Used Oil Tanks, Building 850, Tanks A & B*, Hunter Army Airfield, Savannah, Georgia.

Arora, Ram, 1984. *Hydrologic Evaluation for Underground Injection Control in the Coastal Plain of Georgia*, Department of Natural Resources, Environmental Protection Division, Georgia Geological Survey.

Clark, W. Z. Jr., and Zisa, A. C., 1976. *Physiographic Map of Georgia,* Department of Natural Resources, Environmental Protection Division, Georgia Geologic Survey (reprinted 1988).

City of Savannah Bureau of Water Operations, 1998. *Personal communication with Michael Coon.*

City of Savannah Bureau of Sewer and Water Planning, 1998. *Personal communication with Clay Rogers.*

Environmental Protection Agency (EPA), 1998. *Watershed Environmental Profile, Ogeechee Coastal Dataset*, July.

Furlow, J. W., 1969. *Stratigraphy and Economic Geology of the Eastern Chatham County Phosphate Deposit,* Department of Mines and Mining, Division of Conservation, Georgia Geologic Survey, Bulletin 82.

Fort Stewart Directorate of Public Works (FS DPW), 1998. *Personal communication with Fort Stewart DPW Personnel.*

Georgia Department of Natural Resources (GA DNR), 1976. *Geologic Map of Georgia,* Department of Natural Resources, Environmental Protection Division, Georgia Geologic Survey (reprinted 1997).

GA DNR, 1998a. *Rules and Regulations for Water Quality Control,* Chapter 391-3-6, Department of Natural Resources, Environmental Protection Division.

GA DNR, 1998b. *Underground Storage Tank Corrective Action Plan-Part A Guidance,* Department of Natural Resources, Environmental Protection Division.

Herrick, S. M., 1961. *Wells Logs of the Coastal Plain of Georgia,* Department of Natural Resources, Environmental Protection Division, Georgia Geologic Survey.

Huddlestun, P. F., 1988. *A Revision of the Lithostratigraphic Units of the Coastal Plain of Georgia, The Miocene through Holocene,* Department of Natural Resources, Environmental Protection Division, Georgia Geologic Survey, Bulletin 104.

Miller, J. A., 1990. *Groundwater Atlas of the United States, Segment 6,* U.S. Department of the Interior, U.S. Geological Survey, Hydrologic Inventory Atlas 730G, 28 pp.

Science Applications International Corporation (SAIC), 1995. *Data Validation Guidelines for Analytical Data,* Quality Assurance Technical Procedure TP-DM-300-7, Revision 1.

SAIC, 1998. *Sampling and Analysis Plan for the Corrective Action Plan-Part A Investigations for Former Underground Storage Tanks at Hunter Army Airfield, Georgia,* U.S. Army Corps of Engineers, Savannah District, Contract No. DACA21-95-D-0022, Delivery Order 0019.

SAIC, *Sampling and Analysis Plan for the CAP A Investigation for former UST,* Hunter Army Airfield, Georgia, March 1998.

Trent, V. P., 1992. *Groundwater Pollution Susceptibility Map of Georgia,* Department of Natural Resources, Environmental Protection Division, Georgia Geologic Survey, Hydrologic Atlas 20.

United States Geological Survey (USGS), 1990. *Water Use for the Ogeechee Coastal Watershed.*

Wilkes, R. L., Johnson, J. H., Stoner, H. T., and Bacon, D. D., 1974. *Soil Survey of Bryan and Chatham Counties, Georgia,* U.S. Department of Agriculture Soil Conservation Service, 71 pp.