SITE: HAA-17, HAAF, GEORGIA

(Installation Repository List)

FSGA Final CSR submittal to GA EPD -		25 Apr 2011
GA EPD Final CSR Review Comments -	(rec'vd 8 Nov 2011)	27 Oct 2011
FSGA Final CSR Response to Comments Extension Request -		23 Nov 2011
FSGA Final CSR Response to Comments with CSR Revision #1 to GA EPD -		12 Apr 2012
GA EPD Final CSR Revision #1 Review Comments -		10 Aug 2012
FSGA Final CSR Rev #1 Response to Cmts Ext Request due to contractor change -		13 Sep 2012

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, US ARMY GARRISON, FORT STEWART/HUNTER ARMY AIRFIELD
DIRECTORATE OF PUBLIC WORKS
1587 VETERANS PARKWAY
FORT STEWART, GEORGIA 31314-5048

REPLY TO
ATTENTION OF

Office of the Directorate

September 13, 2012

CERTIFIED MAIL
7010187000023006 9802

Georgia Environmental Protection Division
Attention: Ms. Amy Potter
2 Martin Luther King Jr. Drive, Southeast
Floyd Towers East, Suite 1452
Atlanta, Georgia 30334

Dear Ms. Potter:

Fort Stewart is pleased to receive Georgia Environmental Protection Division's (GA EPD) letter dated August 10, 2012 regarding the Final Compliance Status Report Revision #1, HAA-17, HSI Site #10521, Hunter Army Airfield, Georgia.

The Army Environmental Command has issued a stop work order for the Performance Based Acquisition (PBA) contract associated with the above mentioned site, due to the transition of the regulatory driver from the Hazardous Site Response Act (HSRA) to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The PBA contract is in the process of being modified. Fort Stewart respectfully requests an extension until February 8, 2013 to respond to GA EPD comments until the modification of the contract has been accomplished.

If you have any questions please contact Ms. Algeana Stevenson at (912) 315-5144 or Ms. Tressa Rutland, Directorate of Public Works, Environmental Division, Prevention and Compliance Branch at (912) 767-2010.

Sincerely,

Thomas C. Frey
Robert R. Baumgardt
Director, Public Works

Georgia Department of Natural Resources

2 Martin Luther King Jr. Dr., S.E., Suite 1154, Atlanta, Georgia 30334-9000
Mark Williams, Commissioner
Environmental Protection Division
Judson H. Turner, Director
Land Protection Branch
Keith M. Bentley, Branch Chief
Phone: 404/656-7802 FAX: 404/651-9425

August 10, 2012

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Robert R. Baumgardt
Director, Public Works
Headquarters, Third Infantry Division (Mechanized) and Fort Stewart
Directorate of Public Works, Building 1137
Environmental Branch (ATTN: Algeana Stevenson)
1550 Frank Cochran Drive
Fort Stewart, Georgia 31314-4927

RE: *Final Compliance Status Report Revision 1, HAA-17, Installation-Wide Groundwater Including TCE Groundwater Contamination; Hunter Army Airfield, Georgia (HSI Site #10521)*; dated March 2012 and received April 17, 2012; EPA ID No. GA4 210 022 733.

Dear Mr. Baumgardt:

The Land Protection Branch of the Georgia Environmental Protection Division (EPD) has reviewed Hunter Army Airfield's *Compliance Status Report Revision 1, HAA-17, Installation-Wide Groundwater Including TCE Groundwater Contamination,* dated March 2012 and received April 17, 2012, for compliance with the Rules of Georgia Department of Natural Resources (i.e., Rules), Chapter 391-3-19 Hazardous Sites Response. During that review, the attached comments were generated.

Within than ninety (90) days after receipt of this letter, please submit two (2) copies of all revisions that address the attached comments, and one (1) electronic copy (in PDF format) of the full report. The revised pages should be noted at the bottom with the word "Revised" and the revision date. Please contact Mr. Mo Ghazi or William Powell at 404-656-2833 if you have any questions.

Sincerely,

Amy Potter
Unit Coordinator
Hazardous Waste Management and Remediation Program

cc: Tressa Rutland, Fort Stewart (via e-mail)
File: Hunter Army Air Field, Georgia (G)
S:\RDRIVE\GHAZI\All Sites\Hunter Army Air Field\HAAF-17\GAEPD Review Final CSR Revision 1and RTC HAA-17 April 2012.doc

FINAL COMPLIANCE STATUS REPORT
HAA-17, INSTALLATION-WIDE GROUNDWATER INCLUDING TCE GROUNDWATER CONTAMINATION HSI SITE #10521
DATED APRIL 2012
HUNTER ARMY AIRFIELD (HAAF)
EPD COMMENTS

Original Comments Readdressed

Original EPD Comment # 6: Section 7.2.1.2, Additional Groundwater Delineation, Figures 7-7 through 7-9. The delineation of groundwater contamination in site-wide aquifer system is incomplete. Please include the following additional delineation requirements in accordance with 391-3-19-.06(3)(b)(3):

3rd Bullet: Please add two wells (one shallow, one deep) northeast of Building 1345, in the vicinity of H17-AF–107 where MIP [membrane interface probe] result from 12/2009 sampling event shows TCE [Trichloroethylene] concentration of 0.38J µg/L. The purpose of these wells is to complete the side gradient delineation of VOCs and monitor for potential migration.

HAAF Response: Per the meeting agreement, new sample results from AF-53, AF-70, and AF-71 were evaluated to determine the need for this well. Concentrations had decreased significantly and the additional well was not installed. Sampling of these existing wells is discussed in Sections 6.6 and 7.2.1.2.

EPD Response: Vertical profile sample H17-AF–107 is sufficient to provide current delineation within the deep zone of the surficial aquifer. Please note that a well to determine the point of compliance will be required in the forthcoming Corrective Action Plan. The well sample results from AF-71 show concentrations of Vinyl Chloride (VC) at 2.5 µg/L, which exceeds the MCL of 2 µg/L. Therefore, a side gradient is still required to complete delineation in the shallow zone of the aquifer.

4th Bullet: Please provide one well located in the vicinity of sampling point AF-73, which had previous TCE detections of 437 µg/L at the 41-45' depth interval, to confirm this sampling result. If the presence of contamination is confirmed, please complete appropriate horizontal and vertical delineation accordingly.

HAAF Response: Monitoring well H17-MW-23D was installed at the location of AF-73. Based on concentrations in the sample taken from the well, and additional monitoring well (H17-MW-29D) was installed upgradient (NW) of H17-MW-23D.

EPD Response: Upgradient delineation of the deep zone groundwater contamination has been accomplished. However, additional horizontal and vertical delineation is still required. Please provide one additional well in the shallow zone to complete the vertical delineation as originally requested. Additionally, please provide a well in the deep zone near the vertical profile sample location B159-1 to complete the horizontal delineation.

6th Bullet: Please provide recent sample results from wells AF-53, AF-67, AF-70, and AF-71, and replace well AF-72 (destroyed) to complete delineation of the aerial extent of contamination.

HAAF Response: Wells AF-53, AF-70, and AF-71 were sampled as requested. Please note that AF-67 was a temporary boring. AF-72 was located after additional searching and was sampled.

EPD Response: Elevated concentrations of TCE (390 µg/L) and cis-1,2-Dichloroethylene (290 µg/L) were detected in well AF-72, which is located downgradient of the main plume. Therefore, an additional well that is located downgradient of AF-72, at the edge of the plume, will be required to determine the point of compliance in the forthcoming Corrective Action Plan.

Original EPD Comment # 11: **Figure 7-9, Estimated Extent of TCE Impact in Groundwater.** Please add isocentration lines to this figure to provide an adequate understanding and characterization of the TCE groundwater contamination. Because the contamination occurs at a variety of depths, please separate Figure 7-9 into two figures: one that shows the shallow groundwater contamination (0-20' below water table), and one that shows the deep contamination (greater than 20' below water table).

HAAF Response: The aerial extent of shallow groundwater contamination is shown on Figures 7-20, 7-22A and 7-22B. The aerial extent of deep groundwater contamination is shown on Figures 7-21, 7-23A, and 7-23B.

EPD Response: The isoconcentration lines in the above figures are often based upon data that is 10 years old or older, which is inappropriate for groundwater contaminant plumes since groundwater is a mobile media. Please redraw the isoconcentration lines based only upon recent data (5 years old or less). Because the newly drawn isoconcentration lines are often based upon older data, it has become apparent that additional delineation and re-sampling of wells is required (see below under General Comments).

General Comments (New)

1. **Figure 6-2, MIP ECD Response Overview.** Transect locations for the MIP ECD responses are not shown. Please show the traces for transects A-A', B-B' and C-C' on Figure 6-2.

2. **Figures 7-1 and 7-3.** Please change the name of monitoring well H18-AF-107 to H17-AF-107 to correct this typographical error.

3. **Figures 7-13 and 7-14, Benzene Isoconcentrations.** These figures show the Benzene isoconcentration vertical profiles. However, they do not pass through the center of the Benzene plume including well AF-07, which has the highest Benzene concentrations (1,540 ug/L). Please revise these figures using difference transects that include well AF-07.

4. **Additional Figure, Benzene Isoconcentrations.** Data included in this report – and not included in the previous 2011 report – show significant Benzene concentrations in the groundwater shallow zone. Please include an additional figure demonstrating horizontal delineation of Benzene in the shallow zone.

5. **Figures 7-22A and 22B.** Sample results for monitoring well AF-70 are shown on Figures 7-22A and 7-22B as 3.9 J µg/L and ND (non-detect) respectfully for TCE. However, the lab analytical data sheets show the sample result as 0.39 J µg/L TCE. Please revise accordingly.

6. **Additional Groundwater Delineation, Shallow Zone (Figures 7-22A and B).** The delineation and characterization of groundwater contamination in the shallow zone of the surficial is incomplete as the isoconcentration lines are often based upon data that is 10 years or older, which is inappropriate for groundwater contaminant plumes since groundwater is a mobile media. Please include the following additional delineation requirements in accordance with 391-3-19-.06(3)(b)(3):

   - Please provide recent sample results from wells AF-17, AF-23, AF-24, AF-36, AF-38, and AF-62 to complete the current characterization/aerial extent of the shallow zone groundwater plume.
   - If contamination is found in wells AF-23 or AF-24, please provide one additional well located in the shallow zone near the vertical profile sample location B159-1 to complete the horizontal delineation.

<u>Human Health Risk Assessment Comments (Section 8)</u>

7. **Section 8.3, Toxicity Assessment, Page 8-3.** The citation 'USEPA, 2010a' is missing in the reference list. Please revise to include this citation.

8. **Table 8-3 (Toxicity Values).** In the last submittal (April 2011), the facility evaluated Chromium as Chromium VI. In this submittal, it is evaluated as total Chromium. Please provide an explanation to justify the use of total Chromium.

9. **Vapor Intrusion.** It was noted that the model output for the industrial worker was adjusted for an 8-hour work day. This adjustment is unacceptable as the risk for vapor intrusion needs to account for exposure to vapors for 24-hours per day. Please revise accordingly.

<u>Ecological Risk Assessment (ERA) Comments (Section 9)</u>

10. **Table 9-3 Screening Level - COPEC in Surface Soil.** The following constituents listed as having USEPA R4 ESVs do not have R4 screening values:

- Acetone;
- 2-Butanone, aka MEK;
- Carbon Disulfide;
- Benzo[b]fluoranthene;
- Benzo[k]fluoranthene; and
- Chrysene.

The link listed in Note [a] of Table 9-3 is a broken link. Please use the Oak Ridge National Laboratory (ORNL) Risk Assessment Information System (RAIS) Ecological Benchmark Tool [http://rais.ornl.gov/tools/eco_search.php] as a reference source for screening values. The six constituents listed above should be listed as NSL (no screening level) per Note [c], and carried forward for further discussion per step 3a of the screening level ERA (SLERA). The two constituents with HQs > 1.0 (Toluene and Chromium) should also be carried forward per step 3a of the SLERA. The USEPA R4 soil screening value for Chromium is for Chromium (Total), and should be identified as such in the constituent column. Please revise accordingly.

11. **Table 9-4 Baseline Level – COPEC in Surface Soil.** The following discrepancies were found in this table:
    - Note [a] states, "Background concentrations from," but then fails to provide the background source. Please revise.
    - In the fifth column of Table 4, please replace "Alternative" with "Alternate" as it is the more accepted term.
    - The alternate screening value (ASV) listed for Chromium is based on Chromium (III), and should be identified by the inorganic species or form of the element in the constituent column. Two (2) times the background value (i.e., 15.4 mg/kg) should be the accepted soil screening value (SSV) for Chromium (Total). Please explain more fully the decision process used in the selection of the SSV for Chromium.

12. **Section 9.3.1.1, last paragraph.** This paragraph states that the drainage ditches contain intermittent water levels and provide poor habitat even when water is temporarily present. Please clarify in this paragraph whether the groundwater "daylights" to surface water and reference the applicable photographs located in Appendix K.

13. **9.4.4 Summary and Conclusions:** The premise that the limited intermittent presence of water in the drainage ditches is not a significant ecological factor is acceptable. However, the final paragraph and last sentence of Section 9.4.4 states, "Additional media including surface water, sediment, and groundwater were ruled out because they do not present a complete exposure pathway to ecological receptors at the site." This is not technically correct. The potential for ecological risks to avian species and small mammals may be small, or acceptable, but the risk is not absent. Please rephrase the last paragraph of 9.4.4 and the last bullet of Section 11 (Conclusions and Conceptual Site Model) to state that ecological risks are minimal, but acceptable (or similar language).

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, US ARMY GARRISON, FORT STEWART/HUNTER ARMY AIRFIELD
DIRECTORATE OF PUBLIC WORKS
1587 FRANK COCHRAN DRIVE
FORT STEWART, GEORGIA 31314-5048

REPLY TO
ATTENTION OF

Office of the Directorate

April 12, 2012

CERTIFIED MAIL
7010278000014428 2316

Georgia Environmental Protection Division
Attention: Ms. Amy Potter
2 Martin Luther King Jr. Drive, Southeast
Floyd Towers East, Suite 1452
Atlanta, Georgia 30334

Dear Ms. Potter:

Fort Stewart is pleased to receive Georgia Environmental Protection Division's (GA EPD) letter dated October 27, 2011 regarding the Final Compliance Status Report, HAA-17 Installation-Wide Groundwater Including TCE Groundwater Contamination, Hunter Army Airfield, Savannah, Georgia, dated April 25, 2011. In response to comments, Fort Stewart is pleased to submit two (2) hard copies and one (1) electronic copy of the Final Compliance Status Report Revision #1, HAA-17 Installation-Wide Groundwater Including TCE Groundwater, HSI# 10903, Hunter Army Airfield, Savannah, Georgia, dated March 2012.

Fort Stewart respectfully appreciates GA EPD's acceptance of an extension which was submitted on November 23, 2011, which was required due to additional field work needed to adequately address GA EPD's comments.

In accordance with the Federal Code of Regulations, Section 270.11(d), the following certification is provided by the Installation:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions or comments regarding the enclosed report, please contact Ms. Algeana Stevenson at (912) 315-5144 or Ms. Tressa Rutland, Directorate of Public Works, Environmental Division, Prevention and Compliance Branch at (912) 767-2010.

Sincerely,

Thomas C. Fry
Robert R. Baumgardt
Director, Public Works

Enclosures

ARCADIS MALCOLM PIRNIE

Infrastructure · Water · Environment · Buildings

Imagine the result

IMA

3d Inf Div (Mech)

U.S. Army Environmental Command

And

Fort Stewart Directorate of Public Works
Under Contract Number W91ZLK-05-D-0015 D.O. 0003

Final Compliance Status Report Revision 1 HAA-17 – Installation-Wide Groundwater including TCE Groundwater Contamination

Hunter Army Airfield
Savannah, Georgia
HSI Site No. 10903

Revision 1 - March 2012
Original Report - April 2011

ARCADIS MALCOLM PIRNIE

Revision 1 – March 2012
Original Report – April 2011

Eric Killenbeck
Senior Geologist

C. Scott Bostian, PE
Senior Engineer

Charles A. Bertz, PE
Senior Project Manager

Final
Compliance Status Report
Revision 1
HAA-17 – Installation-Wide Groundwater including TCE Groundwater Contamination

Prepared for:
U.S. Army Environmental Command

Prepared by:
ARCADIS
801 Corporate Center Drive
Suite 300
Raleigh, North Carolina 27607
Tel 919.854.1282
Fax 919.854.5448

Our Ref.:
GP08HAFS.H17C.DPCSR

Date:
March 2012

Executive Summary

Hunter Army Airfield (HAAF) is an active military installation located in Savannah, Georgia, encompassing areas of industrial, commercial, and temporary residential property occupied by a variety of administrative, maintenance, and barracks facilities as well as an active airfield. The U.S. Army Environmental Command (USAEC) retained ARCADIS (ARCADIS U.S., Inc.) on behalf of HAAF to investigate soil and groundwater associated with the impacted area designated as site HAA-17. A Hazardous Site Response Act (HSRA) Release Notification/Reporting Form was submitted to the Georgia Environmental Protection Division (EPD) on April 27, 2009. On November 20, 2009, Georgia EPD assigned the HAA-17 site as Hazardous Sites Inventory (HSI) Site No. 10903. This Compliance Status Report (CSR) has been generated based on historical datasets as well as data generated in the recent investigations conducted from November 2009 through January 2012. Upon approval of the CSR, a Corrective Action Plan (CAP) will be developed.

This CSR describes the investigation activities completed to delineate the potential source(s) and the extent of volatile organic compound (VOC) impacts with specific focus on trichloroethene (TCE) and its degradation compounds. Metals were also investigated in an area where previous data had indicated a potential impact. Initial investigations in the area were related to petroleum impacts associated with underground storage tanks (USTs) 25 and 26. During these activities, in addition to the petroleum impacts, TCE and other chlorinated compound impacts were identified in groundwater. The extent of petroleum-impacted groundwater was delineated in accordance with the requirements of the Georgia EPD Underground Storage Tank Management Program (USTMP) (Facility ID No. 9-025008). In a letter dated August 19, 2008, the Georgia EPD USTMP stated that no further action is required for the petroleum release.

Investigations and Summary of Results

Previous investigations related to the TCE impacts were conducted from 1998 through 2007 at the former UST 25 and 26 area and surrounding areas. These investigations included monitor well installation, sampling through temporary direct push technology (DPT) borings, and a geophysical survey. The tentatively identified TCE detections from 1998 were confirmed when TCE was detected in groundwater during the UST investigation in 1999. In the investigation of TCE impacts in groundwater associated with former USTs 25 and 26, TCE was detected at a maximum of 7,730 micrograms per liter (µg/L) in analyses from temporary boring AF-52 in December 2000. East of the canal adjacent to the former UST area, TCE was detected at 604 µg/L in a DPT groundwater sample from location AF-51 (15 to 20 feet below ground surface [bgs]) in

2000. TCE was detected in 2002 at 807 µg/L in shallow monitor well AF-72 (screened from 2.5 to 12.5 feet bgs), also located east of the former UST 25 and 26 location. Tank excavation and removal activities were performed in April 2006. In 2007, an Interim Remedial Action (IRA) was implemented to remove two wells and the contaminated soil/free product around them. A 6-foot by 6-foot area around each well was excavated to a depth of 9.5 feet.

As part of the investigation of TCE detected in the former UST area, an investigation of the purge facility, located up- and side-gradient of the former UST area, was conducted from May to July 2006. Both soil and groundwater samples were collected. One deep monitor well, screened from 40 to 45 feet bgs, and four shallow wells, each screened from 2.3 to 12.3 feet bgs, were installed. Soil samples were collected from three locations along a surface drainage pathway feature and from the five monitor well borings. During the purge facility investigation in 2006, 34.8 µg/L of TCE was detected in groundwater from the deep monitoring well. Low concentrations of petroleum hydrocarbons were detected in the shallow wells.

An investigation related to Building 1290, where solvents had been used for cleaning in the past, was conducted in 2007 and 2008. The investigation included areas east of Building 1290 extending to the former UST area and locations east of the drainage canal. The investigation included membrane interface probe (MIP) and DPT sampling of groundwater. Twenty-one wells that were installed in May 2007 and two existing wells were sampled in July 2007. The analyses indicated that there were no impacts around Building 1290 and that the highest TCE concentrations were in the former UST 25 and 26 area at approximately 20 to 30 feet bgs.

Building on the previous investigations, the following activities were conducted from November 2009 through January 2012:

- Water level measurements were collected from monitor wells in February 2010 and after new well installation in May and June 2010.
- Slug tests were performed in seven selected wells in December 2009 to determine hydraulic conductivities in the shallow and deep portions of the upper aquifer.
- Thirty-seven existing monitor wells were sampled in February 2010 to confirm previous data and provide additional information on potential source areas and downgradient vertical and horizontal extents.
- The vertical and horizontal profile of VOC contamination in soil and groundwater in suspected source areas around the former UST 25/26 area was investigated using MIP technology. Borings were utilized for the collection of soil and groundwater samples at locations identified by MIP data.

- Additional borings were installed for soil and groundwater sampling using DPT to evaluate contaminant distribution and extent.
- Nine groundwater monitor wells were installed and sampled in April and May 2010 to determine the extent of impacted groundwater.
- Two piezometers were installed in June 2010 to evaluate the relationship between groundwater and surface water flow near the drainage canals southeast of the former USTs and adjacent to Lightning Road.
- Three existing groundwater monitor wells in the former UST 25/26 area were sampled in November 2011 to compare to previous data and provide additional information on vertical and horizontal extents.
- Eight groundwater monitor wells were installed and sampled in December 2011 and January 2012 to determine the vertical and horizontal extent of impacted groundwater.

A clay layer was encountered site-wide between 40 and 45 feet bgs (shallower near canal). The layer is the top of the confining unit above the underlying Floridan aquifer, encountered between 200 and 800 feet bgs. In addition, thinner, silty clays were encountered above 40 ft bgs in some borings located to the east of the runways in the area of former USTs 25 and 26. These clay layers appear to act as semi-confining layers in some areas, separating the shallow and deep portions of the upper aquifer. These layers were not observed in borings completed at the purge facility or at the former dry cleaning facility.

Groundwater flow directions based on the 2010 events appear consistent with previous data. A groundwater divide is evident in both shallow and deep groundwater between Building 1290 and the former purge facility. The flow direction of groundwater in the Building 1290 area appears to be in a westerly direction toward the taxiways. Groundwater in the shallow and deep zones in the central and eastern portions of the HAA-17 area follows the topographic gradient of the site and flows to the southeast toward the former location of USTs 25 and 26 and the canal. Deep zone groundwater continues to flow east under the drainage canal. Data indicate that the drainage ditch is a discharge point for shallow groundwater and that surface water levels mimic shallow groundwater conditions. Artesian conditions exist in some wells proximate to the canal.

For those wells analyzed within the shallow groundwater zone (AF-08, AF-20, and AF-24), hydraulic conductivities ranged from 0.57 to 0.75 feet/day. For those wells analyzed within the deeper groundwater zone (AF-53, AF-54, AF-55, and AF-57), hydraulic conductivities ranged from 0.57 to 63 feet/day.

A MIP investigation was conducted in the former UST area in November 2009. The areas where the highest concentrations had been identified in previous investigations

were targeted for initial MIP points. Ten MIP borings were installed in the former UST area. The largest electron capture detector (ECD) responses were in the 30- to 40-foot interval at three locations near the southwest corner of Building 1345. Temporary borings for soil sampling were installed at locations and depths where MIP technology identified potential areas of concern. Temporary borings were also installed at other locations in the former UST area and at outlying locations where historical results warranted further investigation. TCE was detected in seven saturated soil samples but not at concentrations indicative of a source. The highest TCE concentrations were detected in soil samples from boring location H17-AF-101 at 0.94 milligrams per kilogram (mg/kg) (24 to 25 feet bgs) and 0.81 mg/kg (34 to 35 feet bgs). Similar concentrations were detected in soil samples from two other locations, which were also west of Building 1345 in the former UST area. The remaining concentrations detected in saturated soils ranged from below laboratory detection limits to 0.81 mg/kg. Soil samples taken at the former dry cleaner and the purge facility did not contain chlorinated VOCs indicative of a source or significant impacts.

During the groundwater investigation, there were no significant detections of VOCs in DPT samples taken in the UST 25/26 area in December 2009. All DPT groundwater samples taken in 2009 were from 40 to 45 feet bgs for vertical delineation. Previous investigations had resulted in detections of VOCs, specifically TCE, in the former UST area and east of the canal. TCE had been detected predominantly in samples 5 to 15 feet bgs.

Three monitor well pairs (H17-MW-21S/D, 22S/D, and 27S/D) were installed farther east along Perimeter Road to provide delineation of the eastern extent of impacts. VOCs were not detected in any of the samples from the six monitor wells, thereby providing delineation of the extent of VOC impacts in the eastern portion of the investigation area.

Monitor well H17-MW-19S (screened from 5 to 15 feet bgs) was installed on the east side of the canal south of the former UST 25/26 area to provide delineation of the southern extent of VOCs in the shallow interval. VOCs were not detected in samples from this well. Results from borings and monitor wells in the same area indicated that there were no VOC impacts in the deeper interval. Additionally, monitor well H17-MW-25D (screened from 25 to 35 feet bgs) was installed near existing well AF-58 on the east side of the canal near the south side of Lightning Drive. Sample results from this well also indicated there were no VOC impacts in the deeper interval in this area. Shallow and deep monitor well pair H17-MW-126S/D was installed between Perimeter Road and monitor wells H17-MW-19S and H17-MW-25D. VOCs were not detected in samples from these wells. These results indicate delineation of the southern extent of VOCs in the former UST 25/26 area is complete.

Monitor well H17-MW-29D was installed southeast of Building 1310 and northwest of the former UST 25/26 area to provide upgradient delineation of VOCs in the former UST 25/26 area. Only Toluene was detected in this well at 2.0 µg/L, well below the Type 1RRS of 1,000 µg/L.

Monitor well H17-MW-24, which is screened from 55 to 65 feet bgs, was installed near existing monitoring well AF-53 to provide vertical delineation in the former UST 25/26 area. VOCs were not detected in samples from this well.

Minor TCE impacts were observed in the purge facility area during the 2006 investigation. Low levels of petroleum hydrocarbons had been detected in samples from shallow borings and monitor wells. TCE and its degradation products were detected in the deeper interval (40 to 45 feet bgs). In subsequent sampling in 2009 and 2010, TCE and its degradation products were again detected in the 40- to 45-foot bgs interval but at lower concentrations. The highest TCE concentration was 14 µg/L in deep well AT-MW-01. The VOC impacts in the Purge Facility area are low concentrations and isolated.

Monitor wells previously installed and sampled as part of the Building 1290 investigation were sampled again in 2010. VOCs were not detected in samples from the monitor wells around the building or in monitor wells west, north, and south of the building, thereby providing conformation of delineation of the extent of VOC impacts in the western portion of the investigation area. These results also confirmed that Building 1290 is not a source of TCE impacts at the site.

In the area of the former dry cleaner east of Building 1290, TCE and 1,1-dichloroethene (1,1-DCE) had been detected at 1.08 and 7.77 µg/L, respectively, in 1290-MW-8D during the investigation in 2007. During the same investigation, 1,1-DCE had been detected at 6.01 µg/L in 1290-MW-8S. TCE was not detected and 1,1-DCE was detected at 5.1 µg/L when well 1290-MW-8D was sampled in 2010. Chlorinated VOCs were not detected in samples taken from shallow well 1290-MW-8S in 2010. Groundwater samples were also taken in the area through temporary borings in 2006 and 2010. A DPT sample taken in 2006 south of the former dry cleaner location near the weapons cleaning facility at a depth of 44 to 46 feet bgs (1290-DPT-03) contained 2.5 µg/L of TCE. Samples were also taken with three temporary borings in the area in 2010. Screening from surface to total depth with a photo ionization detector (PID) did not result in any VOC detections. Because of the detections in 2006, samples were taken from 41 to 45 feet bgs at each boring location for laboratory analysis. TCE or another chlorinated VOC was detected at low concentrations in all three samples. TCE was detected in one sample at 1.1 µg/L. The highest chlorinated VOC concentration was 7.1 µg/L of 1,1-dichloroethane (1,1-DCA) in H17-FD2.

Monitor well pair H17-MW-17S/D was installed in 2010 to delineate the northern extent of the investigation area. Chlorinated VOCs were not detected in deep well H17-MW-17D. The only detection was 1.9 µg/L of carbon disulfide. In shallow well H17-MW-17S, the only VOC detected was chloroethane at 0.69 µg/L.

Additional investigation was conducted around the purge facility to evaluate chromium and barium detections in groundwater samples taken in 2006. Chromium was not detected above the practical quantitation limit (PQL) in any sample. Barium was detected above the PQL but below the Type 1 risk reduction standard (RRS) in samples from monitor wells AT-MW-01 and AT-MW-04 at concentrations of 28 and 37 µg/L, respectively.

Human Health Risk Assessment

The human health risk assessment for HAA-17 (former USTs 25 and 26, the purge facility, and Building 1290) evaluated the potential risks to human health by comparing the maximum detected soil and groundwater constituent concentrations with the Type 1 through 4 RRS. The potential exposure to constituents detected in sediment also was evaluated by comparing the maximum detected concentrations to the Type 1 RRS. Detected surface water concentrations were compared to Georgia in-stream standards. Finally, the vapor migration from groundwater into buildings at the site was evaluated.

The data for soil collected above groundwater were compared to the RRS. None of the maximum detected concentrations exceeded the Type 1 standards. Therefore, the derivation of Types 2 through 4 RRS was not conducted.

The groundwater data were compared to the Type 1 through 4 RRS. Acetone, benzene, chloroethane, 1,1-DCE, total 1,2-DCE (listed in Table 8-6 as 1,2-DCE), cis-1,2-DCE, 1,3-dichloropropene, isopropylbenzene, methylene chloride, 1,1,2,2-tetrachloroethane, TCE, and vinyl chloride exceeded the Type 1 and Type 3 groundwater RRS. Acetone, benzene, total 1,2-DCE, cis-1,2-DCE, TCE, and vinyl chloride were detected in groundwater at a maximum concentration exceeding the Type 2 RRS. Only benzene, TCE, and vinyl chloride exceeded the Type 4 RRS for groundwater.

The maximum sediment concentrations were compared to the soil Type 1 RRS. The maximum sediment concentrations were all below the Type 1 soil RRS. The maximum surface water concentrations were compared to the Georgia In-stream Water Quality Standards (IWQS), if available, or the Type 1 groundwater RRS, and were below the standard. Therefore, it is unlikely that the constituents detected in sediment and surface water were present at concentrations that would pose a risk to human health.

The current and historic groundwater concentrations were evaluated for the vapor intrusion pathway. The results indicated that the risks were above than the EPD HSRA benchmark of 1×10^{-5}. The noncancer hazards were above the benchmark of 1. Although the calculated risks are above the regulatory benchmarks, given the use and construction of the buildings at the site and the time individuals are present in the buildings, it is unlikely that there is a significant current risk from inhalation of vapors migrating into buildings.

Ecological Risk Assessment

The Ecological Risk Assessment consisted of a Screening Level Ecological Risk Assessment (SLERA) and Step 3a Baseline Ecological Risk Assessment (BERA) for ecological receptors at the site based on hazard quotients (HQs). An HQ less than or equal to a value of 1 indicates that adverse impacts to wildlife are considered unlikely (USEPA 2004). An HQ greater than 1 indicates that adverse effects of some kind may have occurred in the past or may occur in the future and that further analysis of potential ecological risks may be warranted.

Risks were characterized for ecological receptors at the site by considering direct contact with constituents of potential ecological concern (COPECs) in surface soil (0 to 1 foot bgs). Additional media including surface water, sediment, and groundwater were ruled out because they do not present a complete exposure pathway to ecological receptors at the site.

Overall potential ecological risks do not exist for exposure to site surface soil. All chemicals have HQs below 1. Based on this assessment, there are no ecological risks at the site and no further evaluation is required.

Conclusions

Based on the results of this and previous investigations, the following conclusions are presented:

- With one exception, the full extent of TCE in groundwater at HAA-17 is delineated horizontally and vertically. The exception is the area south of the purge facility where TCE was detected at 2.6 µg/L in deep monitor well H17-MW-18D.
- The highest TCE impacts were around the former UST 25 and 26 area. Although diffuse, the source appears centered in the area of historic soil borings AF-52 and AF-53 located between former USTs 25 and 26 and Building 1345.
- Other minor TCE and VOC impacts were detected in the purge facility area and the former dry cleaner area. These areas are upgradient of the former UST 25 and 26 area and these minor impacts are not related to the TCE detected in the former UST 25 and 26 area.

- Barium and chromium were detected in the area of the purge facility in 2006. Only barium was detected in monitor well samples in 2010. None of the concentrations exceeded the Type 1 RRS.
- The data for soil collected above the groundwater table were compared to the RRS. None of the maximum detected concentrations exceeded the Type 1 standards.
- The groundwater data were compared to the Type 1 through 4 RRS. Acetone, benzene, chloroethane, 1,1-DCE, total 1,2-DCE, cis-1,2-DCE, 1,3-dichloropropene, isopropylbenzene, methylene chloride, 1,1,2,2-tetrachloroethane, TCE, and vinyl chloride exceeded the Type 1 and Type 3 groundwater RRS. Acetone, benzene, total 1,2-DCE, cis-1,2-DCE, TCE, and vinyl chloride were detected in groundwater at a maximum concentration exceeding the Type 2 RRS. Only benzene, TCE, and vinyl chloride exceeded the Type 4 RRS for groundwater.
- Detections of acetone and methylene chloride are likely the result of laboratory contamination. These VOCs are common laboratory contaminants.
- Detections of 1,3-dichloropropene, isopropylbenzene, methylene chloride, and 1,1,2,2-tetrachloroethane were isolated and characterized by very low-level concentrations.
- The maximum sediment and surface water concentrations were all below the soil Type 1 RRS and groundwater Type 1 RRS/IWQS, respectively. Therefore, it is unlikely that the constituents detected in sediment and surface water are present at concentrations that would pose a risk to human health.
- The current and historic groundwater concentrations were evaluated for the vapor intrusion pathway. The results indicated that the risks were above the EPD HSRA benchmark of 1×10^{-5}. The noncancer hazards were above the benchmark of 1. Although the calculated risks are above the regulatory benchmarks, given the use of the buildings at the site and the time individuals are present in the buildings, it is unlikely that there is a significant current risk from inhalation of vapors migrating into buildings. All significant buildings in the impacted area are constructed on slabs with a vapor barrier below grade.
- Based on the assessment of impacted areas and ecological conditions, there are no ecological risks at the site.

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, US ARMY GARRISON, FORT STEWART/HUNTER ARMY AIRFIELD
DIRECTORATE OF PUBLIC WORKS
1587 FRANK COCHRAN DRIVE
FORT STEWART, GEORGIA 31314-5048

REPLY TO
ATTENTION OF

Office of the Directorate

November 23, 2011

CERTIFIED MAIL
7010 2780 0001 4428 1999

Georgia Environmental Protection Division
Attention: Ms. Amy Potter
2 Martin Luther King Jr. Drive, Southeast
Floyd Towers East, Suite 1452
Atlanta, Georgia 30334

Dear Ms. Potter:

Fort Stewart is pleased to receive the Georgia Environmental Protection Division's (GA EPD) letter, dated October 27, 2011, regarding the Final Compliance Status Report, HAA-17 Installation-Wide Groundwater Including TCE Groundwater Contamination, Hunter Army Airfield, Savannah, Georgia (HSI Site #10903), dated April 25, 2011.

Due to additional field work required to adequately address GA EPD's comments, Fort Stewart would like to respectfully request an extension until April 1, 2012 to address GA EPD's comments regarding the above mentioned report.

If there are any questions or comments regarding this extension request, please contact Ms. Algeana Stevenson at (912) 315-5144 or Ms. Tressa Rutland, Directorate of Public Works, Environmental Division, Prevention and Compliance Branch at (912) 767-2010.

Sincerely,

Thomas C. Fry
Robert R. Baumgardt
Director, Public Works

Georgia Department Natural Resources
2 Martin Luther King Jr. Dr., S.E., Suite 1154, Atlanta, Georgia 30334-9000
Mark Williams, Commissioner
Environmental Protection Division
F. Allen Barnes, Director
Land Protection Branch
Mark Smith, Branch Chief
Phone: 404/656-7802 FAX: 404/651-9425

NOV 08 REC'D

October 27, 2011

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Robert R. Baumgardt
Director, Public Works
Headquarters, Third Infantry Division (Mechanized) and Fort Stewart
Directorate of Public Works, Building 1137
Environmental Branch (ATTN: Algeana Stevenson)
1550 Frank Cochran Drive
Fort Stewart, Georgia 31314-4927

RE: *Final Compliance Status Report, HAA-17 Installation-Wide Groundwater Including TCE Groundwater Contamination, Hunter Army Airfield, Savannah, Georgia* (HSI Site #10903); dated April 25, 2011 and received April 29, 2011; EPA ID No. GA4 210 022 733.

Dear Mr. Baumgardt:

The Land Protection Branch of the Georgia Environmental Protection Division (EPD) has reviewed Hunter Army Airfield's *Final Compliance Status Report (CSR), HAA-17 Installation-Wide Groundwater Including TCE Groundwater Contamination,* dated April 25, 2011 and received April 29, 2011, for compliance with the Rules of Georgia Department of Natural Resources (i.e., Rules), Chapter 391-3-19 Hazardous Sites Response. During that review, the attached comments were generated.

Within ninety (90) days after receipt of this letter, please submit two (2) copies of all revisions that address the attached comments, and one (1) electronic copy (in PDF format) of the full report. The revised pages should be noted at the bottom with the word "Revised" and the revision date. Please contact Mr. Mo Ghazi or William Powell at 404-656-2833 if you have any questions.

Sincerely,

Amy Potter
Unit Coordinator
Hazardous Waste Management & Remediation Program

c: Tressa Rutland, Fort Stewart (via facsimile)
File: Hunter Army Air Field, Georgia (G)
S:\RDRIVE\GHAZI\All Sites\Hunter Army Air Field\HAAF-17\GAEPD Review CSR HAA-17_Site-Wide GW Investigation_ Rev August2011.doc

FINAL COMPLIANCE STATUS REPORT
HAA-17, INSTALLATION-WIDE GROUNDWATER INCLUDING TCE GROUNDWATER CONTAMINATION, HSI SITE #10903
DATED APRIL 2011
HUNTER ARMY AIRFIELD
EPD COMMENTS

---

1. **Section 2, Compliance Status Certification.** The Compliance Status Certification has not been signed. Please have the appropriate person sign and date the certification in accordance with 391-3-19-.06(4).

2. **Section 5.** The supplied CSR checklist in Appendix L identifies Section 5 as containing the information required by 391-3-19-.06(3)(b)(1)(iii and iv), which includes the name of each regulated substance released from each source, and the chronology of each source of release. Only Trichloroethylene (TCE) is identified in Section 5, while Section 11 identifies multiple contaminants (e.g., Benzene, cis-1,2-Dichloroethylene, etc.) that have exceeded the Type 1 and Type 3 Risk Reduction Standards (RRS) in groundwater. The origins of these contaminants are not adequately discussed. Additionally, the former dry cleaning facility and Strategic Air Command (SAC) special weapons area (Building 1336) are not discussed as potential sources. Please revise Section 5 to include this information.

3. **Figure 5-1, Well Locations.** This figure does not include a survey of each well's surface reference point and the elevation of its top-of-casing as required by 391-3-19-.06(3)(b)(3)(v)(I). Please modify Figure 5-1 to include this information.

4. **Section 6.4, Membrane Interface Probe (MIP).** There are no figures showing the vertical Electron Capture Detector (ECD) responses. Please provide MIP cross-sections showing the depth of each MIP monitoring well as well as analytical results detected by ECD.

5. **Section 7.2.1.1, Soil Impacts.** While this section discusses soil impacts primarily below the water table, it does not provide any discussion on soil contamination located strictly above the water table. In accordance with Rules 391-3-19-.06(3)(b)(2), please include this discussion and provide a figure showing the extent of soil contamination (organics and inorganics) above the water table.

6. **Section 7.2.1.2, Additional Groundwater Delineation, Figures 7-7 through 7-9.** The delineation of groundwater contamination in site-wide aquifer system is incomplete. Please include the following additional delineation requirements in accordance with 391-3-19-.06(3)(b)(3):

    - Please add two wells (one shallow, one deep) southeast of well H17-MW-20, which has TCE concentration of 280 μg/L. The new wells should be installed between wells H17-MW-22 and H17-MW-21. The purpose of these wells is to complete the delineation of VOCs downgradient of well H17-MW-20 and monitor for potential horizontal and vertical migration.

- Please add two wells (one shallow, one deep) southeast of well AF-58, which has TCE concentration of 270 μg/L. The new wells should be installed between H17-MW-19 and H17-MW-22. The purpose of these wells is to complete the side-gradient delineation of VOCs and monitor for potential migration.

- Please add two wells (one shallow, one deep) northeast of Building 1345, in the vicinity of H17-AF–107 where MIP result from 12/2009 sampling event shows TCE concentration of 0.38J μg/L. The purpose of these wells is to complete the side gradient delineation of VOCs and monitor for potential migration.

- Please provide one well located in the vicinity of sampling point AF-73, which had previous TCE detections of 437 μg/L at the 41-45' depth interval, to confirm this sampling result. If the presence of contamination is confirmed, please complete appropriate horizontal and vertical delineation accordingly.

- Based on the information provided in Figure 7-1 and Figure 7-8, vertical delineation of TCE has not been completed. For example, in the most contaminated zone, in the vicinity of sample points AF-43/AF-53, AF-44/AF-54, AF-45/AF-55, AF-56, AF-48/AF-58, and AF-63/AF-68, vertical delineation has not been achieved. Please install and sample three additional deep monitoring wells (one each below wells AF-53, AF-54, and AF-58) extending below a depth of 50' to provide vertical delineation within this highly contaminated zone and monitor for downward migration.

- Please provide recent sample results from wells AF-53, AF-67, AF-70, and AF-71, and replace well AF-72 (destroyed) to complete delineation of the aerial extent of contamination.

7. **Table 7-1.** The title of this table says, "HAA-17 (MCA Barracks Site)." Please delete "(MCA Barracks Site)" from the title and replace with Site-Wide Groundwater to correct this apparent typo.

8. **Section 7, Additional Figures, Vertical Delineation.** Only the vertical delineation of TCE contamination is depicted (Figure 7-1) perpendicular to the direction of groundwater flow. Please add a figure that shows the delineation of TCE through the center of the plume in the direction of groundwater flow. Please note that 391-3-19-.06(3)(b)(3)(x) requires vertical cross-sections depicting concentrations for all contaminants, not just TCE. Please add two additional figures that depict the vertical delineation of all contaminants. One figure should be in the direction of groundwater flow, and the other figure should be perpendicular to the direction of flow.

9. **Figure 7-1, Geological Cross-Section.** The top of water table trace on the geologic cross-section is missing. Please show the vertical position of the water table on this cross-section.

10. **Figures 7-7 and 7-8, Concentrations of VOCs Detected.** The aerial extent of groundwater contamination is not defined. Please add boundary line on this figure that defines the

horizontal extent of groundwater contamination in accordance with 391-3-19-.06(3)(b)(3)(viii).

11. **Figure 7-9, Estimated Extent of TCE Impact in Groundwater.** Please add isocentration lines to this figure to provide an adequate understanding and characterization of the TCE groundwater contamination. Because the contamination occurs at a variety of depths, please separate Figure 7-9 into two figures: one that shows the shallow groundwater contamination (0-20' below water table), and one that shows the deep contamination (greater than 20' below water table).

12. **Section 11, Conclusion and Conceptual Site Model (CSM), Page 11-1.** Not all previously identified COCs are discussed in the CSM (e.g., cis-1,2-DCE in monitoring wells AF-58, AF-55 and AF 68, and Benzene in H17-MW-18D). Please include a discussion on TCE degradation products, rate of degradation, attenuation/transport mechanisms (i.e., advection, diffusion, dispersion), contaminant transport velocities, etc., in the CSM, and identify and discuss all COCs in this section in accordance with Rules 391-3-19-.06(3)(b)(1 and 3).

13. **Section 11, Conclusion and Conceptual Site Model (CSM), Page 11-1.** The first paragraph states, "Concentrations of TCE in groundwater upgradient of former USTs 25 and 26 do not appear to be related to the more extensive impacts found near the former USTs." However, this section never explains the source of these upgradient TCE concentrations in groundwater. Please expand this section to explain the presence of the upgradient TCE concentrations in accordance with 391-3-19-.06(3)(b)(1).

14. **Appendix C, Laboratory Analytical Reports.** The lab techniques and QA/QC procedures and control data are not adequately discussed for both soil and groundwater samples. Please include this information in accordance with 391-3-19-.06(3)(b)(2)(iv and vii).

15. **Section 5.9.2 and Appendix H, Background data.** This appendix starts with Page 4-8, which appears to be a photocopy from the "Revised Final Compliance Status Report, Former HAAF Fire Training Area, HSI Number 10395, February 2002." This background study uses soil sample data from the Former Fire Training Area (FTA) and Old Property Disposal Yard. However, this appears to be a site-specific study that may not apply to other areas due to site-specific variations. Please include in the CSR a lithological comparison (or soil map) between SWMU HAA-17 and the Former FTA (SWMU HAA-1), and demonstrate whether these background values are representative of SMWU HAA-17.

Review of the Human Health Risk Assessment (Section 8)

16. **Table 8-3, Toxicity Factors.** Some of the toxicity factors provided on Table 8-3 are incorrect. Below are the correct values. Please note that the EPA Regional Screening Level (RSL)[1] Table, which is used to obtain toxicity factors, is updated periodically. The most current table (June 2011) should be used. Please note that the use of surrogates for screening is not permitted under HSRA Rules.

---

1 EPA Regional Screening Levels for Contaminants at Superfund Sites (November 2010). http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm.

Regulated Substances	Oral Slope Factor (mg/kg-day)$^{-01}$	Inhalation Slope Factor (mg/kg-day)$^{-01}$	Oral Reference Dose mg/kg-day	Inhalation Reference Dose mg/kg-day
n-Butylbenzene*	NA	NA	NA	NA
sec-Butylbenzene*	NA	NA	NA	NA
1,2-Dichloroethene	NA	NA	9.00E-03	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA
1,1,2,2-Tetrachloroethene	2.00E-01	2.00E-01	2.00E-02	NA
Vinyl Chloride	7.20E-01	1.50E-02	3.00E-03	2.90E-02
Phenanthrene	NA	NA	NA	NA
Cadmium	NA	6.30E+00	1.00E-03(diet)/5.00 E-04(water)	2.86E-06

17. **Table 8-5, Type 1 RRS for Soil.** The Type 1 Risk Reduction Standards (RRS) provided on Table 8-5 for Chloroform, Methyl isobutyl ketone, and Chromium differ from those derived by the EPD. The correct Type 1 RRS are provided below. Please revise.

Regulated Substance	Type 1 RRS (mg/kg)	Basis
Chloroform	8.0	Based on the groundwater criteria times 100.
Methyl isobutyl ketone	200	Based on the groundwater criteria times 100.
Chromium	29.8	The toxicity factors provided on Table 8-3 are for Chromium VI; therefore, the EPD calculated the Type 1 RRS for Chromium VI based on the carcinogenic RAGS EQ. 6 value.

18. **Table 8-6, Type 1/3 RRS for Groundwater.** The Type 1/3 RRS provided on Table 8-6 for Chloromethane, cis-1,3-Dichloropropene (DCP), trans-1,3-Dichloropropene, 1,2-Dichloroethene (DCE), 1,1,2,2-Tetrachloroethane and Chromium differ from those derived by the EPD. The correct Type 1/3 RRS are provided below. Please revise accordingly.

Regulated Substance	Type 1 RRS (mg/L)	Basis
Chloromethane	0.003	Appendix III, Table 1
cis-1,3-DCP trans-1,3-DCP	NA or detection limit (DL)	These substances are not included in Appendix III. Cis-1,3-DCP should be combined with trans-1,3-DCP to calculate a total for 1,3-DCP since this substance is listed in Appendix III. If this is not possible, the Type 1 RRS for these substances reverts to the DL.
1,2-DCE	NA or DL	1,2-DCE is not listed in Appendix III; therefore this substance should be broken down into cis-1,2-DCE and trans-1,2-DCE since these substances are listed in Appendix III. If this is not possible, the Type 1 RRS for 1,2-DCE reverts to the DL.
1,1,2,2-Tetrachloroethane	0.0002/DL	Appendix III, Table 1
Chromium	DL	The toxicity factors provided on Table 8-3 are for Chromium VI; therefore, the EPD calculated the Type 1 RRS for Chromium VI.

19. **Table 8-6, Type 2 RRS for Groundwater.** The Type 2 RRS provided on Table 8-6 for n-Butylbenzene, sec-Butylbenzene, 1,2-Dichloroethene, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, 1,1,2,2-Tetrachloroethane, Vinyl Chloride, Barium, Cadmium and Chromium differ from those derived by the EPD. These discrepancies may be due to toxicity factors. Please revise toxicity factors as indicated in comment 16 above and revise Type 2 RRS accordingly. Please note that these changes may result in the maximum detected concentration exceeding the respective RRS.

20. **Type 4 RRS for Groundwater.** The Type 4 RRS provided on Table 8-9 for n-Butylbenzene, sec-Butylbenzene, 1,2-Dichloroethene, cis-1,3-Dichloropropene, trans-1,3-Dichloropropene, 1,1,2,2-Tetrachloroethane, Vinyl Chloride, Barium, Cadmium and Chromium differ from those derived by the EPD. These discrepancies may be due to toxicity factors. Please revise toxicity factors as indicated in comment 16 above and revise Type 4 RRS accordingly. Please note that these changes may result in the maximum concentration exceed the respective RRS.

21. **Section 8.5, Vapor Intrusion.** EPD cannot verify the groundwater concentrations used in the Johnson and Ettinger (J&E) model. The groundwater concentrations that should be used in the model should be the maximum detected concentrations in the shallow zone of the aquifer. Additionally, the Henry's Law constants provided on Table 8-15 differ from those used by EPD. Please use the chemical specific parameters used in the J&E model from the current version of the RSL tables. Furthermore, please provide the flow rate into building parameter used to derive vapor intrusion risk. Because this is regulated under HSRA, a target risk of 1.0E-05 can be used in the J&E model. Please revise the model accordingly.

22. **Section 8.5, Vapor Intrusion.** The vapor intrusion evaluation only includes the J&E model results. However, through additional study and analysis, EPA has discovered additional information should be gathered when evaluating vapor intrusion. Therefore, please include an evaluation of preferential pathways in buildings such as pipe and utility penetrations through the foundation for all existing structures in the immediate vicinity of the groundwater plume.

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, US ARMY GARRISON, FORT STEWART/HUNTER ARMY AIRFIELD
DIRECTORATE OF PUBLIC WORKS
1587 FRANK COCHRAN DRIVE
FORT STEWART, GEORGIA 31314-5048

REPLY TO
ATTENTION OF

Office of the Directorate

April 25, 2011

CERTIFIED MAIL
9009 2820 0000 7708 5962

Georgia Environmental Protection Division
Attention: Ms. Amy Potter
2 Martin Luther King Jr. Drive, Southeast
Floyd Towers East, Suite 1452
Atlanta, Georgia 30334

Dear Ms. Potter:

Fort Stewart is pleased to submit two (2) hard copies and one (1) electronic copy of the Final Compliance Status Report HAA-17 Installation-Wide Groundwater Including TCE Groundwater Contamination, HSI Site #10903, Hunter Army Airfield, Savannah, Georgia, dated April 2011.

In accordance with the Federal Code of Regulations, Section 270.11 (d), the following certification is provided by the Installation:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

If you have any questions or comments, regarding the enclosed report, please contact Ms. Algeana Stevenson, at (912) 315-5144 or Ms. Tressa Rutland, Directorate of Public Works, Environmental Division, Prevention and Compliance Branch at (912) 767-2010.

Sincerely,

Robert R. Baumgardt
Director, Public Works

Enclosures

ARCADIS MALCOLM PIRNIE

Infrastructure · Water · Environment · Buildings

Imagine the result

IMA

3d Inf Div (Mech)

U.S. Army
Environmental Command

And

Fort Stewart Directorate of Public Works Under Contract Number W91ZLK-05-D-0015 D.O. 0003

Final Compliance Status Report HAA-17 – Installation-Wide Groundwater including TCE Groundwater Contamination

Hunter Army Airfield
Savannah, Georgia
HSI Site No. 10903

April 2011

ARCADIS MALCOLM PIRNIE

Eric Killenbeck
Senior Geologist

C. Scott Bostian, PE
Senior Engineer

Charles A. Bertz, PE
Senior Project Manager

Final
Compliance Status Report
HAA-17 – Installation-Wide Groundwater including TCE Groundwater Contamination

Prepared for:
U.S. Army Environmental Command

Prepared by:
ARCADIS
801 Corporate Center Drive
Suite 300
Raleigh
North Carolina 27607
Tel 919.854.1282
Fax 919.854.5448

Our Ref.:
GP08HAFS.H17C.DPCSR

Date:
April 2011

mg/day	milligrams per day
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
µg/L	micrograms per liter
MIP	membrane interface probe
msl	mean sea level
NTU	Nephelometric Turbidity Unit
ORP	oxidation-reduction potential
PAH	polyaromatic hydrocarbon
PID	photo ionization detector
PQL	practical quantitation limit
PVC	polyvinyl chloride
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RRS	risk reduction standard
RSL	Regional Screening Level
SAC	Strategic Air Command
SAIC	Science Applications International Corporation
SESD	Science and Ecosystem Support Division
SI	Site Investigation
SLERA	Screening Level Ecological Risk Assessment
SMDP	scientific management decision point
SVOC	semivolatile organic compound
TCE	trichloroethene
UCL	upper confidence limit
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Command
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
USTMP	Underground Storage Tank Management Program
VOC	volatile organic compound

Executive Summary

Hunter Army Airfield (HAAF) is an active military installation located in Savannah, Georgia, encompassing areas of industrial, commercial, and temporary residential property occupied by a variety of administrative, maintenance, and barracks facilities as well as an active airfield. The U.S. Army Environmental Command (USAEC) retained ARCADIS (ARCADIS U.S., Inc.) on behalf of HAAF to investigate soil and groundwater associated with the impacted area designated as site HAA-17. A Hazardous Site Response Act (HSRA) Release Notification/Reporting Form was submitted to the Georgia Environmental Protection Division (EPD) on April 27, 2009. On November 20, 2009, Georgia EPD assigned the HAA-17 site as Hazardous Sites Inventory (HSI) Site No. 10903. This Compliance Status Report (CSR) has been generated based on historical datasets as well as data generated in a recent investigation conducted from November 2009 through June 2010. Upon approval of the CSR, a Corrective Action Plan (CAP) will be developed.

This CSR describes the investigation activities completed to delineate the potential source(s) and the extent of volatile organic compound (VOC) impacts with specific focus on trichloroethene (TCE) and its degradation compounds. Metals impacts were also investigated in an area where previous data had indicated a potential impact. Initial investigations in the area were related to petroleum impacts associated with underground storage tanks (USTs) 25 and 26. During these activities, in addition to the petroleum impacts, TCE and other chlorinated compound impacts were identified in groundwater. The extent of petroleum-impacted groundwater was delineated in accordance with the requirements of the Georgia EPD Underground Storage Tank Management Program (USTMP) (Facility ID No. 9-025008). In a letter dated August 19, 2008, the Georgia EPD USTMP stated that no further action is required for the petroleum release.

Investigations and Summary of Results

Investigations related to the TCE impacts were conducted from 1998 through 2007 at the former UST 25 and 26 area and surrounding areas. These investigations included monitor well installation, sampling through temporary direct push technology (DPT) borings, and a geophysical survey. The tentatively identified TCE detections from 1998 were confirmed when TCE was detected in groundwater during the UST investigation in 1999. In the investigation of TCE impacts in groundwater associated with former USTs 25 and 26, TCE was detected at a maximum of 7,730 micrograms per liter (µg/L) in analyses from temporary boring AF-52 in December 2000. East of the canal adjacent to the former UST area, TCE was detected at 604 µg/L in a DPT groundwater sample from location AF-51 (15 to 20 feet below ground surface [bgs]) in 2000. TCE

was detected in 2002 at 807 µg/L in shallow monitor well AF-72 (screened from 2.5 to 12.5 feet bgs), also located east of the former UST 25 and 26 location. Tank excavation and removal activities were performed in April 2006. In 2007, an Interim Remedial Action (IRA) was implemented to remove two wells and the contaminated soil/free product around them. A 6-foot by 6-foot area around each well was excavated to a depth of 9.5 feet.

As part of the investigation of TCE detected in the former UST area, an investigation of the purge facility, located up- and side-gradient of the former UST area, was conducted from May to July 2006. Both soil and groundwater samples were collected. One deep monitor well, screened from 40 to 45 feet bgs, and four shallow wells, each screened from 2.3 to 12.3 feet bgs, were installed. Soil samples were collected from three locations along a surface drainage pathway feature and from the five monitor well borings. During the purge facility investigation in 2006, 34.8 µg/L of TCE was detected in groundwater from the deep monitoring well. Low concentrations of petroleum hydrocarbons were detected in the shallow wells.

An investigation related to Building 1290, where solvents had been used for cleaning in the past, was conducted in 2007 and 2008. The investigation included areas east of Building 1290 extending to the former UST area and locations east of the drainage canal. The investigation included membrane interface probe (MIP) and DPT sampling of groundwater. Twenty-one wells that were installed in May 2007 and two existing wells were sampled in July 2007. The analyses indicated that there were no impacts around Building 1290 and that the highest TCE concentrations were in the former UST 25 and 26 area at approximately 20 to 30 feet bgs.

Building on the previous investigations, the following activities were conducted from November 2009 through June 2010:

- Water level measurements were collected from monitor wells in February 2010 and after new well installation in May and June 2010.
- Slug tests were performed in seven selected wells in December 2009 to determine hydraulic conductivities in the shallow and deep portions of the upper aquifer.
- Thirty-six existing monitor wells were sampled in February 2010 to confirm previous data and provide additional information on potential source areas and downgradient vertical and horizontal extents.
- The vertical and horizontal profile of VOC contamination in soil and groundwater in suspected source areas around the former UST 25/26 area was investigated using MIP technology. Borings were utilized for the collection of soil and groundwater samples at locations identified by MIP data.

- Additional borings were installed for soil and groundwater sampling using DPT to evaluate contaminant distribution and extent.
- Nine groundwater monitor wells were installed and sampled in April and May 2010 to determine the extent of impacted groundwater.
- Two piezometers were installed in June 2010 to evaluate the relationship between groundwater and surface water flow near the drainage canals southeast of the former USTs and adjacent to Lightning Road.

A consistent clay layer was encountered site-wide between 40 and 45 feet bgs (shallower near canal). The layer is the top of the confining unit above the underlying Floridan aquifer, encountered between 200 and 800 feet bgs. In addition, thinner, silty clays were encountered above 40 ft bgs in some borings located to the east of the runways in the area of former USTs 25 and 26. These clay layers appear to act as semi-confining layers in some areas, separating the shallow and deep portions of the upper aquifer. These layers were not observed in borings completed at the purge facility or at the former dry cleaning facility.

Groundwater flow directions based on the 2010 events appear consistent with previous data. A groundwater divide is evident in both shallow and deep groundwater between Building 1290 and the former purge facility. The flow direction of groundwater in the Building 1290 area appears to be in a westerly direction toward the taxiways. Groundwater in the shallow and deep zones in the central and eastern portions of the HAA-17 area follows the topographic gradient of the site and flows to the southeast toward the former location of USTs 25 and 26 and the canal. Deep zone groundwater continues to flow east under the drainage canal. Data indicate that the drainage ditch is a discharge point for shallow groundwater and that surface water levels mimic shallow groundwater conditions. Artesian conditions exist in some wells proximate to the canal.

For those wells analyzed within the shallow groundwater zone (AF-08, AF-20, and AF-24), hydraulic conductivities ranged from 0.57 to 0.75 feet/day. For those wells analyzed within the deeper groundwater zone (AF-53, AF-54, AF-55, and AF-57), hydraulic conductivities ranged from 0.57 to 63 feet/day.

A MIP investigation was conducted in the former UST area in November 2009. The areas where the highest concentrations had been identified in previous investigations were targeted for initial MIP points. Ten MIP borings were installed in the former UST area. The largest electron capture detector (ECD) responses were in the 30- to 40-foot interval at three locations near the southwest corner of Building 1345. Temporary borings for soil sampling were installed at locations and depths where MIP technology identified potential areas of concern. Temporary borings were also installed at other locations in the former UST area and at outlying locations where historical results

warranted further investigation. TCE was detected in seven saturated soil samples but not at concentrations indicative of a source. The highest TCE concentrations were detected in soil samples from boring location H17-AF-101 at 0.94 milligrams per kilogram (mg/kg) (24 to 25 feet bgs) and 0.81 mg/kg (34 to 35 feet bgs). Similar concentrations were detected in soil samples from two other locations, which were also west of Building 1345 in the former UST area. The remaining concentrations detected in saturated soils ranged from below laboratory detection limits to 0.81 mg/kg. Soil samples taken at the former dry cleaner and the purge facility did not contain chlorinated VOCs indicative of a source or significant impacts.

During the groundwater investigation, there were no significant detections of VOCs in DPT samples taken in the UST 25/26 area in December 2009. All DPT groundwater samples taken in 2009 were from 40 to 45 feet bgs for vertical delineation. Previous investigations had resulted in detections of VOCs, specifically TCE, in the former UST area and east of the canal. TCE was detected predominantly in samples 5 to 15 feet bgs. Two monitor well pairs (H17-MW-21S/D and 22S/D) were installed farther east along Perimeter Road to provide delineation of the eastern extent of impacts. VOCs were not detected in any of the samples from the four monitor wells, thereby providing delineation of the extent of VOC impacts in the eastern portion of the investigation area.

Monitor well H17-MW-19S (screened from 5 to 15 feet bgs) was installed on the east side of the canal south of the former UST 25/26 area to provide delineation of the southern extent of VOCs in the shallow interval. VOCs were not detected in samples from this well. Results from borings and monitor wells in the same area indicated that there were no VOC impacts in the deeper interval.

Minor TCE impacts were observed in the purge facility area during the 2006 investigation. Low levels of petroleum hydrocarbons had been detected in samples from shallow borings and monitor wells. TCE and its degradation products were detected in the deeper interval (40 to 45 feet bgs). In subsequent sampling in 2009 and 2010, TCE and its degradation products were again detected in the 40- to 45-foot bgs interval but at lower concentrations. The highest TCE concentration was 14 µg/L in deep well AT-MW-01.

Monitor wells previously installed and sampled as part of the Building 1290 investigation were sampled again in 2010. VOCs were not detected in samples from the monitor wells around the building or in monitor wells west, north, and south of the building, thereby providing delineation of the extent of VOC impacts in the western portion of the investigation area. These results also confirmed that Building 1290 is not a source of TCE impacts at the site.

In the area of the former dry cleaner east of Building 1290, TCE and 1,1-dichloroethene (1,1-DCE) had been detected at 1.08 and 7.77 µg/L, respectively, in 1290-MW-8D during the investigation in 2007. During the same investigation, 1,1-DCE had been detected at 6.01 µg/L in 1290-MW-8S. TCE was not detected and 1,1-DCE was detected at 5.1 µg/L when well 1290-MW-8D was sampled in 2010. Chlorinated VOCs were not detected in samples taken from shallow well 1290-MW-8S in 2010. Groundwater samples were also taken in the area through temporary borings in 2006 and 2010. A DPT sample taken in 2006 south of the former dry cleaner location near the weapons cleaning facility at a depth of 44 to 46 feet bgs (1290-DPT-03) contained 2.5 µg/L of TCE. Samples were also taken with three temporary borings in the area in 2010. Screening from surface to total depth with a photo ionization detector (PID) did not result in any VOC detections. Because of the detections in 2006, samples were taken from 41 to 45 feet bgs at each boring location for laboratory analysis. TCE or another chlorinated VOC was detected at low concentrations in all three samples. TCE was detected in one sample at 1.1 µg/L. The highest chlorinated VOC concentration was 7.1 µg/L of 1,1-dichloroethane (1,1-DCA) in H17-FD2.

Monitor well pair H17-MW-17S/D was installed in 2010 to delineate the northern extent of the investigation area. Chlorinated VOCs were not detected in deep well H17-MW-17D. The only detection was 1.9 µg/L of carbon disulfide. In shallow well H17-MW-17S, the only VOC detected was chloroethane at 0.69 µg/L.

Additional investigation was conducted around the purge facility to evaluate chromium and barium detections in groundwater samples taken in 2006. Chromium was not detected above the practical quantitation limit (PQL) in any sample. Barium was detected above the PQL but below the Type 1 risk reduction standard (RRS) in samples from monitor wells AT-MW-01 and AT-MW-04 at concentrations of 28 and 37 µg/L, respectively.

Human Health Risk Assessment

The human health risk assessment for HAA-17 (former USTs 25 and 26, the purge facility, and Building 1290) evaluated the potential risks to human health by comparing the maximum detected soil and groundwater constituent concentrations with the Type 1 through 4 RRS. The potential exposure to constituents detected in sediment also was evaluated by comparing the maximum detected concentrations to the Type 1 RRS. Detected surface water concentrations were compared to Georgia in-stream standards. Finally, the vapor migration from groundwater into buildings at the site was evaluated.

The data for soil collected above groundwater were compared to the RRS. None of the maximum detected concentrations exceeded the Type 1 standards. Therefore, the derivation of Types 2 through 4 RRS was not conducted.

The shallow groundwater data were compared to the Type 1 through 4 RRS. Acetone, benzene, chloroethane, 1,1-DCE, total 1,2-DCE, cis-1,2-DCE, cis-1,3-dichloropropene, trans-1,3-dichloropropene, isopropylbenzene, methylene chloride, 1,1,2,2-tetrachloroethane, TCE, and vinyl chloride exceeded the Type 1 and Type 3 groundwater RRS. Acetone, benzene, total 1,2-DCE, cis-1,2-DCE, TCE, and vinyl chloride were detected in groundwater at a maximum concentration exceeding the Type 2 RRS. Only benzene, total 1,2-DCE, TCE, and vinyl chloride exceeded the Type 4 RRS for groundwater.

The maximum sediment concentrations were compared to the soil Type 1 RRS. The maximum sediment concentrations were all below the Type 1 soil RRS. The maximum surface water concentrations were compared to the Georgia in-stream standards, if available, or the Type 1 groundwater RRS, and were below the standard. Therefore, it is unlikely that the constituents detected in sediment and surface water were present at concentrations that would pose a risk to human health.

The current groundwater concentrations were evaluated for the vapor intrusion pathway. The maximum detected current groundwater concentrations were used in the calculations as a conservative measure. The results indicated that the risks were less than the EPD HSRA benchmark of 1×10^{-5}. The noncancer hazards were below the benchmark of 1.

Ecological Risk Assessment

The Ecological Risk Assessment consisted of a Screening Level Ecological Risk Assessment (SLERA) and Step 3a Baseline Ecological Risk Assessment (BERA) for ecological receptors at the site based on hazard quotients (HQs). An HQ less than or equal to a value of 1 indicates that adverse impacts to wildlife are considered unlikely (USEPA 2004). An HQ greater than 1 indicates that adverse effects of some kind may have occurred in the past or may occur in the future and that further analysis of potential ecological risks may be warranted.

Risks were characterized for ecological receptors at the site by considering direct contact with constituents of potential ecological concern (COPECs) in surface soil (0 to 1 foot bgs). Additional media including surface water, sediment, and groundwater were ruled out because they do not present a complete exposure pathway to ecological receptors at the site.

Overall potential ecological risks do not exist for exposure to site surface soil. All chemicals have HQs below 1. Based on this assessment, there are no ecological risks at the site and no further evaluation is required.

Conclusions

Based on the results of this and previous investigations, the following conclusions are presented:

- With one exception, the full extent of TCE in groundwater at HAA-17 is delineated horizontally and vertically. The exception is the area south of the purge facility where TCE was detected at 2.6 µg/L in deep monitor well H17-MW-18D.
- The highest TCE impacts were around the former UST 25 and 26 area. Although diffuse, the source appears centered in the area between the former location of USTs 25 and 26 and Building 1336.
- Other minor TCE and VOC impacts were detected in the purge facility area and the former dry cleaner area. These areas are upgradient of the former UST 25 and 26 area and these minor impacts are not related to the TCE detected in the former UST 25 and 26 area.
- Barium and chromium were detected in the area of the purge facility in 2006. Only barium was detected in monitor well samples in 2010. None of the concentrations exceeded the Type 1 RRS.
- The data for soil collected above the groundwater table were compared to the RRS. None of the maximum detected concentrations exceeded the Type 1 standards.
- The shallow groundwater data were compared to the Type 1 through 4 RRS. Acetone, benzene, 1,1-DCE, total 1,2-DCE, cis-1,2-DCE, trans-1,2-dichloropropene, 2-hexanone, methylene chloride, TCE, and vinyl chloride exceeded the Type 1 and Type 3 groundwater RRS. Acetone, benzene, total 1,2-DCE, 2-hexanone, TCE, and vinyl chloride were detected in groundwater at a maximum concentration exceeding the Type 2 RRS. Only benzene, TCE, and vinyl chloride exceeded the Type 4 RRS for groundwater.
- The maximum sediment and surface water concentrations were compared to the soil and groundwater Type 1 RRS, respectively. The maximum sediment concentrations were all below the Type 1 soil RRS. The maximum surface water concentrations were all below the Type 1 groundwater RRS. Therefore, it is unlikely that the constituents detected in sediment and surface water are present at concentrations that would pose a risk to human health.
- The current groundwater concentrations were evaluated for the vapor intrusion pathway. The maximum detected current groundwater concentrations were used in the calculations as a conservative measure. The results indicated that the risks

were less than the EPD HSRA benchmark of 1×10^{-5}. The noncancer hazards were well below the benchmark of 1.

- Based on the assessment of impacted areas and ecological conditions, there are no ecological risks at the site.