SECTION 2
FIELD INVESTIGATION

2.1 PROJECT OBJECTIVES

The overall goal of the project was to excavate and remove waste material and contaminated soil from the site to achieve closure under TCEQ's RRS1. To meet this goal, the following project objectives were undertaken:

- Establish criteria for closure of the SWMU B-3 soil unit;
- Determine the extent of VOCs and metals exceeding background concentrations in soil overlying bedrock at SWMU B-3;
- Determine the volume of soil to be excavated and disposed offsite during the IRA to achieve closure under RRS1;
- Excavate all waste debris and soil containing COCs above RRS1 criteria;
- Collect data from cover soil to demonstrate that no COCs are above RRS1 criteria and therefore soil is eligible for re-use as backfill and cover material for the SWMU B-3 excavation;
- Confirm sources of imported borrow soil meet background criteria;
- Verify excavation of contaminated soil to the point of clean closure through confirmation samples; and
- Characterize soils to be disposed offsite during the IRA (hazardous or nonhazardous by Toxicity Characteristic Leaching Procedure [TCLP] analysis).

2.2 FIELD ACTIONS

As outlined in the site-specific WP (**Volume 1-2, SWMU B-3**), IRA activities included site preparation, dismantling and removal of the existing SVE system, removal of cover soil and debris from the surface of the western trench, exploratory trenching, excavation of contaminated soil media, stockpiling of cover soil and waste material, waste characterization, closure confirmation sampling, and waste removal and offsite disposal. Remediation of the SWMU B-3 site began on August 28, 2002; regrading and temporary demobilization of the site was completed on November 7, 2002. Photographs documenting site activities are presented in Appendix F. The closure methodology and procedures are described in the **Environmental Encyclopedia (Volume 1-1, Section 2)**. All field activities were conducted in accordance with the approved set of work plans.

2.2.1 Site Preparation Activities

The equipment and crew were mobilized to the site on August 26, 2002. The crew installed silt fencing for sediment control, constructed stormwater diversion berms upgradient of the site to reduce run-on, and built a temporary road crossing, using an estimated 275 loose cubic yards of imported borrow soil, to provide additional access to the site. Temporary stockpile areas for clean soil and metal scrap were lined with 20-mil plastic, surrounded with silt fencing, and covered with Visqueen to provide protection during rain events. Containment cells were

prepared for characterizing and staging contaminated media removed from SWMU B-3 as described below.

Within the former SWMU B-10 area, located adjacent to SWMU B-3, a Phosphate Induced Metal Stabilization (PIMS) treatability study area was used to stockpile contaminated media generated from removal actions at SWMU B-3. The former PIMS area included a holding area (i.e., holding cells), which was constructed from imported low-permeability clay and lined with an impermeable high-density polyethylene (HDPE) liner. Between August 27 and 30, 2002, approximately 642 loose cubic yards of soil treated with phosphate was removed from the bermed containment cells located at SWMU B-10 and transferred to SWMU B-20, its original source. An additional lined bermed area for stockpiling wastes was also constructed during the transfer of phosphate-treated soils. The bermed cells were surrounded with silt fencing and covered with plastic to provide protection during rain events. The cells were then designated to contain materials suspected of being hazardous, Class 1 nonhazardous, and/or Class 2 nonhazardous material.

2.2.2 Removal of the Existing SVE System

The existing SVE system in the area of the west trench was dismantled and removed from the site. CSSA personnel disconnected the power to the SVE system, and unhooked the electrical utilities so that all underground electrical utilities were disabled. The blower was salvaged and aboveground piping was removed. Pin flags were placed to mark VOC hot spots determined from previous investigations.

2.2.3 Removal of Cover Material

Once the SVE system was removed, the upper 1–2 feet of soil cover was stripped from the surface of the western trench area and stockpiled based on field assessment as described in Section 2.2.4. Between September 4 and 26, 2002, approximately 5,556 loose cubic yards of cover soil free of debris was removed and staged in the clean soil stockpile. The stockpiled cover soil was tested on September 9, 2002, to demonstrate its suitability for use as backfill or cover soil at the eastern trench.

2.2.4 Soil and Waste Material Stockpiles

Materials excavated from SWMU B-3 were segregated into separate clean fill stockpiles or within the lined cells near SWMU B-3 (formerly SWMU B-10) based on preliminary analytical data and field screening assessments. Cover materials free of general debris and COCs greater than RRS1 criteria were placed in the clean fill stockpile and metal debris that was easily segregated and deemed recyclable was staged in a scrap stockpile. Waste materials identified visually, such as ash or burned materials, and soil with photoionization detector/flame ionization detector (PID/FID) readings greater than 5 parts per million (ppm) were segregated as Class 1 nonhazardous waste/media within a lined cell. Soil removed from the east disposal trench that was relatively free of waste materials was segregated into the Class 2 nonhazardous media cell. Drums of unknown material, some leaking, were encountered during excavation. These drums were overpacked and segregated into a lined bermed area designated for hazardous waste, along with associated soil material.

2.2.5 Analytical Program

Columbia Analytical Services, Redding, California, analyzed the SWMU B-3 samples in accordance with the analytical methods and parameters specified in the site-specific WP **(Volume 1-4, Sampling and Analysis Plan Addendum and AFCEE QAPP)**. Analytical methods are taken from the latest revision of the *EPA SW-846, Test Methods for Evaluating Solid Waste, Third Edition and Updates* (1986). In addition, Severn Trent laboratories, Corpus Christi, Texas, analyzed the samples for TPH in accordance with TCEQ Method 1005, Revision 03, June 1, 2001. The analytical methods used for the SWMU B-3 IRA are listed below:

Analyte	Method
VOCs	EPA Method 8260B
Semivolatile organic compounds (SVOCs)	EPA Method 8270C
COC metals—arsenic, barium, cadmium, chromium, copper, lead, nickel, zinc, mercury	EPA Methods 6010B/7471A
TPH	TCEQ Method 1005, Revision 03, June 1, 2001
TCLP VOCs—benzene, chlorobenzene, carbon tetrachloride, 1,2-dichloroethane, 1,1-dichloroethene, methyl ethyl ketone, PCE, and TCE	EPA Methods 1311/8260B
TCLP Texas List metals—antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, and silver	EPA Methods 1311/6010B/7470A

2.2.6 Sampling Procedures

All samples were collected, stored, handled, labeled, and transported in accordance with the procedures described in the CSSA SAP presented in the **Environmental Encyclopedia (Volume 1-4, Sampling Analysis Plan (SAP) for SWMU Closures at Camp Stanley Storage Activity, February 1996)**. Applicable quality control (QC) samples were collected during sampling activities. Sample locations for closure certification were surveyed using a global positional system following the procedures in the CSSA SAP.

2.2.7 Quality Assurance/Quality Control

Laboratory QC samples associated with the IRA sample analyses included method blanks, laboratory control samples, matrix spike samples, and laboratory duplicate samples. Field QC samples collected in support of the SWMU B-3 IRA included field duplicate samples, matrix spike samples, equipment rinse blank samples to ensure adequate decontamination of sampling equipment, and trip blank samples associated with the VOC analyses.

2.2.8 Borrow Source Sample

An estimated 600 loose cubic yards of borrow soil was purchased from Waste Management, Inc. for use as backfill or cover soil. One grab sample from the Covel Gardens source was collected on August 28, 2002, and analyzed for VOCs, SVOCs, COC metals, and mercury prior to delivery to the post. The sample was collected from a random location in the borrow area using surface soil sample collection procedures described in the CSSA SAP. Only metals were detected in the borrow soil at concentrations below the background values.

2.2.9 Waste Characterization of Stockpiled Material

Samples were collected from the clean soil stockpile, Class 1 and Class 2 media stockpiles, and overpacked drum as described in the following sections and sent to the offsite laboratories for analysis.

2.2.9.1 Clean Fill Stockpile

The clean fill stockpile was sampled a minimum of once every 1,000 loose cubic yards. Analytical results were compared to background criteria to demonstrate the suitability of the material as backfill or cover soil. Four soil samples and one duplicate sample (CSCS-1 through CSCS-5) collected from the "cover" soil stockpile on September 9, 2002, were analyzed for VOCs and COC metals. One "cover" soil composite sample (CSCS composite) was analyzed for SVOCs and mercury. In addition, five cover soil samples were collected on September 5, 2002, from exploratory trenches excavated across the west trench. Three cover soil samples (CSB3-WT-1 [0–2 feet], CSB3-WT-2 [0–2 feet], CSB3-WT-3 [2–4 feet]) were analyzed for VOCs and COC metals, and two samples (CSB3-WT-3 [2–4 feet and 4–6 feet]) were analyzed for SVOCs. Based on the initial sampling results, five grab soil samples (CSCS-6 through CSCS-10) were collected from the cover soil stockpile on October 11, 2002, and analyzed for zinc and mercury to determine representative concentrations of these metals for comparison to site background levels

2.2.9.2 Class 1 and Class 2 Nonhazardous Waste Stockpiles

In accordance with the project-specific SAP, two grab samples each were colleted from the suspected nonhazardous Class 1 and Class 2 media stockpiles and analyzed for TCLP VOCs, TCLP Texas List metals, and TPH to confirm the waste characterization prior to shipment and disposal offpost. Samples CS-B3-ET-1 and ET-2 were collected on September 24. 2002, from the Class 1 and Class 2 stockpiles, respectively. Sample CS-B3-ET-WC03 was collected from the Class 2 stockpile on September 30, and ET-WC04 was collected from the Class 1 stockpile on October 2, 2002.

Liquid sample CS-B3-ET-Drum was collected on September 24, 2002, from an overpacked drum recovered from the east trench. The sample was analyzed for VOCs, COC metals, and TPH to characterize the waste for disposal offpost. In addition, one waste profile sample was collected from impacted soil media staged in the Class 1 cell for TCLP VOC, metals and TPH analysis.

2.2.10 Waste Characterization—West Trench

Waste characterization samples were collected in the western disposal area on two sampling dates. Nine soil samples (designated WT-1, -2, -3) were collected on September 5, 2002, from three exploratory trenches excavated across the western disposal area. Eighteen soil samples (designated "A," "B," "C," and "D") were collected from four sub-trenches identified based on preliminary field investigation. Samples were analyzed for TCLP VOCs, TCLP Texas List metals, and TPH to characterize the trench media. Sample locations are shown on **Figure SWMUB3-2**. Appendix D describes the IRA field investigation actions and results at the western disposal area.

2.2.11 Waste Excavation and Soil Sampling—East Trench

On September 16 and 17, 2002, the contents and contaminated soil in the "Y"-shaped east disposal trench were excavated to bedrock and staged in containment cells. On the first day of excavation, four drums along with impacted soils were encountered in an area associated with very high volatiles content (FID sustained reading near drums of 300 to 400 ppm; greater than 1,000 ppm at drum). Two of these drums contained an unknown liquid and one drum was leaking. Three drums were overpacked and staged/placed along with impacted soils in a lined hazardous waste staging cell. A fourth, crushed drum was wrapped in plastic and staged in the same cell.

On September 17, 2002, samples were collected at 100-foot intervals from the sidewalls of the excavation for closure confirmation. Because of the shape of the disposal trench, the number of samples required to demonstrate clean closure was greater than what was anticipated and specified in the SAP Addendum. The sample locations are shown on **Figure SWMUB3-3.** Twelve grab samples (CSB3 ET-1 [north end], CSB3 ET-3 through ET-5 [west side], CSB3 ET-7 and ET-9 [southwest leg], CSB3 ET-10 and ET-11 [southeast leg], CSB3 ET-12 through ET-14 [east side], and CSB3 ET-16 [excavation bottom]) were analyzed for VOCs and COC metals; four composite samples (CSB3 ET-2 [northern end], CSB3 ET-6 [western side], CSB3 ET-8 [southern end], and CSB3 ET-15 [eastern side]) were analyzed for SVOCs. The closure confirmation sample results were above background criteria at several locations (samples CSB3 ET-1, CSB3 ET-3, CSB3 ET-11, CSB3 ET-13, CSB3 ET-14, and CSB3 ET-16) and over-excavation was required.

Excavation conducted on September 24 and 25, 2002, removed impacted soil encountered between the east and west trenches and from the east trench's north and east sides and southeastern leg. The material was stockpiled in the nonhazardous staging cell. The east wall was cut back 3 feet down to bedrock beginning at location CSB3 ET-13 and tapered back to locations CSB3 ET-14 and ET-12. Additional closure confirmation samples were collected from the east trench sidewalls on September 25, 2002 (**Figure SWMUB3-3**). Sample CSB3 ET-17 (subsequent to CSB3 ET-1) was analyzed for PCE and TCE; CSB3 ET-18 (subsequent to CSB3 ET-13) was analyzed for PCE; and CSB3 ET-19 (subsequent to CSB3 ET-11) was analyzed for copper. Analytical results indicated that the concentration of constituents in samples CSB3ET-18 and CSB3ET-19 achieved clean closure criteria; however, concentrations of PCE exceeded background in sample CSB3 ET-17, collected from the northern end of the excavation. Partial backfilling of the east trench (southwest portion) with soil from the clean fill stockpile began on the same day.

Over-excavation of the northern portion of the east trench resumed on September 30, progressing from location CSB3 ET-14 to the north. Excavation of the western sidewall (under the road) proceeded to a total depth of 13 feet on October 1, 2002. The bedrock exposed during excavation activities at the western sidewall was stained black and the soil exhibited an odor. On October 2, 2002, four sidewall closure confirmation samples were collected (**Figure SWMUB3-3).** Sample CSB3 ET-20 (subsequent to CSB3 ET-14) and samples CSB3 ET-21 and CSB3 ET-23 (subsequent to CSB3ET-3) were analyzed for PCE and TCE; sample CSB3 ET-22

(subsequent to composite sample CSB3 ET-6) was analyzed for SVOCs only. All parameters analyzed in these samples achieved closure criteria.

Based on the analytical results for sample CSB3 ET-17, additional over-excavation was conducted from October 8 to 31, 2002, at the northern end of the east trench. One closure confirmation sample, CSB3 ET-24, was collected at a location 5 feet to the north of ET-17 and analyzed for PCE and TCE. Although TCE was not detected in this sample, the PCE detection exceeded the background criteria. Following additional over-excavation of the northern sidewall, closure confirmation sample CSB3 ET-25 was collected on October 17, 2002, and analyzed for PCE and TCE. Analytical results indicated this sample achieved clean closure criteria. The final dimensions of the overexcavated area measured 33 feet by 5 feet, centered on sample location E-17, where the average depth to bedrock in this area was approximately 2 feet. Additional soil was removed in a wedge that extended 6 feet to the north of sample location CSB3 ET-24 (sample location CSB3 ET-25) and tapered back to the existing sidewalls. The average depth to bedrock in this area was between 1 and 1.5 feet.

On November 1, 2002, the remaining open excavation at the northern end of the east trench was backfilled with soil from the clean soil stockpile. Approximately 132 loads (1,584 loose cubic yards) of clean fill were used as backfill. The remainder of the soil from the clean soil stockpile was used to regrade the site.

2.2.12 Surveying

The limits of deep excavation, sample locations for closure certification, and topographic features were surveyed by Baker Surveying and Engineering, Marion, Texas. The exploratory trenches and waste characterization samples at the west trench were surveyed using a global position system following the procedures in the CSSA SAP.

2.2.13 Waste Handling and Demobilization

The Waste Management Covel Gardens facility was selected to receive the nonhazardous waste, and the Onyx Port Arthur facility received the hazardous waste/media from the site. Due to a lack of generator's knowledge regarding how the media became impacted with PCE or TCE, listing of the impacted media was deemed inappropriate. Therefore, due to the toxicity characteristics identified by TCLP analytical results, the waste/media was classified as hazardous with EPA waste codes D039—PCE and D040—TCE. A total of 696 cubic yards (916 tons) of hazardous waste/media was shipped to the Onyx Port Arthur facility for incineration. A total of 1,242 cubic yards of Class 1/Class 2 nonhazardous waste was shipped to the Covel Gardens facility for disposal. Waste profile data and waste disposal documentation are provided in Appendix E.

Site grading and temporary demobilization of the site were conducted between November 4 through 7, 2002. The temporary access roads were closed, office facilities were removed, and the liner from the hazardous stockpile area was removed and disposed off-post as Class 2 nonhazardous waste. Metal debris was appropriately recycled. On November 14, 2002, the heavy equipment was decontaminated and demobilized from the site.

2.3 RESULTS AND COMPARISONS

2.3.1 Borrow Source Sample

One grab sample was collected from the Waste Management, Inc. Covel Gardens borrow source and analyzed for VOCs, SVOCs, COC metals, and mercury as described in Section 2.2.8. The data were compared to the CSSA background criteria to determine the suitability of the material as backfill. The analytical results confirmed the borrow source material achieved background criteria. Analytical results reported for the borrow source sample are presented in **Table SWMUB3-1**. A complete list of analytical results is included in Appendix A.

2.3.2 Waste Characterization of Stockpiled Material

2.3.2.1 Clean Fill Stockpile

Soil staged in the clean fill stockpile was sampled on September 9, 2002, to determine its potential use as backfill and cover soil. Four soil samples were analyzed for VOCs and COC metals and one composite sample were analyzed for SVOCs and mercury as described in Section 2.2.9. In addition, five cover soil samples were collected on September 5, 2002, from exploratory trenches excavated in the western disposal area. Three cover soil samples were analyzed for VOCs and COC metals and two cover soil samples were analyzed for SVOCs. Analytical results reported for backfill certification are summarized in **Table SWMUB3-1**. A complete list of analytical results is included in Appendix A.

Analytical results indicated that the upper 6 feet of the clean soil stockpile achieved background criteria. TCE concentrations in sample CSCS-3 and zinc concentrations detected in samples CSCS-1, CSCS-3, and CSCS-5 slightly exceeded background. The composite sample contained mercury concentrations exceeding background. The soil material that exceeded background was segregated from the stockpile. Five samples were collected on October 11 from the clean fill stockpile and analyzed for zinc and mercury. Zinc concentrations reported in one sample (CSCS-6) slightly exceeded the background concentration. On October 18, 2002, soil in the vicinity of sample CSCS-6 was isolated with a barricade that prevented its use as backfill and cover soil pending offsite disposal. The remainder of the clean fill stockpile was used as backfill for the east trench excavation.

2.3.2.2 Class 1 and Class 2 Nonhazardous Waste Stockpiles

The Class 1 and Class 2 nonhazardous media stockpiles excavated from the east trench were sampled in September and October 2002 to confirm the waste characterization for offsite disposal. The waste characterization samples were analyzed for TCLP VOCs, TCLP Texas List metals, and TPH as described in Section 2.2.9. In addition, a sample of the liquid contents from the drum removed during excavation of the east trench was analyzed for VOCs, SVOCs, COC metals, and TPH. Analytical results reported for the Class 1 and Class 2 stockpiles and liquid drum contents are summarized in **Table SWMUB3-2.** A complete list of analytical results is included in Appendix A.

Analytical results for characterization sample CS-B3-ET-1 from the Class 1 media stockpile indicated the segregated impacted soil was D039/D040 hazardous waste based on PCE and TCE concentrations exceeding 40 Code of Federal Regulations (CFR) Part 261 hazardous criteria (0.5 mg/L and 0.7 mg/L, respectively). The contents of the drum were also characterized as D039/D040 hazardous waste, due to exceedances of the 40 CFR characteristic hazardous criteria for PCE and TCE. Analytical results for sample CS-B3-WC04 collected from the unimpacted Class 1 soil on October 2 indicated PCE and TCE concentrations were below the 40 CFR Part 261 hazardous criteria. Based on the waste characterization results for the Class 1 media stockpile and overpacked drum, a total of 696 cubic yards (916 tons) of hazardous waste was identified for offsite incineration.

Characterization of samples CS-B3-ET-2 and CS-B3-WC03, collected from the Class 2 stockpile, confirmed the classification as Class 2 nonhazardous waste. None of the constituents exceeded federal characteristic hazardous or Class 1 nonhazardous criteria per 30 TAC 335 subchapter R.

2.3.3 Waste Excavation and Soil Sampling—East Trench

Excavation was conducted during September and October 2002 to remove waste/contaminated media from the east trench. Twenty-five closure confirmation samples, including one duplicate, were collected as described in Section 2.2.11. **Table SWMUB3-3** presents the detected constituents for the initial confirmation sampling event conducted on September 17, 2002, and additional samples collected after over-excavation was performed on the eastern, western, and northern portions of the trench. Analytical results indicated that all affected soil media and waste were effectively removed from the eastern disposal trench. On October 31, 2002, excavation of the east trench was completed, and the trench was backfilled with soil from the clean fill stockpile.

Approximately 1,938 cubic yards of soil excavated from the east trench was staged in the containment cells designated for Class 1, Class 2, and hazardous media. An estimated 696 cubic yards (916 tons) of hazardous waste/media was shipped to the Onyx Port Arthur facility for incineration. An estimated 1,242 cubic yards of Class 1 and Class 2 nonhazardous waste was shipped to the Covel Gardens facility for disposal.